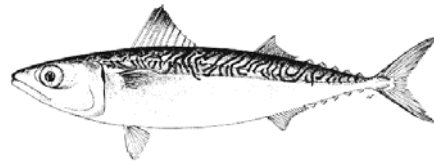


**TERMS OF REFERENCE
FOR A
COASTAL PELAGIC SPECIES
STOCK ASSESSMENT REVIEW PROCESS**

**PUBLIC REVIEW DRAFT
PLEASE DO NOT CITE**



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Introduction

The purpose of this document is to convey expectations and responsibilities for various participants in the coastal pelagic species (CPS) stock assessment review (STAR) process, and to help the Pacific Fishery Management Council (Council) family and others understand the process. Parties involved in the CPS STAR process are the National Marine Fisheries Service (NMFS); state agencies; the Council and its advisors, including the Scientific and Statistical Committee (SSC), Coastal Pelagic Species Management Team (CPSMT), Coastal Pelagic Species Advisory Subpanel (CPSAS), and Council staff; and ~~interested persons~~ the public. The STAR process is a key element in an overall process designed to make timely use of new fishery and survey data, to analyze and understand these data as completely as possible, to provide opportunity for public comment, and to assure the results are as accurate and error-free as possible. The STAR process is designed to assist in balancing these somewhat conflicting goals of timeliness, completeness, and openness.

Stock assessments for Pacific sardine and Pacific mackerel are conducted annually to assess the abundance, trends, and appropriate harvest levels for these species^{1/}. Assessments^{2/} use statistical population models to simultaneously analyze and integrate a combination of survey, fishery, and biological data. Since 2004, the CPS assessments have undergone an assessment cycle and peer review process. There are two distinct types of assessments which are subject to different review procedures. “Full assessments” involve a re-examination of the underlying assumptions, data, and model parameters used to assess the stock, while “update assessments” maintain the model structure of the previous full assessment and are generally restricted to the addition of new data that have become available since the last assessment.

Full assessments for Pacific sardine and Pacific mackerel typically occur every third year, necessitating a three-year STAR Panel cycle. If entirely new, structurally changed or significantly revised assessments are developed, a STAR Panel must be convened to review the assessment prior to its use for setting harvest guidelines (HG). Full stock assessment reports are developed and distributed following each STAR Panel review. Updated assessments are conducted during interim years and involve a less formal review by the CPSMT and the SSC. Details from interim-year assessments are documented in executive summaries.

1/ Stock assessments are conducted for species "actively" managed under the Coastal Pelagic Species Fishery Management Plan (FMP). That is, fisheries for Pacific sardine and Pacific mackerel are actively managed via annual harvest guidelines and management specifications, which are based on current stock assessment information. Jack mackerel, northern anchovy, and market squid are "monitored" species under the FMP. Annual landings of these species are monitored and reported in the annual Stock Assessment and Fishery Evaluation (SAFE) report, but harvest guidelines are not set for them.

2/ In this document, the term “stock assessment” includes activities, analyses and reports, beginning with data collection and continuing through to scientific recommendations and information presented to the Council and its advisors. Stock assessments provide the fundamental basis for management decisions on CPS harvests. To best serve that purpose, stock assessments should attempt to identify and quantify major uncertainties, balance realism and parsimony, and make best use of the available data.

STAR Goals and Objectives

The goals and objectives for the CPS assessment and review process are to:

1. Ensure that CPS stock assessments provide the kinds and quality of information required by all members of the Council family.
2. Satisfy the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and other legal requirements.
3. Provide a well-defined, Council-oriented process that ensures CPS stock assessments are the "best available" scientific information, and facilitates use of the information by the Council. In this context, "well-defined" means with a detailed calendar, explicit responsibilities for all participants, and specified outcomes and reports.
4. Provide an independent external review of CPS stock assessment work.
5. Increase understanding and acceptance of CPS stock assessment and review work by all members of the Council family.
6. Identify research needed to improve assessments, reviews, and fishery management in the future.
7. Use assessment and review resources effectively and efficiently.

Responsibilities

Shared Responsibilities

All parties have a stake in assuring adequate technical review of stock assessments. NMFS must determine that the best scientific advice has been used when it approves fishery management recommendations made by the Council. The Council uses advice from the SSC to determine whether the information on which it will base its recommendation is the "best available" scientific advice. Fishery managers and scientists providing technical documents to the Council for use in management need to ensure the work is technically correct.

Program reviews, in-depth external reviews, and peer-reviewed scientific publications are used by federal and state agencies to provide quality assurance for the basic scientific methods used to produce stock assessments. However, the time-frame for this sort of review is not suited to the routine examination of assessments that are, generally, the primary basis for a harvest recommendation. The review of current stock assessments requires a routine, dedicated effort that simultaneously meets the needs of NMFS, the Council, and others. Leadership, in the context of the stock assessment review process for CPS species, means consulting with all interested parties to plan, prepare terms of reference, and develop a calendar of events and a list of deliverables. Coordination means organizing and carrying out review meetings, distributing documents in a timely fashion, and making sure that assessments and reviews are completed according to plan. Leadership and coordination both involve costs, both monetary and time, which have not been calculated, but are likely substantial.

The Council and NMFS share primary responsibility for a successful STAR process. The Council will sponsor the process and involve its standing advisory committees, especially the SSC. The chair of the SSC CPS subcommittee will coordinate, oversee, and facilitate the process. Together NMFS and the Council will consult with all interested parties to plan, prepare terms of reference,

and develop a calendar of events and a list of deliverables. NMFS and the Council will share fiscal and logistical responsibilities.

The CPS STAR process is sponsored by the Council, because the Federal Advisory Committee Act (FACA) limits the ability of 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.

CPS STAR Coordination

The SSC CPS subcommittee chair will work with the Council, Council staff, other agencies, groups or interested persons that carry out assessment work to coordinate and organize Stock Assessment Team (STAT) Teams, STAR Panels, and reviews of assessment updates. The objective is to make sure that work is carried out in a timely fashion according to the calendar and terms of reference.

The SSC CPS Subcommittee chair, in consultation with the SSC and the Southwest Fisheries Science Center (SWFSC), will coordinate the selection ([including number](#)) of external reviewers. Criteria for reviewer qualifications, nomination, and selection will be established by the SWFSC in consultation with the SSC, and will be based principally on a candidate's knowledge of stock assessments and familiarity with West Coast CPS fisheries. The public is welcome to nominate qualified reviewers. The majority of panelists should be experienced stock assessment scientists, i.e., individuals who have conducted stock assessments using current methods (generally statistical age- and or length-structured assessment models). It is, however, recognized that the pool of qualified reviewers is limited, and that staffing of STAR panels is subject to constraints that may make it difficult to achieve the ideal.

Following any modifications to the stock assessments resulting from STAR Panel reviews and prior to distribution of stock assessment documents and STAR Panel reports, the SSC CPS Subcommittee chair will ensure that the stock assessments and panel reports are reviewed for consistency with the terms of reference, especially completeness. If inconsistencies are identified, authors will be requested to make appropriate revisions in time to meet the deadline for distributing documents for the CPSMT meeting at which HG recommendations are developed.

Individuals (employed by NMFS, state agencies, or other entities) that conduct assessments or technical work in connection with CPS stock assessments are responsible for ensuring their work is technically sound and complete. The Council's review process is the principal means for review of complete stock assessments, although additional in-depth technical review of methods and data is desirable. Stock assessments must be completed and reviewed in full accordance with the terms of reference (Appendices A and B).

CPSMT Responsibilities

The CPSMT is responsible for identifying and evaluating potential management actions based on the best available scientific information. In particular, the CPSMT makes HG recommendations to the Council based on agreed control rules. The CPSMT will use stock assessments, STAR Panel reports, and other information in making their HG recommendations. Preliminary HG recommendations will be developed by the CPSMT according to the management process defined in Council Operating Procedures (COP-9). A representative of the CPSMT will be appointed by the CPSMT Chair and will serve as a liaison to each assessment update review meeting (in most cases, the entire CPSMT participates in assessment update reviews) or STAR Panel, and will participate in review discussions. The CPSMT representative will not serve as a member of a STAR Panel. The CPSMT representative should be prepared to advise the STAT Team and STAR panel on changes in fishing regulations or practices that may influence data used in the assessment and the nature of the fishery in the future. The CPSMT will not seek revision or additional review of stock assessments after they have been reviewed by a STAR Panel. The CPSMT chair will communicate any unresolved issues to the SSC for consideration. Successful separation of scientific (i.e., STAT Team and STAR Panels) from management (i.e., CPSMT) work depends on stock assessment documents and STAR reviews being completed by the time the CPSMT meets to discuss preliminary HG levels. -However, the CPSMT can request additional model projections, based on reviewed model scenarios, to develop a full evaluation of potential management actions.

CPSAS Responsibilities

The chair of the CPSAS will appoint a representative to track each assessment and participate at an assessment update review meeting or STAR Panel meeting. The CPSAS representative will serve as an advisor to the STAT Team and STAR Panel. It is especially important that the CPSAS representative be included in the STAT Team's discussion and review of all the data sources being used in the assessment, prior to development of the stock assessment model. This coordination should first occur via telephone or email. Council funded travel for coordination between the STAT Team and the CPSAS representative requires advanced approval by the Council or the Council Executive Director. It is the responsibility of the CPSAS representative to ensure that industry concerns about the adequacy of data being used by the STAT Team are expressed at an early stage in the process. The CPSAS representative will participate in review discussions as an advisor to the STAR Panel, in the same capacity as the CPSMT advisor.

The CPSAS representative will attend the CPSMT meeting at which preliminary HG recommendations are developed. The CPSAS representative will also attend subsequent CPSMT, Council, and other necessary meetings.

The CPSAS representative may provide appropriate data and advice to the assessment update review meeting, STAR Panel, and CPSMT, and will report to the CPSAS on STAR Panel and other meeting proceedings.

SSC Responsibilities

The SSC will participate in the stock assessment review process and will provide the CPSMT and Council with technical advice related to stock assessments and the review process.

The SSC will assign at least two (ideally three) members from its CPS subcommittee to each assessment update review meeting. The SSC representatives at the review meeting will prepare a meeting summary and present it to the full SSC at its next regular meeting. The SSC will review any additional analytical work required or carried out by the CPSMT after the stock assessments have been reviewed at the update review meeting. In addition, the SSC will review and advise the CPSMT and Council on harvest guideline recommendations.

The SSC will assign at least one member from its CPS Subcommittee to each STAR Panel for reviewing full assessments. This member will chair the STAR Panel and will be expected to attend the assigned STAR Panel meeting, the CPSMT meeting at which HG recommendations are made, and the Council meetings when the STAR Panel reviewed stock assessment is discussed. The SSC representative on the STAR Panel will present the STAR Panel report at CPSMT, SSC, and Council meetings. The SSC representative will communicate SSC comments or questions to the CPSMT. The SSC will review any additional analytical work on any of the stock assessments required or carried out by the CPSMT after the stock assessments have been reviewed by the STAR Panels.

The SSC, during their normally scheduled meetings, will serve as arbitrator to resolve disagreements between the STAT Team, the CPS subcommittee, STAR Panel, the CPSAS or CPSMT. The STAT Team and the STAR Panel (CPS subcommittee in the case of update reviews) may disagree on technical issues regarding an assessment. In this case, the stock assessment report must include a point-by-point response by the STAT Team to each of the STAR Panel (CPS subcommittee) recommendations. Estimates and projections representing all sides of the disagreement need to be presented, reviewed, and commented on by the SSC.

Council Staff Responsibilities

A Council staff officer will be assigned to coordinate, monitor and document the STAR process. The Council staff officer will be responsible for timely issuance of meeting notices and distribution of stock assessment documents, stock summaries, meeting minutes, and other appropriate documents. The Council staff officer will monitor compliance with the most recent version of the Terms of Reference for the ~~2009~~ CPS STAR process adopted by the Council. The Council staff officer will coordinate materials and presentations for Council meetings relevant to final Council adoption of CPS stock assessments. Council staff will also collect and maintain file copies of reports from each STAR Panel (containing items specified in the STAR Panel Terms of Reference), the outline for CPS stock assessment documents, Scientific and Statistical Committee (SSC), Coastal Pelagic Species Management Team (CPSMT), and Coastal Pelagic Species Advisory Subpanel (CPSAS) comments and reports, letters from the public, and any other relevant information. At a minimum, the stock assessments (Stock Assessment Team (STAT) reports, STAR Panel reports, and stock summaries) should be published and distributed in the Council annual stock assessment and fishery evaluation (SAFE) document.

A primary role for the Council staff officer assigned to the STAR process will be to monitor STAR Panel and SSC activities to ensure compliance with these Terms of Reference. The Council staff officer will attend all STAR Panels to ensure continuity and adherence to these Terms of Reference. The Council staff officer will identify inconsistencies with the Terms of Reference that occur during STAR Panels and work with the STAR Panel chair to develop solutions and to correct them. The Council staff officer will coordinate with the STAR Panel chair and the National Marine Fisheries Service (NMFS) in a review of STAT documents to assure they are received on time, are consistent with the Terms of Reference, and are complete. The Council staff officer will review the Executive Summary for consistency with the Terms of Reference. If the STAT materials are obviously not in compliance with the Terms of Reference, the Council staff officer will return the materials to STAT authors with a list of deficiencies, a notice that the deadline has expired, or both. Inconsistencies will be identified and the authors requested to make appropriate revisions in time for the appropriate SSC, CPSMT, and CPSAS meetings, when an assessment is considered. The Council staff officer will also coordinate and monitor SSC review of stock assessments and STAR Panel reports to ensure compliance with these Terms of Reference and the independent review requirements of [Council Operating Procedure COP 4](#).

National Marine Fisheries Service Responsibilities

NMFS Southwest Fisheries Science Center (SWFSC) will provide staff to work with the Council, other agencies, groups, or interested persons that carry out assessment work to assist in organizing the STAT and STAR Panels. Since most assessments are conducted by NMFS STATs, the SWFSC will work with assessment authors to develop a draft list of assessments to be considered by the Council. The SWFSC also will develop a draft STAR Panel schedule for review by the Council. The SWFSC will identify independent STAR panelists following criteria for reviewer qualifications. –The costs associated with these reviewers will be borne by NOAA Fisheries. The SWFSC will coordinate with the STAT 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 STAR Panel chair.

Following any modifications to the stock assessments resulting from STAR Panel reviews and prior to SSC review, the SWFSC will assist the Council staff officer in reviewing the Executive Summary for consistency with the Terms of Reference. Inconsistencies will be identified and the authors requested to make appropriate revisions in time for the appropriate SSC, CPSMT, and CPSAS meetings.

Terms of Reference for STAR Panels and Their Meetings

The principal responsibilities of the STAR Panel are to review stock assessment documents, data inputs, analytical models, and to provide complete STAR Panel reports. [The schedule and goals of the 2009 STAR panel cycle is provided in Appendix C](#). The objective of a STAR Panel review is to complete a detailed evaluation of the results of a stock assessment, which puts the Panel in a good position to advance the best available scientific information to the Council. The STAR Panel's work includes:

1. reviewing draft stock assessment documents and any other pertinent information (e.g.; previous assessments and STAR Panel reports, if available);
2. working with STAT Teams to ensure assessments are reviewed as needed;
3. documenting meeting discussions; and
4. reviewing summaries of stock status (prepared by STAT Teams) for inclusion in the SAFE document.

STAR Panels normally include an SSC chair, at least one "external" member (i.e., outside the Council family and not involved in management or assessment of West Coast CPS, typically designated by the Center for Independent Experts [CIE]), and ~~one~~ two additional members. The total number of STAR Panel members should be at least " $n+3$ " where n is the number of stock assessments and " 3 " counts the chair and external reviewer(s). Occasionally, STAR Panels are charged with the review of matters associated with, but distinct from stock assessments (i.e. survey methodology or sampling designs). In these circumstances additional reviewers with specific expertise may be warranted.

In addition to Panel members, STAR meetings will include CPSMT and CPSAS advisory representatives with responsibilities as laid out in their terms of reference. STAR Panels normally meet for one week. The number of assessments reviewed per Panel should not exceed two.

The STAR Panel chair is responsible for: 1) developing an agenda, 2) ensuring that STAR Panel members at STAT Teams follow the Terms of Reference, 3) participating in the review of the assessment, 4) guiding the STAR Panel and STAT Team to mutually agreeable solutions, 5) coordinating review of final assessment documents, and 6) providing Council staff with a camera ready and suitable electronic version of the Panel's report for inclusion in the annual SAFE report.

The STAR Panel, STAT Team, the CPSMT and CPSAS representatives, and the publically interested parties are legitimate meeting participants that must should be accommodated in discussions. It is the STAR Panel chair's responsibility to manage discussions and public comment so that work can be completed.

The STAR Panel is responsible for determining if a stock assessment document is sufficiently complete according to Appendix A. It is the Panel's responsibility to identify assessments that cannot be reviewed or completed for any reason. The Panel's decision that an assessment is complete should be made by consensus. If a Panel cannot reach agreement, then the nature of the disagreement must be described in the Panels' report.

The STAR Panel's terms of reference solely concern technical aspects of stock assessment work. It is therefore important that the Panel strive for a risk neutral perspective in its reports and deliberations. Assessment results based on model scenarios that have a flawed technical basis, or are questionable on other grounds, should be identified by the Panel and excluded from the set upon which management advice is to be developed. It is recognized that a broad range of results should be reported to better define the scope of the accepted model results. The STAR Panel should comment on the degree to which the accepted model scenarios describe and quantify the major sources of uncertainty Confidence intervals of indices and model outputs, as well as other measures of

uncertainty that could affect management decisions, should be provided in completed stock assessments and the reports prepared by STAR Panels.

Recommendations and requests to the STAT Team for additional or revised analyses must be clear, explicit, and in writing. A written summary of discussion on significant technical points and lists of all STAR Panel recommendations and requests to the STAT Team are required in the STAR Panel's report. This should be completed (at least in draft form) prior to the end of the meeting. It is the chair and Panel's responsibility to carry out any follow-up review ~~of (?)~~ work that is required.

The STAR Panel's primary duty is to conduct a peer review of an assessment that is presented by a STAT Team; STAR Panel meetings are not workshops. In the course of this review, the Panel may ask for a reasonable number of ~~sensitivity-additional~~ runs, ~~additional~~ ~~further~~ details of existing assessments, or similar items from the STAT team. It would not be unusual for this evaluation to result in a change to the initial base model, provided both the STAR Panel and the STAT Team agree. The STAR Panels are expected to be judicious in their requests of the STAT Teams, recognizing that some issues uncovered during review are best flagged as research priorities, and dealt with more effectively and comprehensively between assessments. The STAR Panel may also request additional analysis based on an alternative approach. However, the STAR Panel is not authorized to conduct an alternative assessment representing its own views that are distinct from those of the STAT Team, nor can it impose an alternative assessment on the STAT Team. Similarly, 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 an assessment is inadequate, it should document and report that opinion and, in addition, suggest remedial measures that could be taken by the STAT Team to rectify whatever perceived shortcomings may exist.

STAT Teams and STAR Panels are required to make a good-faith attempt to resolve any areas of disagreement during the meeting. Occasionally, fundamental differences of opinion remain between the STAR Panel and STAT Team that cannot be resolved by discussion. In such cases, the STAR Panel must document the areas of disagreement in its report. In exceptional circumstances, the STAT Team 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 STAR Panel to prepare a rebuttal. These documents will then be appended to STAR Panel report as part of the record of the review meeting. The SSC will then review all information pertaining to the dispute, and issue its recommendation.

Additional analyses required in the stock assessment should be completed during the STAR Panel meeting. If follow-up work by the STAT Team is required after the review meeting, then it is the Panel's responsibility to track STAT Team progress ~~and potentially revise~~ ~~possibly revise~~ ~~the scope of the request(s) to fit~~ ~~given the available time~~. ~~In particular, the~~ Panel chair is responsible for communicating with all Panel members (by phone, email, or any convenient means) to determine if the revised stock assessment and documents are complete and ready to be used by managers in the Council family. If stock assessments and reviews are not complete at the end of the STAR Panel meeting, then the work must be completed prior to the CPSMT meeting where the assessments and preliminary HG levels are discussed.

Suggested Template for STAR Panel Report

- Summary of the STAR Panel meeting, containing:
 - Names and affiliations of STAR Panel members, and
 - List of analyses requested by the STAR Panel, the rationale for each request, and a brief summary the STAT responses to each request.
- Comments on the technical merits and/or deficiencies in the assessment and recommendations for remedies.
- Explanation of areas of disagreement regarding STAR Panel recommendations:
 - among STAR Panel members (including concerns raised by the CPSMT and CPSAS representatives), and
 - between the STAR Panel and STAT Team.
- Unresolved problems and major uncertainties, e.g., any special issues that complicate scientific assessment, questions about the best model scenario.
- Management, data or fishery issues raised by the public and CPSMT and CPSAS representatives during the STAR Panel.
- Prioritized recommendations for future research and data collection.

Terms of Reference for CPS STAT Teams

The STAT Team will carry out its work according to these terms of reference for full assessments.

Each STAT Team will appoint a representative to coordinate work with the STAR Panel and attend the STAR Panel meeting.

The STAT Team shall include in both the STAR Panel draft and final assessment all data sources that include the species being assessed, identify which are used in the assessment, and provide the rationale for data sources that are excluded. The STAT Team is obliged to keep the CPSAS representative informed of the specific data being used in the stock assessment. The STAT team is expected to initiate contact with the CPSAS representative at an early stage in the process, and to be prepared to respond to concerns about the data that might be raised. The STAT Team should also contact the CPSMT representative for information about changes in fishing regulations that may influence data used in the assessment.

Each STAT Team will appoint a representative who will attend the CPSMT, CPSAS, and Council meetings where preliminary harvest levels are discussed. In addition, a representative of the STAT Team should attend the CPSMT and Council meeting where final HG recommendations are developed, if requested or necessary. At these meetings, the STAT Team member shall be available to give a presentation of the assessment and answer questions about the STAT Team report.

The STAT Team is responsible for preparing three versions of the stock assessment document: (1) a complete "draft", including an executive summary, for discussion at the stock assessment review meeting; (2) a "revised draft" for distribution to the CPSMT, CPSAS, SSC, and Council for discussions about preliminary harvest levels; and (3) a "final" version to be published in the SAFE report. Other than authorized changes, only editorial and other minor changes should be made between the "~~complete revised~~ draft" and "final" versions. Post-STAR Panel drafts must be reviewed by the STAR Panel chair prior to being submitted to Council staff, but these reviews are limited to editorial issues, verifying that the required elements are included according to the Terms of Reference, and confirming that the document reflects the discussions and decisions made during the STAR Panel. ~~Other than changes authorized by the SSC, only editorial and other minor alterations should be made between the "revised draft" and "final" versions.~~ The STAT Team will distribute "draft" assessment documents to the STAR Panel, Council, and CPSMT and CPSAS representatives at least two weeks prior to the STAR Panel meeting.

Complete, fully-developed assessments are critical to the STAR Panel process. Draft assessments will be evaluated for completeness prior to the STAR Panel meeting, and assessments that do not satisfy minimum criteria will not be reviewed. The STAR Panel chair will make an initial recommendation, which will then be reviewed by the SSC CPS subcommittee members and Council staff if the chair determines that the draft assessment is not sufficiently complete. The draft document should include all elements listed in Appendix A except a) the point-by-point responses to current STAR Panel recommendations, and 2) acknowledgements. Incomplete assessments will be postponed to a subsequent assessment cycle.

The STAT Team is responsible for bringing computerized data and working assessment models to the review meeting in a form that can be analysed on site. STAT Teams should take the initiative in building and selecting candidate models and should have several complete models ready to present to the STAR Panel, and be prepared to discuss the merits of each. The STAT Team should identify a candidate base model, fully documented in the draft assessment, for STAR Panel consideration. Fully developed assessments that are properly documented should require less time to review and approve than poorly constructed, incomplete assessments.

In most cases, the STAT Team should produce a complete draft of the assessment within three weeks of the end of the STAR Panel meeting, including any internal agency review. In any event, the STAT Team must finalize the assessment document at least one week before the CPSMT meeting at which harvest guidelines are discussed.

The STAT Team and the STAR Panel may disagree on technical issues regarding an assessment, but a complete stock assessment must include a point-by-point response by the STAT Team to each of the STAR Panel recommendations. Estimates and projections representing all sides of any disagreements need to be presented, reviewed by, and commented on by the SSC.

Electronic versions of final assessment documents, parameter files, data files, and key output files must be provided to Council staff. Any tabular data that are inserted into the final documents in an object format should also be submitted in alternative forms (e.g., spreadsheets), which allow selection of individual data elements.

Terms of Reference for Stock Assessment Updates

The STAR process is designed to provide a comprehensive, independent review of a stock assessment. In other situations, a less comprehensive review of assessment results is desirable, particularly in situations where a “model” has already been critically examined and the objective is to simply update the “model” by incorporating the most recent data. For CPS, this typically occurs during two years out of every three because that is the default cycle for CPS assessments. In this context, a “model” refers not only to the population dynamics model *per se*, but also to the particular data sources that are used as inputs to the model, the statistical framework for fitting the data, and the analytical treatment of model outputs used in providing management advice, including reference points and the basis for the harvest guideline (HG). These terms of reference establish a procedure for a limited, but still rigorous, review for stock assessments that fall into this latter category. However, it is recognized that what in theory may seem to be a simple update, may in practice result in a situation that is impossible to resolve in an abbreviated process, and these terms of reference allow for the possibility of limited modifications to an existing “model”:- However, a full assessment and review might still be necessary if an updated assessment could not be accomplished without incorporating major structural changes to the model. A full assessment would then be scheduled for the next year.

Qualification

The Scientific and Statistical Committee (SSC) will determine whether a stock assessment qualifies as an update under these terms of reference. To qualify, a stock assessment must carry forward its fundamental structure from a model that was previously reviewed and endorsed by a STAR Panel. In practice this means similarity in: (a) the particular sources of data used, ~~(b) the analytical methods used to summarize data prior to input to the model,~~ (be) the software used in programming the assessment, (cd) the assumptions and structure of the population dynamics model underlying the stock assessment, (de) the statistical framework for fitting the model to the data and determining goodness of fit, ~~(f) the procedure for weighting of the various data components,~~ and (eg) the analytical treatment of model outputs in determining management reference points. A stock assessment update is appropriate in situations where no significant change in these five factors has occurred. In general, the only changes to a previously reviewed and endorsed assessment would be that the data time series is extended using the most recent information. However, changes to: (a) the analytical methods used to summarize data prior to input to the model, such as how the compositional data are pooled across sampling strata, (b) the weighting of the various data components (including the use of methods for tuning the variances of the data components), and (c) how selectivity is modeled, such as the time periods for the selectivity blocks. A stock assessment update is appropriate in situations where no significant change in these seven factors has occurred, other than extending the time series of elements within particular data components used by the model, e.g., adding information from a recently completed survey and an update of landing are acceptable as long the update assessment clearly documents and justifies the changes. Extending catch per unit of effort (CPUE) time series based on fitted models (i.e., GLM models) will require refitting the model and updating all values in the time series. Assessments using updated CPUE time series qualify as updates if the CPUE standardization models follow the criteria for assessment models described above that are applicable to CPUE standardization models. In practice t There will always be valid reasons for altering a model, ~~as defined in this broad context,~~ although, in the

interests of stability, such changes should be resisted as much as possible. ~~Instead, significant alterations should be addressed in the next subsequent full assessment and review.~~

Composition of the Review Panel

The CPS subcommittee of the SSC will conduct the review of stock assessment updates. A lead reviewer for each updated assessment will be designated by the chair of the CPS subcommittee from among the membership of this subcommittee, and it will be the lead reviewer's responsibility to ensure the review is completed properly and that a written report of the proceedings is produced. In addition, the CPSMT and one designee from the CPSAS will ~~designate one person each to~~ participate in the review in an advisory capacity.

Review Format

Stock assessment updates will be reviewed during a single two-day meeting of the SSC CPS Subcommittee, ~~although in situations where a STAT team arrives with a well-considered, thorough assessment, it may be that the review could take place in less time although there may be situations where the update review could take place in less time, i.e., early dismissal of a STAT Team is an option for well-constructed assessments. This meeting may precede or follow a normally scheduled SSC meeting.~~ The review process will be as follows. The STAT Team preparing the update will distribute the updated stock assessment to the review panelists at least two weeks prior to the review meeting. In addition, Council staff will provide panelists the participants in the update review with a copy of the last stock assessment reviewed under the full STAR process, as well as the previous STAR Panel report. Review of stock assessment updates is not expected to require large numbers of extensive analytical requests or model runs during the meeting, ~~although large or unexpected changes in model results may necessitate some model exploration.~~ The review will focus on two crucial questions: (1) has the assessment complied with the terms of reference for stock assessment updates and (2) are new input data and model results sufficiently consistent with previous data and can the results that from the updated assessment can form the basis of Council decision-making.

If either of these criteria is not met, then a full stock assessment will be required in the next year. If the review meeting agrees concludes that it is not possible to update the stock assessment, the SSC will consider all of the model runs examined during the review meeting and will select one as a basis for the harvest guideline to be presented to the CPSMT and the Council. HG based on those model runs.

STAT Team Deliverables

~~Since there will be limited opportunities for revision during the review meeting, i~~It is the STAT Team's responsibility to provide the review panel with a completed update at least two weeks prior to the meeting. To streamline the process, the Team can reference whatever material it chooses, including that presented in the previous stock assessment (e.g., a description of methods, data sources, stock structure, etc.). However, it is essential that any new information being incorporated into the assessment be presented in enough detail so that the review panel can determine whether the update satisfactorily meets the Council's requirement to use the best available scientific information. Of particular importance will be a retrospective analysis showing the performance of the model with and without the updated data streams. Similarly, if any ~~minor~~ changes to the "model" structure are adopted, above and beyond updating specific data streams, the impact of this needs to be

~~documented a sensitivity analysis to those changes will be required.~~

In addition to documenting changes in the performance of the model, the STAT Team will be required to present key assessment outputs in tabular form. Specifically, the STAT Team's final update document should include the following:

- Title page and list of preparers
- Executive Summary (see Appendix B)
- Introduction
- Documentation of updated data sources
- Short description of overall model structure
- Base-run results (largely tabular and graphical)
- Uncertainty analysis, including retrospective analysis.

Review Panel Report

The ~~review panel~~ SSC Subcommittee members will issue a report that will include the following items:

- Name and affiliation of panelists
- Comments on the technical merits and/or deficiencies of the update
- List of analyses requested by the review panel, the rationale for each request, and a brief summary the STAT responses to each request
- Explanation of areas of disagreement among panelists and between the panel and STAT Team
- Recommendation regarding the adequacy of the updated assessment for use in management

Appendix A: Outline for CPS Stock Assessment Documents

This is an outline of items that should be included in stock assessment reports for CPS managed by the Pacific Fishery Management Council. The outline is a working document meant to provide assessment authors with flexible guidelines about how to organize and communicate their work. All items listed in the outline may not be appropriate or available for each assessment. Items flagged by asterisks (*) are optional for draft assessment documents prepared for STAR Panels, but should be included in the final assessment document. In the interest of clarity and uniformity of presentation, stock assessment authors and reviewers are encouraged (but not required) to use the same organization and section names as in the outline. It is important that time trends of catch, abundance, harvest rates, recruitment and other key quantities be presented in tabular form to facilitate full understanding and follow-up work.

1. Title page and list of preparers - the names and affiliations of the stock assessment team (STAT), either alphabetically or as first and secondary authors
2. Executive Summary (see attached template in Appendix B). This also serves as the STAT summary included in the SAFE)
3. Introduction
 - a. Scientific name, distribution, the basis for the choice of stock structure, including differences in life history or other biological characteristics that should form the basis for management units
 - b. A map depicting the scope of the assessment and identifying boundaries for fisheries or data collection strata.
 - c. Important features of life history that affect management (e.g., migration, sexual dimorphism, bathymetric demography)
 - d. Important features of the current fishery and relevant history of fishery
 - e. Summary of management history (e.g., changes in management measures, harvest guidelines, or other management actions that may have significantly altered selection, catch rates or discards)
 - e. Management performance - a table or tables comparing annual biomass, harvest guidelines, and landings for each management subarea and year
4. Assessment
 - a. Data
 - i. Landings by year and fishery, catch-at-age, weight-at-age, survey and catch-per-unit-effort (CPUE) data, data used to estimate biological parameters (e.g., growth rates, maturity schedules, and natural mortality) with coefficients of variances (CVs) or variances if available. Include complete tables and figures (if practical) and date of extraction.
 - ii. Sample size information for length and age composition data by area, year, gear, market category, etc. including the number of trips and fish sampled.
 - iii. Information on all data sources that were excluded from the assessment.

- b. History of modeling approaches used for this stock - changes between current and previous assessment models
 - i. Response to STAR Panel recommendations from the ~~most recent~~last assessment
 - ii. Report of consultations with CPSAS and CPSMT representatives regarding the use of various data sources in the stock assessment.

- c. Model description
 - i. Complete description of any new modeling approaches
 - ii. Definitions of fleets and areas
 - iii. Assessment program with last revision date (i.e., date executable program file was compiled)
 - iv. List and description of all likelihood components in the model
 - v. Constraints on parameters, selectivity assumptions, natural mortality, assumed level of age reader agreement or assumed ageing error (if applicable), and other assumed parameters
 - vi. Description of stock-recruitment constraints or components
 - vii. Critical assumptions and consequences of assumption failures
 - viii. Description of how the first year that is included in the model was selected and how the population state at that time is defined (e.g. B_0 , stable age-structure)

- d. Model selection and evaluation
 - i. Evidence of search for balance between realistic (but possibly over-parameterized) and simpler (but not realistic) models
 - ii. Comparison of key model assumptions, include comparisons based on nested models (e.g., asymptotic vs. domed selectivities, constant vs. time-varying selectivities)
 - iii. Summary of alternative model configurations that were tried, but rejected
 - iv. Likelihood profile for the base-run (or proposed base-run model for a draft assessment undergoing review) configuration over one or more key parameters (e.g. M, h, q) to show consistency among input data sources.
 - v. Residual analysis for the base-run (or proposed base-run model for a draft assessment undergoing review) configuration, e.g., residual plots, time series plots of observed and predicted values, or other
 - vi. Convergence status and convergence criteria for base-run model (or proposed base-run model)
 - vii. Randomization run results or other evidence of search for global best estimates
 - viii. Evaluation of model parameters. Do they make sense? Are they credible?
 - xi. Point-by-point response to the STAR Panel recommendations*

- e. Base-run(s) results
 - i. Table listing all parameters in the stock assessment model used for base runs, their purpose (e.g., recruitment parameter, selectivity parameter) and whether or not the parameter was actually estimated in the stock assessment model
 - ii. Time-series of total and spawning biomass, recruitment and fishing mortality or exploitation rate estimates (table and figures)

- iii. Selectivity estimates (if not included elsewhere)
 - iv. Stock-recruitment relationship
- f. Uncertainty and sensitivity analyses.
- i. The best approach for describing uncertainty and range of probable biomass estimates in CPS assessments may depend on the situation. Possible approaches include:
 - A. Sensitivity analyses (tables or figures) that show ending biomass levels or likelihood component values obtained while systematically varying emphasis factors for each type of data in the model
 - B. Likelihood profiles for parameters or biomass levels
 - C. CVs for biomass estimated by bootstrap, Bayesian, or asymptotic methods
 - D. Subjective appraisal of magnitude and sources of uncertainty
 - E. Comparison of alternate models
 - F. Comparison of alternate assumptions about recent recruitment
 - ii. If a range of model runs (e.g., based on CVs or alternate assumptions about model structure or recruitment) is used to depict uncertainty, then it is important that some qualitative or quantitative information about relative probability be included. If no statements about relative probability can be made, then it is important to state that all scenarios (or all scenarios between the bounds depicted by the runs) are equally likely
 - iii. If possible, ranges depicting uncertainty should include at least three runs: (a) one judged most probable; (b) at least one that depicts the range of uncertainty in the direction of lower current biomass levels; and (c) one that depicts the range of uncertainty in the direction of higher current biomass levels. The entire range of uncertainty should be carried through to the value for the HG
 - iv. Retrospective analysis, where the model is fitted to a series of shortened input data sets, with the most recent years of data input being dropped.
 - v. Historic analysis (plot of actual estimates from current and previous assessments)
 - vi. Simulation results

5. Harvest Control Rules

Pacific Sardine

The CPS FMP defines the maximum sustainable yield (MSY) control rule for Pacific sardine. This formula is intended to prevent Pacific sardine from being overfished and maintain relatively high and consistent catch levels over a long-term. The harvest formula for sardine is:

$$HG = (\text{TOTAL STOCK BIOMASS} - \text{CUTOFF}) \times \text{FRACTION} \times \text{U.S. DISTRIBUTION},$$

where harvest guideline (HG) is the total U.S. (California, Oregon, and Washington) harvest recommended for the next fishing year, TOTAL STOCK BIOMASS is the estimated stock biomass (ages 1+) at the start of the next year from the current assessment, CUTOFF (150,000 mt) is the lowest level of estimated biomass at which harvest is allowed,

FRACTION is an environment-based percentage of biomass above the CUTOFF that can be harvested by the fisheries, and U.S. DISTRIBUTION is the percentage of TOTAL STOCK BIOMASS in U.S. waters.

The value for FRACTION in the MSY control rule for Pacific sardine is a proxy for F_{MSY} (i.e., the fishing mortality rate that achieves equilibrium MSY). Given F_{MSY} and the productivity of the sardine stock have been shown to increase during relatively warm-water ocean conditions, the following formula has been used to determine an appropriate (sustainable) FRACTION value:

$$\text{FRACTION or } F_{MSY} = 0.248649805(T^2) - 8.190043975(T) + 67.4558326,$$

where T is the running average sea-surface temperature at Scripps Pier, La Jolla, California during the three preceding years. Under the harvest control rule, F_{MSY} is constrained and ranges between 5% and 15% depending on the value of T.

Pacific Mackerel

The CPS FMP defines the MSY control rule for Pacific mackerel as:

$$\text{HG} = (\text{BIOMASS-CUTOFF}) \times \text{FRACTION} \times \text{STOCK DISTRIBUTION},$$

where HG is the U.S. harvest guideline, CUTOFF (18,200 mt) is the lowest level of estimated biomass at which harvest is allowed, FRACTION (30%) is the fraction of biomass above CUTOFF that can be taken by fisheries, and STOCK DISTRIBUTION (70%) is the average fraction of total BIOMASS in U.S. waters.

CUTOFF and FRACTION values applied in the Council's harvest policy for mackerel are based on simulations published by MacCall et al. in 1985. BIOMASS is the estimated biomass of fish age 1 and older for the whole stock as of July 1. As for Pacific sardine, FRACTION is a proxy for F_{MSY} .

~~6. Target Fishing Mortality Rates (if changes are proposed)~~

~~67. Management Recommendations~~

~~78. Research Needs (prioritized)~~

~~89. Acknowledgments (include STAR Panel members and affiliations as well as names and affiliations of persons who contributed data, advice, or information but were not part of the assessment team)*~~

~~910. Literature Cited~~

~~1044. Complete Parameter Files and Results for Base Runs (for a draft undergoing review, these listings can be provided as text files or in spreadsheet format.)~~

Appendix B: Template for Executive Summaries Prepared by STAT Teams

Stock: species/area, including an evaluation of any potential biological basis for regional management

Catches: trends and current levels - include table for last ten years and graph with long-term data

Data and assessment: date of last assessment, type of assessment model, data available, new information, and information lacking

Unresolved problems and major uncertainties: any special issues that complicate scientific assessment, questions about the best model scenario, etc.

Stock biomass: trends and current levels relative to virgin or historic levels, description of uncertainty - include table for last 10 years and graph with long-term estimates

Recruitment: trends and current levels relative to virgin or historic levels - include table for last 10 years and graph with long-term estimates

Exploitation status: exploitation rates (i.e., total catch divided by exploitable biomass) – include a table with the last 10 years of data and a graph showing the trend in fishing mortality relative to the target (y-axis) plotted against the trend in biomass relative to the target (x-axis).

Management performance: catches in comparison to the HG values for the most recent 10 years (when available), actual catch and discard.

Research and data needs: identify information gaps that seriously impede the stock assessment

Appendix C: Proposed 2009 STAR Panel Schedule

Both STAR Panels to be conducted at the SWFSC in La Jolla, California.

<u>Panel</u>	<u>Dates</u>	<u>Goal</u>	<u>Reviewers 1/</u>
<u>1</u>	<u>May 4-8</u>	<u>1. Review Pacific mackerel assessment</u> <u>2. Review Pacific sardine surveys:</u> <u>(a) Pacific NW Aerial Survey</u> <u>(b) SWFSC CCE/CalCOFI Survey</u>	<u>5 total (n+4):</u> <u>2 members of the SSC – one of whom will serve as the panel chair,</u> <u>2 outside reviewers designated by the CIE with stock assessment and survey expertise,</u> <u>1 outside reviewer – designated by the SSC and the SWFSC.</u>
<u>2</u>	<u>Sept. 21-25</u>	<u>1. Review Pacific sardine assessment</u>	<u>4 total (n+3):</u> <u>2 members of the SSC – one of whom will serve as the panel chair,</u> <u>1 outside reviewers designated by the CIE,</u> <u>1 outside reviewer – designated by the SSC and the SWFSC.</u>

1/ One member of the CPSMT and one member of the CPSAS will attend each panel as advisors.