Report on the 2007 South East Data, Assessment and Review (SEDAR 14) Workshop to Review the Assessments of the Status of Stocks of Queen Conch, Mutton Snapper and Yellowfin Grouper, 23–27th July 2007, San Juan, Puerto Rico.

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1. Executive Summary

The SEDAR 14 Review Workshop evaluated the findings and recommendations of the Data and Assessment Workshops on Queen conch, mutton snapper and yellowfin grouper off Puerto Rico and the US Virgin Islands. The data available for all three stocks are presently inadequate to define population benchmarks and management parameters and to determine stock status relative to these. Particular problems exist with the estimation of total commercial and recreational removals of the three species, and the definition and collection of appropriate effort data to allow reliable assessment of CPUE trends. Fishery independent data are also inadequate at present to inform management, although the diver surveys for conch are potentially useful in the future if developed further, and could support regional management based on harvest ratios (ratio of catch to survey estimates of abundance) and density levels in relation to appropriate benchmarks.

In general the statistical methods applied to the fishery data for the conch and mutton snapper stocks were appropriate for the type of data available. However, it was only for mutton snapper that there were indications of consistent trends in different data sets. Changes in mutton snapper length compositions indicated possible trends in fishing mortality consistent with a possible increase in fishing effort in the 1990s and a decline in the 2000s. However, potential sources of bias in the different methods mean that these trends are only indicative and do not provide a quantitative basis for developing management advice. Further work is needed to improve the quality of the historical fishery data and to ensure, through improved sampling and recording schemes and working more closely with fishers, that future commercial and recreational fishery data are more comprehensive and more accurate in all areas. Future development of CPUE indices will require better understanding of the factors affecting catch rates, and the definition and recording of more appropriate effort units. For example, changes in gear design, amount of gear deployed, soak time, depth and location, and competition between species for hook bait or entering traps, will affect CPUE trends, perhaps markedly. There would also be a benefit in carrying out more extensive, suitably designed fishery-independent indices, both to monitor overall stock trends and for comparison with fishery CPUE data.

The SEDAR process of selecting individual species for periodic single-species assessments appears inappropriate for the type of tropical mixed-fishery, data-poor situation evident in Puerto Rican waters. Yellowfin grouper is a particular example of a potentially vulnerable species that may have been substantially depleted over time but for which there are inadequate data to evaluate stock status. There is a need for a fully comprehensive evaluation of the current status of the entire reef fish assemblage and their essential habitats, and compilation of evidence for the longer-term impacts of the different forms of commercial and recreational fishing on all species. Sufficient knowledge probably exists on the life history traits and habitat dependencies of most of the species to predict their relative vulnerability to fishing, taking into account the limited data on size composition of catches. A multi-species, mixed-fishery approach would increase the statistical power to detect fishing impacts on co-occurring species. Individually, the species may have inadequate data but collectively they may show similar temporal patterns in variables such as mean length or CPUE. Comparative studies across similar reef fish populations throughout the Caribbean would further improve understanding of longer term changes. This approach would provide a solid basis for evaluation of regional management initiatives and for developing indicators of overall status of the reef fish populations and for targeting more detailed assessments at suitable indicator species with adequate data.

Every effort should be made to collate all potentially useful data on the abundance and species composition of reef fish further back in time. The current data series are very short and there is a

danger of having inappropriate and shifting baselines for evaluating stock status. If available, historical archives from research labs, angling or diving clubs, including comparative data from similar reef fish assemblages in other areas, may help to establish a more realistic baseline for density and species composition against which the current population status can be gauged.

2. Background

South East Data, Assessment, and Review (SEDAR) is a joint process for conducting stock assessments, and peer-reviewing their outcomes, for stocks of interest to the South Atlantic, Gulf of Mexico and Caribbean Fishery Management Councils, NOAA Fisheries, SEFC, SERO and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR is organized around separate data, assessment and review workshops. Input data are compiled during the Data Workshop (DW), population models are developed during the Assessment Workshop (AW), and an independent peer review of the data and assessment models is provided by the Review Workshop (RW).

The SEDAR 14 RW met in San Juan, Puerto Rico, from 23 to 27 July 2007 to review the data and assessments for stocks of Queen conch, mutton snapper and yellowfin grouper in waters around Puerto Rico and the US Virgin Islands. The Review Panel itself comprised the Chair and three reviewers appointed by the CIE. The workshop was also attended by five US technical experts, the SEDAR facilitator, one representative from CFMC, one representative from Puerto Rico DNR, two representatives from UPR and one representative from NMFS HQ. All documentation, including background documentation provided to earlier DW and AW meetings, was provided to the Review Panel in good time for prior review, and was comprehensive for the job in hand.

The RW provided Consensus Reports for each of the three species. The following report presents my personal evaluation of the review process together with more extended observations on the assessments and possible future developments that are not necessarily shared with the other panel members. It does not repeat all the detailed content of the RW Consensus reports, which should be read in order to provide the necessary background information.

3. Description of review activities

Documentation from the DW and AW were provided by e-mail during the two weeks leading up to the RW meeting. Relevant background documents to the DW and AW meetings were downloaded from the web site. The DW and AW had done a very job in collating and evaluating a wide range of relevant information on the biology of the stocks and data from fishery log book data, recreational fishing surveys and localized fishery-independent surveys.

The SEDAR 14 RW took place at the Hotel El Convento in San Juan, Puerto Rico, from 1:00pm Monday 23 July to 1:00pm Friday 27 July. The meeting was chaired by John Butler and coordinated by John Carmichael. The meeting was well-run, in an informal way that encouraged all the experts present to contribute constructively to the discussions. The assessment results and background were clearly presented by the experts at the meeting, and highlighted the difficulties of interpreting the often limited data sets. The Review Panel (RP) requested a number of sensitivity analyses and extraction of other supporting data, and these were done very quickly and led to fruitful discussion that helped to clarify a number of important issues.

To a large extent, the RW was an exercise in evaluating the usefulness of the existing data, drawing out indications (where possible) of stock trends from data subject to many uncertainties, and recommending approaches for data collection and analysis in the future. The participants who had been working with the data and the fisheries had extensive local knowledge that emerged progressively during discussions. The importance of consolidating such knowledge prior to future DW and AW meeting should not be underestimated. For example, a difficulty in interpreting many of the fishery data sets presented at the RW was a lack of information on how the data are influenced by the nature of the fishing gear and its deployment, the reaction of fish to the gear, and changes in fishing practices over time. A detailed description of the fisheries, fishing methods and how these have changed over time would have been useful.

The RP had to spend a significant amount of time collating the voluminous research proposals scattered through the DW and AW reports. Most of the proposals were very sensible, but it would help future SEDAR review panels if the proposals were consolidated and prioritized, with a clear indication of the potential utility of the results for addressing short-term and longer-term needs.

3.1. Queen Conch

3.1.1. Summary of findings

The RW Consensus Report for Queen conch contains a very comprehensive evaluation of the AW and DW outputs and recommendations and the conclusions from the RW meeting. These encapsulate most of my own observations and views on the data collection and analysis.

I agree with the DW and AW conclusions that the fishery data are currently rather uninformative for Queen conch due to uncertainties in the removals figures (including lack of data on the substantial recreational removals) and inappropriate measures of fishing effort (CPUE does not reflect population abundance). The collection of accurate data on all significant sources of removals is essential for management of the fisheries.

The RW Consensus report focuses on diver surveys as the most suitable method for supporting assessments and management. Diver surveys appear to provide the best possibility for estimating population abundance and structure by area, depth and habitat type, using well established survey designs. However, the variance associated with the population estimates (overall as well as regionally) needs careful evaluation, to determine the statistical power for detecting changes in abundance over time (variance estimates were not given in the AW or DW reports). Spatial coverage also needs to be adequate to avoid biases due to non-random distribution of patches within habitat types extending well beyond the boundaries of the surveys. Realistic estimates of variance are also needed for comparison of conch abundance with fishery removals, if these can be accurately quantified.

Benchmarks for sustainable harvesting of Queen conch based on data from diver surveys could be derived using methods currently applied to other benthic invertebrates such as ocean quahog off Massachusetts and *Nephrops* stocks in European waters. Methods have been developed to give near-absolute estimates of abundance (e.g. quahog surveys using dredges of measured efficiency and *Nephrops* surveys using underwater TV to estimate burrow density). Simple per-recruit type models have been applied to determine an appropriate annual removal rate. For example, a harvest ratio (catch:biomass ratio) of ~ 20% provides an $F_{0.1}$ proxy for *Nephrops*. This approach requires adequate knowledge of the biology to establish a target harvest ratio and accurate estimates of fishery removals to monitor actual harvest ratios.

There are several areas of work that need adequate support if this type of approach was considered for supporting management of Queen conch fishing on the Puerto Rican shelf. These are listed below and elaborated further in the subsequent text:

1. Collection of accurate data on fishery and recreational removals and their size composition, on a regional basis;
2. Improved understanding of those aspects of the biology of Queen conch necessary for calculating fishing mortality reference points and the equivalent harvest ratios;
3. Further investigation into what constitutes the minimum density for successful reproduction (Fig. 3 in the AW report Section III) and how to derive population abundance benchmarks (e.g. $0.5B_{MSY}$) that take this into account.
4. Extending the stratified random diver survey coverage to avoid excessive extrapolation to non-surveyed areas within a specified habitat type.

Recommendation (1) relates to the need for sufficiently accurate removals figures on a regional basis to calculate harvest ratios using the diver survey estimates. Random sampling procedures that estimate catches, with an associated variance, would be preferable to reporting schemes that have potentially large and unknown biases. Random sampling schemes may however be difficult to implement and the method for raising the sample means to the total removals would need careful evaluation to avoid creating yet another source of bias. Good cooperation with fishers and recreational divers, and suitable incentives to report fishing activities and catches accurately, are needed (as everywhere else). A random intercept scheme would operate in parallel to the commercial log book scheme which also needs to be improved to minimize biases.

Recommendation (2) is probably tractable by combining local studies with comparative data from other populations. A range of per-recruit biological reference points could be evaluated for a number of plausible scenarios for the biology of the local stocks and fishery selectivity, and be used to calculate equivalent harvest ratios.

Recommendation (3) led to some discussion at the RW, and participants considered the concept of minimum density for successful reproduction to be useful for informing management decisions. Average densities on the Puerto Rican shelf appear relatively low compared to areas such as the deep stratum on the Pedro Bank, which is assumed to have virgin stock density. The difficulty with this approach is that average densities are misleading if calculated over larger areas with variable amounts of suitable habitat. It is more pertinent to think in terms of the density distribution within suitable habitat types, i.e. what fraction of the habitat is occupied by conch above a given density threshold, and the population size within these patches. This underlines the importance of the habitat studies in determining the potential area for colonization by conch at different stages in their development. However, some areas that may otherwise be favorable for conch to live in may not be favorable for larval retention and settlement and may have lower than expected densities.

Recommendation (4): The diver surveys currently appear to be targeted at a variety of reef species and not specifically conch. It is not completely clear from the documentation how much of the total conch population estimates represent extrapolation from surveyed areas to non-surveyed areas with particular habitat types. Substantial extrapolation could lead to significant bias, and efforts should be made to extend the stratified random survey to as many areas as possible where conch are present in adequate densities. Given that conch may have home ranges less than 8 hectares (DW report Section II), fishing mortality may vary widely between areas according to local effort deployment, and it would make sense to compare landings and population abundance for suitable regional units linked to fishing activities.

3.1.2. Conclusions and recommendations

Although it is currently not possible to identify the status of the conch population in relation to benchmarks for sustainable exploitation, the potential exists to develop assessment and management procedures that are not overly dependent upon historical fishery data subject to unknown biases. The data requirements are however quite demanding, and it would be useful to carry out a range of simulations to evaluate the potential risks and cost-benefit tradeoffs of using periodic dive surveys of different possible extents to regionally manage conch fisheries (e.g. through effort and bag limits).

3.2. Mutton Snapper

3.2.1. Summary of findings

The main issues with the mutton snapper data and assessment are:

- incomplete data on removals (incomplete log book submission; insufficient data on recreational catches; no discards data; species not recorded in USVI);
- problems with effort recording (large fraction of total number of trips could be in "NTrips = 0" category; trips may be a poor measure of effort if soak time and gear design and targeting have changed);
- small sample sizes for length composition;
- no data on recruitment trends to help interpret changes in length compositions;
- catch-independent abundance indices not extensive enough.

The assessment data on mutton snapper were from the commercial fishery log-book scheme in Puerto Rico and from length frequency data collected during landings intercepts. Mutton snapper are a common catch, although they are a small component of the overall finfish catch in Puerto Rico. The line and trap fisheries are two of the most important commercial fisheries for mutton snapper, and the assessment data were derived from these fisheries. There are no discards data, and the total landings data have to be corrected for variable amounts of non-reporting of log book data. The fishing effort data have an additional problem in that a significant number of landings up to the early 2000s were for aggregations of trips for which the number of trips was not recorded (NTrips = 0), and there is no information to evaluate if these have the same average CPUE as the NTrips = 1 or >1. The local experts considered that the apparently low effort in the late 1980s and early 1990s calculated from landings with NTrips > 1 and over may be substantial underestimates of total effort, so the combined loss of data from non-return of log books and non-reporting of numbers of trips is a serious issue for interpretation of fishery trends.

Calculated landings of mutton snapper in all the named commercial gears off Puerto Rico roughly doubled between 1990 and the early 2000s and, except for dive-caught fish, have subsequently declined (Fig. 1a). The relative contribution of mutton snapper to total calculated finfish landings has increased over time (Fig. 1b). Total yellowfin grouper landings follow a similar pattern (Fig. 1b). It is not clear to what extent any errors in the expansion factors used to account for non-reporting of log books could have contribute to the landings trends.

In the trap fishery off Puerto Rico, mutton snapper landings have increased whilst total finfish landings have decreased (Fig. 1c). Does this reflect changes in abundance, an increasing probability

of mutton snapper getting into traps as other species have become less abundant, or changes to gear and deployment affecting relative catchability of different species?

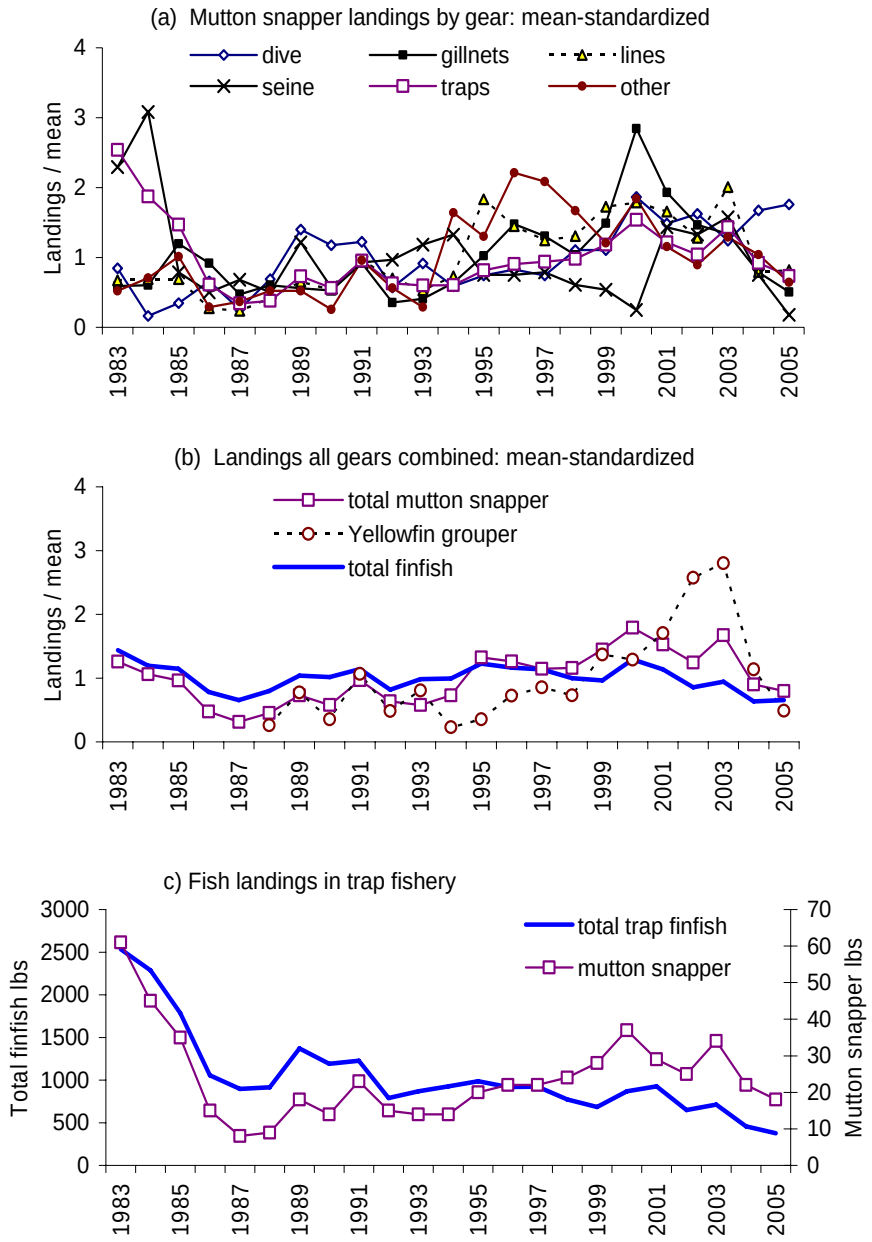

Fig. 1. Calculated landings of mutton snapper off Puerto Rico. (a) Mean-standardized landings by gear type. (b) Mean-standardized total mutton snapper, yellowfin grouper and total finfish landings (all gears); (c) mutton snapper and total finfish landings from trap fishery. Data are from the Data Workshop report.

Although there is much uncertainty over fishing effort trends during the period over which mutton snapper landings increased, there appeared to be an increase in effort during the 1990s and a decline

in effort in recent years (for which data are more reliable), and the trends in landings may to an extent reflect changes in effort (with the same caveat regarding expansion factors).

The GLM method used by the AW for analysis of CPUE was appropriate to the rather limited data that were available. The Stephens and MacCall method of selecting trips that could have caught mutton snapper also provided an objective means of dealing with the large number of trips that didn't catch mutton snapper. The approach for identifying regions (municipalities), making use of fisher's knowledge rather than the data, was very sensible. In the final analysis, there was always a significant interaction between municipality and year or month (treating municipality as a random factor). Some exploration of the different trends between municipalities would have been useful to see what is driving the interaction and how to include it in the model. The use of expansion factors calculated for the whole area could have led to a significant interaction term if the expansion factors had regionally-varying trends over time.

Given the inherent problems with the data and their interpretation, the apparent CPUE trends remain subject to unknown biases. Better understanding is needed of the factors influencing catch rate of gears such as lines and traps. For example, how is CPUE affected by changes in the design of gear, gear deployment (e.g. location; soak-time) and technology such as GPS? For gears such as lines, traps and gill nets, factors such as gear saturation, competition between species and species-specific reaction to the gears all affect CPUE and trends over time and need to be evaluated.

The length-based analysis carried out by the AW on the trap fishery and extended to the line fishery at the RW, indicate a possible increase in mortality around 1990 and a possible decline since the late 1990s. This would be consistent with the calculated landings and effort trends over the same period if these are correlated with fishing mortality. However, the possible influence of changes in recruitment on the length based analysis need to be considered. If the stock size did increase in the 1990s, while effort was increasing, it implies increasing recruitment, which would bias the length-based analysis. Evidence for recruitment trends, for example from inshore surveys or angler catch rates, would help interpret the results of the length-based analysis.

The length-based method works on a very simple premise that, assuming more or less constant recruitment and selectivity, less fishing leads to improved survival and a larger average size. The model was parameterized assuming one or two step changes in mortality. This will be an approximation, as in reality, mortality is likely to change progressively. The method appeared to be applied correctly, and gave results consistent with possible effort and landings trends. Similar trends were apparent in the trap and line fishery, although different fully-selected length ranges were required for each gear. The results appeared sensitive to whether or not the mean lengths were weighted by number of fish measured.

The length-based method provided useful insights into how the population structure has changed over time. The main difficulties with the model are both methodological (particularly the influence of recruitment variability) and data-related (sample sizes vary systematically with time, with very low numbers in the mid 1990s; changes in gear or fishing locations could affect length compositions). The model needs to be simulation tested using a range of data-poor and recruitment scenarios mimicking the mutton snapper example. Until this is done it is difficult to evaluate the robustness of the results. Another approach could be to apply the method to a wide range of species taken in the mixed pot or line fishery. Changes in effort are likely to impact fishing mortality on all the species (although probably to differing degrees), however commonalities in the directional change in mean lengths may be informative provided these can be shown to not be a result of changing gear selectivity. Such an analysis could form part of the mixed-species, mixed-fishery approach recommended by the RW for the reef fish populations on the Puerto Rican shelf.

The AW did not attempt to carry out simple per-recruit analyses. However, growth parameters are implicit in the length-based model, and information is available on size at maturity. The limited length data provided by the DW indicate that a substantial number of the fish caught are below the probable length at 50% maturity. Most shore-caught fish are immature on this basis. Simple per-recruit models could be explored for a range of plausible scenarios for growth, fishery selectivity and natural mortality at age/size. This would require a range of possible figures for overall size composition of catches based on commercial sampling and MRFSS intercepts (e.g. from data as given in Figs. 5 – 11 and Fig. 17 in the DW report). The main aim would be to determine if the selectivity characteristics of particular components of the commercial and recreational fishery are not in keeping with the conservation needs for the stock, and if improving the selectivity could lead to significant improvements in yield or SSB per recruit.

The habitat based method of estimating population numbers from visual surveys was presented in the AW reports and in document Sedar14-AW2. The method appears useful for establishing local densities by habitat type although numbers of fish observed can be very low, leading to high variance. The RW Consensus report recommends further development of fishery-independent surveys for providing indices of abundance, but emphasizes the need to fully evaluate the potential precision and accuracy of such surveys. The RW recommended extending the surveys to provide better data for management of the conch fishery, and I have suggested some cost-benefit analyses before simply adding more locations for surveys. This applies also to the potential usefulness of the data for mutton snapper and other species.

3.2.2. Conclusions and recommendations

The data and analyses presented to the RW, and the discussions around these, highlighted several important issues that need to be addressed before significant improvement in advice for mutton snapper can be developed. I consider the following areas of work would provide a major improvement in the assessment and advice for mutton snapper:

1. More accurate fishery data series need to be developed. This includes: better insight into the how representative the historical log book data are; calculation of regional expansion factors where appropriate; improvements in fishery data collection based on closer working relationships with fishers to build mutual trust and improve data accuracy and level of reporting of logbooks.
2. Development of a random sampling (intercept) scheme to estimate landings independently of logbooks if robust raising procedures can be developed and sufficient precision can be obtained.
3. Better understanding is needed of the factors influencing CPUE, to facilitate interpretation of trends and to allow recording of more appropriate effort statistics in future.
4. Development of larger-scale, suitably designed fishery-independent indices, both to monitor overall stock trends and to compare with fishery CPUE data (subject to demonstration of an acceptable cost-benefit tradeoff in delivering on the survey objectives).
5. Establishment of routine monitoring of numbers and sizes of mutton snapper killed by recreational fishing in all areas (same comment on raising factors and precision as for recommendation (2)).
6. Development of a recruitment index to support future developments of length-based analyses.
7. Simulation testing of the length-based method and application to a range of co-occurring species; testing of the method on data from stocks that also have good age composition data and accepted analytical assessments.

8. Simple per-recruit type modeling to examine the potential effects of the current size selectivity pattern and the benefits of improving selectivity, and to investigate appropriate reference values for fishing mortality.

3.3. Yellowfin Grouper

3.3.1. Summary of findings

Yellowfin grouper are much rarer than mutton snapper, and are recorded in only a very small fraction of commercial landings and are rarely recorded in visual surveys. The AW concluded that the data were inadequate for any form of stock assessment, and the consensus RW report agrees with this view. The absence of adequate assessment data is a severe concern given the IUCN classification of the species as "Near Threatened" and the evidence for stock declines throughout the species' range.

All the problems with expansion factors and reporting of trips in the commercial fishery, discussed above for mutton snapper, also apply to yellowfin grouper and all the recommendations for improving the fishery data and understanding of factors affecting CPUE apply also to this species. The RW asked for a simple analysis of the CPUE data but found the results uninformative, probably due to the extremely small proportion of landings containing yellowfin grouper. This will continue to be a problem, and development of methods of analysis of fishery data will require a specific focus on how best to model presence-absence data and to filter out uninformative data obscuring the population signals.

The AW recommended pursuing alternative assessment methods for evaluating the status of stocks such as yellowfin grouper that are not commonly encountered by fishery-dependent or fishery-independent sampling and monitoring programs. I would endorse this view. It is likely that the population of yellowfin grouper on the Puerto Rican shelf has become depleted along with other larger bodied groupers and other large reef fish whose life history characteristics have made them vulnerable to overfishing. Yellowfin grouper may possibly be a protogynous hermaphrodite, changing from female to male in the latter part of life, although this has not been demonstrated using histology. If true, this aspect of the life history could render the stock even more vulnerable to overharvesting, and should be investigated further. The limited length frequency data presented by the DW (Figs 12 & 13 in the DW report) indicate that a large fraction of the landings may currently comprise fish smaller than the length at maturity of around 50 cm. The selectivity characteristics of the fishery may therefore be sub-optimal if the species has normal reproductive behaviour, but the possibility that the fish may change from female to male later in life would impose particular requirements for fishery selectivity that would need to be evaluated.

Given the potentially poor data on many of the low-abundance reef fish on the Puerto Rican shelf, it is counter-productive to conduct assessments on only a couple of individual species at a time. A clearer picture may emerge if the full available time series of data for all co-occurring inshore and reef fish are evaluated at the same time. Common features such as changes in length composition in response to changes in fishing mortality may become apparent, and year-effects in CPUE across many species could indicate data problems rather than changes in abundance. A mixed species approach could lead to the development of a suite of indicators for monitoring future status of the reef fish community.

The possibility that "fishing down the food chain" has progressively depleted the larger bodied, more vulnerable species may become more apparent in a mixed-species approach. If there has been a recent increase in abundance of smaller species such as mutton snapper, is this a symptom of the depletion

of competitors and predators? It is for these reasons that the RW has recommended an interim workshop in the next 12-18 months to evaluate the information needed to support a multi-species, mixed-fishery approach. Such a workshop should identify the relative abundance, potential vulnerability to exploitation and type and quality of data available for each species, potential indicator species for which data may be adequate for providing reliable single-species assessments and benchmarks, and procedures and data-needs for deriving indicators and benchmarks at the fish community level.

3.3.2. Conclusions and recommendations

I agree with the AW that the data collated by the DW are inadequate for evaluating the status of yellowfin grouper on the Puerto Rican shelf, but express concern that systematic rejection of assessments for individual species due to poor data quality may delay appropriate action to conserve vulnerable species. Other approaches to evaluating the status of reef fish are needed, and a multi-species, mixed-fishery approach is recommended.

Every effort should be made to collate all potentially useful data on the abundance and species composition of reef fish further back in time. The current data series are very short and there is a danger of having inappropriate and shifting baselines for evaluating stock status. Historical archives from research labs, angling or diving clubs, including comparative data from similar reef fish assemblages in other areas, may help to establish a more realistic baseline for density and species composition against which the current populations can be gauged.

Appendix 1 Materials provided for review

DW and AW reports

SEDAR14-AR01	SEDAR 14 Stock Assessment Report 1: Yellowfin Grouper	
SEDAR14-AR02	SEDAR 14 Stock Assessment Report 2: Mutton Snapper	
SEDAR14-AR03	SEDAR 14 Stock Assessment Report 1: Queen Conch	

Working Papers:

SEDAR14-RW01	Estimating mutton snapper mortality rates from mean lengths and catch rates in non-equilibrium conditions.	Gedamke and Porch
SEDAR14-RW02	SEDAR 14 Assessment Workshop Data and analytical status overview	SEDAR 14 AW Panel
SEDAR14-RW03	Standardized visual counts of mutton off the US Virgin Islands and their possible use as indices of abundance.	Gedamke and Porch
SEDAR14-AW01-1	Updated commercial catch per unit effort indices for mutton snapper line and pot fisheries in Puerto Rico, 1983-2006. Addendum 1 to SEDAR14-AW01.	Cummings, N.
SEDAR14-AW05-1	Revised estimates of mutton snapper total mortality rates from length observations. Addendum 1 to SEDAR14-AW05	Gedamke, T.

Reference Documents:

SEDAR14-RD49 US Geol. Surv., Carib. Field Station, St. John, USVI 2003	Temporal analysis of monitoring data on reef fish assemblages inside Virgin Islands National Park and around St. John, US Virgin Islands, 1988-2000	Beets, J. and A. Friedlander
SEDAR14-RD50 TAFS 135:476-487 2006	Estimating mortality from mean length data in nonequilbrium situations, with application to the assessment of goosefish.	Gedamke, T. and J. M. Hoenig
SEDAR14-RD51 Caribbean Coral Reef Institute (CCRI) 2007	Reef fish spawning aggregations of the Puerto Rican shelf. Final Report	Ojeda, E.

A large number of other background documents submitted to the DW and AW meetings were available on the SEDAR website.

Appendix 2 Statement of Work for CEFAS (Dr. Michael Armstrong)

SEDAR 14 Stock Assessment Review

Caribbean yellow fin grouper, mutton snapper, and queen conch

July 23 - 27, 2007

San Juan, Puerto Rico

SEDAR Overview:

South East Data, Assessment, and Review (SEDAR) is a process for fisheries stock assessment development and review conducted by the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; NOAA Fisheries Southeast Fisheries Science Center (SEFSC) and Southeast Regional Office (SERO); and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR is organized around three workshops: data, assessment, and review. Input data are compiled during the data workshop, population models are developed during the assessment workshop, and an independent peer review of the data, assessment models, and results is provided by the review workshop. SEDAR documents include working papers prepared for each workshop, supporting reference documents, and a SEDAR Stock Assessment Report. The SEDAR Stock Assessment Report consists of a data report produced by the data workshop, a stock assessment report produced by the assessment workshop, and a peer review consensus report prepared by the review workshop. Assessment findings are summarized in an Advisory Report that serves as an Executive Summary for the SEDAR Stock Assessment Report.

SEDAR is a public process conducted by the Fishery Management Councils in the Southeast US. All workshops, including the review, are open to the public and noticed in the Federal Register. All documents prepared for SEDAR are freely distributed to the public upon request and posted to the publicly accessible SEDAR website. Public comment during SEDAR workshops is taken on an 'as needed' basis; the workshop chair is allowed discretion to recognize the public and solicit comment as appropriate during panel deliberations. The names of all participants, including those on the Review Panel, are revealed.

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, correction of errors, and sensitivity runs of the assessment model provided by the assessment workshop. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The review panel task is specified in Terms of Reference.

The SEDAR 14 review panel will be composed of three Center for Independent Experts (CIE)-appointed reviewers, one reviewer appointed by the Caribbean Fishery Management Council, and a chair appointed by the SEFSC director. Council staff, Council members, and Council Advisory Panel and Scientific and Statistical Committee (SSC) members will attend as observers. Members of the public may attend SEDAR review workshops.

CIE Request:

NMFS-SEFSC requests the assistance of three fisheries assessment scientists from the CIE to serve as technical reviewers for the SEDAR 14 review panel that will consider assessments of Caribbean yellowfin grouper, mutton snapper, and queen conch. Reviewer tasks are listed below.

The stocks assessed through SEDAR 14 are within the jurisdiction of the Caribbean Fishery Management Council, the US Virgin Islands, and Puerto Rico.

The review workshop will take place at the Hotel El Convento in San Juan, Puerto Rico, from 1:00 p.m. Monday, July 23, 2007 through 1:00 p.m. Friday, July 27, 2007.

Meeting materials will be forwarded electronically to review panel participants and made available through the internet (http://www.sefsc.noaa.gov/sedar/); printed copies of any documents are available by request. The names of reviewers will be included in workshop briefing materials.

Please contact John Carmichael (SEDAR Program Manager; 843-571-4366 or John.Carmichael@safmc.net) for additional details.

Hotel arrangements:

Hotel El Convento
100 Cristo Street
Old San Juan, PR 00901
Phone: (787) 723-9036
Fax: (787) 723-0754

Group "SEDAR" Rate: $195 + (12% tariff, 9% tax, $3 tax, $2 maid) = $243.06; guaranteed through May 22, 2007.

(*NOTE: Hotel will charge one night upon reservation*)

SEDAR Review Workshop Panel Tasks:

The SEDAR 14 Review Workshop Panel will evaluate assessments of Caribbean yellowfin grouper, mutton snapper, and queen conch. During the evaluation the panel will consider data, assessment methods, and model results. The evaluation will be guided by Terms of Reference that are specified in advance. The Review Workshop panel will document its findings regarding each assessment in a Peer Review Consensus Summary (Annex I). The Consensus Summary is a SEDAR product, not a product of the CIE. Separate CIE reviewer reports will also be produced, as described in Annex II, to provide additional, independent analyses of the technical issues and of the SEDAR process.

SEDAR 14 Review Workshop Terms of Reference (apply to each stock):

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.
3. Recommend appropriate estimates of stock abundance, biomass, and exploitation.
4. Evaluate the methods used to estimate population benchmarks and management parameters; recommend values for management benchmarks and a range of ABC and provide declarations of stock status.
5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition.
6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty, considering input data, model fit, and model configuration. Ensure that the implications of uncertainty with regard to status determinations and management values are clearly stated.
7. Ensure that assessment results are clearly and accurately presented in the Stock Assessment Report and SEDAR Advisory Report, and that reported results are consistent with Review Panel recommendations.
8. Evaluate the SEDAR Process. Identify any Terms of Reference that were inadequately addressed by the Data or Assessment Workshops; identify any additional information or assistance that will improve Review Workshops; and suggest improvements or identify aspects requiring clarification.
9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations warranted. Clearly indicate the research and monitoring needs that may appreciably improve the reliability of future assessments. Recommend an appropriate interval for the next assessment and indicate whether a benchmark or update assessment should be considered.
10. Prepare a Peer Review Consensus Summary summarizing these evaluations and addressing each Term of Reference. (Consensus Report to be drafted by the Panel during the review workshop with a final report due two weeks after the workshop ends.)

NOTES: The review panel may request additional sensitivity analyses, evaluation of alternative assumptions, and correction of errors identified in the assessments provided by the assessment workshop panel; the review

panel may not request a new assessment. Additional details regarding the latitude given the review panel to deviate from assessments provided by the assessment workshop panel are provided in the *SEDAR Guidelines* and the *SEDAR Review Panel Overview and Instructions*.

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.

These Terms of Reference may be modified prior to the Review Workshop. Final Terms of Reference will be provided to the Reviewers with the workshop briefing materials.

SEDAR Review Workshop Panel Supplementary Instructions

The review panel Chair is responsible for reviewing documents prior to the workshop, conducting the meeting during the workshop in an orderly fashion, compiling and editing the Peer Review Consensus Summary for each species assessed and submitting it to the SEDAR Program Manager by a deadline specified by the SEDAR Steering Committee. The Review Panel Chair will work with SEDAR staff to complete the SEDAR Advisory Report. The review panel chair may participate in panel deliberations and contribute to report preparation.

Review panel reviewers are responsible for reviewing documents prior to the workshop, participating in workshop discussions addressing the terms of reference, preparing assessment summaries and consensus reports during the workshop, and finalizing SEDAR documents within two weeks of the conclusion of the workshop. Each reviewer appointed by the CIE is responsible for preparing an additional CIE Reviewer Report as described in Annex II.

The Chair and SEDAR Program Manager will work with the appointed reviewers to assign tasks during the workshop. For example, the Chair may appoint one panelist to serve as assessment leader for each assessment covered by the review, with the leader responsible for providing an initial draft consensus report text for consideration by the panel. Reviewers may alternatively be assigned particular terms of reference to initially address. Regardless of how initial drafting is accomplished, all panelists are expected to participate in discussion of all terms of reference and contribute to all aspects of the review.

The Review Panel's primary responsibility is to ensure that assessment results are based on sound science, appropriate methods, and appropriate data. During the course of the review, the panel is allowed limited flexibility to deviate from the assessment provided by the Assessment Workshop. This flexibility may include modifying the assessment configuration and assumptions, requesting a reasonable number of sensitivity runs, requesting additional details and results of the existing assessments, or requesting correction of any errors identified. However, the allowance for flexibility is limited, and the review panel is not authorized to conduct an alternative assessment or to request an alternative assessment from the technical staff present. The Review Panel is responsible for applying its collective judgment in determining whether proposed changes and corrections to the presented assessment are sufficient to constitute an alternative assessment. The Review Panel Chair will coordinate with the technical staff present to determine which requests can be accomplished and prioritize desired analyses.

Any changes in assessment results stemming from modifications or corrections solicited by the review panel will be documented in an addendum to the assessment report. If updated estimates are not available for review by the conclusion of the workshop, the review panel shall agree to a process for reviewing the final results.

The review panel should not provide specific management advice. Such advice will be provided by existing Council Committees, such as the Science and Statistical Committee and Advisory Panels, following completion of the assessment.

If the Review Panel finds an assessment deficient to the extent that technical staff present cannot correct the deficiencies during the course of the workshop, or the Panel deems that desired modifications would result in a new assessment, then the Review Panel shall provide in writing the required remedial measures, including an appropriate approach for correcting and subsequently reviewing the assessment.

Statement of Tasks for Technical Reviewers:

1. Approximately three weeks prior to the meeting, the reviewers shall be provided with the stock assessment reports, associated supporting documents, and review workshop instructions including the Terms of Reference. Reviewers shall read these documents to gain an in-depth understanding of the stock assessment, the resources and information considered in the assessment, and their responsibilities as reviewers.
2. During the Review Panel meeting, reviewers shall participate in panel discussions on assessment methods, data, validity, results, recommendations, and conclusions as guided by the Terms of Reference. The reviewers also shall participate in the development of a Peer Review Consensus Summary report for each assessment reviewed, as described in Annex I. Reviewers may be asked to serve as an assessment leader during the review to facilitate preparing first drafts of review reports.
3. Following the Review Panel meeting, the reviewers shall work with the chair to complete and review the Peer Review Consensus Summary Reports. Reports shall be completed, reviewed by all panelists, and comments submitted to the Chair by August 10, 2007.
4. Following the Review Panel meeting, each reviewer appointed by the CIE shall prepare an individual CIE Reviewer Report. These reports shall be submitted to the CIE no later than August 17, addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Sampson, via email to David.Sampson@oregonstate.edu, and to Mr. Manoj Shivlani, via email to mshivlani@rsmas.miami.edu. See Annex II for complete details on the report outline.

The duties of each CIE panelist shall occupy a maximum of 14 workdays; several days prior to the meeting for document review; five days at the SEDAR meeting; and several days following the meeting to ensure final review comments and document edits are provided to the Chair and to complete a CIE review report.

Workshop Final Reports:

The SEDAR Program Manager will send copies of the final Review Panel Consensus Report and the complete SEDAR Stock Assessment Report for each stock assessed to Mr. Manoj Shivlani at the CIE.

Submission and Acceptance of CIE Reports:

The CIE shall provide via e-mail the individual CIE Reviewer Reports to the COTR, Dr. Stephen Brown (stephen.k.brown@noaa.gov) for review and approval, based on compliance with this Statement of Work, by August 24, 2007. The COTR shall notify the CIE via e-mail regarding acceptance of the reports within two working days of receipt. Within two working days of the COTR's approval, the CIE shall provide the final individual CIE Reviewer Reports to the COTR in pdf format.
The COTR shall provide the final CIE Reviewer Reports to:

SEFSC Acting Director: Alex Chester, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149 (email, Alex.Chester@NOAA.gov)

SEDAR Program Manager: John Carmichael, SAFMC, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405 (email, John.Carmichael@safmc.net). (SEDAR shall provide the final CIE Reviewer Reports to the SEDAR Steering Committee and Executive Directors of those Councils having jurisdiction over the included stocks)

Schedule of Deliverables:

July 27, 2007:	Review Panel completes first draft of Review Panel Consensus Reports (conclusion of Review Workshop)
August 10, 2007:	Review Panel submits final draft Review Panel Consensus Reports to Workshop Chair.
August 17, 2007:	Workshop Chair submits final Review Panel Consensus Reports and SEDAR Advisory Reports to SEDAR Program Manager.
August 17, 2007:	CIE Technical Reviewers submit individual Reviewer Reports to CIE.
August 29, 2007:	SEDAR Program Manager submits final Review Panel Consensus Reports and SEDAR Stock Assessment Reports to CIE.
September 7, 2007:	CIE submits individual CIE Reviewer Reports to the COTR.
September 11, 2007:	COTR notifies CIE regarding individual Reviewer Report acceptance.
September 13, 2007:	CIE provides final individual CIE Reviewer Reports to COTR.
September 19, 2007:	COTR provides final CIE Reviewer Reports to SEFSC Acting Director and SEDAR Program Manager.
September 21, 2007:	SEDAR submits individual CIE Reviewer Reports to the SEDAR Steering Committee and Councils.

For Additional Information or Emergency:

SEDAR contact: John Carmichael, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405. Phone: 843-571-4366; cell phone (843) 224-4559. Email: John.Carmichael@safmc.net.

Draft Agenda

SEDAR 14: Caribbean Yellowfin Grouper, Mutton Snapper, and Queen Conch

July 23 - 27, 2007

Monday

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

Tuesday

8:30 a.m. – 11:30 a.m.	**Assessment Presentation**	**Chair**
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion**	**TBD**
	- Assessment Data & Methods	
	- Identify additional analyses, sensitivities, and corrections	
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion**	**Chair**
	- Continue deliberations	
	- Review additional analyses	

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

Wednesday

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

Wednesday Goals: Final sensitivities identified, preferred models selected, Projection approaches approved, Consensus report drafts begun

Thursday

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

Thursday Goals: Complete assessment work and discussions. Final results available. Draft Consensus Reports reviewed.

Friday

8:30 a.m. – 1:00 p.m.	**Panel Work Session**	**Chair**
1:00 p.m.	**ADJOURN**	

Annex I. SEDAR Review Panel Consensus Summary Report Contents

I. Terms of Reference

List each Term of Reference, and include a summary of the Panel discussion regarding the particular item. Include a clear statement indicating whether or not the criteria in the Term of Reference are satisfied.

II. Further Analyses and Evaluations

Summary and findings of review panel analytical requests not previously addressed in TOR discussion above.

III. Additional Comments

Provide a summary of any additional discussions not captured in the Terms of Reference statements.

IV. Recommendations for Future Workshops

Panelists are encouraged to provide general suggestions to improve the SEDAR process.

V. Reviewer Statements

Each individual reviewer should provide a statement attesting whether or not the contents of the Consensus Report provide an accurate and complete summary of their views on the issues covered in the review. Reviewers may also make any additional individual comments or suggestions desired.

ANNEX II: Contents of CIE Reviewer Report

1. The reviewer report shall be prefaced with an executive summary of findings and recommendations.

2. The main body of the reviewer report shall consist of a background, description of review activities, summary of findings, and conclusions and recommendations. Reviewers are encouraged to elaborate on any points raised in the Consensus Summary Report that they feel might require further clarification. Reviewers are encouraged to provide any criticisms and suggestions for improvement of the SEDAR process. Reviewers are not required to repeat comments and recommendations contained in the Consensus Summary Reports.

3. The reviewer report shall include as separate appendices a copy of the CIE Statement of Work and a bibliography that includes all materials provided for review.

Please refer to the following website for additional information on report generation: http://www.rsmas.miami.edu/groups/cie.