REVIEW OF IMPACTS OF POTENTIAL INCREASES IN HAWAII SHALLOW-SET SWORDFISH LONGLINE EFFORT ON SEA TURTLE POPULATIONS

By

W. Don Bowen

External Review Conducted for the Center of Independent Experts

January 2009

Executive Summary

1. The leatherback turtle (*Dermochelys coriacea*) is listed as Endangered and, in the Pacific Ocean populations, is in severe decline. Hawaiian Islands are important foraging areas. The loggerhead turtle (*Caretta caretta*) occurs throughout the Pacific and is listed as Threatened. Threats to both species include incidental capture in fishing gear, particularly longlines.

2. The Hawaii Longline Association has proposed to expand the Hawaii-based shallow-set longline fishery, which will likely increase the level of sea turtle interactions. There is very little demographic information for these populations except for time series of nesting beach census data so a population viability assessment was conducted by the National Marine Fisheries Service, Pacific Islands Fisheries Science Center in May 2008.

3. The assessment used a quasi-extinction risk index based on diffusion approximation called susceptibility to quasi-extinction (SQE). This index can be used to classify populations based on relative risks.

4. This technique was applied to time series of nest census data for Pacific loggerheads and leatherbacks to assess the population-level impacts of increased mortality resulting from the Hawaii Longline Association's proposed expansion of the Hawaii-based shallow-set longline fishery. The leatherback data come from Jamursba-Medi beaches on Papua New Guinea and three beaches in Parque Nacional Las Bualas, Playa Grande, Costa Rica, whereas the loggerhead data come from Japanese counts.

5. This assessment suggests that the proposed expansion of the shallow-set longline fishery off Hawaii will likely not increase the risk of quasi-extinction as defined in the analysis. While this seems a reasonable *short-term* conclusion based on the analysis, as the author notes continued decline in these populations would invalidate this assessment.

6. I am concerned that uncertainty in some of the parameters used in the model (e.g., population identity and distribution) was apparently not included in this assessment and this uncertainty might change the overall conclusions about risk.

7. Given the high level of uncertainty, it will be critical to continue the time series of nesting female numbers and the number and composition of turtle interactions with the fishery.

Background

The leatherback turtle (*Dermochelys coriacea*) is listed as Endangered and, in the Pacific Ocean populations, is in severe decline. There are no nesting beaches of leatherbacks in United States territory in the Pacific, but there are important foraging areas near the Hawaiian Islands. In the eastern Pacific, major nesting beaches are found in Costa Rica and Mexico. Despite the alarming reduction in the numbers of nesting females on Playa Grande, Costa Rica, the population is still the most important in the eastern Pacific Ocean (Spotila et al. 2000). Leatherbacks do not generally nest in the insular Central and South Pacific (exceptions include the Solomon Islands, Vanuatu, and Fiji). Nesting is widely reported from the western Pacific, with major nesting beaches in Indonesia. The loggerhead turtle (*Caretta caretta*) occurs throughout the Pacific and is listed as Threatened. The only known nesting areas for loggerheads in the North Pacific are found in southern Japan. The Japanese population may be declining. Threats to both species include incidental capture in fishing gear, particularly longlines.

The Hawaii Longline Association has proposed to expand the Hawaii-based shallow-set longline fishery, which will likely increase the level of sea turtle interactions. There is very little demographic information for these populations except for time series of nesting beach census data, so a relatively simple population viability assessment approach was taken using diffusion approximation on these time series.

Snover and Heppell (in press) present a quasi-extinction risk index based on diffusion approximation called susceptibility to quasi-extinction (SQE) that can be used to classify populations based on relative risks. This technique was applied to nest census data for Pacific loggerheads and leatherbacks to assess the population-level impacts of increased mortality resulting from the Hawaii Longline Association's proposed expansion of the Hawaii-based shallow-set longline fishery. Anticipated increases in SQE for turtle populations from mortalities associated with this fishery were estimated.

The manuscript presenting the SQE index has received full peer review and is now in press with *Ecological Applications*. The specific application of SQE to determining appropriate take levels for protected marine turtle population has not received a full peer review; and as these analyses are designed to be a general tool for managers to assess how different levels of fishery interactions may impact the extinction risk of marine turtle populations, a CIE review is warranted.

Description of Review

This review is based on my reading of the following documents:

1) Snover, M.L. and S.S. Heppell. In press. Application of diffusion approximation for risk assessment of sea turtle populations. Ecological Applications,
2) Snover, M.L. 2008. Assessment of the population-level impacts of potential increases in marine turtle interactions from a Hawaii Longline Association proposal to expand the

Hawaii-based shallow-set fishery. NOAA/NMFS/Internal Report IR-08-010, and literature listed in the references.

The review focused on the following issues in the Statement of Work:

1. the adequacy, appropriateness, and application of data used in the assessment,
2. the adequacy, appropriateness, and application of methods used in the assessment,
3. the adequacy, appropriateness, and application of the methods used to project population status and trends, and
4. research recommendations.

Summary of Findings

Adequacy, appropriateness, and application of data used in the assessment

Nesting counts

With the exception of regular nest censuses, which provide information on the adult female component of these populations only, there are relatively few demographic data on Pacific leatherback and loggerhead turtles. Beach counts of nests or nesting females only represent a fraction of the female population and a small and variable fraction of the whole population (< 2%; Crowder et al. 1994, Lewison et al. 2004). Abundance and trends of juveniles and adult males are generally unknown. Furthermore, these census data exhibit high interannual variation in numbers and several sources of observation error (e.g., variable seasonal effort, changes in methods). Despite these limitations, time series of counts of nests or nesting females currently provide the only basis for population assessment.

Leatherbacks

Despite indications of a long-term decline over the last 20 years, the nesting population along the northwest coast of Papua on the island of New Guinea is still the largest remaining in the Pacific. Although there are seasonal data going back to 1984, the Jamursba-Medi series from 1993 onwards appears to be the most consistent in term of effort and methodology. As such, they represent the best data for the region. However, it is not clear why the unadjusted data from Hitipeuw et al. (2007) were used rather than the series adjusted for survey effort. The former are more conservative, and are presumably the underlying rationale, but this would be useful to state in the text. To convert, nest counts to an estimate of the number of females an estimate of the number of nest per female is needed. A value of 5.5 from Martinez et al (2007) for Mexican colonies in the eastern Pacific was used in this analysis. Presumably, this value was used because there are no reliable estimates for the western Pacific. If so, this would be useful to state in the text. The number of nests per female from the Martinez study has a CV of 34.5%. It is not clear that this source of measurement error is included in the analysis.

For the eastern Pacific, counts of nesting females were used for the three beaches in Parque Nacional Las Bualas, Playa Grande, Costa Rica reported in Tomillo et al. (2007). Here the estimated the number of nesting females per season was calculated by adding the number of turtles uniquely marked as individuals with PIT tags identified on Playa Grande and Playa Ventanas to the number of turtles identified on Playa Langosta from 1997–1998 to 2003– 2004. To account for turtles that may nest outside the main nesting season (October through February), a correction was used based on female body pit counts recorded during two full years (Reina et al. 2002). The estimated number of female turtles from 1988–1989 to 1992–1993 was based on body pit counts (Reina et al. 2002). Ten percent of turtles nested only on Playa Langosta within a nesting season. To obtain the total annual number of turtles from 1988–1989 to 1996–1997, counts at the other two beaches were increased by 10%. This appears to be the best long-term time series in the eastern Pacific.

Loggerheads

I did not have access to reports describing the Japanese nesting data. Nevertheless, it is clear from this assessment that considerable effort has gone into to censusing the number of nesting females since 1990. Because effort increased dramatically from 1998 to 2007, it was necessary to effort-correct the data between 1990 and 1997 to generate a consistent time series. This was done by using the average percentage of the earlier series to the total number of colonies censused in 1998 and 1999. This assumes that the 33 colonies monitored in the earlier time period represent a constant fraction of the total. Another approach would have been to only use those 33 colonies monitored consistently throughout the entire time period from 1990 to 2007 to determine if the same over pattern of counts was evident. One could also examine if the 33 colonies monitored from 1990 to 1997 in fact represented a constant proportion of the total number of nests in the 1998 to 2007 series. These additional analyses would serve to determine if a bias might have been introduced in the effort correction.

Post-interaction mortality rates

Mortality rates used in the assessment are based on the estimates of the proportion that die as a function of how the turtle was hooked. These data are presented in Ryder et al. (2006). What is not clear from the text of this assessment is how the average values of post-interaction mortality rated where estimated for each species between 2004 and 2007. Presumably this is a weighted average of the hooking categories observed in shallow-set longline fishery, but again a clear statement would help the reader. A table showing the frequency of hooking type for each species would be useful.

Population specific interactions

In the case of leatherbacks it is necessary to estimate the fraction of the turtles interacting with the fishery that come from the Jamursba-Medi nesting beaches. This was done using genetic assignment to nesting assemblage of turtles taken in the fishery (Dutton, personal communication, in Snover 2008) and using information on the seasonal distribution of turtles based on satellite tracking studies (Benson et al. 2007a,b). Although this is a good approach, the sample sizes for the number of genotyped turtles and the number tracked needs to be included in the paper. This would provide the reader with a better understanding of why the midpoint of a range was used in the analysis rather than a mean with some measure of uncertainty derived from the data. For example, only 16 (9 and 7 seasonally) tracks of migrating turtles were available from which to estimate seasonal distribution. These data are invaluable, but are not sufficient to provide quantitative estimates and this is presumably way the midpoint of a range was used in the analysis. Given this level of uncertainty, I would have thought that a range of values should have been used in the assessment.

Adequacy, appropriateness, and application of methods used in the assessment

Given that few demographic data are available for either species and that the available data show high interannual variability and may be subject to bias, I believe that conducting a population risk analysis based on extinction risk estimated from the stochastic diffusion approximation is a good approach. The theory of this approach is well-studied (Beissinger and McCullough 2002, Morris and Doak 2002). This assessment uses a slight modification of a new method based on the application of diffusion approximation to population risk assessment (Snover and Heppell in press). The new method avoids the problem of large confidence intervals which can arise with highly uncertain or variable abundance estimates, such as counts of nesting female sea turtles. The modification uses bootstrapping to derive an index of susceptibility to quasi-extinction (SQE). The metric incorporates both error introduced by parameter estimation by diffusion approximation and the uncertainty due to the stochastic nature of a population's future trajectories. This index is designed to measure if the probability of quasi-extinction risk is high enough to warrant a particular conservation status listing, but can also be used to assess the consequences of a human activity such as fishing on the future dynamics of a population. It is mainly in this context that the method is used in the case of these turtle populations and the proposed expansion of the shallow-set longline fishery off Hawaii.

Using population simulations, Snover and Heppell (in press) show that the method is robust in assessing actual risk (in terms of a binary assessment of at risk or not at risk) for a population based on nesting beach census data, assuming that current conditions remain the same over the time period of the projection. Evaluation of risk to a population based on its current trajectory and variance requires a critical value for the proportion of replicates that have a high (>90% in this case) probability of falling below a quasi-extinction threshold (QET). Based on simulations, the authors found that a critical value between 0.35 and 0.45 was satisfactory, in that a species should be listed as “at risk” if 35-45% of bootstrapped replicates indicate a >90% probability of falling below a pre-determined QET.

In this assessment, Snover chose not to use the SQE as defined in Snover and Heppell, but the mean value of the parametric bootstrap of SQE because this value is easily interpreted as the mean risk of reaching the QET in a specified time period. Again based on simulations, this new metric has critical values of 0.65-0.75, such that populations are at risk if the critical value is >0.75. I see no problems with the application of the assessment model to evaluate if mortalities due to the fishery are likely to affect population persistence.

I also quite liked the population analyses undertaken to equate the juvenile loggerheads interacting with the fishery to adult female time series used in the population persistence. However, I would have liked to have seen more rationale for the selection of the high end of the range of estimated reproductive values. Presumably, it is thought to be conservative, but this should be explicitly stated. The situation is more straight-forward in the case of leatherbacks and the decision to use a mean reproductive value of 0.85 seems reasonable, but based on relatively little data (11 turtles measured).

With respect to sex ratios, it is not clear from the data in Table 3 why the value of 0.65 females was selected by both PIRO and the author. Presumably the rationale for this is given in the letter referenced a footnote 7 on p.13, but it seems important to be explicit here as well.

Adequacy, appropriateness, and application of the methods used to project population status and trends

Results of this assessment indicate that to minimize increased risks of quasi-extinction, mortalities of adult female (or 'equivalent) Japanese loggerheads should be < 7, from Jamursba-Medi the mortalities should be < 4 adult female leatherbacks, and for the Costa Rica population, no adult leatherback females should be killed at the 10% of 1-SQE, and < 3 and 2 for loggerheads and Jamursba- Medi leatherbacks at the 5% of 1-SQE. The proposed interaction levels of the expanded fishery are 46 loggerheads and 19 leatherbacks. These levels are estimated to result in 2.51 adult female mortalities for loggerheads in Japan, 1.56 adult female mortalities for leatherbacks from Jamursba-Medi, and 0.12 adult female leatherbacks from Costa Rica. Thus the predicted mortalities are similar to those expected not to increase the risk to these populations.

Overall, this seems an appropriate analysis of these data. However, there are a couple of issues that merit more discussion. For example, it is not clear how the predicted increase in the number of interactions (46 and 19 for loggerheads and leatherbacks, respectively) was determined. As these are rather important predictions with respect to the conclusions of the analysis, I believe there should be more discussion of their derivation. Also, the conversion of estimates of interaction to adult female mortalities requires information on the population identity and distribution, sex ratio, reproductive value, and post-interaction mortality rates. However, the variance in these parameters is not included in the analysis, nor are they discussed as sources of uncertainty. I would also suggest somewhat stronger language with respect to the ongoing assessment frequency. Given the uncertainty in demographic data, regular and frequent assessment of these populations and monitoring of the actual levels of turtle interaction with the expanded fishery will be critical.

Conclusions and Recommendations

This assessment suggests that the proposed expansion of the shallow-set longline fishery off Hawaii will likely not increase the risk of quasi-extinction as defined in the analysis. While this seems a reasonable *short-term* conclusion based on the analysis, as the author notes, continued decline in these populations would invalidate this assessment. Therefore, it will be critical to continue the time series of nesting female numbers and the actual number of turtle interactions with the fishery. I am concerned that uncertainty in some of the parameters used in the model (e.g., population identity and distribution, sex ratio) was apparently not included in this assessment, and this uncertainty might change the overall conclusions about risk. Thus, I **recommend** that the impact of these sources of uncertainty be evaluated as to their impact on the conclusions. I **recommend** that the basis for the predicted turtle encounter rates with the fishery be included in the assessment as these values play an important role in the assessment. I would also **recommend** that an analysis be conducted to see if the method of effort-correcting the loggerhead time series may have introduced a bias in the trend data. Finally, I **recommend** that a table of the frequency of hooking types be included in the assessment.

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Snover, M.L. and S.S. Heppell. In press. Application of diffusion approximation for risk assessment of sea turtle populations. Ecological Applications.

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Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405:529-530.

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Appendix I: Statement of Work for Dr. Don Bowen

External Independent Peer Review by the Center for Independent Experts

Impacts of Potential Increases in Hawaii Shallow-set Swordfish Longline Effort on Sea Turtle Populations

Project Background:

The Hawaii Longline Association has proposed to expand the Hawaii-based shallow-set longline fishery, which will likely increase the level of sea turtle interactions. There is very little demographic information for these populations except for time series of nesting beach census data so a relatively simple population viability assessment approach was taken using diffusion approximation on these time series.

Snover and Heppell (in press) present a quasi-extinction risk index based on diffusion approximation called susceptibility to quasi-extinction (SQE) that can be used to classify populations based on relative risks. Using population simulations, they show that the method is robust in assessing actual risk (in terms of a binary assessment of at risk or not at risk) for a population based on nesting beach census data, assuming that current conditions remain the same over the time period of the projection. As they use long time frames of 3 generations (following IUCN criteria) they clarify that SQE values are primarily useful as an index for comparing populations and assessing the impacts of increased mortalities by comparing SQE values between perturbed and non-perturbed populations.

This technique was applied to nest census data for Pacific loggerheads and leatherbacks to assess the population-level impacts of increased mortality resulting from the Hawaii Longline Association's (HLA) proposed expansion of the Hawaii-based shallow-set longline fishery. Anticipated increases in SQE for turtle populations from mortalities associated with this fishery were estimated. As the SQE index is based on nest census data, only units of adult females are considered and the turtles interacting with the fishery are converted to adult female 'equivalents' by assuming a 65% female sex ratio and mean reproductive values of 0.41 for loggerheads and 0.85 for leatherbacks. Nesting data from Japan (loggerheads), Jamursba Medi, Papua, Indonesia (leatherbacks) and Costa Rica (leatherbacks) were used.

Results of this study indicated that to minimize increased risks of quasi-extinction, mortalities of adult female (or 'equivalent) Japanese loggerheads should be less than 4, from Jamursba Medi the mortalities should be less than 3 adult females, and for the Costa Rica population, no adult females should be killed. The proposed interaction levels of the expanded fishery are 46 loggerheads and 19 leatherbacks. These levels are estimated to result in 2.51 adult female mortalities for loggerheads in Japan, 1.56 adult female mortalities for leatherbacks from Jamursba-Medi, and 0.12 adult female leatherbacks from Costa Rica.

The manuscript presenting the SQE index has received full peer review and is now in press with *Ecological Applications*. The specific application of SQE to determining appropriate take levels for protected marine turtle population has not received a full peer review; and as these analyses are designed to be a general tool for managers to assess how different levels of fishery interactions may impact the extinction risk of marine turtle populations, a CIE review is warranted.

Overview of CIE Peer Review Process:

The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR), to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. At times, the ToR may require a CIE reviewer to produce a CIE summary report. The Office of Science and Technology serves as the Contract Officer's Technical Representative (COTR) for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

Requirements for CIE Reviewers:

Three CIE reviewers shall conduct an independent peer review in accordance with the Statement of Work (SoW). The CIE reviewers shall have strong quantitative expertise in the population dynamics including critical analysis in stock assessment and alternative methods for improving stock assessment methods using limited datasets such as are typically available for protected species. It is desirable to have one CIE reviewer with experience in population dynamics or ecology of sea turtles. Each CIE reviewer shall have the ability to conduct the necessary pre-review preparations, desk review (no travel is necessary), and completion of the peer review report in accordance to the ToR and schedule of milestone and deliverables specified herein, and the number of days for each CIE reviewer shall not exceed 14 days.

The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR as stated herein (refer to the ToR in Annex 1).

(1). Strong quantitative expertise in the population dynamics including population viability assessment methods using limited datasets such as are typically available for protected species. Knowledge of diffusion approximation methods as they apply to quantifying quasi-extinction risks would be helpful.

(2). An understanding of the difficulties inherent in marine turtle research, nesting beach monitoring and the interpretation of these data

(3). As this analysis was driven by immediate needs of management in preparing an EA/EIS and in an ESA section 7 consultation, an understanding of endangered species regulations that drive these management needs would also be helpful

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct necessary preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and milestone dates as specified in the Schedule section.

<u>Prior to the Peer Review</u>: The CIE shall provide the CIE reviewers' contact information (name, affiliation, address, email, and phone) to the Office of Science and Technology COTR no later than the date as specified in the SoW, and this information will be forwarded to the Project Contact.

<u>Pre-review Documents</u>: Approximately two weeks before the peer review, the Project Contact will send the CIE reviewers the necessary documents for the peer review, including supplementary documents for background information. The CIE reviewers shall read the pre-review documents in preparation for the peer review (see tentative list below).

1) Snover, M.L. and S.S. Heppell. In press. Application of diffusion approximation for risk assessment of sea turtle populations. Ecological Applications.
2) Snover, M.L. 2008. Assessment of the population-level impacts of potential increases in marine turtle interactions from a Hawaii Longline Association proposal to expand the Hawaii-based shallow-set fishery. NOAA/NMFS/Internal Report IR-08-010.

This tentative list of pre-review documents may be updated up to two weeks before the peer review. Any delays in submission of pre-review documents for the CIE peer review will result in delays with the CIE peer review process. Furthermore, the CIE reviewers are responsible for only the pre-review documents that are delivered to them in accordance to the SoW scheduled deadlines specified herein.

Desk Peer Review:

The primary role of the CIE reviewer is to conduct an impartial peer review in accordance to the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service (NMFS) management decisions.

Terms of Reference:

CIE reviewers shall conduct an independent peer review addressing each of the following Term of Reference:

(1). Background information on the diffusion approximation methods used to estimate quasi-extinction risks has been peer reviewed and is found in the Snover and Heppell (in press) document. Comments and criticisms on this document are welcome but should not be the focus of the reviews.

(2). An application of the methods presented in the Snover and Heppell (in press) document is contained in the Snover (2008) report which is being used by the Pacific Islands Regional Office in a section 7 consultation to determine conservative interaction levels for marine turtles in the Hawaii-based shallow-set fishery. The peer review reports should contain an assessment of this report, including input on the following questions:

- Is the overall approach appropriately conservative for species listed on the Endangered Species list?
- Do the methods used to determine 'adult equivalents' appear adequate?
- Are the methods used to determine population specific takes appropriate?
- Is the range of allowed adult female anticipated mortalities appropriately conservative for the status of the populations?

(3) Overall, the reports should contain a critical review of the methods used to determine conservative interaction levels for marine turtle populations as presented in the Snover 2008 internal report, including recommendations for improvements.

Independent CIE Peer Review Reports:

The primary deliverable of the SoW is for each CIE reviewer shall be to complete and submit an independent CIE peer review report in accordance with the ToR, and this report shall be formatted as specified in the attached Annex 1. The report will be sent to Mr. Manoj Shivlani, CIE lead coordinator, via email to shivlanim@bellsouth.net and Dr. David Die, CIE regional coordinator, via email to ddie@rsmas.miami.edu.

Schedule of Milestones and Deliverables:

Each CIE Reviewer shall complete the independent peer review in accordance with the following schedule of milestones and deliverables.

October 16, 2008	CIE shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
October 20, 2008	The Project Contact will send the background documents and report to the CIE Lead Coordinator and CIE reviewers
October 21- November 7, 2008	Each reviewer shall conduct an independent peer review
November 7, 2008	Each reviewer shall submit draft CIE independent peer review reports to the CIE
November 21, 2008	CIE will submit CIE independent peer review reports to the COTR
December 21, 2008	The COTR will distribute the final CIE reports to the Project Contact

Acceptance of Deliverables:

Each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, which shall be formatted as specified in Annex 1. Upon review and acceptance of the CIE reports by the CIE Coordination and Steering Committees, CIE shall send via e-mail the CIE reports to the COTR (William Michaels via William.Michaels@noaa.gov at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

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Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect any approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

ANNEX 1

Format and Contents of CIE Independent Reports

1. The report should be prefaced with an Executive Summary with concise summary of goals for the peer review, findings, conclusions, and recommendations.

2. The main body of the report should consist of an Introduction with
    a. Background
    b. Terms of Reference
    c. Panel Membership
    d. Description of Review Activities

3. Summary of Findings in accordance to the Term of Reference

4. Conclusions and Recommendations in accordance to the Term of Reference

5. Appendix for the Bibliography of Materials used prior and during the peer review.

6. Appendix for the Statement of Work

7. Appendix for the final panel review meeting agenda.

8. Appendix for other pertinent information for the CIE peer review.