
**REPORT ON THE 8th SOUTHEAST DATA,
ASSESSMENT AND REVIEW (SEDAR 8)**

REVIEW WORKSHOP

**Caribbean Yellowtail Snapper and Spiny Lobster
South Atlantic – Gulf of Mexico Spiny Lobster**

by

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1. Executive Summary and Recommendations

SEDAR 8 met in San Juan, Puerto Rico, 16–20 May 2005, and addressed assessments of Caribbean yellowtail snapper, Caribbean spiny lobster, and South Atlantic – Gulf of Mexico spiny lobster. The meeting arrangements were excellent, but I have one clear recommendation relating to them: **(1) to ensure the provision of a large-scale locator map in the meeting room (for those not familiar with the geography or sampling areas).**

Those charged with assisting me in my capacity as Chair (John Carmichael and his assistants) did an excellent job, and the meeting would not have been near so successful without their totally committed input. The panellists were a competent and disciplined group of mainly technical people, but also included two from across the stakeholder spectrum. Their lack of exposure to the assessments of these three stocks allowed them to be penetrating in their questioning, but they were all both efficient and fair, resulting in a fruitful meeting.

The terms of reference supplied were adhered to, but regrettably neither Caribbean yellowtail snapper nor Caribbean spiny lobster yielded scientifically defensible assessments that allowed determination of stock status or health. Perhaps it would have been better had these assessments been held back for a year or two, but the positive input made to the assessments of both these stocks would then have been lost. The South Atlantic – Gulf of Mexico spiny lobster assessment was accepted, virtually as is, and discussion of that assessment focused on improvements to be made in future, maximizing its management utility.

Discussion was intense, probing and fruitful, and re-runs were called for and provided for South Atlantic – Gulf of Mexico spiny lobster. It seems that overfishing of that stock is not occurring, but a few concerns about overfishing remained that the staffers would do well to address in future. For all three stocks, clear advice on future research and monitoring was given, as well as (for the non-assessable stocks) comments on the best way forward.

I have no criticisms of the process followed. Indeed, favourable comments were received from virtually all those asked to comment, as per my indicated Chair duties. The willingness of many fishers and their representatives to give willingly of their time was highlighted, as was the need to preserve the independence of the Review Workshop procedure. Indeed, my second recommendation reflects that feeling: **(2) to try to ensure that membership of Panels for future SEDAR Review Workshops preserves independence of any involvement in assessment of the stocks being addressed, in terms of both Chair and Panel (the latter to retain participation if possible by several US scientists not involved in the assessment).** What was particularly gratifying was that, in chairing the meeting, I felt that the spirit of compromise and the will to reach consensus was very strong.

2. Background, preliminaries and documentation

The panel met from 16 to 20 May 2005 at the Caribe Hilton Hotel, San Juan, Puerto Rico, with a Chair and seven members (along with several presenters and observers, who also participated in discussions), as listed in the Consensus Summary Report, Section 1.3 (which is attached hereto as Appendix 3). The terms of reference and the main bibliography of this SEDAR Review Workshop are also listed in the Consensus Summary Report, the latter as Section 1.4. My Chair's Statement of Work (agreed with the CIE) is given as Appendix 2, and the final agreed agenda is attached here as Appendix 1.

John Carmichael provided me all material necessary in good time for the meeting, the first CD arriving by courier more than two weeks before the Review Workshop, and the second (containing also all material that had been sent to me by email after the first CD had arrived) arriving about four days before I left. This arrangement suited me very well, because it allowed me plenty of time to absorb the material and also to archive it electronically and efficiently for use at the meeting. John acted throughout as my primary point of contact, very efficiently, and we also made email contact with some of the other technical members of the panel while John and I were planning responsibilities for aspects of the review and its write-up. This latter email interchange precluded the need for a conference call, which is always difficult to achieve with panel members travelling and/or several time zones apart. John and his able assistants, notably Cynthia Morant, were responsible for and outstandingly delivered, the "housekeeping" arrangements at the meeting itself, namely the provision of refreshments and other hotel-provided materials, recording of the meeting proceedings, and the supply of hard copy of documentation. Lloyd Darby kept the electronic housekeeping in order, and although I personally did not connect my laptop by wireless card to the meeting network, others did, and the system worked faultlessly throughout the week.

Once the material arrived electronically, I studied it in detail, familiarizing myself with its contents, specifically that pertinent to the assessments. The material included also most of the material relevant to the assessments provided earlier at the Data Workshop and the Assessment Workshop, although because of its sheer volume, it is not listed in the bibliography of material given in Appendix 3. It was, however, very relevant to the Review, and as a bibliography is listed in the reports of the appropriate workshops. John also engaged me electronically in discussion about the meeting agenda, and allowed for the presence in Puerto Rico of relevant staff and working group members at their times of availability. Finally, at a pre-meeting with John in San Juan, I was given valuable background on the evolving SEDAR meeting procedures (specifically about how the process had moved on since the SEDAR 3 meeting I chaired two years ago), and clear direction of what was expected by his customers as output from this meeting.

The terms of reference were clear and, to my mind, achievable fully in terms of South Atlantic – Gulf of Mexico spiny lobster. However, it was obvious to

me from my first reading of the assessments and background information that the assessments of Caribbean yellowtail snapper and Caribbean spiny lobster were in for some criticism in terms of the data on which they were based. Therefore, when I convened the meeting, I was not sure whether all the terms of reference were fully achievable for those species.

Overall, therefore, I was well briefed and prepared by the time the meeting was held in San Juan.

3. Conduct of the meeting

The meeting convened at 14:00 on 16 May with all panel members (other than Richard Appeldoorn, who was delayed until later the first day) and presenters present. The facilitator opened the meeting with a welcome to all and an introduction of the members of the panel, myself as Chair, Paul Medley from the United Kingdom and also representing the CIE, later Richard Appeldoorn of the University of Puerto Rico, Jim Berkson of NOAA Fisheries' RTR Unit, Edward Schuster of the St Croix Fisheries Advisory Committee, Simon Stafford of the Gulf of Mexico Fishery Management Council Advisory Panel, Ian Stewart of the Northwest Fisheries Science Center, and Doug Vaughan of the Southeast Fisheries Science Center. All other participants, presenters and observers also introduced themselves. He then handed the meeting over to me and I explained what I wanted to achieve (as listed in the Terms of Reference and my own Statement of Work – Appendix 2) and how I wished to get there, through debate and consensus. Specifically, I stressed the need for us to produce a clear and customer-usable Consensus Summary Report, accurately reflecting our deliberations on all three stocks. I stressed that I saw the Panel as mandated to provide information rather than advice, other than in outlining ways forward to enhance future assessments of the same stocks. In terms of the panel itself, I stressed that I saw my own role as primarily process-orientated in terms of the meeting discussion, and that of Drs Medley, Appeldoorn, Berkson, Stewart and Vaughan as to delve deeper into technical aspects of the work than I would be able to while controlling the meeting. Messrs Schuster and Stafford would provide stakeholder input whenever so motivated to do so.

After the preliminaries, the agenda was confirmed, and the order of debate throughout the week stayed the same as initially agreed in the agenda (Appendix 1). At this juncture, I pointed out that we were privileged on the Panel to have representatives of industry (fishers). We also had some environmental and other stakeholder representatives as observers, so I urged them all to take full advantage of their opportunity by providing the extra background their unique knowledge afforded us by participating in the discussions.

The meeting commenced with a presentation of the yellowtail snapper assessment by Josh Sladek Nowlis, supported by Nancie Cummings, with Jim Berkson undertaking the responsibility of drafting our Panel findings for the stock. Subsequently, the Caribbean spiny lobster assessment and background presentations were made by David Die, Liz Brooks and Monica

Valle, with responsibility for producing the first draft taken by Richard Appeldoorn, and the South Atlantic – Gulf of Mexico spiny lobster assessment was presented by Bob Muller, supported by John Hunt, and Ian Stewart and Doug Vaughan produced the first draft of the report on that stock. The presentations were all excellent, well conceived and explained, and the first drafts of the Consensus Summary Report parts were produced accurately and in a timely manner. My intention was to receive the presentations and to conduct a full discussion of each stock in the afternoon and early evening of one day, to allow the presenters to conduct extra runs if necessary overnight, to receive the output of those runs the following morning, then to review the drafted part of the Consensus Summary Report, and to receive written stakeholder opinions on their views relating to that specific stock. This tentative plan worked excellently, and tribute must be paid to all participants for so willingly accommodating the crowded schedule.

In the event, and despite South-Atlantic – Gulf of Mexico spiny lobster requiring more re-runs and sensitivity analyses during the morning when the draft was being considered, we were ready by Thursday afternoon to hear comments from all about their views of the current and proposed SEDAR assessment process. One other breakout session was convened early in the week of the Review. Tony Iarocci of the South Atlantic Fisheries Management Council offered to facilitate a brainstorming session with mainly stakeholders and other lobbyists (but also some interested technical participants) to draw out from them the most pressing concerns they might have regarding the SEDAR process, and to prioritise and focus their own opinions about stock status, research to be undertaken, etc, on the stocks under Review. This arrangement worked well and appropriate wording found its way into the Consensus Summary Report in good time, allowing me to spend the final morning of the Workshop reviewing the Consensus Summary Report in its “almost final” form. I was very satisfied with the manner in which the meeting and discussions were conducted. There were inevitably a few sticking points and some counter views, but a spirit of consensus-seeking by all was followed to adjournment.

One specific point deserves mention here. From my UK perspective, I found it a little hard to know always the geographic (or even Council) area being referred to by the presenters and in discussion. I did try to prepare myself for this eventuality before the meeting (and I also tried to learn much of the acronym jargon that I knew would be used!), but I sometimes found myself lost geographically during the meeting. I therefore recommend that future SEDAR meetings provide a large-scale locator map that is available at all times for participants, particularly the Chair and CIE reviewers, who seem traditionally to be contracted from outside the USA.

Finally, I wish to pay tribute to the positive manner in which the stakeholder representatives on the Panel (Messrs Schuster and Stafford) and among the observers (all listed in Section 1.3 of the Consensus Summary Report, Appendix 3) conducted themselves. Throughout my career, I have always stressed that fisheries scientists who conduct their work without the benefit of fisher and stakeholder input miss a valuable opportunity. That the current

meeting listened to and made use of the valuable inputs of these Panel members and observers, lends more credibility to the outcome of this Review, and I hope the same system will be followed in future SEDARs.

4. Summary of the meeting content

A comprehensive report of the meeting output is given in the Consensus Summary Report, but for the purpose of completeness and to support my own recommendations, a summary is given here per stock, highlighting the aspects I personally consider to be most important.

Caribbean yellowtail snapper

Despite laudable effort having been made by those charged with assessing this stock, the underlying data did not currently allow production of an adequate assessment, meaning that at this point in time, no scientifically defensible determination of the state of the stock or target reference points was possible. Although several key reference points were provided (B_{msy}/B_0 , SPR_{msy} , F_{msy} – given a selectivity vector) and seem to be robust across the various models presented, they do not provide information on current stock status.

For the stock to be assessed adequately in future, well-designed, systematic, long-term research and data collection programmes are crucial, and data-collection methodology must also take into account the unique aspects of the yellowtail snapper fishery. Therefore, sampling effort needs to be either added or redirected to target the species more effectively. Alongside the collection of new data is a need for quality control and validation of historical data (which will likely play an important future role in providing contrast in the data series), also maintaining documentation on changes in fisheries, management methods and data-collection methods.

Cost-effective partnerships with local fishers to conduct research and to collect needed data are the way to go with this fishery. The scientists need to build on the current high level of interest in the fishing community to cooperate with management agencies in collecting data, facilitating cooperation and participation by fishers in the management process. However, all future monitoring and assessment should be undertaken with due consideration given to the species' importance in the overall species assemblage and community.

In terms of future research and monitoring, much needs to be done, but to maximize the likelihood of generating an acceptable assessment of the stock in the near future, the highest priority should be on:

- carrying out fishery-independent surveys;
- collecting more catch data, including specifically the recreational fishery; and
- collecting age and length data from commercial and recreational catches and from fishery-independent surveys

Caribbean spiny lobster

In the case of this stock too, great efforts had been made to produce a scientifically defensible assessment, but the underlying data were considered too uninformative to support it. There was also some concern about the method used to standardize the stock abundance indices. The GLM and delta-lognormal approach is appropriate, but determining terms in the model based purely on statistical criteria could lead to bias in the index. Therefore, it was suggested that there needed to be consideration as to how the various effects might influence an abundance index, and testing of the GLM terms accordingly.

Determining stock status of Caribbean spiny lobster proved elusive given the assessments provided. Analysis of percentage catch under minimum size coupled with other YPR studies showed the current minimum size to be appropriate to maximize YPR, and trends in relative abundance indices and length distributions indicated some stability over the past 20 years. YPR analyses suggest that the fishery is not experiencing growth-overfishing, but this conclusion was countered by the recruitment-based models indicating a wider range of uncertainty regarding overfishing. In any case, YPR analyses were limited in their value by assumptions about parameters such as natural mortality and the shape of the stock-recruitment curve, and their limited time frame.

There seemed to be a split in the data series at about 1992. In the first part of the time-series, the abundance indices declined, but in the second part, the abundance index seemingly remained steady while the catch increased, a trend inconsistent with expectations of a fishery. Because of this, standard production model approaches could not fit the entire time-series, because they do not have the ability to recreate the behaviour observed. Additional factors were proposed for consideration in an attempt to understand better the dynamics of the population. Perhaps recruitment increased during the second part of the time-series, allowing for increased catch without reducing population size, or perhaps fishers moved into new areas, accessing a previously unexploited portion of the population, or maybe there were changes in the gear used, in post-settlement survival, and/or in post-larval settlement. In any case, it seemed necessary in future to create a model unique to this stock that possibly allowed the recruitment parameter to increase over the second part of the time-series. Only once a model could recreate the behaviour observed in the data would it be possible better for the scientists to identify hypotheses for the cause of the behaviour. In any case, understanding the dynamics of recruitment in the fishery for Caribbean spiny lobster is crucial, so creation of a standardized annual recruitment index to support assessment was deemed of great priority.

As for yellowtail snapper, the building of cost-effective partnerships with local fishers was highlighted as an excellent means of improving data collection and research on this species, but given the importance of developing a robust assessment swiftly, the priority for future research and monitoring was given to:

- developing/strengthening fishery-independent data collection;
- incorporating historical data into existing data sets; and
- utilizing refined models (better to identify viable hypotheses).

South Atlantic – Gulf of Mexico spiny lobster

Gratifyingly, this stock produced a robust assessment that allowed in-depth discussion of stock status and health, and hence meeting of the terms of reference completely. It also allowed the Panel to be innovative in suggesting extra runs better to understand the dynamics of the resource, which were carried out and slightly influenced our deliberations.

In addressing the lack of direct linkage between spawning stock biomass (SSB) and subsequent recruitment, it was noted that there was no comparable proxy benchmark for SSB. For this reason, SSB/SSB_{msy} , MSY, and related criteria could not be estimated reliably. However, a proxy benchmark for F was available from the SAFMC Fishery Management Plan for Spiny Lobster (Amendment 6) based on static SPR ($F_{oy} = 30\%$ SPR, and $F_{msy\ proxy} = 20\%$ SPR). Notwithstanding, there was considerable discussion as to whether the $F_{20\%}$ threshold made biological sense, given that values were likely to be close to this level under historical rates of fishing mortality. Of course, if all portions of this Caribbean stock had high fishing mortality rates, the value might not be biologically reasonable over longer time-scales. The long-term average is currently estimated by the assessment to be $SPR = 19\%$, which was presumed to be sustainable though slightly below the limit. We had no basis for recommending alternative benchmarks and, based on the assessment model results presented, overfishing does not appear to be in evidence. Indeed, we were not sure whether growth-overfishing would occur even at very high rates of fishing mortality, given current estimated selectivity patterns. Regrettably, it was not possible to evaluate stock status relative to overfished levels.

Most discussion around estimating relative stock status with respect to overfished levels focused on the connectivity of the entire Caribbean spiny lobster population and the relative importance of the SA - GOM area in the total. Catches from the area under review constitute $<10\%$ of the catch in the western Atlantic, and present understanding of oceanographic patterns indicates that it is quite likely that the area receives larvae from other areas. Therefore, critical information required to evaluate whether the stock is overfished include identifying the source of the larvae settling in the SA - GOM area and determining the proportion of larval production from the area that is retained locally. Unfortunately, a broad assessment of the Caribbean population, though desirable, is currently impractical.

A strong call was made at the Review Workshop to re-establish an observer programme for the commercial trap fishery, which could in time supply useful data on pre-recruit numbers, adults, and other information that could not be gained through other methods. The value of such a time-series would naturally strengthen as the series lengthened. Again, as for the two stocks

above, the need for efficient coordination and communication between all participants (industry and scientists) was highlighted. Improved knowledge of growth rates, and Monte Carlo simulation modelling of target and threshold reference points were also advanced as desirable future activities to underpin future assessment.

5. Final comments

The meeting's objectives were clear and enshrined in the Terms of Reference. The process by which the assessments came into being is sound and follows established SEDAR procedure. Indeed, the process followed up to the Review Workshop, namely evaluation of the data at a Data Workshop, followed by in-depth analysis of stock assessment options at an Assessment Workshop, is wholeheartedly endorsed, especially if both initial workshops involve as many of those involved in researching, monitoring and prosecuting the fishery as possible, as seems to be the case. Continuity of some personnel across all three workshops for each stock is particularly helpful and was mentioned in the discussion of the SEDAR process this time as being one of the strengths of the process.

Unfortunately, though, two of the assessments failed to provide robust outputs meaningful to management, and in retrospect, it would be easy to criticize the process for failing to deliver. However, that would be a simplistic criticism that, in my opinion, is not warranted. Every avenue of potential data was explored at the Data Workshops, and virtually every possibility for creating a sound assessment was investigated at the Assessment Workshops. That the Review Workshop, with its total independence from the assessments, rubber-stamped what was obvious to many involved in the assessments at their earlier stages is supportive of the process, not supportively critical of its outcome. The quality of the work undertaken to get as far as the process did for both unsuccessful assessments was outstanding. In particular, the involvement of stakeholders in almost all parts of the process is very healthy and is endorsed.

The fact that the final assessment with which we were provided (SA - GOM spiny lobster) hardly changed despite being subjected to extra sensitivity tests and runs speaks volumes for its quality and the competence of those providing the original and the updates, and the staffers who produced it deserve much credit for their efforts. Particularly obvious was their understanding of the dynamics their stock. Many of the suggestions the panel made for elaboration were met with comments such as "I expected you to ask that – here is the answer!" Very impressive scientifically, and technically the assessment was a sound piece of work.

Overall, it is my belief that the output from the review will be valuable in informing the appropriate Management Councils on how best to manage their stocks for the benefit of present and future generations of citizens, so I think the review also achieved a "political" objective, even though none was written. That statement applies equally to those stocks for which the assessments were deemed currently unrevealing of stock status, and for which

precautionary management will be put in place until a sound assessment is produced, and the assessment of Caribbean spiny lobster, whose assessment is sound, but for which the dynamics of its inter-relationships with other portions of the same stock in the Caribbean are not yet fully understood.

The SEDAR process is valuable in ensuring the credibility of fisheries science and scientific advice. However, it would not work without the professionalism and competence of all panellists, presenters and observers, the last of who willingly gave up their valuable time, and perhaps were out of pocket, to participate. That issue is rightly raised in the discussion of the SEDAR process at the end of the Consensus Summary Report. However, to me the most important aspect of the SEDAR Review Workshop process is another of those mentioned in the Consensus Summary Report, its independence. Independence in this case means the chair and many members of the panel. I hope that future SEDARs do not lose this specific credibility-supporting attribute. Without exception too, the meeting was conducted in excellent spirit, despite the sometimes rigorous and probing debate.

I enjoyed and personally benefited from the discussion around the fringes of the meeting, over refreshments and sometimes into the evening. I can therefore honestly say that I enjoyed myself and consider myself privileged to have been selected to assist in some small manner. My personal thanks are due to the CIE for having sufficient confidence to entrust me with chairing this meeting, to my co-panellists (Paul Medley, CIE; Richard Appeldoorn, University of Puerto Rico; Jim Berkson, NOAA Fisheries; Ian Stewart and Doug Vaughan, NMFS; Ed Schuster, St Croix Fisheries Advisory Committee; Simon Stafford, Gulf of Mexico Fishery Management Council Advisory Panel), with whom I shared many hours of discussion inside and outside the meeting room, to John Carmichael for efficiently facilitating the meeting arrangements and in ensuring that I had access to all the material I required, and to all participants, including observers, for their valuable, personally hugely appreciated, contributions. Without everyone's contributions, the meeting output would not have been as comprehensive as it turned out to be.

Appendix 1

SEDAR 8 REVIEW WORKSHOP

Caribbean Yellowtail Snapper and Spiny Lobster

South Atlantic – Gulf of Mexico Spiny Lobster

FINAL AGENDA

Monday, May 16, 2005

- 1:00 p.m.** Convene
- 1:00 – 1:30** Introductions and Opening Remarks
John Carmichael
- Agenda Review, TOR, Task Assignments
- 1:30 – 3:30** Caribbean Yellowtail Assessment Presentation
Josh Sladek Nowlis and Nancie Cummings
- 3:30 – 3:45** Break
- 3:45 – 6:00** Caribbean Yellowtail Discussion
Chair
- Data, Methods, Results Evaluation
- identify additional analyses, sensitivities, corrections
- 6:00 – 8:00** Dinner Break
- 8:00 – 10:00** Evening session if necessary
Chair
- Continue deliberations or work session

Tuesday, May 17, 2005

- 8:00 a.m. – 12:00 p.m.** Caribbean Yellowtail Assessment Discussion
Chair
- Review additional analyses, sensitivities
- Initial recommendations and comments
- 12:00 p.m. – 2:00 p.m.** Lunch Break
- 2:00 p.m. – 4:00 p.m.** Caribbean Spiny Lobster Assessment Presentation
David Die, Liz Brooks and Monica Valle
- Data, Methods, Results Evaluation
- identify additional analyses, sensitivities, corrections
- 4:00 p.m. – 4:15 p.m.** Break
- 4:15 p.m. – 6:15 p.m.** Caribbean Spiny Lobster Discussion
Chair
- Data, Methods, Results Evaluation
- identify additional analyses, sensitivities, corrections
- 6:15 – 8:00** Dinner Break

8:00 – 10:00 **Evening session if necessary**
Chair
- Continue deliberations or work session

Wednesday, May 18, 2005

8:00 a.m. – 12:00 p.m. **Caribbean Spiny Lobster Discussion**
Chair
- Review additional analyses, sensitivities
- Initial recommendations and comments

12:00 p.m. – 2:00 p.m. **Lunch Break**

2:00 p.m. – 4:00 p.m. **SA-GOM Spiny Lobster Assessment Presentation**
Bob Muller and John Hunt
- Data, Methods, Results Evaluation
- identify additional analyses, sensitivities, corrections

4:00 p.m. – 4:15 p.m. **Break**

4:15 p.m. – 6:15 p.m. **SA-GOM Spiny Lobster Discussion**
Chair
- Data, Methods, Results Evaluation
- identify additional analyses, sensitivities, corrections

6:15 – 8:00 **Dinner Break**

8:00 – 10:00 **Evening session if necessary**
Chair
- Continue deliberations or work session

Thursday, May 19, 2005

8:00 a.m. – 12:00 p.m. **SA-GOM Spiny Lobster Discussion**
Chair
- Review additional analyses, sensitivities
- Initial recommendations and comments

12:00 p.m. – 2:00 p.m. **Lunch Break**

2:00 p.m. – 4:00 p.m. **Review Workshop Consensus Summary**
Chair
- Discuss TORs
- Review Draft consensus statements

4:00 p.m. – 4:15 p.m. **Break**

4:15 p.m. – 6:15 p.m. **Continue TOR review**
Chair

6:15 – 8:00 **Dinner Break**

8:00 – 10:00 **Evening session if necessary**
Chair
- Continue deliberations or work session

Friday, May 20, 2005

**8:00 a.m. – 11:00 a.m. Final Review of Panel Documents
Chair**

- *Yellowtail snapper Consensus Summary*
- *Caribbean Spiny Lobster Consensus Summary*
- *SA-GOM Spiny Lobster Consensus Summary*

11:00 a.m. ADJOURN

Appendix 2

Statement of Work

Consulting Agreement between the University of Miami and CEFAS,

Dr Andrew I. L. Payne

March 17th, 2005

South East Data, Assessment, and Review (SEDAR) is a joint process for stock assessment and review of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; NOAA Fisheries, SEFSC and 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 and assessment models is provided by the review workshop. SEDAR documents include a data report produced by the data workshop, a stock assessment report and summary produced by the assessment workshop, a review panel report evaluating the assessment (drafted during the review panel workshop), and collected stock assessment documents considered in the SEDAR process.

The peer review panel is composed of stock assessment experts, other scientists, and representatives of councils, fishing industries, and non-governmental conservation organizations. For each assessment considered during the review workshop a panel member will be chosen to serve as review leader whose responsibilities include ensuring that panel comments regarding the assessment are accurately documented in the consensus report and assisting the chair in drafting the report during the workshop.

NMFS-SEFSC requests the assistance of two assessment scientists from the CIE: one to serve as Chair and one to serve as a technical reviewer for the SEDAR 8 Review Panel that will consider assessments for Caribbean yellowtail snapper, Caribbean spiny lobster, and South Atlantic and Gulf of Mexico spiny lobster. No consensus opinion between the two CIE panelists is sought.

These species fall within the jurisdictions of the Caribbean, South Atlantic, and Gulf of Mexico Fishery Management Councils and respective southeastern states and Caribbean territories.

The review workshop for SEDAR 8 will take place at the Best Western San Juan Airport, in San Juan, Puerto Rico, from 1:00 p.m. on Monday, May 16, 2005 through 12:00 p.m. on Friday, May 20, 2005.

Meeting materials will be forwarded electronically and in hard copy. Please contact John Carmichael (SEDAR Coordinator; 843-571-4366 or John.Carmichael@safmc.net) for additional details.

Hotel arrangements:

Best Western San Juan Airport (*later changed to Caribe Hilton*)

Luis Munoz Marin International Airport, 2nd Floor

Carolina, Puerto Rico 00981

Phone: 1-800-981-1701 or 787-791-1700; Fax: 1-787-791-1248

Group rate of \$109 including tax guaranteed through May 2, 2005.

SEDAR Assessment Review Panel Tasks:

The SEDAR Assessment Review Panel will evaluate the Caribbean yellowtail snapper and spiny lobster and the South Atlantic – Gulf of Mexico spiny lobster stock assessments, including input data, assessment methods, and model results as put forward in stock assessment reports. The Assessment Review Panel will:

1. Evaluate whether data used in the analyses are treated appropriately and are adequate for assessing the stocks; state whether or not the input data are scientifically sound.
2. Evaluate the adequacy, appropriateness, and application of the methods used to assess the populations; state whether or not the methods are scientifically sound.
3. Recommend appropriate or best estimated values of population parameters such as abundance, biomass, and exploitation.
4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate stock status criteria (population benchmarks such as MSY, Fmsy, Bmsy, MSST, MFMT). State whether or not the methods are scientifically sound.
5. Recommend appropriate values for stock status criteria.
6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.
7. Recommend probable values for future population condition and status.
8. Ensure that all desired and necessary assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.
9. Evaluate the Data and Assessment Workshops with regard to fulfilling their respective Terms of Reference and state whether or not the Terms of Reference for previous workshops are adequately addressed in the Data Workshop and Stock Assessment Report sections;
10. Develop recommendations for future research for improving data collection and stock assessment.
11. Prepare a Consensus Report summarizing the peer review panel's evaluation of the reviewed stock assessments and addressing these Terms of Reference. (Drafted during the Review Workshop with a final report due two weeks after the workshop ends.)

The Assessment Review Panel's primary duty is to review the assessments as presented. The Chair may request a reasonable number of sensitivity runs, additional details regarding the existing assessment, or similar items from technical staff. However, conducting an alternative assessment is beyond the scope of the review panel and the technical staff present at the workshop. If the review panel finds that either the input data or the stock assessment are not adequate and reliable, the panel shall outline in its report the remedial measures necessary to correct the shortcomings.

Statement of Tasks for Review Panel Chair:

The CIE designee shall serve as Chair of a SEDAR Stock Assessment Review Panel workshop to be held May 16 - 20, 2005, in San Juan Puerto Rico (see attached agenda). The workshop panel shall review stock assessments for Caribbean yellowtail snapper and Caribbean spiny lobster in the jurisdiction of the Caribbean Fishery Management Council and applicable territories, and South Atlantic – Gulf of Mexico spiny lobster in the jurisdiction of the South Atlantic and Gulf of Mexico Fishery Management Councils and associated states. Roles and responsibilities of the Chair include:

(1) Prior to the Assessment Review Panel workshop the Chair shall be provided with stock assessment reports and associated documents. The Chair shall read and review all documents to gain an in-depth understanding of the stock assessment under consideration and the data and information considered in the assessment.

(2) Approximately 1 week prior to the workshop the Chair may be asked to participate in a conference call with the SEDAR Coordinator and representatives of the stock assessment teams to review the final agenda and meeting format.

(3) During the Assessment Review Panel workshop the Chair shall control and guide the meeting, including the coordination of presentations, discussions, and document flow.

(4) The Chair shall facilitate the preparation and writing of the Consensus Report. Review panel members, agency staff, and others present at the meeting will assist the Chair as needed. The Chair shall be responsible for the editorial content of the Consensus Report, and the Chair shall be responsible for overseeing that the report is produced and distributed to appropriate contacts on schedule (see “Final Reports” below).

(4) The SEDAR coordinator shall assist the Assessment Review Panel Chair prior to, during, and after the meeting to ensure that all final documents are distributed in a timely fashion.

(5) No later than June 3, 2005, the Chair shall submit a written Chair Report¹ addressed to the “University of Miami Independent System for Peer Review,” and sent to Dr David Sampson, via e-mail to David.Sampson@oregonstate.edu, and to Mr Manoj Shivlani, via e-mail to mshivlani@rsmas.miami.edu. See Annex for the contents of the Chair’s report.

It is estimated that the Chair’s duties shall occupy up to 17 days: several days prior to the Review Panel meeting for document review, five days for the workshop, and several days following the meeting to ensure that the final documents are completed and to prepare the Chair’s report for the CIE.

¹ The written Chair’s report will undergo an internal CIE review before it is considered final. After completion, the CIE will create a PDF version of the Chair’s report that will be submitted to NMFS and the consultant.

Workshop Final Reports:

The Chair shall send final review workshop reports to the University of Miami Independent System for Peer Review, Dr. David Die, via email to ddie@rsmas.miami.edu.

Final workshop reports (in Word or WordPerfect format and in hardcopy) shall also be sent to:

Nancy Thompson, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149 (email, Nancy.Thompson@NOAA.gov)

Larry Massey, 101 Nina Drive #302, Virginia Beach, VA 23462 (email, Larry.Massey@NOAA.gov)

John Carmichael, SAFMC, One Southpark Circle, Suite 306, Charleston, SC 29407 (email, John.Carmichael@safmc.net)

Robert Mahood, South Atlantic Fishery Management Council, One Southpark Circle, Suite 306, Charleston, SC 29407 (email, Robert.Mahood@safmc.net)

Wayne Swingle, Gulf of Mexico Fishery Management Council, 3018 US 301 North, Suite 1000, Tampa, FL 33619-2266. (email, Wayne.Swingle@gulfcouncil.org)

Miguel Rolon, Caribbean Fishery Management Council, 268 Muñoz Rivera Ave., Suite 1108, San Juan, Puerto Rico 00918-2577. (email, Miguel.A.Rolon@noaa.gov)

For Additional Information or Emergency:

SEDAR contact: John Carmichael, One Southpark Circle, Suite 306, Charleston, SC 29407. Phone: 843-571-4366; cell phone (843) 224-4559. Email: John.Carmichael@safmc.net.

ANNEX: Contents of Chair Report

1. Synopsis/summary of the meeting – to provide context for the comments rather than to rewrite the consensus report, which is a product of the meeting and not a CIE product.
2. Views on the meeting process, including recommendations for improvements on:
 - The meeting process itself;
 - The outcome of the meeting;
 - Materials provided for the meeting, including timeliness, relevance, content, and quality;
 - The guidance provided to run the meeting.
3. Other observations on the meeting process.
4. Appendices, including:
 - Statement of Work;
 - Bibliography of the materials provided for the meeting;
 - Consensus report (if available at the time of report submission).

Appendix 3

Bibliography

- Caribbean Yellowtail Snapper Stock Assessment Report 1 Section I Introduction. S8 SAR1_YTS_DWdraft2.pdf
- Caribbean Yellowtail Snapper Stock Assessment Report 1 Section II. Data Workshop Report. Prepared by the SEDAR 8 Data Workshop Panel. Edited by Nancie Cummings, SEFSC. (Draft). March, 2005. S8 SAR1_YTS_DWdraft2.pdf
- Caribbean Yellowtail Snapper *Ocyurus chrysurus* Section III. Stock Assessment Workshop Report. Developed by the Assessment Workshop Panel. Edited by Joshua Sladek Nowlis, Southeast Fisheries Science Center, Miami, FL. March 2005. SEDAR8-AW-Report 1 YTS FINAL.pdf
- SEDAR 8 Stock Assessment Report 2 Caribbean Spiny Lobster. Section II. Data Workshop. Edited by Nancie Cummings, SEFSC. March, 2005. S8_SAR2_SIIv1_Lobster.pdf
- Caribbean Spiny Lobster *Panulirus argus* Section III. Stock Assessment Workshop Report. Developed by the Assessment Workshop Panel. Edited by Joshua Sladek Nowlis, Southeast Fisheries Science Center, Miami, FL. March 2005. SEDAR8-AW-Report 2 SL FINAL.pdf
- Assessment of spiny lobster, *Panulirus argus*, in the Southeast United States Stock Assessment Report. Prepared by SEDAR 08 U.S. Stock Assessment Panel. 29 April 2005. SE US Spiny Lobster Stock Assessment Report.pdf
- Stock Assessment Summary Report for Southeast United States Spiny Lobster. SEDAR 08 Stock Assessment Panel. 2 May 2005. SE US Spiny Lobster Stock Assessment Summary Report.pdf

Appendix 4

Consensus Summary Report

Caribbean yellowtail snapper (*Ocyurus chrysurus*)

Caribbean spiny lobster (*Panulirus argus*)

South Atlantic – Gulf of Mexico spiny lobster (*Panulirus argus*)

Prepared by the SEDAR 8 Review Panel for:

Caribbean Fishery Management Council

Gulf of Mexico Fishery Management Council

South Atlantic Fishery Management Council

*Edited by Andrew I. L. Payne for
SEDAR 8, 16-20 May 2005,
San Juan, Puerto Rico*

Executive summary

The SEDAR 8 Review Workshop met in San Juan, Puerto Rico, from 16 to 20 May 2005. The Panel itself comprised the Chair and a reviewer appointed by the CIE, four US technical experts, the SEDAR facilitator, and two stakeholder representatives. All documentation, including background documentation provided to earlier Data and Assessment Workshops, was provided to the Panel in good time for prior review, and was comprehensive for the job in hand.

The meeting considered three stocks, Caribbean yellowtail snapper, Caribbean spiny lobster, and South Atlantic – Gulf of Mexico spiny lobster. Able presenters had been assigned by the Assessment Workshops and went to great trouble to explain the background behind and the output from the assessments. For only one of these stocks, South Atlantic – Gulf of Mexico spiny lobster, were extensive additional runs requested during the meeting. Discussions for all three stocks focused on the assessments and what they meant in terms of the Review Workshop's Terms of Reference, the documentation of relevant comments about them, derivation of suggestions for future research and monitoring, and canvassing of stakeholder opinion. Finally, some time was spent evaluating the SEDAR assessment process in full, as requested.

For Caribbean yellowtail snapper, the data were deemed insufficient to provide a signal to underpin management advice, though the assessment methodology itself was sound. The importance of well-designed, systematic, long-term targeted research programs needed to construct adequate time-series of catch and abundance indices was stressed. Currently, it seems that data quality control independent of the data collection process has not been effectively realized, and validation of historical and future collections is urgently needed. Partnerships with fishermen are clearly one way to achieve this, and the need to look at the stock as part of a species assemblage or community was noted. Of the many research suggestions made, highest priority was assigned to the carrying out of fishery-independent surveys, the collection of more catch data, including specifically the recreational fishery, and the collection of age and length data from commercial and recreational catches and from fishery-independent surveys.

For Caribbean spiny lobster, the data were also deemed currently insufficient to provide the required management advice, though again the methodology applied was sound. The Panel noted that the data series could seemingly be split into two components, before and after about 1992, and focused much discussion on why this might be and how best to model it in future. Additional factors and modifications to the modelling approach were proposed for consideration in an attempt to understand better the dynamics of the population, and high priority was suggested be assigned to the creation of a standardized recruitment index. Other priority research and monitoring included incorporating historical data into existing data sets, and utilizing refined models (better to identify viable hypotheses). Partnerships with fishermen were again proposed to facilitate the data collection process.

In respect of South Atlantic – Gulf of Mexico spiny lobster, the data and assessments were accepted, as was the base-case ICA model of stock dynamics. Several further runs were requested and provided, but overall the base-case results were considered the best and not likely to be unreliable. Some time was spent discussing relative stock status with respect to overfished levels and the importance of this stock in terms of the whole population in the Western Atlantic. The various stocks likely primed each other with larvae and recruits. There was also strong support to re-establish an observer program for the commercial trap fishery. Other research priorities should include a broadening of the fishery-independent indices of abundance, the provision of improved growth information, perhaps through tagging, and

modelling of various scenarios covering a range of hypotheses concerning recruitment and changes in gear selectivity, as well as suitable performance indicators.

Comments on the SEDAR assessment process stressed: the need for better communication with and dissemination of information to stakeholders; the need for an advanced plan for assessments and a comprehensive glossary of terms; the continuity of personnel throughout each workshop process, in terms of stakeholders perhaps finding new ways of ensuring their participation; incorporation of fishermen's knowledge into the assessment process better; the need to maximize the time for preparing data series; the importance of independence in the review process, though not solely through CIE-contracted reviewers; and the importance of providing for the Review Panel an executive summary for substantive documents, a succinct table of model parameters, and if appropriate a table of management options.

1. Introduction

1.1 Time and Place

The SEDAR 8 Review Workshop met in San Juan, Puerto Rico, from 16 to 20 May 2005.

1.2 Terms of Reference for the Review Workshop

1. Evaluate whether data used in the analyses are treated appropriately and are adequate for assessing the stocks; state whether or not the input data are scientifically sound.
2. Evaluate the adequacy, appropriateness, and application of the methods used to assess the populations; state whether or not the methods are scientifically sound.
3. Recommend appropriate or best-estimated values of population parameters such as abundance, biomass, and exploitation.
4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate stock status criteria (population benchmarks such as MSY , F_{msy} , B_{msy} , $MSST$, $MFMT$). State whether or not the methods are scientifically sound.
5. Recommend appropriate values for stock status criteria.
6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.
7. Recommend probable values for future population condition and status.
8. Ensure that all desired and necessary assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.
9. Evaluate the Data and Assessment Workshops with regard to fulfilling their respective Terms of Reference and state whether or not the Terms of Reference for previous workshops are adequately addressed in the Data Workshop and Stock Assessment Report sections.
10. Develop recommendations for future research for improving data collection and stock assessment.
11. Prepare a Consensus Report summarizing the peer review Panel's evaluation of the reviewed stock assessments and addressing these Terms of Reference. (Drafted during the Review Workshop with a final report due two weeks after the workshop ends.)

1.3 List of Participants

<u>Participants</u>	<u>Affiliation</u>
<i>Review Panel:</i>	
Andrew Payne	CIE, Chair
Paul Medley	CIE, Reviewer
Richard Appeldoorn	University of Puerto Rico
James Berkson	NOAA Fisheries/RTR Unit
Edward Schuster	St Croix Fisheries Advisory Cttee
Simon Stafford	GMFMC Advisory Panel
Ian Stewart	NOAA Fisheries/NWFSC
Doug Vaughan	NOAA Fisheries/SEFSC
<i>Presenters:</i>	
Liz Brooks	NOAA Fisheries/SEFSC
Nancie Cummings	NOAA Fisheries/SEFSC
David Die	University of Miami, RSMAS
John Hunt	Florida FWC
Robert Muller	Florida FWC
Mike Murphy	Florida FWC
Josh Sladek Nowlis	NOAA Fisheries/SEFSC
Francisco Pagan	University of Puerto Rico
Jerry Scott	NOAA Fisheries/SEFSC
Monica Valle	University of Miami, RSMAS
<i>Observers:</i>	
Mark Drew	Nature Conservancy, St Croix
Michon Fabio	CFMC Advisory Panel
Tony Iarocci	SAFMC
Joe Kimmel	NOAA Fisheries SERO
Barbara Kojis	US Virgin Islands DFW
Jimmy Magner	St Thomas Fishermen's Assn
Eugenio Pinero	CFMC
Julian Magras	St Thomas Fishermen's Assn
John Merriner	NOAA Fisheries SEFSC
Miguel Rolon	CFMC
Roger Uwate	US Virgin Islands DFW
Roy Williams	GMFMC
<i>Staff support:</i>	
John Carmichael	SEDAR
Cynthia Morant	SAFMC
Lloyd Darby	SEFSC
Graciela Garcia-Moliner	CFMC

1.4 Review Workshop working papers

An impressive quantity of documentation was provided before the meeting by the facilitator. Much of this pertained to material provided to either the Data Workshop or Assessment Workshop for each of the three review species. However, specific material for the review workshop itself was also provided, and this is listed below.

NUMBER	TITLE	Author
Working Papers		
SEDAR8-RW1	Further explorations of a stock production model incorporating covariates (ASPIC) for yellowtail snapper (<i>Ocyurus chrysurus</i>) in the US Caribbean	J. Sladek Nowlis
SEDAR8-RW2	Length frequency analysis of Caribbean spiny lobster (<i>Panulirus argus</i>) sampled by the Puerto Rico commercial Trip Interview Program (1980-2003)	S.D. Chormanski, D. Die, S. Saul
SEDAR8-RW3	Maturity of spiny lobsters in the US Caribbean	D. Die
Supplementary Documents		
SEDAR8-RD24	Preliminary estimations of growth, mortality and yield per recruit for the spiny lobster <i>Panulirus argus</i> in St. Croix, USVI. <i>Proc. Gulf Carib. Fish. Inst.</i> 53: 59-75	I. Mateo, W.J. Tobias
SEDAR8-RD25	Population dynamics for spiny lobster <i>Panulirus argus</i> in Puerto Rico: Progress report. <i>Proc. Gulf Carib. Fish. Inst.</i> 55: 506-520	I. Mateo
Assessment Reports		
SEDAR8-SAR1	Stock assessment report for Caribbean yellowtail snapper	J. Sladek Nowlis
SEDAR8-SAR2	Stock assessment report for Caribbean spiny lobster	J. Sladek Nowlis
SEDAR8-SAR3	Stock assessment report for South Atlantic – Gulf of Mexico spiny lobster	R. Muller, J. Hunt

2. Terms of Reference

2.1 Background

Generally, the Review Workshop is the third meeting in the SEDAR process, and this situation pertained to all three stocks reviewed during SEDAR 8. The Panel was pleased to be able to record that the terms of reference set for Data Workshops and Assessment Workshops for the three stocks were fully met, but there was some concern expressed that pressure may have been brought to bear on participants at some of those workshops to progress management further than was possible from the available data. Quite simply, data time-series, and in some cases recent basic biological data, were likely unable to support the development of meaningful assessments for the stocks just yet.

Notwithstanding, the Panel was impressed by the quantity and quality of the work that had gone into the various assessments. The presentations were well structured and clear, and the information provided through the presentations, and in response to questions, gave an excellent basis for the Panel's subsequent deliberations and conclusions.

2.2 Review of the Panel's deliberations

The deliberations on each species are presented in the form of responses to the terms of reference questions specifically, followed by relevant comments on the discussions, suggestions for future research, and stakeholder opinion, the last two not specifically in order of priority.

A. *Caribbean yellowtail snapper*

Terms of reference

1. Evaluate whether data used in the analyses are treated appropriately and are adequate for assessing the stocks; state whether or not the input data are scientifically sound.

The data were treated appropriately, but were not adequate yet for assessing the stocks.

2. Evaluate the adequacy, appropriateness, and application of the methods used to assess the populations; state whether or not the methods are scientifically sound.

The two methods were appropriate for exploring the potential for an assessment, but ultimately merely showed the inadequacy of the data. Nonetheless, the methods are scientifically sound, if given appropriate data.

3. Recommend appropriate or best-estimated values of population parameters such as abundance, biomass, and exploitation.

An acceptable assessment had not been developed, so appropriate population parameters were not produced.

4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate stock status criteria (population benchmarks such as MSY , F_{msy} , B_{msy} , $MSST$, $MFMT$). State whether or not the methods are scientifically sound.

An acceptable assessment had not been developed, so estimates of stock status criteria were not produced.

5. Recommend appropriate values for stock status criteria.

An acceptable assessment had not been developed, so appropriate stock status criteria were not produced. Although a number of key reference points were provided (B_{msy}/B_0 , SPR_{msy} , F_{msy} – given selectivity vector) and seem to be robust across the various models, they do not provide information on current stock status.

6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.

No population projections were possible.

7. Recommend probable values for future population condition and status.

No population projections were made or possible, so probable values for future population condition and status were not produced.

8. Ensure that all desired and necessary assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.

All desired and necessary assessment results are clearly and accurately presented in the Stock Assessment Report for the species, but they are currently uninformative on stock status. These results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.

9. Evaluate the Data and Assessment Workshops with regard to fulfilling their respective Terms of Reference and state whether or not the Terms of Reference for previous workshops are adequately addressed in the Data Workshop and Stock Assessment Report sections.

The Data Workshop fulfilled its Terms of Reference. The Assessment Workshop fulfilled its Terms of Reference to the extent possible, given the limitations of the data.

10. Develop recommendations for future research for improving data collection and stock assessment.

See below the comments section.

Comments

The Review Panel offers the following comments regarding research needs and the data and assessment of yellowtail snapper.

1. Well-designed, systematic research programs are essential to providing the data necessary for effective management. Much of the research reviewed lacked the necessary sample sizes and regular (ongoing) data collection needed to construct an adequate time-series of catch and abundance indices.

2. The yellowtail snapper fishery is unique among Caribbean fisheries with regard to fishing methods and timing, and the needed research designs. It is an important fishery in the U.S. Caribbean. The design of data collection must take into account the unique aspects of the fishery, and therefore sampling effort will need to be either added or redirected to target yellowtail snapper more effectively.

3. A commitment to long-term research and data collection is essential for effective management. Short-term research and data collection are not the solution to the data

problems identified in this assessment. Long-term research and monitoring are necessary in the Caribbean, as in any other managed fishery. Based on the studies and data available, it is clear that the resources necessary to collect essential data are not currently available to support scientifically based management of yellowtail snapper in the region.

4. Throughout the region, data quality control independent of the data collection process has not been effectively realized. Validation of historical and future collections is needed for the data to be used appropriately for any type of assessment. Documentation of changes in data collection and management methods must be maintained and provided to those charged with conducting the assessments and reviews.

5. The Panel recognizes the significant effort that has been put into data collection in the region and emphasizes that, although the resulting data are insufficient for an assessment at this time, they will be useful for assessment in future when combined with additional data identified elsewhere in this report. Past efforts are not wasted, but rather their data will play an important role, providing the temporal contrast needed by assessment models. The recommendations below are offered as improvements to the current data collection, not as replacements.

6. The Panel strongly endorses the need to develop partnerships with local fishermen to conduct research and to collect needed data. Partnerships with the fishing community and other stakeholders are a cost-effective way to collect components of the data necessary for the assessment process. Currently, it is clear that there is a high level of interest in the fishing community to cooperate with management agencies in collecting data, and this partnership should be encouraged and strengthened. This would also facilitate ongoing cooperation and participation by fishermen in the management process, benefiting all involved.

7. Monitoring and assessment of yellowtail snapper should be undertaken with due consideration given to the species' importance in the overall species assemblage and community. Future ecosystem management will likely dictate such a course of action.

Recommendations for future data collection and research

Fishery-independent data

- A new independent sampling regime to target yellowtail snapper more effectively should be created, because current methods do not allow temporal or spatial coverage.
- Visual surveys can provide useful fishery-independent data. The methods would, however, vary, based on the depth of the insular shelf.
- The output of other existing studies (NOAA and non-NOAA) should be examined to see if alternative fishery-independent sampling already exists.

Life history data

- Fecundity data should be collected
- Maturity data should be collected
- Growth information should be collected
- The parameter natural mortality needs investigation on the basis of better data

Catch data

- Recreational catches need to be sampled and quantified better
- Information on trip species targeting is needed
- Information on the location of catches is sometimes not good, and should be improved
- Identification of species in the snapper complex in the US Virgin Islands is crucial to future assessments
- Historical data from the US Virgin Islands need to be collected from fishermen, if they exist
- Port samplers need to modify their schedules to target yellowtail snapper landings, and to sample sizes of the species need to increase
- TIP sampling in the US Virgin Islands needs to be revitalized

Age and length frequency data

- These are needed from all commercial catches
- These are urgently required from recreational catches
- Fishery-independent surveys can provide these crucial data

Genetic / otolith microchemistry studies

- Stock structure is important in assessments, and genetics and otolith microchemistry offer hope to unravel it in future

Spatially explicit studies

- Identification of spawning areas and the source of recruits is important
- Construction of habitat maps will help identify stratification for research designs
- Combination of habitat maps with fish counts and habitat models will aid in providing population estimates
- Development of a GIS map of yellowtail snapper landings throughout the species' geographical range could help in the production of a distribution map of catches

Mark-recapture studies

- This could help identify movements and migrations
- Fishing mortality estimates could be derived
- Population estimates would be enhanced with such studies
- Such studies could help solve the perplexing question of stock structure

Of the above, the Panel places the highest priority on the following, understanding the need to maximize the likelihood of generating an acceptable assessment of the stock in the near future:

- The carrying out of fishery-independent surveys
- Collection of more catch data, including specifically the recreational fishery
- The collection of age and length data from commercial and recreational catches and from fishery-independent surveys

Stakeholder opinion

- The need for robust education of fishermen and other stakeholders is acknowledged. Such education should be of a two-way nature and would potentially lead to an enhancement of their trust in the assessment and management process, especially if they were to become involved in research program design.
- The fact that most of the product in the yellowtail snapper fishery is sold retail and that there are no fish houses (at least in the US Virgin Islands) makes any meaningful future stock assessment in the region extremely dependent on cooperation with the local fishermen.
- A paucity of recent socio-economic information continues to hinder the development of integrated biological, economic, and social assessments.
- Partnerships with organizations such as NGOs, which are often staffed by highly qualified people and are perhaps also less constrained by political influence, can mobilize extra resources in meeting some of the research objectives.
- Biological and habitat/ecosystem research information is as important in the assessment process as catch data.
- Over the past 35+ years of fishing, yellowtail snapper abundance has remained stable.
- Detailed data (information) on yellowtail snapper catch are lacking for US Virgin Islands commercial landings. The lack of this type of data has introduced uncertainty into the determination of stock status. Therefore, collection of detailed catch information there is suggested as a top research priority.

B. Caribbean spiny lobster

Terms of reference

1. Evaluate whether data used in the analyses are treated appropriately and are adequate for assessing the stocks; state whether or not the input data are scientifically sound.

The data were treated appropriately, but they were not sufficiently informative to assess stock status. An alternative explanation is that the data may be inconsistent with the assumptions of the models being applied.

2. Evaluate the adequacy, appropriateness, and application of the methods used to assess the populations; state whether or not the methods are scientifically sound.

The methods were appropriate to explore the potential for an assessment, but ultimately were limited by the uninformative nature of the data. The Panel expressed some concern about the method used to standardize the stock abundance indices. The GLM and delta-lognormal approach is appropriate, but determining terms in the model based purely on statistical criteria can lead to bias in the index. Future assessment workshops need to reconsider how the various effects might influence an abundance index, and choose to test GLM terms accordingly.

3. Recommend appropriate or best-estimated values of population parameters such as abundance, biomass, and exploitation.

It had not been possible to produce an acceptable assessment so appropriate population parameters were not recommended.

4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate stock status criteria (population benchmarks such as MSY, F_{msy} , B_{msy} , MSST, MFMT). State whether or not the methods are scientifically sound.

An acceptable assessment had not been developed, so estimates of stock status criteria were not produced.

5. Recommend appropriate values for stock status criteria.

An acceptable assessment had not been developed, so appropriate stock status criteria were not produced. Analysis of % catch under minimum size coupled with other YPR studies showed the current minimum size to be appropriate to maximize YPR, and trends in relative abundance indices and length distributions indicate some stability over the past 20 years, but these results do not provide information on stock status. YPR analyses suggest that the Caribbean spiny lobster fishery is not experiencing growth-overfishing (i.e. the ratios of current to MSY-level exploitation rates were consistently <1). Although it would be tempting to draw a specific conclusion on stock status from this information, there are a number of reasons to avoid doing so. The recruitment-based models indicated a wider range of uncertainty regarding overfishing, and the YPR analyses were limited by assumptions about key parameters (e.g. natural mortality, stock-recruitment shape) and a limited time frame. Consequently, the Review Panel concluded that Caribbean spiny lobster stock status remained unknown.

6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.

No population projections were possible.

7. Recommend probable values for future population condition and status.

No population projections were possible, so probable values for future population condition and status were not produced.

8. Ensure that all desired and necessary assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.

All desired and necessary assessment results are clearly and accurately presented in the Stock Assessment Report, but they remain uninformative on stock status. The results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.

9. Evaluate the Data and Assessment Workshops with regard to fulfilling their respective Terms of Reference and state whether or not the Terms of Reference for previous workshops are adequately addressed in the Data Workshop and Stock Assessment Report sections.

The Data Workshop fulfilled its Terms of Reference. The Assessment Workshop fulfilled its Terms of Reference to the extent possible, given the limitations of the data.

10. Develop recommendations for future research for improving data collection and stock assessment.

See below the comments section.

Comments

1. With the available data, an interesting story becomes evident. The data series can seemingly be split into two components, before and after about 1992. In the first part of the time-series, the abundance indices decline. The models were able to recreate the decline in nominal CPUE on Puerto Rico / St Thomas / St John. This is a common pattern found in exploited fish populations, biomass steadily decreasing, and fishing mortality steadily increasing. The second part of the time-series shows the abundance index remaining steady while the catch increases, a trend inconsistent with our expectation of a fishery in a closed system. As catch increases above the level that was causing a population decline in the first portion of the time-series, we would expect the abundance index either to continue to decline or for the decline potentially to accelerate. Instead, the abundance index levels off as the catch increases. Because of this situation, standard production model approaches do not fit the entire time-series, because they do not have the ability to recreate the observed behavior.

The Panel therefore suggests that additional factors be considered in an attempt to understand better the dynamics of the population. One possibility is that recruitment may have increased during the second half of the time-series, allowing for increased catch without reducing population size. Another possibility is that fishermen may have moved into new areas, accessing a previously unexploited portion of the population, so allowing for increased catches. Other possible hypotheses involve changes in the gear used, or in post-settlement survival, and/or changes in post-larval settlement rates.

It should be possible to modify the modelling approach to produce a model that would support the observed data. One way to do this would be to allow the recruitment parameter r to increase over the second part of the time-series. This would require refining a model unique to the system, perhaps moving beyond the standard modelling software currently used. Once a model can recreate the behavior observed in the data, it should be possible better to identify hypotheses for the cause of the behavior.

Clearly, understanding the dynamics of recruitment in this fishery is crucial. There is therefore a great need to create a standardized annual recruitment index to support any assessment of this stock.

2. The Panel strongly endorses the development of partnerships with local fishermen, to conduct research and to collect the data needed for assessments. Partnership with the fishing community is a cost-effective way to collect components of the needed data. Currently, there is a high level of interest in the fishing community to cooperate with management agencies in collecting data, so the partnership should be encouraged and strengthened. This would also facilitate ongoing cooperation and participation by fishermen in the management process, benefiting all involved.

Recommendations for future data collection and research

Improve and complete historical data on relative abundance indices and catch

- For the commercial fishery
 - Recover pre-1983 data for Puerto Rico
 - Create/recover pre-1975 data for the US Virgin Islands by working with the fishermen's associations
 - Use the newly available US Virgin Islands data for the period 1987–1992
 - Use structured interviews with fishermen to assess gear changes
- For the recreational fishery
 - Estimate historical and current levels

Fishery-independent monitoring

- The Panel identified an apparent inconsistency between the assessment model assumptions of recruitment as a direct function of spawning stock. This appeared to be important enough to warrant two recommendations: 1) to build additional flexibility into the models to allow time-varying recruitment (or at least recruitment dynamics); and 2) to seek to establish a fishery-independent index of recruitment, which is deemed to be crucial. Based on presentations made during the review, there appears to be a tested method for conducting such a survey, and these types of data are currently being used in the SA-GOM lobster assessment. The method consists of placing a series of post-larval collectors in appropriate areas and consistent sampling their catch. This approach appears to be conducive to cooperative research, utilizing fishermen's knowledge of the area as well as their frequent visits to sampling areas. The Panel strongly endorses the need for such a survey to provide a data series for use in the Caribbean spiny lobster assessment, preferably with a sampling design covering both platforms, given the uncertainty about the spatial coupling of recruitment dynamics
- It is necessary to develop and implement sampling program(s) specific to both pre-recruit and adult Caribbean spiny lobsters
- It is crucial to increase sampling effort in the US Caribbean.
- There will be benefit in further diversifying the regions sampled to include equal coverage of areas frequently fished
- Visual surveys for size structure, abundance, and YPR could provide useful time-series of data

Revise the trip interview program (TIP) database exhaustively

- Completing the historical data set would be valuable
- Revitalizing TIP sampling in the US Virgin Islands would have many benefits, not just for the Caribbean spiny lobster stock
- Effort should be directed at key species, generating trip-target information, and obtaining needed detail

Length distribution of the catch

- For the commercial fishery
 - Complete incorporation of non-digitized data for the US Virgin Islands (TIP)

Recover historical length data for Puerto Rico and the US Virgin Islands from other studies prior to the TIP

- For the recreational fishery
Determine length distributions

Conduct studies to understand the ecology of early juveniles (25 mm carapace length)

- Habitat use needs to be understood better
- More needs to be known about settlement habitat
- Information on movements and migrations needs to be sought
- Clarity of the mortality rates needs to be sought

Spatially explicit studies

- Identify spawning areas and sources of recruits
- Build/acquire habitat maps to identify stratification for research designs
- Combine habitat maps with density counts and habitat models to provide population estimates
- Develop a GIS map of spiny lobster landings throughout the geographic range of the stock, producing catch distributions

Mark-recapture techniques

- Such studies could hone knowledge of abundance
- The techniques could provide additional information on movements and migrations
- Habitat preferences would be better understood

Stock structure

- Stock structure is important in assessments, and genetics offers hope to improve knowledge

Future assessments

- These should explore further use of length structure and density from closed areas as reference points
- Assessments need to be repeated when significant quantities of previously unavailable historical data have become available
- Alternative stock assumptions need to be considered during assessment
 - That of a wider Caribbean stock
 - That of the stock of the US Caribbean and neighboring islands
- The use of nominal CPUE should be considered in future assessments
- The modelling approach needs to be modified to produce a model that would support the observed data. Within the model, the recruitment parameter r should be allowed to increase over the second part of the time-series, perhaps moving beyond the standard modelling software currently used.

Of the above, the Panel places the highest priority on the following, understanding the need to maximize the likelihood of generating an acceptable assessment of the stock in the near future:

- Develop/strengthen fishery-independent data collection

- Incorporate historical data into existing data sets
- Utilize refined models (better to identify viable hypotheses)

Stakeholder opinion

- Priority should be given to research that supports efforts to collect new catch data and increase port sampling. Research efforts should foster involvement of and collaboration with fishers.
- The fact that most of the product in the Caribbean spiny lobster fishery is sold retail and that there are no fish houses (at least in the US Virgin Islands) makes any meaningful future stock assessment extremely dependent on cooperation with the local fishermen.
- There is need at least to explore approaches to identify and incorporate socio-economic and other data types into the model. Some such data may indirectly be reflected but still influence CPUE, and may be available for 20 years or more. Examples are (i) employment; (ii) fuel costs; (iii) coastal development, e.g. on St Croix the number of homes per hectare is a significant predictor of water quality, and water quality may impact habitat and species populations; (iv) km of roads; (v) average *per capita* income.

C. Spiny lobster in the Southeast United States

Introduction

A comprehensive overview of the data and models used for the SE lobster assessment was provided. The assessment models explored included ASPIC, a modified DeLury model, catch-curves, untuned VPA, and an integrated catch-at-age (ICA, developed by Ken Paterson) model. The results presented focused primarily on the DeLury and ICA models, with ICA the preferred base-case assessment model.

Panel requests for further analyses during the meeting

1. Additional sensitivity runs using the ICA model, intended to explore the effect of the base-case selectivity assumptions on the results:
 - Try an alternate year (>1993) to transition from estimated to constant selectivity
 - Try constant selectivity in the early period, then estimated selectivity thereafter, if possible.

The values estimated with three alternative selectivity assumptions were very close to the base-case model result. However, the CVs of recent fishing mortality did increase when the shortest period of constant recruitment was assumed. The second part of the request was not feasible using the current model framework. The Panel was nevertheless satisfied that the base-case results were not likely to be unreliable as a consequence of the selectivity assumptions used.

2. Try a run estimating natural mortality (M) using the DeLury model.

On attempting this, M was not considered to be reliably estimated, but the value used in the base-case model did appear to be consistent with the data.

3. Explore alternative methods for projecting future recruitments with uncertainty, possibly including

- Extrapolation of the recent estimated trend
- Re-sampling from residuals about the mean
- Re-sampling from Monte-Carlo results

A projection including variability in model parameters was completed. The qualitative results were similar for projections based on $F_{current}$ and $F_{20\%}$, although projected harvest levels were somewhat lower than the deterministic values. The Panel was satisfied that the approach adequately reflected uncertainty in future projections.

4. Subsequent to the first three requests, an additional request was made to produce a decision or scenario table based on the model runs already completed and evaluated by the Panel.

Three alternate recruitment scenarios were presented: similar to the last 12 years, similar to the last 4 years, and based on a stock-recruit curve. Respectively, these roughly corresponded to two levels of constant (high and low) recruitment, and to stock-sensitive recruitment. Three alternate management targets were simulated through F values of $F_{5\%}$, $F_{20\%}$ and $F_{30\%}$. However, after reviewing a series of results from this analysis, the Panel concluded that no further material needed to be included in this report or for them to formulate their decisions.

Terms of reference

1. Evaluate whether data used in the analyses are treated appropriately and are adequate for assessing the stocks; state whether or not the input data are scientifically sound.

The data used in this assessment were treated appropriately and are considered fully adequate to assess the stock.

2. Evaluate the adequacy, appropriateness, and application of the methods used to assess the populations; state whether or not the methods are scientifically sound.

The methods used in this assessment were adequate, appropriate, and scientifically sound.

3. Recommend appropriate or best-estimated values of population parameters such as abundance, biomass, and exploitation.

The base-case assessment model provided the best estimates for these values.

4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate stock status criteria (population benchmarks such as MSY , F_{msy} , B_{msy} , $MSST$, $MFMT$). State whether or not the methods are scientifically sound.

Because of the lack of direct linkage between spawning stock and subsequent recruitment, there is no comparable proxy benchmark for SSB . For this reason, SSB/SSB_{msy} , MSY , and related criteria could not be estimated. A proxy benchmark for F was available from the SAFMC Fishery Management Plan for Spiny Lobster (Amendment 6) based on static SPR ($F_{oy} = 30\% SPR$, and

$F_{\text{msy proxy}} = 20\%$ SPR). The method used in this assessment for estimating stock status criteria for F was adequate, appropriate, and scientifically sound.

5. Recommend appropriate values for stock status criteria.

There was considerable discussion as to whether the $F_{20\%}$ threshold makes biological sense, given that values are likely to be close to this level under historical rates of fishing mortality. It was noted that, if all portions of this Caribbean stock had high fishing mortality rates, this might not be biologically reasonable over longer time-scales. The long-term average is currently estimated to be SPR = 19%, presumed to be sustainable though slightly below the limit. The Panel concluded that there was no basis for recommending alternative benchmarks. Based on the assessment model results presented, overfishing does not appear to be occurring at the moment. Indeed, there is no evidence that growth-overfishing would occur even at very high rates of fishing mortality, given current estimated selectivity patterns. However, the stock status relative to overfished levels cannot be evaluated.

6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.

The methods used in this assessment were adequate, appropriate, and scientifically sound. The Panel preferred the revised projections including uncertainty in estimated model parameters.

7. Recommend probable values for future population condition and status.

There was no indication that future population conditions and status would be below the current levels reported from the base-case assessment model.

8. Ensure that all desired and necessary assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Review Panel's consensus regarding adequacy, appropriateness, and application of the data and methods.

The necessary results fulfilling the SEDAR stock assessment report outline were presented. Additional analyses were performed in response to requests made by the Panel, the summary results of which are included in this report.

9. Evaluate the Data and Assessment Workshops with regard to fulfilling their respective Terms of Reference and state whether or not the Terms of Reference for previous workshops are adequately addressed in the Data Workshop and Stock Assessment Report sections.

The Data and Assessment Workshops appeared to have met their respective terms of reference fully.

10. Develop recommendations for future research for improving data collection and stock assessment.

See below the comments section.

Comments

The Review Panel offers the following comments regarding research needs:

1. Discussion of the ability to estimate the relative stock status with respect to overfished levels focused on the connectivity of the entire Caribbean spiny lobster population and the relative importance of the SA-GOM area in the total. It was noted that catches from the area make up <10% of the catch in the western Atlantic, and that present understanding of oceanographic patterns indicates that it is quite likely that the area receives larvae from other areas. This statement is based on the duration of the larval period and the speed and direction of prevailing currents. Critical information required to evaluate fully whether the stock is overfished include: identifying the source of the larvae settling in the SA-GOM area as well as determining the proportion of larval production from the area that is retained locally. A broad assessment of the Caribbean population would be desirable, but is impractical at this time.
2. There was support from both stakeholders and scientists at the Panel to re-establish an observer program for the commercial trap fishery. This program could supply useful data to be used directly in the present assessment model including: an index of pre-recruit numbers, adults, and other information that cannot be gained through other methods. Efficient coordination and communication between participants (both industry and scientists) must be a priority in planning this program. The Panel recognized that the program will be most valuable as the duration of the time-series increases, and planning should reflect this.

Recommendations for future data collection and research

Data from the commercial fishery

- Re-establish a commercial fishery observer program (described above).

Fishery-independent indices of abundance

- Standardize existing data sets that may be used for juvenile and legal-sized indices of abundance
- Design new monitoring programs to collect systematic, consistent, and statistically rigorous data.

Improved growth information

- Tagging projects should be initiated to obtain growth-rate data from larger (CL >100 mm) lobsters
- Activity may need to be focused in areas of reduced exploitation (such as the Tortugas) to allow capture of these larger individuals in appreciable numbers
- Reconcile growth information from Lipofuscin and tagging data

Modelling

- Conduct Monte Carlo simulations to test $F_{20\%}$ and $F_{30\%}$ threshold and target reference points against various performance criteria. The stock assessment workshop for the stock should develop various scenarios covering a range of hypotheses concerning recruitment and changes in gear selectivity, as well as suitable performance indicators, including catch and measures of SSB. Risks in the performance indicators associated with applying the threshold and target should be generated in future assessments.

Stakeholder opinion

- Fishing pressure has decreased in the Keys because (i) there are less traps as a result of the Trap Certificate Program, (ii) recent efforts to curtail a rapidly expanding illegal dive fishery, (iii) the loss of dock space and subsequent selling out as gentrification continues at an increasing rate, (iv) the loss of suitable crew as a direct consequence of the increasing cost of living in the Keys.
- Fishermen are very willing to sit down with scientists to devise long-term observer/sampling programs that enmesh with operational activity and satisfy crucial needs for data.

2.3 Recommendations for future SEDAR assessments

In lieu of the terms of reference provided to the Review Workshop, opportunity was given to all participants (as well as to the Review Panel) to comment upon the whole SEDAR assessment process. What follows is a non-prioritized list of the main points made.

- There is a strong need for enhanced communication, specifically to stakeholders, about what SEDAR is trying to achieve in terms of management.
- To date, there has not been full acceptance from all, and this is put down at least partially to the lack of education and training of certain key parties about the process. Their cooperation is essential if SEDAR is to succeed in its objectives.
- An advanced plan of what species is to be handled when is essential for all those who need and wish to be involved in the process.
- There is need for a (web-based) Glossary of Terms used.
- Continuity of personnel in the workshops is crucial to ensuring both acceptance and enhanced understanding.
- Dissemination of the information created and the results in terms of management action are not always perceived by stakeholders to have been achieved, so it was felt that Councils should make greater effort in this regard, at all levels of the process.
- Several participants, both technical and representing fishermen, felt that greater effort should be made to maximize the time for preparation of data series, assessments, and review material. The Panel shied away from suggesting a deadline for receipt of material prior to each workshop, realizing that the very nature of some data would always make collection to the last possible moment necessary, but stressed that late receipt could easily lead to delayed or less informative assessments of stock status.
- As mentioned several times elsewhere in this report, strong cases were made for incorporating fishermen's knowledge better into the assessment and management process.
- The Review Panel requires the presence of scientists who have not been involved in the Data and/or Assessment Workshops. This may not be a preferred requirement for the participating stakeholders. Stakeholders would clearly benefit and be better able to participate fully in the review process if they had been present throughout all meetings. The Councils could maximize meeting

this recommendation by considering paying stipends to participating stakeholders to compensate them for lost earnings.

- There was strong feeling that the anticipated changed representation on the Review Panel may not be most appropriate for the SEDAR area. While understanding and wholeheartedly endorsing the need for independent peer review, a strong case could be made for Panel representation to include stakeholders, biologists knowledgeable about the species, and stock assessment scientists who were not involved in the immediate assessment. It was felt unlikely that such people would be able to participate in the discussions at the current enthusiastic level unless they were formally accepted as members of the Panel.
- Allied to the above and notwithstanding what was ultimately decided on the make-up of the Panel, there was unanimity that the independence of the Review Panel chair (currently appointed by the CIE) was paramount and matched well the objective of independence.
- Given the volume of documentation associated with such reviews and the shortage of time often available to assimilate it, the Review Panel and other participants stressed the need for a clear executive summary to be provided for all substantive documents being addressed. Further, there was a call for a succinct table of model parameters (estimated and observed) to be provided for each assessment along with, if appropriate, a table of management options (e.g. a decision table) and the risks associated with them.