

# **Peer review of SEDAR 26 stock assessment of**

- a) Caribbean Queen Snapper**
- b) Caribbean Silk Snapper,**
- c) Caribbean Redtail Parrotfish**

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*Assignment undertaken for:*

**Center for Independent Experts**

November 2011



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## **Executive Summary**

The SEDAR 26 Review Workshop took place in San Juan, Puerto Rico between 17<sup>th</sup> and 20<sup>th</sup> October 2011 and reviewed the stock assessment of the Caribbean Queen Snapper, Silk Snapper, and Redtail Parrotfish. The stocks assessed (9 stocks) were within the jurisdiction of the Caribbean Fisheries Management Council and the territorial waters of Puerto Rico and the U.S. Virgin Islands.

All stocks fall within the group of data-poor species and that limits the range of methods that could be used for stock assessment. The Assessment Workshop (AW) took place in St. Thomas, USVI between 25<sup>th</sup> and 29<sup>th</sup> July 2011 and used a combination of quantitative and qualitative methods to provide advice on the status of the stocks. Three quantitative methods were applied to the data; standardised catch rates (CPUE), the Beverton-Holt length-based total mortality estimator, and an extension of the latter method developed by Gedamke and Hoenig and used in cases where total mortality changed over the period considered in the calculations (SEINE model). The combination of the three methods ensured maximum utilisation of the data available for the three species.

Due to uncertainty in the input data, model results were also very imprecise and that limited their use in deriving conclusions about stock status and exploitation. Given the limited conclusions that could be drawn from the quantitative analysis, the AW used first principles of population dynamics to draw relevant conclusions. Based on those principles and the results of the quantitative analysis, it was concluded that overfishing is not occurring for all stocks considered except queen and silk snapper in St Thomas/St John, for which conclusions could not be drawn. The process for reaching those conclusions was appropriate and made very good use of the data available.

## **Background**

Silk and queen snapper are found in western Atlantic waters and in the Gulf of Mexico over the continental shelf. Redtail parrotfish are found throughout the Caribbean and also from South Florida to Brazil. SEDAR 26 was a compilation of data, a benchmark assessment of the stocks, and an assessment review conducted for Caribbean queen snapper, silk snapper, and redtail parrotfish caught in fisheries in Puerto Rico, St Thomas/St John, and St. Croix (9 species-area combinations in total). The stocks assessed through SEDAR 26 are within the jurisdiction of the Caribbean Fisheries Management Council and the territorial waters of Puerto Rico and the U.S. Virgin Islands.

All nine stocks fall within the group of data-poor species; lack of information on natural mortality and other biological processes as well as gaps and high uncertainty about information relating to exploitation are the main reasons for that classification. Paucity of data on the biology and exploitation limits the range of approaches that could be used for stock assessment of any of the stocks.

The Assessment Workshop took place in July 2011 in St Thomas USVI and used two quantitative approaches to provide estimates of stock status and to develop benchmarks that could inform management decisions. The two approaches were development of standardised catch per unit effort (CPUE) series and estimation of total mortality using length frequency analysis. At least one of the two methods was applied to each stock; the only exceptions were queen snapper and silk snapper in St Thomas/St John. That was the area with the least amount of information for those species/stocks.

Owing to data limitations, it was not possible to estimate benchmarks and provide specific estimates of stock status. Nevertheless, some general conclusions were reached and are listed below:

*Puerto Rico fisheries*

- Queen snapper – The results suggest that the stock is not likely to be subject to overfishing.
- Silk snapper – The results suggest that the stock is not currently subject to overfishing.
- Redtail parrotfish – The results suggest that the stock is not currently subject to overfishing.

*St. Croix fisheries*

- Queen snapper – The results suggest that fishing has been occurring at rates that are sustainable.
- Silk snapper - There is no evidence to suggest that overfishing is occurring. It was noted that the proportion of larger fish in the sampled catch had declined in recent years, but sample sizes are too small to allow for any robust conclusions to be drawn.
- Redtail parrotfish – There is no evidence to suggest that overfishing is occurring.

*St Thomas/St John fisheries*

- Queen snapper - The current state of knowledge precludes conclusions about the status of the stock or exploitation levels.
- Silk snapper - The current state of knowledge precludes conclusions about the status of the stock or exploitation levels.
- Redtail parrotfish – There is no evidence to suggest that overfishing is occurring.

Three CIE reviewers were commissioned to provide an impartial and independent peer review of the SEDAR 26 assessments in accordance with the SoW and ToRs listed in Appendix 2. This document presents my comments on the SEDAR 26 assessment and supporting material. Further details on the reviewer's role and the review request of the Center for Independent Experts are presented below and in Appendix 1.

## **Description of the Reviewers Role in the Review Activities**

I was contracted to

- a) 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.
- b) Participate in the SEDAR 26 review workshop for the Caribbean silk snapper, queen snapper and redbtail parrotfish as a member of the meeting review panel and to ensure that the best possible assessment is provided through the SEDAR process. The review workshop took place in San Juan, Puerto Rico, from 17 to 21 October 2011
- c) Assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review.
- d) Conduct an independent peer review of the SEDAR 26 assessments in accordance with the ToRs (**Annex 2**).

This document provides the outcome of that review.

## Summary of findings

### **TOR 1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.**

*A table with all the data considered in the DW can be found in the Addendum to the Assessment Review.*

#### **Life History**

Information on natural mortality, Von Bertalanffy growth parameters, reproduction, and stock definition were compiled and considered at the data workshop (DW). A review of the parameters for all three species shows that either the range of parameter values found in the literature is very broad (e.g. natural mortality values for silk snapper) or there is very limited information in the literature (e.g. no values of natural mortality in the literature for redbtail parrotfish). Also, most of the information collected came from studies that were not undertaken in the area of interest. In the case of redbtail parrotfish, for which very limited information was available, the DW also considered life history information for other parrotfish species.

Although the DW used information from a wide range of resources to decide on the values of the life history parameters for the three species, the uncertainty in the parameter values chosen was significant. To address that, the AW conducted sensitivity analysis to characterize the uncertainty and assess its impact on the outcomes of stock assessment. **The life history information was appropriate and has been used correctly in the stock assessment. However, it is clear that there are significant gaps in the information that constrain the stock assessment process. Therefore, collection of data to support calculation of key biological parameters needs to be afforded priority.** Information that will confirm that stock units have been defined correctly and whether more than one subpopulation is exploited will also be useful (but is of lower priority).

The DW also compiled information on recreational and commercial catches, discards, and fishing effort. Comments on those data are provided below:

#### **Commercial landings**

Statistical data collection systems have been in place since around 1967 in Puerto Rico (Suarez-Caabro 1975) but electronic records documenting commercial catches exist only since 1983. The first part of the data (~20 years) was obtained through voluntary reports by fishers. Silk snapper and queen snapper are reported as individual species in the catch records. However, parrotfish are not recorded at species level, so landings records are available for all parrotfish species as a group.

According to the electronic records, landings of silk snapper declined from about 400,000 pounds in 1983 to <200,000 pounds in recent years. The reported landings of parrotfish have also declined from >230,000 pounds in 1983 to about 28,000 pounds in 2009. In contrast to those trends, catches of queen snapper increased from about 4000 pounds in 1987 (the year when the first non-zero landings for queen snapper were documented) to >100,000 pounds in recent years. Although the catch data used for the calculations were for 1983 on, silk snapper have been intensively exploited since the 1960s.

*The commercial landings used are appropriate for the calculation.*

The DW noted that the commercial landings data for Puerto Rico reflected somewhere between 50 and 60% on average of the total commercial landings. Expanded catches were presented only for the parrotfish family in the Assessment report. ***Expanded catches for silk and queen snapper should also have been presented to provide a more complete picture of the exploitation of these stocks.***

The information on reporting levels shows that misreporting is an important source of uncertainty in the exploitation of the three species in Puerto Rico. Lack of discards information and limited data on recreational catches (see below) add to that uncertainty. As a first step towards addressing that issue, **it is important to characterise the uncertainty in the landings estimates.** Estimates of variance in catch statistics (or expansion factors) were not provided in the assessment report; **effort needs in future to focus on providing a more comprehensive picture of fish removal either by estimating the uncertainty in reported catch and/or improving the catch statistics (i.e. increased reporting rate and quality and range of information collected).**

For the USVI, landings are reported at a family group level (i.e. snapper, parrotfish), and it was not possible to derive species-specific landings from them. The DW recommended that landings statistics should be species-specific. I agree that this is important and desirable, if feasible. Nevertheless, even if collection of species-specific landings information starts immediately, it will take at least a few years before such information can be used in an analysis. For this reason, ***it is also important to explore ways to use information on a group of species and assess whether information can be sufficiently informative to guide management decisions in the immediate future.***

Although species-specific catches for redbtail parrotfish were not available, redbtail parrotfish were believed to make up the majority of parrotfish landings in the USVI. CPUE series were developed for the parrotfish family group and were presented at the DW as a proxy for redbtail parrotfish indices. However, none of this information was used in the AW because recommendations on CPUEs to be taken forward to the AW were not made at the DW. Given the high proportion of redbtail parrotfish in the catches, the proxy proposed appears reasonable. Therefore, ***it is recommended that work be done to assess whether CPUE based on aggregated parrotfish data could be used for stock assessment of redbtail parrotfish.***

### **Discards**

The group noted that scant information was available to document the level of discards in the commercial fisheries.

For silk snapper in Puerto Rico, closed seasons and the introduction of minimum size limits during certain years could have led to discarding. A recent survey on bycatch also reported silk and queen snapper in the trips surveyed (Matos-Caraballo 2005)



*It is not clear whether discarding is (has been) significant for the three species. It is recommended that work be done to assess the level of discarding in the fisheries that might catch those species.*

### **Effort**

Information on species-specific fishing effort is not available for commercial fisheries in Puerto Rico or the USVI. For Puerto Rico, information on the number of trips undertaken every year and the proportions of those that caught silk or queen snapper were used to describe fishing effort directed on each species. Effort data used in the calculations cover the period 1983-2009. A similar approach could not be used for redbtail parrotfish because commercial landings for parrotfish are not recorded to the species level. The same is true for silk and queen snapper in the USVI (one group: “snapper”), so the proportion of trips that caught each species could not be used to calculate species-specific effort. ***The data are appropriate, however, and have been used correctly.***

### **Length data**

The NMFS, SEFSC Trip Interview Program (TIP) has been collecting biological information from a subsample of commercial landings since 1983. Their records include information on length of fish by year, gear, and fishing region and, in some cases, mean depth of fishing. The sampling intensity of the program varied over the years; for Puerto Rico, data are available starting in 1983 and appear regularly since then. For St. Croix, a relatively large number of records are available from the period between 1983 and the mid-1990s; thereafter the number of records varies. The smallest number of records has been obtained from St. Thomas/St. John (fewer than 1000 records in total for the period 1983-2011).

Length information from the NMFS Trip Interview Programme (TIP) was used in the assessment to estimate total mortality and to provide insight into the behaviour of the fishery. This is a valuable source of information and ***has been used extensively and adequately to inform the analysis. These data appear to be the most promising source of information to support assessment in future, so their collection needs to be continued and, in some cases, extended*** (see text below on recreational landings). However, some concerns about the way in which sampling is conducted has been noted, so it is important that **work also focuses on developing and implementing a robust sampling design for this program.**

### **Recreational landings**

Estimates of recreational harvest, discards, and number of angler trips are available through the Marine Recreational Information Program (MRIP); that information is available only for Puerto Rico fisheries. Data for the three species of interest are available since 2000 by two-month interval, by fishing mode (charter, private, shore mode) and area offshore. Information on the variability measured as the coefficient of variation (CV) of stratum mean estimates of catch, discards, and angler trips is also available. Species-specific information is available for silk and queen snapper, but not for redbtail parrotfish. For the latter, the information is available for the parrotfish group of species. Information on the effort directed at each species is not available.

The number of silk snapper taken in recreational fisheries is much larger than the number of queen snapper or redbtail parrotfish. The mean landings between 2000 and

2010 for the former is close to 90,000 pounds, whereas for queen snapper and the parrotfish family, mean annual landings are <30,000 pounds and 5000 pounds, respectively. For some years, the recreational landings of silk snapper are comparable with or even greater than the reported commercial landings of the same species.

Information on recreational catches was not used in the calculations. From the information above, it is clear that the contribution of recreational catches to the total catches of silk snapper in Puerto Rico is high. ***Therefore, future assessments need to account for recreational fishing. Collection of length data, in addition to catch data, as well as work to assess whether effort-specific information could be derived from the species-aggregated effort data, is recommended, especially for the silk snapper fishery. I also agree with the recommendation of the DW for more work to be done to quantify the magnitude of recreational catches in the USVI.***

**TOR 2. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock taking into consideration the data-poor nature of the fisheries.**

All species evaluated in the analysis were species for which limited information exists. Therefore, the range of stock assessment methods that could be used was limited. The assessment workshop (AW) applied three quantitative methods to the data; standardised catch rates (CPUE), the Beverton-Holt length-based total mortality estimator (Beverton-Holt 1956) , and an extension of the latter method developed by Gedamke and Hoenig (2006) and used in cases where total mortality changed over the period considered in the calculations (SEINE model). ***The combination of the three methods ensures maximum utilisation of the data available for the three species***; the first method uses catch and effort data and the other two make use of the length frequency data collected in the TIP surveys and information on fish growth. In addition, application of the SEINE model means that length frequency data can be used even if the population was not at equilibrium during the period considered in the calculations (the Beverton-Holt estimator can be used only if the equilibrium assumption is met).

Graphs were produced that showed the spatial distribution of landings sampled and fishing depths over the years to check for changes in the behaviour of fisheries that could inform the stock assessment. In addition, length frequency plots were used to examine (visually) whether the length composition of the catches has changed over the years. ***This is a standard test that could provide some indications of the status of the stock (e.g. a shift in length composition of catches to smaller sizes could be an indication of unsustainable exploitation of the stock).***

***Given the paucity of information on the biology and exploitation, the choice of methods used in the AW is appropriate and reflect the data limitations. The AW employed both quantitative and qualitative approaches to make the best use of data and to highlight key challenges and knowledge gaps.***

Specific recommendations and comments on the application of each method are provided below:

a) CPUE

CPUE standardization was applied to catch and effort data for Puerto Rico queen and silk snapper. Two CPUE series were developed for silk snapper; one for the hook-and-line fishery and one for the pot-and-trap fishery. One CPUE series was developed for queen snapper, for the bottom line fishery

A delta-lognormal approach was used to standardize the data. A binomial model was used to describe the proportion of successful observations in that approach. A lognormal distribution was used to model the value of each successful observation. This approach is widely used for modelling data that include several trips that reported zero catches of the species of interest (Maunder and Punt 2004). Catch data from the fisheries in Puerto Rico fall in that category; ***therefore, the use of the delta-lognormal approach for CPUE standardisation is appropriate.*** Alternative parameterizations or approaches could be considered (e.g. replacing lognormal with a different distribution or using zero-inflated models (Maunder and Punt 2004, Minami *et al.* 2007) to assess whether further improvement in the standardisation could be achieved. ***However, given more significant sources of uncertainty including underreporting and the lack of species-specific effort data, such analysis a) is not so important at this stage, and b) it is unlikely that it would have changed significantly the general conclusions***

It was not possible to construct species-specific CPUE series for any of the fisheries in the USVI because commercial fishing data had been reported by species group (snapper or parrotfish). For the same reason, single species CPUE was not available for redbtail parrotfish in Puerto Rico. ***Further work to ensure that the information available for these stocks has been utilized to the maximum is needed.*** I have provided specific recommendations on this in the section entitled “commercial landings”

b) Length based mortality estimator

This method was applied to data from:

- Puerto Rico silk snapper (hook and line fishery and pot and traps fishery);
- St. Croix silk snapper (hook and line);
- Puerto Rico queen snapper (hook and line);
- St. Croix queen snapper (hook and line).

The AW noted that the change in the size range of silk snapper landed in Puerto Rico could indicate a change in selectivity. As both the Beverton and Holt mortality estimator analysis and SEINE model assume constant selectivity, it was decided that they could not be used with the silk snapper data in Puerto Rico. ***I agree with that decision.*** The SEINE analysis was used for silk snapper in St Croix and estimated a single value of total mortality for the whole period used in the calculations.

For queen snapper in Puerto Rico, the SEINE model predicted a change in mortality in the mid-1990s. The results supported an increase in mortality and indicated that the increase in total mortality in recent years is between 55% and 87%. However, further analysis during the RW showed that it was the data from three years that were mainly responsible for the predicted change in total mortality. Once those data had been removed, the results did not provide statistically significant support to the model that

predicted an increase in total mortality. For St. Croix, the results did not support a change in total mortality.

The Akaike information criterion (AIC) was used to choose the most parsimonious model. The sensitivity of the model results to the choice of parameter values was tested by running the model using combination of a range of values for the VBF parameters and length at full vulnerability.

***The application of the model (including the additional analysis conducted during the RW) and the use of the AIC criterion were appropriate and made the best use of the data available.*** I have provided specific comments on model fit to the data and sensitivity analysis under ToR 6.

c) Use of annual length-frequency plots to identify targeting of spawning aggregations  
This method was applied to:

- Puerto Rico silk snapper (hook and line fishery and pot and traps fishery);
- St Croix silk snapper (hook and line);
- Puerto Rico queen snapper (hook and line);
- St Croix queen snapper (hook and line).

All fisheries considered in this part of the analysis catch mainly mature fish. Therefore, any targeting behaviour is unlikely to change the length distribution to highlight such behaviour. For this reason, ***I consider that length frequency graphs cannot provide information on targeting of spawning aggregations and therefore, their use is not appropriate for this purpose.***

d) Spatio-temporal patterns in fishing

For stocks for which data on spatio-temporal patterns of fishing were available in the TIP database, the AW used those data to explore changes in the area and depth where fishing is taking place. That was done by creating plots that showed the change in fishing region or fishing depth over the years.

***That is an appropriate analysis of the data and provides additional information about fisher behaviour. However, it is not possible to assess whether conclusions about the behaviour of the fishery are biased due, for example, to the way sampling was conducted. It is important to address such concerns when designing future sampling.***

e) Change in selectivity over the years

The AW combined length-frequency data from 5-year blocks to produce graphs that they then used to examine whether there have been changes in selectivity over the years. ***I consider this approach to be an acceptable one.***

f) Length at full vulnerability

Visual inspection of length frequency graphs to identify the part of the population that is fully selected for each gear is **an acceptable approach in this case**. The length at full vulnerability was used in the total mortality estimator analysis. However, it is not always obvious from the length frequency graphs what the length at full vulnerability is (as in the case of queen snapper for example). To account for that, the AW

conducted sensitivity analysis of the total mortality estimator results using a range of values of the length at full vulnerability.

**TOR 3. Recommend appropriate estimates, when available, of stock abundance, biomass, and exploitation. When data-limitations preclude estimates, provide summary of conclusions that can be drawn from data-poor methodologies that were used in assessment.**

For all stocks for which sufficient length frequency information was available to apply the total mortality estimator method, *the uncertainty in the data precluded the use of estimated absolute values of total mortality to derive conclusions about stock status and exploitation.*

Similarly for the two stocks for which standardized CPUE series were considered in the AW, *the standardized CPUEs provided very limited insight into the status of the stocks.* For silk snapper in Puerto Rico, the AW stated that operational changes could have taken place during the period covered by the CPUE series for both the fish pot and pole and line fishery. A switch in targeting might have taken place during that period, and the parameterization used to describe the proportion of successful trips (binomial model) could not simulate a switch in targeting effectively. The AW concluded that neither of the two CPUE series could be considered to provide reliable information about the change in stock size over the years. Similarly, the AW noted that operational changes in the late 1990s in the queen snapper fishery made it difficult to use the standardized CPUE series for that species as a representative index of abundance. *The arguments put forward to support the conclusions are reasonable, and I agree with the interpretation of the results and supporting information.*

*I also agree with the conclusion of the AW that without additional information, it is not possible to provide estimates of stock size or level of exploitation.*

Given the limited conclusions that could be drawn from the quantitative analysis, the AW used first principles of population dynamics to draw relevant conclusions. Specifically, they noted the length distribution of the catches, which had remained constant over the years (with the exception of silk snapper in St Croix) and the presence of large fish (high proportion of mature fish) in the catches. Such observations suggest that overfishing is not occurring for all stocks considered except queen and silk snapper in St Thomas/St John, for which conclusions could not be drawn.

*The process for reaching the aforementioned conclusions is appropriate and I agree with the conclusions drawn.*

**TOR 4. Evaluate the methods used to estimate population benchmarks and management parameters (e.g.,  $MSY$ ,  $F_{msy}$ ,  $B_{msy}$ ,  $MSST$ ,  $MFMT$ , or their proxies); recommend appropriate management benchmarks, provide estimated values for management benchmarks, and provide declarations of stock status.**

It was not possible to calculate benchmarks owing to the paucity of data available.

**TOR 5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status taking into consideration the data limitations and proposed alternatives; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).**

The AW did not carry out any projections because data were not available to support such calculations.

**TOR 6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide, if available, measures of uncertainty for estimated parameters. Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty. Ensure that the implications of uncertainty in technical conclusions are clearly stated.**

The AW explored the uncertainty in their estimated CPUE indices for silk and queen snapper in Puerto Rico. *The sensitivity runs using different subsets of the catch data are a logical extension of the base case.* However, the uncertainty in the catch data was not adequately described, and that influenced the choice of sensitivity runs. *Further work on the latter (e.g. the use of expanded catches) will support a more comprehensive characterisation of the uncertainty in the CPUE series. The implications of uncertainty are explained in the AW report.*

For the SEINE model, uncertainty was accounted for by running the analysis for ranges of values for the parameters of the Von Bertalanffy equation ( $K$  and  $L_{inf}$ ) and  $L_c$  to test the sensitivity of the model predictions to changes in the values of those parameters. A base case set of parameter values was also chosen that corresponded to the mean of the values of  $K$ ,  $L_{inf}$ , and  $L_c$  found in the literature. This was not the most plausible set of parameter values. *The sensitivity analysis was appropriate*, but it covered some combinations of parameter values that were not realistic. Also, inspection of the likelihood surface indicated that some combinations of the variables values were undersampled. *Future analysis needs to use a more efficient sampling algorithm to construct the likelihood surface and estimate parameter values. Use of prior distributions will also be recommended to make use of information about the most plausible values of the variables and associated uncertainty. Such an approach could also facilitate incorporation of information about mortality (using a prior) in the calculations once such information is available.*

The sensitivity runs showed that model predictions for total mortality are sensitive to the choice of value for  $K$  (the growth parameter of the von Bertalanffy equation). Therefore, as noted earlier, *it is recommended that more work be undertaken to estimate the VBF parameters for the three species.*

**TOR 7. 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.\***

A separate report that described the work undertaken by the analysts on each of the three species has been produced. The reports covered most of the relevant aspects adequately.

The panel highlighted the following weaknesses in the report and I agree with those statements:

1. The Assessment reports are incomplete in that they do not fully describe the data that were not used and why that is the case. This relies on other documentation, which is inappropriate given that the Assessment Review Report should logically take the reader through the whole process from data and analysis to conclusions.
2. The major summary per species and region did not provide a comprehensive review of the process and conclusions, such that the reader is able to clearly understand the appropriateness of the methods and conclusions. This is especially important given that the fisheries are data-poor and a combination of results is used to provide conclusions. The review team asked the Assessment team to develop such a statement during the review, as this provides clearer information to address the key Terms of Reference.
3. The report should include a description of how the fishery is managed. This puts the analysis in better context.

To address point 1, the panel asked the assessment team to produce a table summarizing the data available for consideration in the assessment and to provide details on those that were used. That table is included in the addendum to the AW report. The Assessment team was also asked to provide a more concise description of the conclusions and the evidence that supported them. That summary is also included in the addendum.

**TOR 8. Evaluate the SEDAR Process as applied to the reviewed assessment and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.**

The Terms of Reference were adequately addressed by both the Data and Assessment Workshops. It would be useful, however, if additional information about the processes followed to calculate expanded catches were included in the DW (or AW) report, and I recommend that the process be described in more detail in future reports. The Panel has provided some details about the calculation of expanded catches in the Review Summary Report.

Addressing all issues and covering all the material for nine stocks in a single review was challenging and put a lot of pressure on the analysts (who, nevertheless, responded to all the requests for new work we made) and, to a lesser extent, on the reviewers. Therefore, *I would recommend that fewer stocks be considered in a single review in future.*

**TOR 9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.**

Both the DW and AW made a number of research recommendations that would improve the quality of future assessments. The Review Panel considered those recommendations and the Summary Report includes a detailed list of research recommendations that the Review Panel identified as important. I agree with the research recommendations included in the Review Summary Report and have included them below.

### **Major priorities**

1. There is large degree of uncertainty in the assessment due to the data poor nature of this fishery. In the short to medium terms, the key data set is likely to remain the size frequency distributions. The ability to utilize length-frequency data is contingent upon having reliable estimates of life history parameters (von Bertalanffy parameters in particular), therefore the highest priority for future research are:
  - a. Studies on basic life history (e.g. age-growth relationships and estimating natural mortality) are essential in the US Caribbean and will greatly enhance the utility of the existing length-frequency data. This information should provide the greatest benefit to providing management advice in the short term. This should be placed as a top priority for key species.
  - b. At present, the TIP size frequency data provides the only source of information on stock status and benchmarks and it is therefore essential that this program be at least continued. However, expansion (for example, to USVI) and improvement of the TIP program will be recommended for continued collection of species-specific size information.
  - c. Focus should be on developing more complete and accurate data sets into the future, particularly on trip based catch and effort and recording of more geographical data on catch location.
  - d. The recreational catch and effort is an important data set and should be continued. Expanding this system to the USVI may also be useful. Furthermore, this source of mortality should be included in the analyses.
  - e. Emphasis should be placed on extension, as compliance and unreporting is likely to increase when more data are required of fishers. Given the present low rate of reporting in PR, this would be of great concern.
  - f. Validation of fisher reported catch, landings and trip effort should be undertaken.



- g. The collection of landings statistics in the USVI should be species-specific because analysis of the current species-groupings is not informative for stock assessments, unless future assessments and management action focus on logical clusters of species.
  - h. Characterization of multi- species trips to allow identification of trips that split fishing effort across different gears and species groups. This work should be coordinated with fisher groups to enhance buy-in by the industry.
  - i. It is important to encourage fishermen to submit all the monthly catch reports, to submit reports for months when they do not fish, and to complete all the fields in the reports, since critical information such as effort, gear, and location fished are often missing or incomplete.
2. All sources of mortality should be considered in the analyses especially for the recreational fishery catch in Puerto Rico for silk and queen snapper.
  3. Given the importance of the SEINE method and that extensions of this method are likely to be used into the near future, the following additional modifications are required:
    - a. When the full likelihood surface for the SEINE analyses were shown in the session, it was clear that unnecessary combinations are sampled and that the surface is reasonably flat near the optimal likelihood, which means more sampling needs to be undertaken within this range.
    - b. The SEINE method should be extended to apply a Bayesian hierarchical model that draws on species with more information (Punt *et al.*, 2011, although this method is not Bayesian). This method would integrate across all the different forms of uncertainty and also allow more data rich species' information to be drawn from for the data poor species.
    - c. The SEINE method should be extended to include the estimate of M for those species where this information is available. This directly acknowledged the correlation between growth, maximum length and natural mortality.
    - d. The SEINE method should be tested in a simulation study using a simulated population with known parameters, recruitment, and size frequency and including variability in key parameters. Furthermore, these results should then be converted to a guideline on how to apply this information in a data poor situation.
    - e. Some preliminary analyses were undertaken during the Review that should be further investigated.

**Medium priority**

1. For all landings series, a more appropriate method would be to present median estimates of landings with confidence intervals for all regions. All sources of uncertainty should be included in this analysis.
2. The CPUE standardisation methods needs much more extensive investigation, including:

- a. The feasibility of including additional factors or variables either as offsets or ratios of catch to relevant species total catch should be undertaken in the future. An overall redtailed parrotfish index from the catch rate standardisation is developed in the future.
- b. Developing an overall redtailed parrotfish index from the catch rate standardisation be developed in the future.
3. Given the uncertainty in the data, any future FIS should be designed in such a way as to be aligned with the earlier surveys. This would be extremely useful for comparison.

### **Lower priority**

1. There is some question whether changing the commercial catch expansion method during the series produces biases. Therefore, the effect of the two different methods over the time series to develop the expansion factors should be tested.
2. There is a need to develop sampling efforts to better identify and quantify discards in the commercial fisheries.

There was not time at the review workshop (RW) to discuss when the next assessment should take place. However, given the significant gaps in information about the biology and exploitation of the species, much work needs to be done before another stock assessment is undertaken. Therefore, ***I would not recommend another assessment during the next three years. However, an earlier assessment might be appropriate if it is concluded that species-aggregated data that are available could be used to support management plans.***

### **TOR 10. Prepare a Peer Review Summary Report summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference.**

A Review Summary Report was prepared during the RW meeting.

## **Conclusions/Recommendations**

- Three species in three areas in Puerto Rico and the US Virgin Islands (two areas: St Thomas/St John and St Croix) were assessed in SEDAR 26 (nine stocks in total).
- All stocks assessed were species for which limited information about life history and exploitation is available (data-poor species).
- The AW made very good use of the data available and used a combination of quantitative and qualitative approaches to analyse the data and provide information that could guide management dialogue.
- Because of high uncertainty in input parameters, the conclusions that one could draw from the results of the stock assessments are limited.
- Nevertheless, a combination of model results and the use of fundamental rules of population dynamics to interpret raw data did not provide any evidence to suggest

that overfishing is occurring for any of the stocks considered. The only exceptions are queen and silk snapper in St Thomas/St John, for which it was not possible to draw any firm conclusions.

- The interpretation of the findings was appropriate and supported the conclusions of the AW.

Below, I have provided a list of recommendations for further action/work.

### **ToR 1**

- 1.1 Collection of data to support calculation of key biological parameters needs to be given priority. Information that will confirm that stock units have been defined correctly and whether more than one subpopulation is exploited will also be useful (but of lower priority).
- 1.2 Expanded catches should be included in future assessments to provide a more complete picture of the exploitation of these stocks.
- 1.3 It is important to characterize the uncertainty in estimates of landings, so future effort needs to focus on providing a more comprehensive picture of fish removal either by estimating the uncertainty in the reported catch and/or improving catch statistics (i.e. increased reporting rate and quality and range of information collected).
- 1.4 It is also important to explore ways to use information on a group of species and assess whether such information could be informative enough to guide management decisions in the immediate future.
- 1.5 It is recommended that work be done to assess whether CPUE based on aggregated parrotfish data could be used for the stock assessment of redbtail parrotfish.
- 1.6 It is recommended that some work be done to assess the level of discarding in the fisheries that might catch those species.
- 1.7 TIP data appear to be the most promising source of information to support assessment in future; collection of TIP data needs to continue and, in some cases, be extended. However, work also needs to focus on developing and implementing a robust sampling design for this program.
- 1.8 Future assessments need to account for recreational fishing. Collection of length data, in addition to catch data, as well as work to assess whether effort-specific information could be derived from the species-aggregated effort data is recommended, especially for the silk snapper fishery.

### **ToR 2**

- 2.1 Further work is recommended to ensure that available information for those stocks for which only species-aggregated data have been collected has been utilized to the maximum. (see also points 1.4 and 1.5)
- 2.2 It is not possible to assess whether conclusions about the behaviour of the fishery, derived from an examination of the TIP data, are biased due, for example, to the way sampling was conducted. It is important to address such concerns when designing future sampling (see point 1.7).

**ToR 4**

4.1 Benchmarks were not calculated

**ToR 5**

5.1 Projections were not carried out

**ToR 6**

- 6.1 Further work on characterising the uncertainty in catches (e.g. the use of expanded catches) is recommended
- 6.2 Future analysis of length frequency data using the SEINE method needs to use a more efficient sampling algorithm to construct the likelihood surface and estimate parameter values. Use of prior distributions will also be recommended to make use of information about the most plausible values of the parameters and associated uncertainty. Such an approach could also facilitate incorporation of information about mortality (using a prior) in the calculations once such information is available.

**ToR 8**

8.1 I would recommend that fewer stocks be considered in a single review in the future.

**ToR 9**

- 9.1 A list of research recommendations have been provided in the main part of this report.
- 9.2 I would not recommend another assessment during the next three years. However, an earlier assessment might be appropriate if it is concluded that species-aggregated data that are available could be used to support management plans.

## Appendix 1: Bibliography

### a) Workshop Document List

Document #	Title	Authors	Working Group
<b>Documents Prepared for the Data Workshop</b>			
SEDAR26-DW-01	A review of the life history characteristics of silk snapper, queen snapper, and redbtail parrotfish	Bryan, M.D., M. del Mar Lopez, and B. Tokotch	Life History
SEDAR26-DW-02	Summarized information on recreational catches of silk and queen snapper and parrotfish in Puerto Rico since 2000	Cummings, N.J. and V. Matter	PR Catch Statistics
SEDAR26-DW-03	Updated landings information for the commercial fisheries in Puerto Rico with emphasis on silk and queen snapper and parrotfish fisheries	Cummings, N.J. and Daniel Matos-Caraballo	PR Catch Statistics
SEDAR26-DW-04	Preliminary Evaluation of available length-frequency information in the US Caribbean Trip Interview Program (TIP) data	Matthew Campbell, Todd Gedamke, Walter Ingram	
SEDAR26-DW-05	Updated catch per unit abundance indices for silk and queen snapper from the commercial fisheries in Puerto Rico	Cummings, N.J.	Indices
SEDAR26-DW-06	Not Received		
SEDAR26-DW-07	Delta-lognormal and multinomial approaches to index development for parrotfish, silk snapper, and queen snapper from Puerto Rican Trip Tickets	G. Walter Ingram, Jr.	Indices
SEDAR26-DW-08	Reported commercial landings of parrotfish, snappers, groupers, and unclassified finfish in the United States Virgin Islands, 1974-2008	McCarthy, K.J.	USVI Catch Statistics
SEDAR26-DW-09	Standardized catch rates of parrotfish from commercial fish traps, SCUBA, and gillnets in the US Virgin Islands, 1998-2008	McCarthy, K.J.	Indices
SEDAR26-DW-	Summary of Fishery	Adam G. Pollack	Indices

10	Independent Data from Puerto Rico and the U.S. Virgin Islands	and G. Walter Ingram, Jr.	
<b>Data Workshop Report</b>			
	U.S. Caribbean Silk Snapper, Queen Snapper, and Redtail Parrotfish Data Workshop Report		
<b>Fishery Management Documents</b>			
	Parrotfish Management Overview	Graciela García-Moliner and Bill Arnold	
	Queen Snapper Management Overview	Graciela García-Moliner and Bill Arnold	
	Silk Snapper Management Overview	Graciela García-Moliner and Bill Arnold	
<b>Final Stock Assessment Reports</b>			
SEDAR26-SAR1	Silk snapper		
SEDAR26-SAR2	Queen snapper		
SEDAR26-SAR3	Redtail parrotfish		
<b>Reference Documents</b>			
SEDAR26-RD01	SEDAR Procedural Workshop 3: Caribbean Data Evaluation		
SEDAR26-RD02	Inventory and Atlas of Corals and Coral Reefs, with Emphasis on Deep-Water Coral Reefs from the U. S. Caribbean EEZ	Jorge R. García Sais	
SEDAR26-RD03	Estimating mutton snapper mortality rates from mean lengths and catch rates in non-equilibrium conditions (SEDAR 14 – RW- 01)	Gedamke, T. and C. Porch	
SEDAR26-RD04	Estimation of mutton snapper total mortality rate from length observations	Todd Gedamke	
SEDAR26-RD05	A preliminary investigation into the accuracy of commercial catch reports using information from the St. Croix net fishery	Wes Toller	

## **b) Additional references**

Beverton, R.J.H. and S.J. Holt. 1956. A review of methods for estimating mortality rates in fish populations, with special reference to sources of bias in catch sampling. *Rapports et Proces-verbaux des Reunions, Conseil International Pour L'Exploration de la Mer* 140:67-83.

Gedamke, T. and J.M. Hoenig. 2006. Estimating mortality from mean length data in nonequilibrium situations, with application to the assessment of goosefish. *Transactions of the American Fisheries Society* 135: 476-487.

Matos-Caraballo, D. 2005. Bycatch Study of the Puerto Rico's Marine Commercial Fisheries. Puerto Rico Department of Natural and Environmental Resources. Final Report to NOAA National Marine Fisheries Service (NMFS), Grant NA04NMF433071. 15

Maunder, M. N. and Punt, A. E. 2004. Standardizing catch and effort data: a review of recent approaches. *Fisheries Research* 70: 141 – 159.

Minami, M., Lennert-Cody, C.E., Gao, W, and Rom'an-Verdesoto, M. 2007. Modeling shark bycatch: The zero-inflated negative binomial regression model with smoothing. *Fisheries Research* 84: 210 – 221.

## **Appendix 2. Statement of Work for Dr. Panayiota Apostolaki (CEFAS)**

### **External Independent Peer Review by the Center for Independent Experts**

#### **SEDAR 26 Caribbean Queen Snapper, Silk Snapper, and Redtail Parrotfish 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 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](http://www.ciereviews.org).

**Project Description:** SEDAR 26 will be a compilation of data, a benchmark assessment of the stock, and an assessment review conducted for Caribbean Queen Snapper, Silk Snapper, and Redtail Parrotfish. 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 workshop 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 26 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**. 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 shall have working knowledge and recent experience in the application stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of reviewing the technical details of the methods used for the assessment. Expertise with data poor assessment methods would be preferable. 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 San Juan, Puerto Rico during October 17-21, 2011.



**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/sponsor.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 in the panel review meeting in San Juan, Puerto Rico during October 17-21, 2011.
- 3) In San Juan, Puerto Rico during October 17-21, 2011 as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 4) No later than November 4, 2011, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to Manoj Shivlani, CIE Lead Coordinator, via email to [shivlanim@bellsouth.net](mailto:shivlanim@bellsouth.net), and David Sampson, CIE Regional Coordinator, via email to [david.sampson@oregonstate.edu](mailto: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.

September 12, 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
October 3, 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
<b>October 17-21, 2011</b>	Each reviewer participates and conducts an independent peer review during the panel review meeting
November 4, 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
November 18, 2011	CIE submits CIE independent peer review reports to the COTR
November 24, 2012	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

**Modifications to the Statement of Work:** Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. 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](mailto: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) each CIE report shall be completed with the format and content in accordance with **Annex 1**,
- (2) each 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.

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## **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: Terms of Reference for the Peer Review

### SEDAR 26 Caribbean Queen Snapper, Silk Snapper, and Redtail Parrotfish Review

1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.
2. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock taking into consideration the data-poor nature of the fisheries.
3. Recommend appropriate estimates, when available, of stock abundance, biomass, and exploitation. When data-limitations preclude estimates, provide summary of conclusions that can be drawn from data-poor methodologies that were used in assessment.
4. Evaluate the methods used to estimate population benchmarks and management parameters (*e.g., MSY, Fmsy, Bmsy, MSST, MFMT, or their proxies*); recommend appropriate management benchmarks, provide estimated values for management benchmarks, and provide declarations of stock status.
5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status taking into consideration the data limitations and proposed alternatives; recommend appropriate estimates of future stock condition (*e.g., exploitation, abundance, biomass*).
6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide, if available, measures of uncertainty for estimated parameters. Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
7. 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.\*
8. Evaluate the SEDAR Process as applied to the reviewed assessment and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.
9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.
10. Prepare a Peer Review Summary Report summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference.

The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.

**Annex 3: Agenda**  
**SEDAR 26 Caribbean Queen Snapper, Silk Snapper, and Redtail Parrotfish**  
**Review**

San Juan, Puerto Rico

October 17-21, 2011

**Monday**

1:00 p.m. 1:00 – 1:30	<b>Convene</b> <b>Introductions</b> <b>and</b> <b>Opening</b> <b>Coordinator</b>	<b>Remarks</b>
	- <i>Agenda Review, TOR, Task Assignments</i>	
1:30 – 3:30	<b>Assessment</b> <b>TBD</b>	<b>Presentation</b>
3:30 – 4:00	<b>Break</b>	
4:00 – 6:00	<b>Continue</b> <b>Chair</b>	<b>Presentation/Discussion</b>

**Tuesday**

8:30 a.m. – 11:30 a.m.	<b>Assessment</b> <b>Chair</b>	<b>Presentation</b>
11:30 a.m. – 1:30 p.m.	<b>Lunch Break</b>	
1:30 p.m. – 3:30 p.m.	<b>Panel</b> <b>TBD</b>	<b>Discussion</b>
	- <i>Assessment Data &amp; Methods</i> - <i>Identify additional analyses, sensitivities, corrections</i>	
3:30 p.m. – 4:00 p.m.	<b>Break</b>	
4:00 p.m. – 6:00 p.m.	<b>Panel</b> <b>Chair</b>	<b>Discussion</b>
	- <i>Continue deliberations</i> - <i>Review additional analyses</i>	

**Tuesday Goals:** Initial presentations completed, sensitivities and modifications identified.

**Wednesday**

8:30 a.m. – 11:30 a.m.	<b>Panel</b> <b>Chair</b>	<b>Discussion</b>
	- <i>Review additional analyses, sensitivities</i> - <i>Consensus recommendations and comments</i>	
11:30 a.m. – 1:30 p.m.	<b>Lunch Break</b>	
1:30 p.m. – 3:30 p.m.	<b>Panel</b> <b>TBD</b>	<b>Discussion</b>
3:30 p.m. – 4:00 p.m.	<b>Break</b>	
4:00 p.m. – 6:00 p.m.	<b>Panel</b> <b>Chair</b>	<b>Discussion</b>

**Wednesday Goals:** Final sensitivities identified, Preferred models selected, Projection approaches approved, Summary report drafts begun

**Thursday**

8:30 a.m. – 11:30 a.m.	<b>Panel</b> <b>Chair</b>	<b>Discussion</b>
	- <i>Final sensitivities reviewed.</i> - <i>Projections reviewed.</i>	
11:30 a.m. – 1:30 p.m.	<b>Lunch Break</b>	
1:30 p.m. – 3:30 p.m.	<b>Panel</b> <b>Discussion</b> <b>or</b> <b>Work</b> <b>Chair</b>	<b>Session</b>
3:30 p.m. - 4:00 p.m.	<b>Break</b>	
4:00 p.m. - 6:00 p.m.	<b>Panel</b> <b>Work</b> <b>Chair</b>	<b>Session</b>
	- <i>Review Consensus Reports</i>	

**Thursday Goals:** Complete assessment work and discussions. Final results available. Draft Summary Report reviewed.

**Friday**

**8:30 a.m. – 12:00 p.m.**

**Panel Work Session**

**Chair**

**12:00 p.m.**

**ADJOURN**



### **Appendix 3: Panel Membership**

Walter R. Keithly, Jr. (Chair)

Panayiota Apostolaki CIE

Cathy Dichmont CIE

Vivian Haist CIE

Reni Garcia