Reviewer's Report on SEDAR 39 Assessment of HMS Atlantic smooth shark and Gulf of Mexico smoothhound complex

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Prepared for the Center for Independent Experts

Contents

Executive Summary

1. A review of assessments of HMS Gulf of Mexico smoothhound complex and HMS Atlantic smooth sharks was conducted in February 2015 as part of SEDAR 39. The review process included a review workshop in Panama City 10-12 February where additional assessment runs were carried out.

Gulf of Mexico smoothhound complex

2. The assessment applied a Bayesian surplus production model to estimates of total catch and four fishery independent surveys to a complex of three similar species. The assessment method is appropriate for the available data.
3. There is large uncertainty in the shrimp trawl bycatch estimates as these are derived from a survey CPUE index which has been heavily smoothed. This uncertainty is not considered in the model which treats the data as precise. Consequently model results may be significantly affected by errors and bias in the catch estimates.
4. Uncertainty in the model results is quantified by the posterior distributions of critical parameters and through a series of sensitivity tests. The base model and sensitivity runs estimate that the stock is not over-fished or experiencing overfishing. These results are conditioned on the assumption that the catch is known precisely and therefore stock status may be less certain than the sensitivity tests suggest.
5. The stock biomass trends appear to be robust and are consistent with the fishery independent surveys and the hierarchical index.
6. Stock projections are made on the assumption of constant catch and suggest the risk of overfishing is low at current catch levels. Some caution is required in interpreting these projections as process error on stock biomass is not considered and they may underestimate uncertainty. The assumption of constant catch may mean the stock is overfished in intermediate years if the biomass falls to a low value during the projection period.
7. In the interests of transparency the WinBUGS code used in the assessment should be included in the assessment report.

Atlantic smooth shark

8. The assessment applied an age structured model (Stock Synthesis, SS3) to estimates of total catch, fishery independent survey biomass indices and length frequencies. The assessment method is appropriate for the available data but required a number of critical parameters to be heavily constrained or estimated externally to the model.
9. There is some uncertainty in the catch estimates as these are in part derived from discard estimates and post release survival which is not well known. The model treats the catch data as precise and consequently model results may be significantly affected by errors and bias in the catch estimates.
10. Uncertainty in the model results is quantified by the asymptotic parameter covariance matrix and through a series of sensitivity tests. The base model and sensitivity runs estimate that the stock is not over-fished or experiencing overfishing. These results are conditioned on the assumption that the catch is known precisely and therefore stock status may be less certain than the sensitivity tests suggest.

11. The stock biomass trends appear to be robust and are consistent with the fishery independent surveys and the hierarchical index.
12. The model estimates of annual recruitment are not consistent with the shape of the fitted stock-recruitment relationship and the deviations appear to be strongly auto-correlated, violating the model assumptions. This may lead to poorly estimated MSY reference points.
13. Stock projections are made on the assumption of constant catch and suggest the risk of overfishing is low at current catch levels. Some caution is required in interpreting these projections as there is considerable uncertainty in the stock-recruitment relationship which will largely determine the stock trajectory beyond the base year. The assumption of constant catch may mean the stock is overfished in intermediate years if the biomass falls to a low value during the projection period. Projections based on the sensitivity runs need to be carried out to explore the full range of uncertainty in the assessment.

General

14. Both assessments rely on a single assessment model for determining stock status. It would be desirable, given the uncertainties in the data and these models, to apply other (and probably simpler) models to investigate model uncertainty.
15. The Bayesian surplus production model needs to be developed to handle missing catch values and to treat those years with real catch data has having observation error. It should also use shrimp trawl effort as data in the model.
16. It would be desirable to develop an assessment method that uses a length based projection matrix to characterise the population dynamics of smooth sharks so that the length frequency data can be more realistically modelled. If the length frequency data are not representative samples of the population then simpler biomass based methods should be attempted.
17. At present the limited expert resources available appear to devote a disproportionate time to process rather than science. The SEDAR process is thorough, transparent and provides opportunities for all relevant stakeholders to contribute. Consideration needs to be given to the balance between the burden of process (meetings etc.) on the lead assessment scientists and the time needed to undertake innovative science to achieve the best possible assessments.

Background

SEDAR 39 is a compilation of data, a standard assessment of the stock, and CIE assessment review conducted for the HMS Gulf of Mexico smoothhound complex and HMS Atlantic smooth sharks. The report here provides an independent peer review of these stock assessments carried out in part at a meeting in Panama City, FL in February 2015. The review is intended to ensure that the best possible assessment is provided through the SEDAR process and will provide guidance to the SEFSC to aid in their review and determination of best available science, and to HMS when determining if the assessment is useful for management.

Description of the Individual Reviewer's Role

The reviewer accessed initial documents from the SEDAR ftp site on the 22nd January 2015 and commenced reviewing the main assessment reports. During the review of the main assessments a number of additional working documents were consulted. After an initial examination of the reports, the reviewer participated in a Review Workshop in Panama City from the 10th-12th February 2015. During the meeting the reviewer actively participated in the discussion and requested some additional model runs. The task of preparing an initial draft RW summary report was shared with two other CIE reviewers. The contributions to the initial draft were discussed before the end of the meeting with the panel chair. A draft report was completed on the 26th February and sent to the CIE as required.

Summary of Findings

Gulf of Mexico Smoothhound complex

1. Evaluate the data used in the assessment, including discussion of the strengths and weaknesses of data sources and decisions.

a) Are data decisions made by the DW and AW sound and robust?

I would support the majority of the decisions reached at the Data Workshop which included the decision to treat the Gulf smoothhound as a separate complex from the Atlantic. The DW also suggested discard survival rates for the calculation of dead discards to be used for the catches. These values are likely to be the best available but which nevertheless are subject to high uncertainty and need to be treated with caution as they may have a large effect on the estimated catch. Provided these survival rates are similar over time, the effect on the assessment should be mainly one of changing the scale of the estimated biomass rather than affecting the estimated stock trend.

The DW also recommended the reconstruction of shrimp trawl bycatch using the summer SEAMAP CPUE with a fitted linear or non-linear trend. The use of these rigid smoothers may not offer the best way of reducing noise in the time series but they may be adequate for the present assessment as there is a clear upward trend in the CPUE time series which is captured by the fitted line. This is an improvement over earlier methods used in SEDAR 34 that assumed constant CPUE in the years prior to 2009 but may be considered over-rigid smoothing. Another approach that more naturally smooths the data series would be to fit a simple time series model to the SEAMAP CPUE of the form:

$y(t)=y(t-1)+e(t)$, $e(t)\sim normal(0,s^2)$

And

$y'(t)\sim normal(y(t),\sigma^2)$

where y is the true log CPUE, y´ is the observed log CPUE, and s and σ are the standard deviation of process and observation errors respectively.

b) Are data uncertainties acknowledged, reported, and within normal or expected levels?

In general data uncertainties are discussed and acknowledged. Ranges are given for the biological parameters and a rationale given for the choice of values used. However, the catch data are dominated by the shrimp fleet bycatch and no quantitative estimates of uncertainty are provided. This is a difficult task but some of the uncertainty could be captured from the GLM models used to model effort and the CVs of the SEAMAP survey to provide minimum estimates of variance. Given that the catch data are treated as error free in the model, it is important to try to quantify the uncertainty in these data.

c) Are data applied properly within the assessment model?

The assessment model is a Schaefer model implemented in Bayesian framework using WinBUGS. The model is fit to survey indices that are assumed to be observed with error while the catch data are treated as known. One potential statistical problem is that the SEAMAP summer index is used to derive the catch data and is also used as an abundance index in the model. It therefore may unduly weight model results towards this index. This is unlikely to be a significant issue but ways of avoiding the problem in the future would be desirable.

As there are effort data for the largest fleet (shrimp trawl) it should in principle be possible to use the effort data within the model to avoid estimating catches externally. There are some catch data from 2009 onwards that are regarded as well estimated so including these and the effort index as data within the model to estimate harvest rate and the associated catches should be possible. This would avoid the need to make *ad hoc* judgements about raising the SEAMAP CPUE using the effort index.

d) Are input data series reliable and sufficient to support the assessment approach and findings?

The indices used in the model show a great deal of variability but do show some general agreement in the long term trends. This is also reflected in the hierarchical index that seeks to identify the common signal in the survey data. It seems likely that the indices are adequate to estimate general stock trends but probably do not capture inter-annual variability in stock biomass well.

It is more difficult to assess the adequacy of the catch data as these are derived from discard estimates that are inherently uncertain and the use of a survey index that is clearly noisy. The trend in the catches is driven by the effort of the shrimp trawl fleet and as this signal is very strong, the gross trend in catches is likely to be adequately reflected in the data. What is more uncertain is the scale of the catches and their inter-annual variability.

Sensitivity testing of the assessment making different assumptions about the surveys and the level of catch suggest that the data do provide a basis for supporting the assessment approach and findings. An additional run requested at the meeting looked at a "worst case" scenario including high catch and low productivity but this did not change the perceived status of the stock.

2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data.

a) Are methods scientifically sound and robust?

The assessment model used was a Schaefer production model that includes process error in the annual biomass. The inclusion of process error is an important feature since attempts to fit the model without it proved unsuccessful. Including process error is more realistic but the fact that it was found to be critical to fit the model successfully may be an indication of lack of real information or poor contrast in the data. The method is probably appropriate and sufficiently robust for the purpose but its dependence on catch data of uncertain precision or bias means that some care is required in interpreting the results.

b) Are assessment models configured properly and used consistent with standard practices?

The model was configured properly and is consistent with standard practices. The main elements of configuration relate to the choice of priors. Those chosen were generally moderately informative reflecting strong belief in the range of possible values of the parameters. The sensitivity to the choice of priors was investigated. Typically the results did not show undue sensitivity to the priors but the degree to which the priors were updated by the data in the posterior distributions was quite small suggesting that the data are not particularly informative. In the case of carrying capacity for example, a bounded uniform prior was used but in the posterior distributions the upper bound was always reached. This suggests there was little information in the data to estimate K.

Standard Bayesian model diagnostics were applied and these showed good MCMC chain mixing with low autocorrelation. An additional run using three MCMC chains (as opposed to the 2 used in the assessment document) requested by the panel confirmed good chain convergence.

c) Are the methods appropriate for the available data?

The Schaefer model is widely used and is appropriate for the available data. One feature that merits comment is that usually such a model would be used to describe the dynamics of a single stock. In this assessment a species complex has in effect been treated as a uniform stock and problems affecting one of the components could be hidden if the species concerned exhibited markedly different biology and dynamics. Applying Schaefer models to species complexes is not new and there is no reason to believe that this was a problem in this assessment. Testing the model using simulated data for three species with biological characteristics similar to the species in question might be a useful way of checking that the aggregate model performs adequately.

3. Evaluate the assessment findings.

a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?

The abundance, exploitation, and biomass estimates are consistent with the estimated catches and the general trend seen in the indices. To some degree the consistency between the indices and the estimated catch is produced by the fact that the catches are derived from the trend in the SEAMAP summer survey. Most sensitivity runs suggest the same stock status implying the assessment results are insensitive to a range of alternative assumptions. This offers some reassurance in making inferences about stock status. It is notable, however, that the DIC calculated for the different model runs are all very similar indicating that there is little statistical information to distinguish between them.

Perhaps one area of sensitivity that still requires investigation is alternative trends in the catches. The test applied in the assessment document only considers a change in scale of the catches whereas a change in trend may have a more significant effect on the perceived stock status. Given that the procedure for estimating historical catches is inevitably *ad hoc*, this is an issue worth investigating.

b) Is the stock overfished? What information helps you reach this conclusion?

The stock is most likely not overfished since the base run and all the sensitivity runs all lie in the region where the ratio N_{cur}/N_{msy} is >1. Addition runs requested at the review meeting that included alternative catch series did not alter this conclusion.

c) Is the stock undergoing overfishing? What information helps you reach this conclusion?

The stock is most likely not experiencing overfishing since the base run and all the sensitivity runs lie in the region where the ratio H_{cur}/H_{msy} is <1. Addition runs requested at the review meeting that included alternative catch series did not alter this conclusion.

d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?

The assessment method does not explicitly estimate a stock-recruitment relationship. The growth of the stock is captured by the r parameter that expresses the rate at which the population approaches the carrying capacity, K, of the environment. The model estimates of these parameters are influenced by the priors in the model. In the case of r this was derived using plausible biological information and provides a credible basis for evaluating future stock conditions. In the case of carrying capacity the data do not appear to be informative as the posterior distributions are constrained by the upper bound specified in the prior. It is more difficult to judge the usefulness of this estimate. Higher values of K would rescale the estimated stock biomass upward but there was no evidence in the sensitivity runs (e.g. when the upper bound of K was increased) to support a higher value and until further analysis can be done, the base run prior should be used.

e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

The status determination criteria are expressed as the ratio of current stock numbers or harvest rate relative to the MSY values calculated within the Schaefer model. Such estimators are more robust than absolute values as they will be less sensitive to changes in scale that might result, for example, from uncertainty in K. The model fits the CPUE indices adequately but this is conditioned on the

assumption that the catch data are more or less error free. Hence the reliability of the stock status indicators is dependent on the veracity of the shrimp trawl bycatch estimates. It is important to note, however that if K is in fact larger than the upper bound set in the model, estimates both of B_{msy} and MSY itself would be larger. It shows that the interpretation of absolute values requires great care and that the ratio estimators are more robust and are to be preferred.

4. Evaluate the stock projections, including discussing strengths and weaknesses

a) Are the methods consistent with accepted practices and available data?

The projections are based directly on the MCMC samples taken from the model fit and are then run forward using the same Schaefer model formulation but without the associated process error applied to the population. The core method is consistent with accepted practices and data though the omission of process error is unusual given the need to include it in the assessment model.

The method assumes a fixed catch (at various levels) for a 10 year forward projection period. As the fishery is largely a bycatch fishery this may not best capture likely scenarios since the actual catch will be driven by effort in the shrimp fishery rather than a catch constraint. However, fixed catch scenarios may better reflect management preference and the projections are likely to capture adequately the effects of a range of possible fishing regimes. Assuming a fixed catch over time could allow the harvest rate to exceed the over-fishing threshold over the projection period even if the biomass remained above the MSY threshold. In the particular simulations presented this is less likely to occur because process error was not considered and hence the projected population will be less variable. While this may be comforting, it is less realistic than if the process error was included.

b) Are the methods appropriate for the assessment model and outputs?

The methods are appropriate for the assessment model and outputs, though the omission of process error from the projections will tend to underestimate the range of possible outcomes and may give an optimistic picture of stock status in relation to reference points.

c) Are the results informative and robust, and useful to support inferences of probable future conditions?

The methods are useful to support inference of probable future conditions as they are limited to a time period where the initial conditions (which are the best known) inform the outcome of the projections. Longer projections would be less useful as they become dominated by populations generated entirely from the population dynamics parameters (rather than observations) and are subject to cumulative errors. Given the large distance of the evaluated stock status from the MSY reference points it likely that the projections are robust since only assumptions of very large fixed catches are sufficient to change the perceived status of the stock. Large catches seem less likely in the future given the current status of the shrimp fishery.

d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?

Uncertainties in the model parameters are captured in the MCMC samples used in the projections and the sensitivity runs give insight into the uncertainties about a range of model assumptions. An important source of uncertainty that is not included in the projections is the process error estimated in the assessment model. Technical problems with the WinBUGS software appear to have prevented

the inclusion of this aspect of population variation. It does mean that the range of projected outcomes will be smaller than the range that would otherwise occur of process error was included and could affect the perceived risk of overfishing.

5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.

The Bayesian model framework and sensitivity analysis go a long way to capturing the principal uncertainties associated with the assessment. Perhaps the most important source of uncertainty in the data relates to the shrimp trawl bycatch as this has been derived from effort data and the SEAMAP summer survey. The implications of the uncertainty in these data were explored using high and low catch scenarios. While this is helpful in considering uncertainty in the scale of the catches it does not consider alternative trends in the catch which may have a larger effect on the estimated population trend. It would be worth investigating alternative but plausible catch streams to explore this uncertainty.

The assessment relies almost entirely on the Schaefer model and while some model assumptions were subject to sensitivity analysis it is not really possible to evaluate model uncertainty without comparison to alternative structural models. It would be worthwhile considering methods suggested by Brooks *et al* (2010) or developing the hierarchical index model to include a population dynamics model so that stock trends could be evaluated from the survey data alone.

6. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.

The research recommendations of the DW an AW should be supported. It is particularly important to maintain the ability to estimate the shrimp trawl bycatch for the future. As more years of data accumulate there will be an improvement in the ability to assess the stock.

The present model software requires that complete catch data are input to the assessment and that they are treated as known error free values. In principle it should be possible to use the shrimp fishery effort data along with the more reliable estimates of catch from 2009 onwards within the model to estimate historical catch and the uncertainties relating to it. It would be desirable to develop such a model which would have wider applicability to stocks that are affected by the same catch data problems.

7. Consider whether the stock assessment constitutes the best scientific information available using the following criteria as appropriate: relevance, inclusiveness, objectivity, transparency, timeliness, verification, validation, and peer review of fishery management information.

The input data were subject to review and appear to offer the best information available. Work has been done to try to improve the catch estimates from the shrimp fishery by using the SEAMAP CPUE data. This is an important change from the assumption of constant CPUE used in SEDAR 34 but more work is required to make better use of the available data (see section 6). Nevertheless the assessment makes good use of currently available software and data. In the interests of transparency the WinBUGS code used in the assessment should be included in the assessment report.

8. Provide guidance on key improvements in data or modelling approaches which should be considered when scheduling the next assessment.

The Schaefer modelling software needs to be developed to allow incomplete catch data and indices of fishing effort to be included in the model. See also section 6 above.

Atlantic smooth sharks

1. Evaluate the data used in the assessment, including discussion of the strengths and weaknesses of data sources and decisions.

a) Are data decisions made by the DW and AW sound and robust?

While the decisions by the DW and AW can be regarded as sound, the robustness of the decisions is harder to evaluate.

The data comprise survey abundance indices, length frequency distributions and estimates of catch. The DW reviewed the available data and recommended fishery independent surveys for use in the assessment. These were ranked according to a number of criteria that included area coverage, length of time series and precision. The allocation of ranks appears logical and should be interpreted as an order of preference in their use, rather than an estimate of statistical precision.

The catch data are a mixture of recorded landings and estimates of discards from surveys. Dead discards were estimated assuming survival rates recommended by the DW. The choices are based on such published material as is available but since these are highly variable the precision of the dead discard estimates is unclear and the values should be regarded as uncertain. Given the assumption in the assessment that catch data are exact, uncertainties in the catch data will translate directly in to errors and bias in the population estimates and management indicators. This may be a significant issue and needs to be investigated.

Length frequency data are used in the model and form one of the few potential sources of information on annual recruitment. These distributions appear highly variable and it is hard to believe they provide a robust indicator of the true overall frequency distributions especially for the spatially localised surveys. These data need careful analysis to provide confidence they do actually reflect the population. There is a danger they are distorted by a patchy spatial distribution of the stock and sporadic large catches of sharks with a limited size distribution that is not reflective of the whole population.

b) Are data uncertainties acknowledged, reported, and within normal or expected levels?

Uncertainties in the data are acknowledged. Survey precision is reported based on GLM modelling though this is likely to underestimate overall precision as a result of year effects in surveys, area coverage and other environmental factors affecting catchability. No estimates of precision of the catches are provided and this needs to be done especially since the assessment model uses the catch data as if it were precise.

c) Are data applied properly within the assessment model?

Given the limitations of stock synthesis (SS3) the data are applied correctly. An important feature of SS3 is that the underlying model is age based yet much of the data are length based. This requires conversion of numbers at age to numbers at length in the model in order to compare observed frequencies to modelled values. This is probably not the best way to handle length data and a model that describes the population dynamics by length rather than age would be preferable.

d) Are input data series reliable and sufficient to support the assessment approach and findings?

I am sceptical that the data series are reliable and sufficient to support the assessment findings in relation to reference points. There is a great deal of variability in the survey index series and

while there is a tendency to show similar long term trends there are substantial inter-annual differences between them. The only way the model can account for differences in trends is through the survey selectivities and their length frequencies. Some selectivity parameters were not estimable in the model and the length frequencies were very poorly fit for some surveys which calls into question the adequacy of estimated trends. Another difficulty is that the model attempts to estimate a stock recruitment relationship and the recruitment deviations around it. It is clear from the model output that the estimated Beverton-Holt curve is not consistent with the recruitment deviations and this undermines the validity of the management reference points calculated within the model. In my opinion the data are sufficient to provide broad insight in to stock trends and harvest rates but I am not convinced the status of the stock can be robustly determined from the assessment.

2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data.

a) Are methods scientifically sound and robust?

The assessment approach used is the SS3 version of Stock Synthesis. This is a well-established statistical framework for fish stock assessment. The method has been subject to numerous reviews and has been published in the peer-reviewed literature. It can therefore be regarded as scientifically sound. Its robustness will depend on the data and way the model is configured. In the particular application in this assessment I would not regard it as robust because the fits to important elements of the data were very poor and certain parameters, such as steepness in the Beverton-Holt function and many selectivity parameters were not estimable. This is indicative of lack of information in the data and a reliance on user choice to constrain a number of critical quantities. These choices were all rigorous and respectable but remain to some degree a matter of opinion.

b) Are assessment models configured properly and used consistent with standard practices?

There was some discussion by the review panel as to whether the model was configured according to standard practices. One panellist felt that there were a number of differences from standard practice. However, additional runs during the review meeting using a standard approach made very little difference either to the stock trajectory or the perceived status of the stock. I therefore conclude that the model was configured in a way consistent with standard practice.

c) Are the methods appropriate for the available data?

SS3 offers an approach to the use of the data available but it is very demanding in terms of information. In this assessment it requires a lot of information on fleet selectivity, growth and recruitment. I fear that such information is simply lacking in the data and as a result a substantial element of the assessment requires user judgement in fixing certain parameters (e.g. selectivity and steepness) which may be critical in the calculation of management reference points. It is therefore hard to judge from the model diagnostics how much of the assessment is driven by the data and how much is simply pre-determined by the external specification of critical quantities. This does not invalidate the assessment, but it simply makes it harder to judge the extent to which the data inform the results.

One way to deal with the problem of the over-complexity in the assessment model is perhaps to be more realistic about what can be expected from the data and a use a much simpler model for comparison. Where structural uncertainties are high, as in this case, the use of a number of other models making somewhat different (and simpler) structural assumptions can be instructive.

3. Evaluate the assessment findings.

a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?

The abundance, exploitation, and biomass estimates appear consistent with the long term trends in the survey. The agreement between the survey indices and the estimated biomass trend offers some reassurance that these trends are real. Furthermore, the hierarchical index, which is probably the best measure of biomass trends, is consistent with the assessment results and avoids many of the assumptions made in configuring SS3. The trend in fishing mortality will be influenced by the catches which are assumed error free and may therefore be biased but which nevertheless do reflect the estimated catch trend.

b) Is the stock overfished? What information helps you reach this conclusion?

The preferred base assessment model uses dome shaped selectivity of the F1 fleet (SEL2) and I would concur with this choice given the gear used in the F1 fleet. Sensitivity analyses based on this model configuration all suggest that the stock is currently not over-fished and that the distance from the over-fished threshold is quite large. This suggests the overfished status is fairly robust but conditioned on the assumptions in the assessment model.

c) Is the stock undergoing overfishing? What information helps you reach this conclusion?

Sensitivity analyses based on the SEL2 configuration all suggest that the stock is currently not experiencing over-fishing. However, it is hard to judge, for reasons discussed above relating to the stock recruitment curve, whether the conclusion about overfishing status is robust. Some sensitivity runs place current status close to the overfishing threshold and if alternative assumptions about recruitment were made, it is possible that the stock could be experiencing overfishing.

d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?

The stock recruitment relationship shows some behaviour which brings its veracity into question. The estimated Beverton-Holt curve does not go through the annual recruitment values and the deviations are clearly autocorrelated violating the error structure assumed in the assessment model. The autocorrelation will mean that the variability of recruitment will not be adequately modelled by the assumption of independence and will affect the forward projections. These problems mean that the estimates of MSY may not be reliable and make assessing stock status problematic.

The productivity of the stock as encompassed by steepness was estimated externally to the assessment model and was based on life history data. It may well prove a reliable way to estimate steepness. This means the model is left to estimate R_0 and it is clear from the stock recruitment plot that the annual values of R are too variable to estimate it with any precision.

The projections were based on an estimate of recruitment variability that assumes annual recruitment deviations are independently distributed. The assessment estimates of these deviations shows that in fact they are strongly autocorrelated. It may be that such auto-correlation is an artefact arising from the data and model mis-specification. It is likely that the variability of recruitment has not been adequately characterised and this could affect probability statements about future stock status.

e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

The stock status criteria are conditioned on the stock recruitment relationship that models the recruitment process as an underlying Beverton-Holt curve and lognormal deviations from this function. The assessment model output indicates an inconsistency between the annual recruitment deviations and the fitted curve and inevitably calls into question the robustness of the MSY reference points. It may be better to try to use MSY proxies that do not explicitly depend on a stock-recruitment function such as 40%SPR or F0.1.

4. Evaluate the stock projections, including discussing strengths and weaknesses.

a) Are the methods consistent with accepted practices and available data?

The projection methods are consistent with accepted practices and the available data. They use the model output from SS3 and make similar assumptions about the stock recruitment relationship. The projections are made assuming a fixed catch over the forecast period which will mean variable annual fishing mortality and, by implication, that F may exceed F_{msy} in some years and the stock may therefore suffer periods of over-fishing even if the biomass remains above B_{msy}. An alternative approach would be to project under assumptions of constant F and characterise the expected catches under this assumption. The value of each of these approaches will depend on how managers prefer to implement fishery controls. If constant TAC management is the preferred system then the constant catch scenario will be the more useful.

b) Are the methods appropriate for the assessment model and outputs?

The projection methods are entirely consistent with the assessment method and make essentially the same modelling assumptions. One somewhat technical issue is the way in which recruitment parameters are corrected for bias as a result of the use of a lognormal distribution. SS3 goes to some lengths to make bias corrections to translate the recruitment parameters back to the natural scale. In so doing, it makes it necessary to do the same thing when making projections. It would actually be simpler if SS3 output was in log space so that projections could be made without the need to correct for bias as the difficulty arises mainly as a result of making random draws from a lognormal distribution where the expected value derived from SS3 is a biased estimate of the geometric mean needed in the simulations.

c) Are the results informative and robust, and useful to support inferences of probable future conditions? d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?

The projection results presented at the meeting considered only the base model assessment (with the SEL2 assumption) under fixed catch scenarios. The range of fixed catches used will reflect a wide range of possible outcomes but it would be desirable to run projections using the output from at least some of the sensitivity runs to explore more of the envelope of uncertainty. Critically, the projections will be heavily dependent on the assumed stock-recruitment model which I don't believe can be considered robust. Projections should therefore also reflect alternative assumptions about recruitment, and in particular, the impact of time auto-correlated annual recruitment. At present, therefore, I do not believe the projections fully reflect uncertainties in the analysis.

5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.

Uncertainties in the assessment are characterised principally through the estimated asymptotic parameter covariance matrix and sensitivity analyses where alternative assumptions about the data and SS3 model configuration are made. These will encompass much of the uncertainty but overall probably do not explore its full range. Although a sensitivity run was performed

assuming a different level of catch, for example, it only explores the scale of the catch rather than considering alternative catch trends, which may be more revealing. Only the SS3 model has been used so the wider issue of potential model mis-specification is not addressed, and given the uncertainty relating to the stock-recruitment function, may be an important omission. A much simpler model, such as a surplus production model would provide a good foil for comparison to the complex SS3 model, circumventing explicit assumptions about recruitment.

6. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.

The DW and AW make research recommendations that should be supported in principle. However, it is important to ensure that further work is proportionate to the importance of the fishery. It is clear that considerable resources have gone into the current assessment, not only in terms of data but also in expertise and process. If smooth shark is largely a bycatch species of relatively low economic value then one would imagine that the management of the stock is principally concerned with ecological considerations and it is perhaps more worthwhile to focus on the scientific issues related to those rather than try to collect data to fuel the most complex single species assessment models. Given the significance of the fishery it is likely that simple models are as efficient in determining stock status as complex ones and it may be preferable to invest scarce expert resources in the application of simpler approaches. Understanding the ecological role of the species may well be of greater significance than attempting very precise determinations of MSY reference points. Indeed a broader understanding of the ecology of the system may be more informative about sustainable fishing on smooth sharks than strong focus on the application of single species MSY.

7. Consider whether the stock assessment constitutes the best scientific information available using the following criteria as appropriate: relevance, inclusiveness, objectivity, transparency, timeliness, verification, validation, and peer review of fishery management information.

From the documentation provided the assessment appears to use the best information available. There has clearly been a substantial investment in the process of assembling experts with relevant data and expertise to inform the development of the assessment. Peer review is also a prominent part of the process. The assessment is likely to reflect the best science available.

8. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.

One of the key issues in this assessment is the value of the length frequency data. It is unclear how representative they are of the fishery or the stock. If they are adequately representative samples then an assessment model based explicitly on length using a projection matrix approach may be preferable. Such models can use size selectivity more naturally and account for growth increments within a year rather than relying on a coarser annual increment. However, such an approach would require good quality length frequency data with a fair degree of temporal resolution.

An alternative modelling approach is to rely more on the survey data. These could be used either on their own to determine stock status using methods such as those proposed by Brooks *et al*(2010), or used in combination with catch data in a surplus production model. The latter has the advantage of making less detailed assumptions about recruitment and growth and may reflect more realistically the amount of information in the data.

The SEDAR Process

The SEDAR process is well organised and brings together a wide range of appropriate expertise in the preparation of data and assessment. Great care is taken to ensure independent and objective review of the science and that legitimate stakeholders have an opportunity to contribute to the assessment. Generally documentation is substantial and timely although for this particular review some documents were not quite complete. Projections for the Atlantic smooth shark were only available very shortly before the review meeting.

It is apparent that the process is very onerous for the assessment scientists as there is a heavy procedural burden placed upon them. Clearly a balance needs to be struck between the time available to carry out the science and the need for transparency and participation. I felt the balance perhaps compromises the ability of experts to get on with the science and think innovatively about the approach to the assessments. For example, I would question the wisdom of adopting a highly complex assessment model for smooth sharks that requires substantial effort to configure and parameterise when the fishery itself is of low commercial value. An assessment suitable for management purposes could be achieved much more simply, especially if more time was allowed for creative thought. Given that stock assessment expertise is a scarce resource I would suggest that consideration be given to reducing the overhead of process (e.g. frequency and number of meetings) so that more time can be given to strengthening science.

Conclusions and Recommendations

There can always be debate about whether assessments could have been done better and it is always possible to see improvements after an analysis has been completed. The two assessments considered at the review workshop have been conducted very thoroughly and represent high quality science, but there are clearly ways they can be improved in the future.

As they stand the assessments are likely to show realistic trends in biomass and possibly also in harvest rate. For both stocks the evaluation of stock status in relation to MSY reference points is, in my view, rather uncertain despite the apparent robustness of the assessments. This is because in the case of the Gulf of Mexico, shrimp trawl bycatch is highly uncertain yet the assessment model uses these data as exact. In the case of the Atlantic smooth shark the estimated stock-recruitment relationship appears inconsistent with the modelled values, which undermines the estimates of MSY values.

In the case of the Gulf of Mexico I would recommend that the Bayesian surplus production model is developed to avoid the requirement to use exact catch data. This can be done by using effort data within the model and treating the available catch data as observations made with error rather than constants. This would allow unknown catches to be estimated within the model.

For the Atlantic smooth shark I would recommend that an assessment model is developed that describes the population dynamics in length rather than age as this more naturally models the data available. However, the length frequency data may not be of adequate quality for such an approach, in which case methods that use survey data alone may prove more practical and less time consuming to implement.

In both assessments I would recommend the use of alternative and simpler methods to compare with the principal assessment model as a test of model robustness.

Reference

Brooks, E.N., J.E. Powers, and E. Cortés. 2010. Analytic reference points for age-structured models: application to data-poor fisheries. ICES J. Mar. Sci. 67:165-175.

Appendix 1: Bibliography of materials provided for review

SEDAR 39
HMS Smoothhound Sharks
Document List

Document #	Title	Authors	Date Submitted
Documents Prepared for the Data Workshop			
SEDAR39-DW-01	Tag and recapture data for smoothhound sharks, *Mustelus* spp., in the Gulf of Mexico and US South Atlantic: 1998-2012	Dana M. Bethea and William B. Driggers III	14 March 2014
SEDAR39-DW-02	Standardized catch rates of smooth dogfish from the SEAMAP-South Atlantic Shallow Water Trawl Survey	E. Cortés and J. Boylan	9 May 2014
SEDAR39-DW-03	Preliminary catches of smoothhound sharks	E. Cortés and H. Balchowsky	9 May 2014
SEDAR39-DW-04	Relative abundance of *Mustelus spp.* in the Gulf of Mexico based on observer data collected in the reeffish bottom longline fishery	John Carlson and Elizabeth Scott-Denton	30 April 2014
SEDAR39-DW-05	Shrimp Fishery Bycatch Estimates for Smoothhound Sharks in the Gulf of Mexico, 1972-2012	Xinsheng Zhang, Enric Cortés, Dean Courtney and Elizabeth Scott-Denton	12 May 2014
SEDAR39-DW-06	Smoothhound Abundance Indices from NMFS Bottom Longline Surveys in the Western North Atlantic and Northern Gulf of Mexico	Adam G. Pollack and G. Walter Ingram, Jr.	7 May 2014 Updated 22 May 2014
SEDAR39-DW-07	Smoothhound Abundance Indices from SEAMAP Groundfish Surveys in the Northern Gulf of Mexico	Adam G. Pollack and G. Walter Ingram, Jr.	20 May 2014 Updated 22 May 2014
SEDAR39-DW-08	Smoothhound Abundance Indices from NFMS Small Pelagics Surveys in the Northern Gulf of Mexico	Adam G. Pollack and G. Walter Ingram, Jr.	9 May 2014 Updated 16 May 2014
SEDAR39-DW-09	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Northeast Fisheries Observer Program	C.T. McCandless and J.J. Mello	30 June 2014
SEDAR39-DW-10	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Rhode Island Department of Environmental Management trawl surveys	C.T. McCandless and S.D. Olszewski	30 June 2014
SEDAR39-DW-11	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the University of Rhode Island trawl survey conducted by the Graduate School of Oceanography.	C.T. McCandless	17 June 2014
SEDAR39-DW-12	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the	C.T. McCandless and K. Gottschall	17 June 2014

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	Long Island Sound Trawl Survey conducted by the Connecticut Department of Energy and Environmental Protection		
SEDAR39-DW-13	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Peconic Bay Small Mesh Trawl Survey conducted by the New York State Department of Environmental Conservation	C.T. McCandless and C. Grahn	17 June 2014
SEDAR39-DW-14	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the New Jersey Division of Fish and Wildlife ocean trawl surveys	C.T. McCandless, J. Pyle, G. Hinks and L. Barry	17 June 2014
SEDAR39-DW-15	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Delaware Division of Fish and Wildlife 30-foot otter trawl survey	C.T. McCandless and M. Greco	17 June 2014
SEDAR39-DW-16	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) longline surveys in Delaware Bay	C.T. McCandless	30 June 2014
SEDAR39-DW-17	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the Ocean Gillnet Program conducted by the North Carolina Division of Marine Fisheries	C.T. McCandless, C. Stewart, and H. White	30 June 2014
SEDAR39-DW-18	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the University of North Carolina shark longline survey south of Shakleford Banks	C.T. McCandless, F.J. Schwartz, and John J. Hoey	17 June 2014
SEDAR39-DW-19	Standardized indices of abundance for Smooth Dogfish, *Mustelus canis*, from the South Carolina Department of Natural Resources red drum longline survey	C.T. McCandless and B. Frazier	30 June 2014
SEDAR39-DW-20	Mark/Recapture Data for the Smooth Dogfish, *Mustelus Canis*, in the western North Atlantic from the NEFSC Cooperative Shark Tagging Program	N. E. Kohler, P. A. Turner, M. Pezzullo, and C. T. McCandless	19 May 2014 Updated 17 June 2014
SEDAR39-DW-21	A Preliminary Review of Post-release Live-discard Mortality Rate Estimates in Sharks for use in SEDAR 39	Dean Courtney	18 May 2014 Updated: 20 June 2014
SEDAR39-DW-22	Identification, Life History and Distribution of *Mustelus canis*, *M. norrisi* and *M. sinusmexicanus* in the northern Gulf of Mexico	Lisa M. Jones, William B. Driggers III, Kristin M. Hannan, Eric R.	16 May 2014 Updated: 22 May 2014

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		Hoffmayer, and Christian M. Jones	
SEDAR39-DW-23	Discards of *Mustelus canis* in the coastal gillnet fishery off the Southeast United States	John Carlson, Alyssa Mathers, and David Gloeckner	9 May 2014 Addendum: 22 May 2014
SEDAR39-DW-24	Biomass. Abundance and distribution of smooth dogfish (Mustelus canis) from the Northeast Fisheries Science Center and Massachusetts Department of Marine Fisheries trawl surveys	Katherine A, Sosebee, Jeremy King, Michele Traver, and Larry Alade	19 May 2014 Updated: 24 June 2014
SEDAR39-DW-25	Estimation of smooth dogfish discards in the Northeast United States fisheries using data collected by the Northeast Fisheries Observer Program	Katherine A, Sosebee	16 May 2014 Updated: 18 June 2014
SEDAR39-DW-26	Discards of *Mustelus spp.* in the Gulf of Mexico reeffish bottom longline fishery	John Carlson, Elizabeth Scott-Denton, and Kevin McCarthy	14 May 2014 Addendum: 21 May 2014
SEDAR39-DW-27	SEDAR 39 Indices Report Cards	S39 Indices WG	18 June 2014
SEDAR39-DW-28	Seasonal Distribution of *Mustelus canis* off the Atlantic coast of the U.S.	Melissa M. Giresi, William B. Driggers, R. Dean Grubbs, Jim Gelsleichter, Eric R. Hoffmayer	21 May 2014
SEDAR39-DW-29	Initial Comparison of Genetic Population Structure of *Mustelus canis* using the mitochondrial gene, NADH-2	Melissa M. Giresi and David S. Portnoy	21 March 2014
SEDAR39-DW-30	Size composition and indices of relative abundance of the smooth dogfish (*Mustelus canis*) in the near shore Atlantic Ocean	Robert J. Latour, Christopher F. Bonzek, and J. Gartland	16 June 2014
SEDAR39-DW-31	Length/weight relationships and life history data for *Mustelus canis* off of the Atlantic coast of the U.S.	Eric R. Hoffmayer, William B. Driggers, R. Dean Grubbs, Melissa M. Giresi, Jim Gelsleichter, Robert Latour	22 May 2014
Documents Prepared for the Assessment Process			
SEDAR39-AW-01	Review of Available Length Composition Data Submitted for use in the SEDAR 39 *Mustelus canis* Atlantic Stock Assessment	Dean Courtney	10 Sept 2014
SEDAR39-AW-02	Hierarchical analysis of U.S Atlantic Smooth dogfish and Gulf of Mexico smoothhound species indices of	Cami McCandless	15 Oct 2014

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		Tommy Garrison,Andre Punt, John Wallace, Chantel Wetzel, James Thorson,Yukio Takeuchi, Cole Monnahan, and other contributors
SEDAR39-RD13	User Manual for Stock Synthesis - Model Version 3.24s	Richard D. Methot Jr.
SEDAR39-RD14	FINAL REPORT FOR THE ASSESSMENT METHODS WORKING GROUP SUMMARIZING THE DOMESTIC SHARK P* STANDARDIZATION WORKSHOP	DEAN L. COURTNEY ENRIC CORTÉS XINSHENG ZHANG
SEDAR39-RD15		

Appendix 2: Statement of work

Statement of Work

External Independent Peer Review by the Center for Independent Experts

SEDAR 39 HMS Smoothhound Sharks Assessment Review Workshop

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from *www.ciereviews.org*.

Project Description: SEDAR 39 will be a compilation of data, an assessment of the stocks, and CIE assessment review conducted SEDAR 39 HMS Smoothhound sharks. The review workshop provides an independent peer review of SEDAR stock assessments. The term review is applied broadly, as the review panel may request additional analyses, error corrections and sensitivity runs of the assessment models provided by the assessment panel. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The stocks assessed through SEDAR 39 are within the jurisdiction of the Highly Migratory Species Division of NOAA Fisheries and the states of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, and North Carolina, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers should have expertise in stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of providing peer-review advice in compliance with the workshop Terms of Reference. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in **Panama City, Florida** during **February 10-12, 2015.**

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website:

http://deemedexports.noaa.gov/

http://deemedexports.noaa.gov/compliance_access_control_procedures/noaa-foreign-national-registration-system.html

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting at the **Panama City, Florida during February 10-12, 2015**.
3) **In Panama City, Florida during February 10-12, 2015** as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than **February 26, 2015**, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to Dr. David Sampson d*avid.sampson@oregonstate.edu*. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Tentative Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

January 6, 2015	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
January 27, 2015	NMFS Project Contact sends the CIE Reviewers the pre-review documents
February 10-12, 2015	Each reviewer participates and conducts an independent peer review during the panel review meeting
February 26, 2015	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
March 12, 2015	CIE submits CIE independent peer review reports to the COTR
March 19, 2015	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. The COTR can approve changes to the milestone

dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) The CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) The CIE report shall address each ToR as specified in **Annex 2**,
(3) The CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

Allen Shimada
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
Allen.Shimada@noaa.gov Phone: 301-427-8174

William Michaels
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Manoj Shivlani, CIE Lead Coordinator
Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
shivlanim@bellsouth.net Phone: 305-383-4229

Key Personnel:

NMFS Project Contact:

Julie A. Neer
SEDAR Coordinator
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405
(843) 571-4366
julie.neer@safmc.net

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Tentative Terms of Reference for the Peer Review

SEDAR 39 HMS Smoothhound Sharks Assessment Review Workshop

1. Evaluate the data used in the assessment, including discussion of the strengths and weaknesses of data sources and decisions, and consider the following:
   a) Are data decisions made by the DW and AW sound and robust?
   b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   c) Are data applied properly within the assessment model?
   d) Are input data series reliable and sufficient to support the assessment approach and findings?
2. Evaluate and discuss the strengths and weaknesses of the methods used to assess the stock, taking into account the available data, and considering the following:
   a) Are methods scientifically sound and robust?
   b) Are assessment models configured properly and used consistent with standard practices?
   c) Are the methods appropriate for the available data?
3. Evaluate the assessment findings and consider the following:
   a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   b) Is the stock overfished? What information helps you reach this conclusion?
   c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?
4. Evaluate the stock projections, including discussing strengths and weaknesses, and consider the following:
   a) Are the methods consistent with accepted practices and available data?
   b) Are the methods appropriate for the assessment model and outputs?
   c) Are the results informative and robust, and useful to support inferences of probable future conditions?
   d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?
5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods.
   - Ensure that the implications of uncertainty in technical conclusions are clearly stated.
6. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.
   - Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.

- Provide recommendations on possible ways to improve the SEDAR process.

7. Consider whether the stock assessment constitutes the best scientific information available using the following criteria as appropriate: relevance, inclusiveness, objectivity, transparency, timeliness, verification, validation, and peer review of fishery management information.
8. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.
9. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations. If there are differences between the AW and RW due to the reviewer's request for changes and/or additional model runs, etc. describe those reasons and results.
10. CIE Reviewer may contribute to a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference.

Annex 3: Tentative Agenda

SEDAR 39 HMS Smoothhound Sharks Review Workshop

Panama City, Florida

10-12 February 2015

Tuesday

9:00 a.m.	**Introductions and Opening Remarks**	**Coordinator**
	- Agenda Review, TOR, Task Assignments	
9:30 a.m. – 11:30 a.m.	**Assessment Presentations – Gulf of Mexico**	**Enric Cortés**
	- *Assessment Data & Methods*	
	- Identify additional analyses, sensitivities, corrections	
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 6:00 p.m.	**Assessment Presentations – Atlantic**	**Dean Courtney**
	- *Assessment Data & Methods*	
	- Identify additional analyses, sensitivities, corrections	

***Tuesday Goals*:** Initial presentations completed, sensitivity and base model discussion begun

Wednesday

8:00 a.m. – 11:30 a.m.	**Panel Discussion**	**Chair**
	- *Assessment Data & Methods*	
	- Identify additional analyses, sensitivities, corrections	
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 6:00 p.m.	**Panel Discussion/Panel Work Session**	**Chair**
	- Continue deliberations	
	- Review additional analyses	
	- Recommendations and comments	
6:00 p.m. – 6:30 p.m.	**Public comment**	**Chair**

***Wednesday Goals*:** sensitivities and modifications identified, preferred models selected, projection approaches approved, Report drafts begun

Thursday

8:00 a.m. – 11:30 a.m.	**Panel Discussion**	**Chair**
	- Final sensitivities reviewed.	
	- Projections reviewed.	**Chair**
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 5:00 p.m.	**Panel Discussion or Work Session**	**Chair**
	- Review Reports	
5:00 p.m. – 5:30 p.m.	**Public comment**	**Chair**
5:30 p.m.	**ADJOURN**	

Thursday Goals: Complete assessment work and discussions, final results available. Draft Reports reviewed.

Appendix 3: Panel members

Workshop Panel

Carolyn Belcher, Chair ..... HMS AP
Robin Cook ..... CIE Reviewer
Neil Klaer ..... CIE Reviewer
Joel Rice ..... CIE Reviewer

Analytic Representation

Enric Cortés ..... SEFSC, Panama City
Dean Courtney ..... SEFSC, Panama City
Xinsheng Zhang ..... SEFSC, Panama City

Council Representation

Anna Beckwith ..... SAFMC
Ben Hartig ..... SAFMC

Appointed Observers

Peter Barile ..... SFA
Kathy Sosebee ..... NEFSC

Staff

Julie Neer ..... SEDAR
Julie O'Dell ..... SAFMC Staff
Karyl Brewster-Geisz ..... HMS