Appendix G: Review Committee's Final Report "*Evaluation of the Red Abalone Stock Assessment By the Review Committee In Support of Deliberations of the Abalone Advisory Group, La Jolla, California 17-18 February 200[9]*"

Evaluation of the Red Abalone Stock Assessment
By the Review Committee
in
Support of Deliberations of the Abalone Advisory Group

La Jolla, California 17-18, February 2009

Review Committee:
Dr. Doug Butterworth, University of Cape Town
Dr. Harry Gorfine, Victorian Department of Primary Industries and University of Melbourne
Dr. Stephen Schroeter, University of California Santa Barbara
Dr. Edward Weber, NOAA Fisheries

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February 26, 2009

Ian Taniguchi
California Department of Fish and Game
4665 Lampson Ave. Suite C
Los Alamitos, CA. 90720

Dear Mr. Taniguchi:

Please accept the attached report titled *Evaluation of the Red Abalone Stock Assessment By the Review Committee In Support of Deliberations of the Abalone Advisory Group, LaJolla, California 17-18 February 2008*. This report describes the findings of the Review Committee and completes our charge under the Terms of Reference provided by the San Miguel Island Abalone Advisory Group (Attachment 1 to the report). Please do not hesitate to contact us if we can be of further assistance.

Sincerely,

Edward D. Weber *for*
The Review Committee serving the San Miguel
Island Abalone Advisory Group

Douglas Butterworth
Harry Gorfine
Stephen Schroeter
Edward Weber

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Evaluation of the Red Abalone Stock Assessment By the Review Committee In Support of Deliberations of the Abalone Advisory Group, La Jolla, California 17-18 February 2008

I. Introduction

The Review Committee (Doug Butterworth, University of Cape Town; Harry Gorfine, Victorian Department of Primary Industries and University of Melbourne; Stephen Schroeter, University of California, Santa Barbara; Ed Weber, NOAA Fisheries) considered the report from the Technical Panel and associated documents, aided by an interactive discussion with the Panel and other stakeholders. Although data for a stock assessment of the abalone at San Miguel Island (SMI) are limited, the Committee considers that it is not necessary to wait for further data collection before a change in the current moratorium at SMI might be elected. There would be value in a parallel process where some removal was permitted on an experimental basis to provide additional information to that already being collected. Such a level of experimental take must be set conservatively, must be subject to monitoring, and should be reviewed immediately if monitoring indicates adverse trends in abundance that are likely linked to removals.

Here the Committee reviews the input data used in the assessment (Section II), the statistical catch-at-age assessment model (Section III), and risk considerations and computations (Section IV). It then proceeds to comment on experimental removal as a possible way forward (Section V), and on-going resource monitoring that would be necessary to accompany such a program (Section VI). Section VII summarizes the next steps recommended if the proposed approach is to be implemented. This document meets the objectives of the revised terms of reference (TOR) for the Review Committee (Seventh draft, 16 December 2008; Attachment 1).

II. Data

1. The recent surveys are very good and provide important data that are not normally available to managers. The Committee agrees with the Technical Panel that these are the best data available.

2. Data collection protocols for these surveys should nevertheless be reexamined and altered appropriately to better estimate absolute abundance and proportion of suitable habitat (i.e. non-sand). This can be done by positioning transects along predetermined, randomly chosen azimuth to avoid possible bias. Transect directions should not be altered to avoid sand.

3. It may be possible to include zeros for the areas that were avoided as non-habitat, and thus calculate a more accurate estimate of abundance in the kelp area for existing surveys. In the future, it may be better to estimate densities and totals based on the survey design (almost a two-stage stratified design in 2006–2008) instead of using geostatistics.

4. The data collected in 2006–2008 should be evaluated to see if it is possible to develop a stratification scheme that would permit similar power with fewer transects. This might involve analysis of hierarchical structure of data to determine appropriate scales of stratification. It is also important to check that stratification actually succeeds in reducing variance. Numbers of samples should also be allocated among strata optimally (e.g., Neyman allocation) based on variance estimates from the existing surveys. Cochran (1977) and Thompson

(2002) describe appropriate sampling designs, allocation of effort, and sampling estimators.

5. Use data from existing surveys to determine appropriate sample size and estimate power to detect biologically important effect sizes for comparisons among years. Future surveys must have sufficient statistical power (i.e., precision of effect-size estimates) to detect biologically important changes in abundance of abalone.

6. The assessment of relative strengths and weaknesses of the other survey data by the Technical Panel were accepted given the absence of full documentation. The Channel Island National Park Kelp Forest Survey may not adequately represent the general trends in population vital rates at SMI. It reflects a small area only, and the low densities relative to other areas may indicate marginal habitat.

7. Growth rates of larger, older red abalone reported in the Haaker *et al.* (1998) manuscript are likely to have been biased because the study area was fished, and the relation for larger animals was largely extrapolated. This probably leads to underestimates of L_∞ and growth rates, perpetuated through the per-recruit and other analyses for larger red abalone. The Committee notes that this problem is being addressed through additional data collection (Section 6, Bullet 5).

III. Assessment (statistical catch-at-age model approach)

1. The record should be checked for reasons (regulations perhaps) to explain the trend up and then down of the historic catch during the 1990s immediately before the closure of the abalone fisheries.

2. A flexible functional form should be used to model selectivity-at-length for abalone sampled in the 2006+ surveys, and used in providing model predicted values for proportions at length and abundance corresponding to these surveys.

3. The report tabled did not fully explain some of the details of the assessment model, perhaps because it had to be prepared in a very short time; future reports need to provide the specifications of this model in complete detail. Furthermore, such reports should contain summaries that present their conclusions in a form more readily understood by non-specialists.

4. A baseline assessment should be considered based on input from the most reliable data only – likely past catches and the proportions-at-length and abundance estimates from the 2006+ surveys. The effects of adding further relative abundance information should be explored through sensitivity tests.

5. More model fit diagnostics should be reported so that the quality of fits can be judged better, and with a view to clarifying which elements of the inputs have the greatest influence on key features of the outputs (such as recent resource trends): for example, both data and model predictions should be compared for each data series input, together with the value of the associated residual standard deviation, for maximum penalized likelihood estimation.

6. Use of a multinomial with the actual number of animals sampled each year for the likelihood for proportions-at-length likely over weights these data because of

their lack of independence. Use of a lower effective sample size, and its effects on results, should be investigated.

7. Consideration should be given to augmenting estimates of more recent year-class strength by shrinkage (Darby and Flatman 1994; Shepherd 1997) to the mean of past values to improve precision (this being a special case of fitting a stock-recruitment relationship within the statistical catch-at-age assessment).

IV. Risk considerations and computations

1. Risk should be evaluated in relation to the statistical catch-at-age assessment by projecting the population trajectory estimated into the future, probably for 20 years so that the differing consequences of different options are more readily evident.

2. For the immediate future, risk should be evaluated by projecting forward under different fixed catch levels. At a later stage this should be extended to consider the impact of catches set under some feedback control rules.

3. Future year-class strength in projections should be determined by sampling from a lognormal distribution with mean, variance and first-order autocorrelation determined from the previous 20 years of estimates from the assessment. Appropriate choices for the values for these parameters might be informed by considering such values evaluated for similar resources elsewhere.

4. Performance statistics reported should include median and 90% probability intervals for the spawning stock abundance, and where relevant for the cumulative catch made.

5. The values for some conventional fishing mortality based reference points (e.g. $F_{40\%}$, as is applied in the case of groundfish) can be established within this framework by projecting the assessment model forward under a fixed catch or fishing mortality until the age-structure stabilizes. The effect of changing the age at first capture should be investigated within this framework, giving consideration also to the population density and hence ease of capture of abalone above the associated minimum size limit.

6. The adequacy of the Abalone Recovery Management Plan (California Department of Fish and Game 2005) generic minimum-viable-population threshold value of 2,000 abalone per hectare for SMI should be evaluated in the context of 20 years of apparent population stability.

7. Application of this value would effectively preclude the re-opening an abalone fishery at SMI at present. However, initiation of an experimental fishery that is (for example) restricted to the Southwest Zone and takes only 5–10 % of the population above 203 mm is a risk-averse alternative, and likely to be well within the level the resource could sustain.

8. The current estimate of an average density of 1,200 red abalone per hectare at SMI is effectively similar to densities for commercially viable abalone populations in other countries once the relative size of, or space occupied by, red abalone is taken into account. A modelling study by Hobday & Tegner (2002) showed that adult ($\geq$ 90 mm) red abalone densities at San Miguel could be

expected to be 860 per hectare under a stable catch regime equating to 30% of harvestable size.

V. A Way Forward?

Although the following section extends beyond the Review Committee's terms of reference to some extent, discussions with conveners and stakeholders suggested that there would be value in providing broad indications of a possible way forward for management of SMI abalone based upon review of the analysis presented. What follows should be read understanding that it refers only to initial steps in what would be an adaptive approach, and that subsequent sections enlarge upon associated monitoring requirements and other prerequisites.

1. A program of experimental fishing should be considered for the Southwest Zone as an initial step in pursuing the option for removals. If specific sustainability criteria are met then this might subsequently be expanded in a stepwise post-moratorium process that is consistent with the Abalone Recovery and Management Plan (California Department of Fish and Game 2005). An increased minimum legal size would provide additional resource protection without unduly reducing the available stock. For instance, if set to 203mm as tabled in the 2007 SMI survey report, the stock size would be 9–15% less than at the current minimum legal size of 197mm. A conservative risk-averse approach could be based on the 95% lower confidence level of estimated abundance from the 2007 abundance survey. For instance, an experimental TAC of 8,300 red abalone would provide a viable harvest whilst leaving 90% of the available stock (to which recruitment would be added the next year). Given such a relatively high age at first capture, this 10% proportional take is well below standard fishing mortality reference points.

2. The experimental harvest could be timed to occur during a defined period, allowing for weather and market considerations. This would ensure that concerns regarding regulatory compliance could be more readily satisfied without undue cost.

3. The Southeast Zone should remain as an unfished control region that enables the detection of changes in abundance caused by environmental effects. This region could also be used as a source for brood-stock transplantation as per the option for a non-consumptive TAC.

4. If an experimental commercial harvest is implemented, then recreational stakeholders should be provided with equitable resource access without compromising the integrity of the experimental strategy.

VI. On-going resource monitoring

1. Commercial access to experimental harvesting in any area of SMI should be conditional upon acquisition and provision of adequately precise, spatially resolved, fishery dependent data, and on-going commercial diver participation in fishery independent abundance surveys.

2. Recreational access to experimental harvesting should be conditional upon provision of logbook catch data.

3. On-going fishery independent abundance surveys should occur in all three non-protected zones of SMI via adherence to a defined sampling protocol. This protocol would be affordable in the medium to longer term with surveys conducted at an intensity and frequency that will enable detection of change at an agreed probability and effect size.

4. The design of recent surveys should be evaluated to seek a less intensive approach without an undue sacrifice of estimation precision. The option of less intensive but annual surveys is preferred over more intensive but less frequent surveys. Estimation of a trend in abundance from these surveys is important, but will likely require at least 5 years of data before reliable inferences become possible.

5. A tag release-recapture program has been initiated to collect data to support estimation of biological parameters for growth and natural mortality, and is welcomed.

6. Periodic sampling should be implemented to estimate changes in reproductive capacity.

7. The length-frequency distribution of the current stock contains enough large animals to better estimate growth and fecundity in the size range that is actually fished (> ~200mm). The current growth and fecundity models are largely extrapolations of functions that were fit using smaller animals. Some additional growth and fecundity data should be collected with an emphasis on larger animals. The study need not be as extensive as that reported by Haaker *et al.* (1998), which was used in the current assessment.

VII. Next Steps

If the approach outlined above for a possible way forward is taken further, there are certain prerequisites to implementation and permitting removal of abalone.

1. The details of a monitoring program must be specified and agreed to.

2. A power analysis must be conducted to confirm that the monitoring will be able to detect effects of importance, in particular that of reduction in abundance as a result of removals.

3. The statistical catch-at-age assessment methodology should be advanced in line with the advice given above, and used in projection mode to estimate the range of possible consequences for SMI abalone abundance of any level of removals that comes under consideration.

References

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Appendix 1
Revised Terms of Reference
Technical Panel and Review Committee to Support Development of a Total Allowable
Catch (TAC) for Red Abalone at San Miguel Island
(Eighth Draft, January 22, 2009)

Revised Terms of Reference
Technical Panel and Review Committee to Support Development of a Total Allowable Catch (TAC) for Red Abalone at San Miguel Island
(Eighth Draft, January 22, 2009)

Introduction:

This Terms of Reference (TOR) is intended to spell out the charge for a technical panel and a review committee to undertake research efforts that generally address status determination of a red abalone (*Haliotis rufescens*) population(s) that inhabits waters off San Miguel Island (SMI), California. Ultimately, results (and recommendations) from this research will be used by management bodies to better assess the impact a potential Total Allowable Catch (TAC—i.e., annual yield) would have on this species' long-term sustainability. Henceforth, the TAC is broadly defined and reflects any fishery-based harvest that is executed on some systematic basis. The technical panel and review committee serve in an advisory capacity to the San Miguel Island Abalone Fishery Advisory Group (AAG).

This TOR describes the purpose, background, objectives, and guiding principles of the technical panel and review committee. It also describes the deliverables, recruitment criteria, organization, and communications protocols for these two bodies.

Purpose:

To help fulfill its charge, AAG intends to convene a technical panel along with a review committee to spearhead this research—i.e., population modeling that addresses red abalone, with particular emphasis on determining impacts to this resource associated with re-establishment of a fishery (TAC). Ultimately, the overall research will require the technical panel and review committee to coalesce available sources of data and explore alternative analytical approaches for assessing the resiliency of this population to fishing pressure. Scientific findings from this research will become part of the AAG's final work product and will be transmitted as part of the AAG's recommendations to the Fish and Game Commission for the primary purpose of determining the extent to which this species can support a proposed, limited entry fishery at SMI.

Background:

The Abalone Recovery and Management Plan (ARMP) was adopted by the California Fish and Game Commission (Commission) in December 2005. After plan adoption, the Department of Fish and Game (Department), under the direction of the Commission, initiated a fishery consideration process for a limited abalone fishery at San Miguel Island. The Department embarked on this fishery consideration process by applying a cooperative planning approach and empanelling a constituent advisory group, the AAG. The AAG mission is to provide a limited range of fully developed alternatives for managing a potential fishery at SMI to the Department. The Department will use these management alternatives in recommendations to the Commission when a red abalone fishery at SMI is considered.

The AAG will provide recommendations to the Department regarding the following four key topics:[1]
- A TAC for SMI red abalone
- Alternatives for allocation between recreational and commercial take
- Alternative regulations to achieve the TAC and allocation
- Potential management, enforcement, and monitoring techniques

To help the AAG complete its task to develop a scientifically-based TAC, the AAG agreed that it is appropriate to tap external scientific expertise to complement the expertise of AAG members. The AAG asked the Department to set up a process for involving external scientific experts on population and fishery modeling, as well as TAC development.

A multi-step process is proposed for establishing a methodology for determining the TAC. The structure involves convening a core technical panel and a review committee. Together, these scientific experts will be charged with developing a draft methodology for determining the TAC, to be presented for the AAG's consideration. This methodology will be used to determine the TAC (or alternate versions of the TAC), and the AAG will use the TAC to complete its work product. The AAG will work to receive and review interim and final work products produced by the technical panel and review committee in an iterative review process.

Objectives:

The primary objective for the technical panel and review committee is to provide the AAG with a draft methodology for determination of a TAC as well as other possible alternative TAC determination methodologies.

The process for accomplishing the primary objective is split between the two groups, with each group having specific tasks and objectives that dovetail together to achieve the primary objective.

The objectives for the technical panel are to:
1. Prepare a draft methodology for determining a TAC that best fits the conditions for red abalone stock at SMI.
2. Identify gaps or further data needs for improving the accuracy of the TAC in the future.
3. Propose alternative methodological approaches for TAC determination.
4. Incorporate input from the review committee and prepare a revised draft for presentation to the AAG.
5. Present and discuss the methodology and alternatives with the full AAG.

The objectives for the review committee are to:
1. Conduct an objective scientific review of draft methodology for TAC determination.
2. Provide comments and suggestions to strengthen the logic, rigor, and internal consistency of the draft methodology.
3. Propose methods to filling data gaps and identification of any additional gaps.
4. As appropriate, propose alternative approaches for determining the TAC.

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[1] AAG Mission Statement: AAG_MissionStatement_Sep2706.pdf

Guiding Principles:

The technical panel and review committee will be guided by the following key principles:

1. *Work with the AAG's ambitious time line for completion.* The AAG and fishery consideration process is governed by a very tight timeline for completion in the Summer of 2009. The AAG recognizes that the process of determining the TAC will take place over a period of 6-12 months but is eager to integrate that information as it is being developed. The technical panel will work to complete a draft methodology, including a preliminary model(s), by January 16, 2009. The technical panel will distribute a draft methodology and preliminary model(s) to the review committee in February 2009. The review committee will complete its review by the end of February 2009, and the technical panel will revise the methodology (or methodologies) and alternatives and present it to the AAG at a meeting in the March 2009 timeframe.
2. *Prepare a science-based outcome.* The TAC methodology and alternatives must be developed on sound, best available science, including sourcing and justifying all parameters used and providing statistical confidence intervals for important parameters and final TAC.
3. *Balance a long-term planning approach with the need for sufficient levels of certainty in the modeling process.* The technical panel and review committee should seek to balance: 1) the need to model for the long term (i.e., to account for multiple generations and foreseeable but unpredictable events like El Nino) with 2) the decrease in certainty that comes from modeling a decade or more into the future.
4. *Structure the work in an outcome-focused fashion.* The AAG's charge is to provide collaborative-based recommendations to the Department in this fishery consideration process. It is the intention of the AAG to include the advice and proposed work product of the technical panel and review committee in their recommendations to the Department. The AAG intends to conduct an iterative review process of the technical panel and review committee work as the TAC development process unfolds.
5. *Structure the meetings to strike an appropriate balance between the AAG's interest in observing and tracking the technical panel's work and the panel's interest in having a space to deliberate privately.* The Department's overarching goal in the AAG process, including technical panel meetings, and all public processes is to create a high level of transparency and public involvement. It is understood, however, that if all discussions are public, technical panel members may not feel at liberty to participate openly and candidly. Thus, a balance will be struck in the technical panel process between openness and ability to tackle difficult topics without fear of being misinterpreted or misunderstood.
6. *Schedule periodic joint meetings and briefings.* The technical panel will schedule periodic joint meetings or presentations with the AAG to report progress, discuss the status of draft work products, and consider implications for the AAG's final report. These meetings will be the primary venue for discussions between the two groups.

Key Work Considerations and Deliverables:

Key Inputs and Considerations

In developing the TAC methodology and model(s), the technical panel will:

1. Take account of existing SMI red abalone stock data as the basis (e.g., population density, habitat structure) and any fishery dependent data from the past fishery.
2. Consider published data on biological parameters of red abalone in general (fecundity, mortality, survival rates, intrinsic growth rate).

3. Consider associated ecological and anthropogenic parameters that may result in stock fluctuations.
4. Consider continued recovery of SMI stock and surrounding areas.
5. Take into consideration the stock in existing reserves and how it is associated with TAC determination.
6. Utilize information from other similar TAC processes from other fisheries as best as possible.
7. Develop an adaptable methodology that uses the precautionary principle, which is more precautionary at lower levels of data and less precautionary as more data and more accurate stock estimates are available. The methodology should include appropriate statistical models (SD/SE negatively correlated with amount of data available) and error propagation procedures.
8. Incorporate a wide variety of information sources besides peer-reviewed literature. Field observations, working papers, and other materials are considered to be relevant for this assignment. All sources must be cited in a traceable fashion.
9. Provide a best estimate of what the effect of a potential TAC(s) is on the population, e.g., how much recovery of the population is slowed due to a given TAC (e.g. provide a null-model of population development).
10. Consider optimum/minimum densities of the abalone beds in determining a TAC and sustainability of the proposed fishery.

Work Products

The deliverable for the technical panel is a complete methodology for TAC determination with alternative methodological approaches to be used by the AAG. The format of the intended work product is a concise memorandum, with appropriate graphics and tabular information, presented in a manner that can be well understood by AAG members and other policy bodies. The memorandum will include the following:
1. Fully referenced working assumptions and relevant conceptual models used (i.e., akin to Materials & Methods of a scientific paper, and accessible to AAG members).
2. A fully referenced statement of the data consulted.
3. A list of appropriate stock models to use for abalone and determining TAC along with pros and cons for using them.
4. A risk analysis for various ranges of stock level and corresponding TACs.
5. A comprehensive bibliography of all documents and data sources consulted.
6. A list of data gaps for properly determining stock levels and TAC, with brief discussion of how deviation from the current best guess will affect TAC.
7. A timeframe for periodic revision of the TAC (i.e. 1 year, 2 years … 10 years etc.)

The deliverable for the review committee is a concise memorandum presenting the complete review of the draft methodology (both the stock assessment modeling report and the TAC development framework) with suggested changes and further advice for the technical panel. The review committee will also have the opportunity to review the final recommendation from the AAG on the methodology for TAC determination.

Technical Panel and Review Committee Expertise and Recruitment Criteria:

The technical panel will consist of four to six experts. Collectively, their expertise should span the fields of abalone biology, marine ecology, fisheries, population dynamics and modeling, fishery dynamics and modeling, and natural resource policy and management.

Collectively, the candidates for the technical panel and review committee must meet all of the following recruitment criteria:

1. Technical capability in their respective discipline, combined with the ability to work across disciplines
2. Objectivity as reflected in their willingness/ability to understand and integrate diverse disciplinary and resource user viewpoints
3. Ability and willingness to work collaboratively, and commitment to produce concise work products in a timely fashion
4. Availability during the timeframe of this process
5. Experience in population modeling of marine organisms, in particular marine invertebrates
6. Experience in fishery modeling, in particular marine invertebrate fisheries.
7. Demonstrated experience in science advising for public policy, and appreciation for the policy context of this assignment.
8. Technical panelists and review committee members are not explicitly precluded from participating if they have affiliations with stakeholder groups active on the AAG, but they must fully disclose these affiliations.

One technical panel member will be on point for spearheading the analysis and doing much of the legwork of model development. This lead analyst will work closely with and receive guidance, advice, and feedback from the other panel members. This lead analyst will have strong technical expertise in the area of population modeling. Once brought on board, the lead analyst will also be available to work in a dedicated fashion to develop a TAC model(s).

Recruitment of lead analyst:

The technical panel will work with members of the AAG's TOR work group to recruit a lead analyst. As needed, funding will be sought to support the work of the lead analyst. The Department will seek an appropriate funding source to ensure the lead analyst is contracted in an appropriate time frame. CONCUR, Inc., a member of the AAG facilitation team, would structure a suitable contracting vehicle to use funds from the Department to support the lead analyst.

Recruitment will proceed according to the following general steps:

1. Technical panel and TOR work group members will establish specific selection criteria for a lead analyst.
2. Technical panel and TOR work group members will identify potential candidates for the lead analyst position and solicit concise statements of qualifications keyed to the selection criteria and the charge.
3. Technical panel and TOR work group members will discuss potential candidates and agree on the selection of a lead analyst.

Recruitment of review committee members:

The review committee will consist of three to four experts. Department staff will work with the AAG TOR work group (TOR work group) to recruit members of the review committee by January 9, 2009. Recruitment will proceed according to the following general steps:

1. Department staff and the TOR work group will meet to establish the general composition of the review committee.

2. Department staff and the TOR work group will identify potential candidates for the review committee.
3. Department staff and the TOR work group will discuss potential candidates and agree on the selection of a review committee.

Communication Protocols:

The AAG Facilitation Team will assist the technical panel and the review committee as appropriate. The technical panel and review committee's communications are otherwise self-organized.

Technical panel members have at their discretion the use of face-to face meetings, teleconferences, and/or email exchanges in their deliberations. Review committee members, due to their possible wide geographic dispersion, will probably convene via teleconference and communicate by email and/or phone and possibly one face to face meeting with the technical panel in southern California.

Technical panel and review committee members are not precluded from corresponding with members of the AAG, but they should focus their primary deliberations on their fellow technical panel and review committee members while this task is in progress. Technical panel and review committee members will be asked not to disseminate their work on the TAC beyond AAG process participants until the AAG completes its mission.

Technical panel and review committee members will deliver their final recommendations and work products to the AAG.

Technical Panel and Review Committee Organization and Deliberations:

Technical Panel:

Technical panel members will meet by teleconference initially to organize. The technical panel will then establish their workplan for additional meetings.

Review Committee:

It is anticipated that the review committee may meet at least once via teleconference to formulate a coordinated review and select a committee lead. The committee lead will coordinate and summarize the committee's review. The review committee will also meet in person to discuss their review comments with the technical panel and to finalize the review memorandum. Additional review committee meetings and organizational structure will be left to the discretion of the committee.

Overall Organization and Deliberations:

Further communications between the technical panel and the review committee or review committee representatives may be needed to coordinate the overall methodology product prior to its presentation to the full AAG.

Technical panel and review committee members will deliberate in good faith. Panelists will work towards a consensus recommendation, and specifically identify major areas of scientific

agreement.   As appropriate, they should identify important areas of scientific disagreement and uncertainty.

Roles of AAG Members and Department Staff:

All participants in the technical panel and review committee process are working in support of a well-informed recommendation.

Within this charge, AAG and Department staff members may serve on the technical panel, provided that they meet the recruitment criteria.

To help strike an appropriate balance between the AAG's interest in observing and tracking the technical panel's work and the panel's interest in having a space to deliberate privately, the technical panel meetings will be organized as follows:

- In general, technical panel meetings will be open to AAG member viewing. AAG members will not speak during technical panel meetings, and comment will only be taken at times specified by the technical panel.
- The Department and facilitation team will agendize a brief technical panel standing agenda item as part of each meeting to discuss items that may be sensitive or contain confidential information.
- Technical Panel members may request private meetings if a particular topic requires this. These meetings will only be scheduled if the Department feels there is a specific need that cannot otherwise be met in public meeting.
- The Technical Panel will schedule periodic joint meetings or presentations with the AAG to report progress, discuss the status of draft work products, and consider implications for the AAG's final report. These meetings will be the primary venue for discussions between the two groups.
- Department staff and the facilitation team will prepare summaries of the key outcomes of all technical panel meetings for distribution to both the technical panel and the AAG.

AAG and Department staff members may not serve on the review committee, in order to create an external review step in development of the methodology.

The final TAC document will be a work product of the full AAG, and will be submitted as part of the AAG's final report to the Fish and Game Commission.

Process Support and Facilitation:

Department staff is available to provide support to both the technical panel and review committee during their deliberations.