

30th Southeast Data, Assessment and Review (SEDAR 30)

**Reviewer Report to the Center for Independent Experts on the U.S.
Caribbean Blue Tang and Queen Triggerfish (SEDAR 30)**

March 20, 2013

Prepared for:
Center for Independent Experts

By:
M. Kurtis Trzcinski
5 1/2 A Quarry Rd
Halifax, Nova Scotia, Canada
B3N 1X1

Executive Summary

This document is an independent review of the activities and findings of the 30th Southeast Data, Assessment and Review (SEDAR 30). The review was a desktop review, that is, assessment documents and supporting material were sent out for review, but there was not a meeting or an opportunity for dialogue regarding the assessment. Two stocks were reviewed: the U.S. Caribbean blue tang and queen triggerfish. While I acknowledge that the science reviewed is the best scientific information available and that considerable effort was made to make the best use of the data available, I do not find that either assessment provides a sound basis for management advice. Several of the ToRs were met, but the most important ones regarding stock status, trends and the impact of fishing were not (ToRs 3 and 4). The failure to meet these ToRs are through no fault of the assessment team, but rather, are due to the lack of data and often the poor quality of the data they do have.

The approach to each assessment was similar. It was in fact so similar, I had trouble seeing the differences and I wonder what differences in methods, if any, are warranted given the life history of each species and any differences in the fishery. Consequently, my comments typically apply to both assessments and I only make distinctions where necessary.

My overall conclusions are that we don't know much about the status of these fish or whether overfishing has occurred. A noble effort has been made, but alas, we have tremendous uncertainty and little basis for management advice. Rather than focusing on the particulars of these assessments, which I do below, I encourage the assessment team to take a strategic approach to the problem. In particular, to formulate a medium to long-term plan to, 1) engage external scientists in a program review where an assessment framework (benchmark) can be agreed upon, and 2) make plans to collect the data to support it.

1.0 Background

This document is an independent review of the findings of the 30th Southeast Data, Assessment and Review (SEDAR 30). The review was a desktop review, that is, assessment documents and supporting material were sent out for review, but there was not a meeting or an opportunity for dialogue regarding the assessment. Two stocks were reviewed: the U.S. Caribbean blue tang and queen triggerfish. Assessment documents (Appendix 1) and background materials were provided via a website two weeks before the review. I was also provided with a Statement of Work (Appendix 2), including the Terms of Reference (ToR).

2.0 Individual Reviewer Activities

I reviewed the assessment and background documents provided for the review. This was a desktop review so there was no dialogue between the assessment team and me and all my comments only pertain to documents provided to me. As outlined in Statement of Work (Appendix 2), these reports should state in the reviewer's own words whether each ToR of the Stock Assessment Workshop was completed successfully, should state whether they accepted or rejected the work that they reviewed, and should include an explanation of their decisions (strengths, weaknesses of the analyses, etc.) and recommendations for each ToR. A key determinant of whether a ToR had been met was the extent to which it provided a scientifically credible basis for developing fishery management advice. The following section contains my review for both assessments.

3.0 Review of U.S. Caribbean Blue Tang and Queen Triggerfish

U.S. Caribbean blue tang and queen triggerfish were assessed using a length-based estimate of total mortality (Beverton and Holt 1957, Gedamke and Hoenig 2006). I presume that this is the first time these stocks have been assessed as there were no citations to previous assessments. If these are the first assessments of these stocks, I think it is important to put in the assessment report as context (as it stands now, the information is presented in section 3 of Section I; I suggest making that more prominent in the introductions to Sections I and II). I felt like a lot of the structure of the report and writing was 'cookie cutter', that is, following a particular formulae. This seems counter productive to me. In my view, what is needed in a first assessment is a review of past work and some soul searching for ways forward. This is better done in a free format. Furthermore, the assessments are chopped up into little pieces (six supporting documents). While the details should remain in the supporting documents, I think a synthesis of these documents is needed in the Assessment Process Report. Maybe that is what is lacking the most: a cohesive synthesis and vision. Blue tang and queen triggerfish have similar data and assessment problems, how can we solve them together? Or for perhaps a larger species group? Step back and take stock of the situation, so to speak. I

am having trouble getting the sense of whether people care and if so exactly what they care about. Compared to some of the world's fisheries the landings of surgeonfish and triggerfish are small (~35, ~80 metric tons / year respectively) although this is a relatively small area as well. Maybe more data and analysis to support management is not needed. If it is, then a stronger case should be made for it. Similarly, if one is going to choose an assessment method, it should be defended and not simply stated that the 'AW panel decided'.

The assessment of blue tag and queen triggerfish is difficult given the quality and limited amount of data. Overall, the data have been assembled with considerable care and diligence. Some issues remain, but it is a good point in the history of these fisheries to step back and evaluate the quality of the data and the most effective means of assessing stock status and the impact of fishing. The assessment team makes good use of the data, given what they have and it is clear that progress has been made and that higher quality data are being collected. Stock status, in terms of a biomass based reference, cannot be determined given the approach used and the impact of fishing can only be estimated using strong and weakly supported assumptions about fishing and natural mortality. In my view, the current monitoring and assessment approach is inadequate and what is needed is an overall program review. I am not a manager, but if I were, I would be uncomfortable managing this fishery with such limited tools to assess stock status and the impact of fishing. So that causes me, as a reviewer, to look to the future. What is the framework or benchmark which will be used to assess these populations? Has there been adequate discussion and review of a proposed framework? Once the framework is decided upon, then the focus can be put on the most important and useful information to collect. The discussion of the assessment approach and data collection needs to proceed hand in hand. I will go so far as to suggest that this assessment team formulate a proposal for a new assessment approach along with a plan to collect the necessary data and submit that for review.

I did find the management history and context presented in Section I: Introduction useful, complicated, but important to be aware of. Actually, I would like to be slightly more complimentary of this work, as I don't see it enough and appreciate the work it takes. What I would like is for the managers and biologists to make stronger statements about if and when these management measures would be expected to affect the data used in the assessment. If a management measure was put in place and it was expected to affect mean length in the catch, did we see it? Did we even have the data to see it? Which of these management measures can be ignored, in terms of the assessment, and which should be explicitly accounted for. If you find a change in total mortality, can it be attributed to a management measure and / or a change in fishing practices? This is good work, but it should be pushed to the next level, if possible (I acknowledge the difficulties, but encourage those involved to try).

I find the explanation of methods in the Section II: Assessment Process Report thin, but what is needed even more is better motivation of the general approach and methods used. The motivation is even more important because this is a desktop review. It is much easier to get a sense of why decisions about the data or methods were made when there is a

presentation and reviewers are afforded the opportunity to ask questions. In the situation of a desktop review, we are left with sentences like 'The AW [assessment workshop] panel determined...', 'The AW panel agreed...!', but I need more written explanation supporting the decision or conclusion in order to decide whether I reach the same conclusion or not.

I see at least four major data categories where you might concentrate your efforts: 1) landings data, 2) fisheries independent survey, 3) life history data, and 4) tagging. As I noted, the priority and amount of effort given to each depends on the assessment framework you plan to use. Obviously, if one wishes to assess the stock with fisheries based catch per unit effort (cpue) data, then emphasis would be placed on collecting high quality effort and landings data. If on the other hand, one wishes to assess the stock using a fisheries independent survey, or calculate yield per recruit then the priorities shift and a different investment is required. I fear I state the obvious to my fellow stock assessment scientists, but in an effort to be as helpful and constructive as possible, I elaborate on these issues below (ToR 7).

ToRs 1,2,5 and 6 were met, but ToRs 3 and 4 were not in both assessments. I provide comments on all the ToRs below.

ToR 1

1. *Evaluate the data used in the assessment, addressing the following:*
 - a) *Are data decisions made by the Assessment Workshop 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?*

This ToR was met. There are limited data for this fishery. The landings are unknown for the species blue tang or queen triggerfish, but are recorded collectively as surgeonfish and triggerfish. There has been some length sampling, but they appear to be uninformative for a length-based cohort analysis as one cannot see cohorts in the length frequency plots (both species). Life history data (growth, age at maturity) for blue tang from the management unit is lacking and data are taken from other areas. The life history data for queen triggerfish is taken from Puerto Rico and the US Virgin Islands but the authors suggest that it needs to be verified by another study using otoliths rather than dorsal spines. Plots of the frequency at length by age and examining the modes and overlap among ages would be useful, to help determine if a length or age based model might be effective. Neither species has a fisheries independent survey. Overall, there is very little to go on. So, the greatest advancements in understanding the dynamics in these stocks will occur by collecting better data.

One big difficulty is not knowing the landings. The landings are aggregated into large species groups and until there is a method to estimate landings at a species level it will be hard to answer the question 'should we care'. I would like to say we should care about every fish we remove from the ocean, but the fact is that we must prioritize our efforts. Certainly some surgeonfish and triggerfish are being removed, but even a rough estimate of proportion by species would be useful. It appears that the reporting regulations have changed and that this will no longer be a problem, but I suggest you take the time to demonstrate that it is not a problem in the future with some biological sampling of the catch. It is stated that species-specific data were reported in the US Virgin Islands during the 2011 - 2012 fishing year. I think it would have been very useful to report the proportion of blue tang and queen triggerfish in your assessment. If there have not been a lot of gear changes or changes in fishing practices, these proportions can be applied with some caution to the older landings data. Do we have enough information to partition the landings in the other areas? If not, what additional data would be needed?

I am not entirely sure if blue tang and queen triggerfish are targeted in the fishery or if they are principally bycatch species. If they are only a small proportion of the surgeonfish and triggerfish maybe this assessment approach is adequate. My confusion, of course, would have been cleared up immediately if this review was done at a meeting. This small example shows how extra effort is required by the assessment team to explain the context of the situation.

In general, I would have appreciated more background on the natural history of these fish and the community and ecosystem in general. This context is important in evaluating the appropriateness of this assessment and avenues for its improvement. I would integrate all the information in SEDAR30-AW-03 'A review of the life history characteristics...' into the Assessment Process Report. One notable gap in your knowledge is the length or age at maturity.

I can appreciate the fact that improved sampling of the catch will be difficult, and I found the pilot studies examining these issues useful (SEDAR30-RD-01, SEDAR30-RD-02). Some sort of improved sampling will need to occur, but the level of investment is proportional to the assessment method. If you want to use a length-based or age-based model then this data stream will be very important and will require further study and planning. If you instead choose to use tagging as an assessment method, sampling the catch is less of a priority.

- a) The decisions about how to use the data appear to be robust and sound.
- b) Data uncertainties are acknowledged and reported. I find the uncertainties larger than 'normal' and these uncertainties severely limit the ability to track the population and to estimate the impact of fishing. Only the most general of statements about total mortality and whether it has changed can be made and given the uncertainties we cannot be confident in these conclusions.
- c) The data appear to be applied properly within the model: the length based mortality estimator by Gedamke and Hoenig (2006).

d) This depends on what the goals are. I think the goals should be on how to move to a better assessment framework. The input data series are not reliable and sufficient to support the assessment of stock status and the impact of fishing, the typical goals of an assessment. If the goal is to estimate whether there has been a change (increase?) in the total mortality rate, then this work makes a contribution, but the conclusions must be very tentative given the quality of the data.

ToR 2

2. *Evaluate the methods used to assess the stock, taking into account the available data.*
 - 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?*

This ToR was met. The methods used for a length-based estimate of the total mortality rate look sound, but maybe not very robust. The methods are appropriate for the data available. As noble as these efforts are, I have trouble viewing these methods as an 'assessment'. With better life history and selectivity data we may have more confidence in an estimate of the total mortality rate and any conclusion about whether the total mortality rate has changed. The signal in any changes in length does not appear to be as strong as in the examples in Gedamke and Hoenig (2006). There is some evidence that the total mortality rate has increased for blue tang and possibly decreased for queen triggerfish, but changes in fishing practices may (probably?) make it difficult to interpret these data. In the AIC results, it is essentially profiling over different life history input parameters *and* changes in Z . The interpretation focuses on the best model for Z within a combination of life history parameters, but do these results also indicate the most likely combination of life history parameters? Can one actually put forth one or two models from Table 18 blue tang and Table 13 queen triggerfish as the best model?

a) The methods are scientifically sound and robust, but they cannot estimate stock status and the impact of fishing. I would like to have seen the profile likelihoods or the Bayesian posteriors for the estimates of total mortality and change year, similar to Figure 3 in Gedamke and Hoenig (2006), but more. These kinds of diagnostics are typically important to present.

b) The model is configured properly.

c) The methods are appropriate for the available data but do not form the basis for strong management advice (objectives 3 and 4 below). I have some trouble with the sensitivity analysis. It seems like a very wide range was chosen and that just has the effect of demonstrating that the estimates of the total mortality rate could be just about anything. How were the ranges of the life history parameters chosen? Were they the 95% credible interval (CI) from a growth study? I also have difficulty tracing back the range of total mortality rates used in the tables estimating F and M (blue tang: Tables 16 and 24, queen

triggerfish: Tables 19, 21, 25). Couldn't that range be taken from the CI of Z estimated from your analysis of mean length?

ToR 3

3. Evaluate the assessment findings with respect to 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?

This ToR was not met. By and large it is not possible to reach these objectives given the lack of suitable data. The assessment does not provide abundance or biomass estimates and given the data, it currently is not possible. It does provide an estimate of total mortality (Z) from which fishing mortality (F) can be inferred. However, there are large uncertainties in both total mortality and natural mortality making it exceedingly difficult to estimate fishing mortality ($Z-M=F$). They did not provide a convincing argument that their estimate(s) of mortality are useful to support status inferences. They do a good job of showing the uncertainty, but could do a better job arguing which estimate has the most support. A preferred model or estimate brings focus to the discussion about whether the estimate or model is 'useful to support status inferences'. As noted by the authors in the general discussion of the blue tang assessment:

'The disparate estimates of growth led to considerable uncertainty in the mortality estimates. They also made it difficult to meaningfully interpret stock status in terms of fishing mortality, in the absence of a weighting system giving credence to one life-history strategy over another.'

So given these data, the status of the blue tang fishery cannot be well determined. I agree entirely with this statement. Although, I think sometime we need to stick our neck out and rely on 'expert knowledge', if for nothing else than to push things forward (I guess that is what I am doing with all these comments!).

Similarly for queen triggerfish in the section on stock status and general conclusions the authors state:

'...it is difficult to interpret the sustainability of the estimated, current exploitation rates and that the absolute estimates of mortality should be interpreted with caution.'

I also agree entirely with this statement. So given the data, and a good analysis of what data is available, I conclude that we can not determine if the stock is overfished or if overfishing is occurring. The current data and modeling is light-years away from estimating a stock recruitment relationship, and I don't think this should be a short or medium term goal. Stock status cannot be determined with the current data and there are very few other data, if any, that can be used to inform managers about stock trends and conditions. If there were better life history data from the management unit and better length sampling of the catch then statements about overfishing based on F relative to M potentially could be better substantiated, but it will not solve all your problems and I would not rush to this without a more thorough program review.

ToR 4

4. *Evaluate the stock projections, addressing 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?*

This ToR was not met. No projections were done.

ToR 5

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.*

The uncertainties are well addressed, there are just so many! Most of the uncertainties are either due to the lack of data or to data of poor quality / resolution. The AIC analysis and sensitivity analyses are useful and demonstrate the need for better data, but I think that one could and should put forth (tentatively) the best model. You could work on how to better visualize the output from multiple models. The assessment team points out that the estimates from the length based total mortality estimator 'should be considered with caution', which is clearly and appropriately stated.

ToR 6

6. *Consider the research recommendations provided by the Assessment workshop 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.*

I set this out more generally below. I cannot prioritize these well because I do not know 1) the species biology, ecosystem and fishery well, 2) the long-term assessment goals or 3) the financial constraints. I think the assessment team would benefit from a meeting to discuss these issues and help set out the overall assessment framework. But if prioritizing is at all useful given my limited knowledge, I would work on getting a fisheries independent survey together, I might even do this over the life history work although that should be done as well.

Presumably some discussion occurred about whether the method used was the best given the available data. I think it is important to review and recapitulate that argument in the introduction to the assessment report.

ToR 7

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

I wouldn't schedule another assessment until an assessment framework is chosen and the appropriate data collected to support it. Below I briefly review the potential value of collecting better data in four areas.

Landings

I encourage to continue to try and improve sampling of the landings. Some changes have already been made. Check to see they accomplish your goals. Stratification and expansion factors will be important issues if you decide to go to a length based or age based model.

Fisheries independent survey

A fisheries independent survey can be the most useful and important piece of data indicating stock status and the impact of fishing. I am showing some of my bias, but I think many fisheries scientists believe this as well. The effectiveness of a survey, however, depends on many things including, the natural variability in the distribution and abundance of the species or community of interest, the survey design, the gear, the catchability, etc.. Designing a good survey is a big task and unless the species is extremely valuable, most surveys are used for an array of species. In your research recommendations you identify a fisheries independent survey as a 'top research priority'. If so, then this is quite an undertaking and probably deserves a suite of studies examining 1) the species which the survey would focus on monitoring, 2) the gear and fishing method, and 3) statistical design including stratification, sample size and power analysis.

I would like to encourage this work, but it should be acknowledged that commitment to a survey is a high level decision and that a new survey will take a lot of work and will require some long-term planning.

Life history data

There is quite a bit of uncertainty in the basic biology of this species. In particular, there has not been a growth study done in this area for blue tang, and there is quite a bit of variability in growth when looking across other regions. The authors suggest that the growth study for queen triggerfish be redone. Natural mortality is estimated from these growth studies, but you seem to show with the different methods and your sensitivity analysis that it could be just about anything. Which estimate should go forward and why? The authors argue that the Pauly (1980) method is better because it includes the growth coefficient and asymptotic length and then state that it 'may be robust to their negative correlation', but the real question is whether the extra parameter contains new or different information. No information was presented on the length or age at maturity which I believe is used in Roff's method (1984). It is stated that beyond the age of five, length is not informative about blue tang age. While this may be true, it would be better to support it with plots of the frequency at length for each age group, so we can see how much overlap there is. If the first 4 or 5 ages show distinct modes then a length-based model may still be a good way forward.

Although it appears that the authors have some data to estimate the selectivity of the gear, this has not been done. In the analysis of the total mortality rate, the parameter measuring the length of first capture (L_c) was allowed to vary. I would think about how to better estimate the selectivity of the gear. Tagging? If one ever wanted to do a yield per recruit analysis, this parameter along with natural mortality, and maturity would have to be better estimated.

Tagging

A tagging program can be used to address many questions, as I am sure most of those involved are aware. I just think it is important to bring up because it may be useful in designing a program for assessing these fish. Conventional tags can be used to estimate movement and help determine the appropriateness of the management unit, the selectivity of the gear and fish growth. Tagging can be used to get an estimate of the fishing and natural mortality rates, and an estimate of population size, however population size is more difficult and requires more tags. In my view, an overall assessment and research program benefits from a tagging program. It has the potential to reduce the number of assumptions in an assessment and the uncertainty in some parameters. In some cases it is the best method for an assessment given the natural history of the fish and the nature of the fishery.

4.0 References

Beverton, R. J., & Holt, S. J. (1957). *On the dynamics of exploited fish populations*. Springer.

Pauly, D. (1980). A new methodology for rapidly acquiring basic information on tropical fish stocks: growth, mortality and stock-recruitment relationships. *Stock assessment for tropical small-scale fisheries*, 154-172.

Roff, D. A. (1984). The evolution of life history parameters in teleosts. *Canadian Journal of Fisheries and Aquatic Sciences*, 41(6), 989-1000.

5.0 Appendices

Appendix 1: Bibliography of Materials Provided for Review

Appendix 2: CIE Statement of Work

Appendix 1: Bibliography of Materials Provided for Review

Documents Prepared for the Assessment Workshop

SEDAR30-AW-01. Summary of recreational catch and effort for blue tang and queen triggerfish caught in Puerto Rico since 2000. Meaghan Bryan

SEDAR30-AW-02. Evaluation of the available length-frequency information in the US Caribbean Trip Interview Program (TIP) data. Meaghan Bryan

SEDAR30-AW-03. A review of the life history characteristics of blue tang and queen triggerfish. Adyan B. Rios

SEDAR30-AW-04. Commercial fishery landings of queen triggerfish and blue tang in the United States Caribbean, 1983- 2011. Kevin J. McCarthy

Final Stock Assessment Reports

SEDAR30-SAR1. Blue tang

SEDAR30-SAR2. Queen triggerfish

Reference Documents

SEDAR30-RD01. A pilot program to assess methods of collecting bycatch, discard, and biological data in the commercial fisheries of St. Thomas, U.S. Caribbean. MRAG Americas

SEDAR30-RD02. A pilot program to assess methods of collecting bycatch, discard, and biological data in the commercial fisheries of U.S. Caribbean (Saint Croix). MRAG Americas

Appendix 1: CIE Statement of Work.

Attachment A: Statement of Work for Dr. Kurtis Trzcinski

External Independent Peer Review by the Center for Independent Experts

SEDAR 30 Caribbean blue tang and queen triggerfish assessment review

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 Representative (COR), 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 30 will be a compilation of data, an assessment of the stock, and an assessment review conducted for Caribbean blue tang and queen triggerfish. The CIE peer review is ultimately responsible for ensuring that the best possible assessment has been provided through the SEDAR process. The stocks assessed through SEDAR 30 are within the jurisdiction of the Caribbean Fisheries Management Council and the territorial waters of Puerto Rico and the U.S. Virgin Islands. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall have the necessary qualifications to complete an impartial and independent peer review in accordance with the tasks and ToRs described in the SoW herein. The CIE reviewers shall have expertise in stock assessment, statistics, fisheries science, and marine biology sufficient to complete the tasks of the scientific peer-review described herein. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct the desk review during 4-7 February 2013, therefore no travel will be required.

Statement of Tasks: Each CIE reviewer 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 COR, 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, and other information pertinent to the desk review arrangements. Any changes to the SoW or ToRs must be made through the COR prior to the commencement of the peer review.

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.

Desk Review: 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 shall not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COR and CIE Lead Coordinator.** The CIE Lead Coordinator can contact the Project Contact to confirm any peer review 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.

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) During February 4-7, 2013 as specified herein, conduct an independent desk peer review in accordance with the ToRs (**Annex 2**).
- (3) No later than February 21, 2013, 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 david.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**.

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

14 January 2013	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
18 January 2013	NMFS Project Contact sends the stock assessment report and background documents to the CIE reviewers.
4-13 February 2013	Each reviewer conducts an independent desk peer review
19 February 2013	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
7 March 2013	CIE submits CIE independent peer review reports to the COR
14 March 2013	The COR 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 COR within 10 working days after receipt of all required information of the decision on changes. The COR 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 COR 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 COR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COR 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 be 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 COR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COR. The COR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COR
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-427-8155

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

Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPeretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:

NMFS Project Contact:

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

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. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed. The CIE independent report shall be an independent peer review of each ToRs.

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

Annex 2: Terms of Reference for the Peer Review

SEDAR 30 Caribbean blue tang and queen triggerfish assessment review

1. Evaluate the data used in the assessment, addressing the following:
 - a) Are data decisions made by the Assessment Workshop 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 the methods used to assess the stock, taking into account the available data.
 1. Are methods scientifically sound and robust?
 2. Are assessment models configured properly and used consistent with standard practices?
 3. Are the methods appropriate for the available data?
3. Evaluate the assessment findings with respect to 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, addressing 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
 - 1. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
 6. Consider the research recommendations provided by the Assessment workshop 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. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.