CRFM Fishery Report – 2008

Volume 2

Fishery Management Advisory Summaries

**Report of Fourth Annual Scientific Meeting –
Kingstown, St. Vincent and the Grenadines, 10-20 June 2008**

CRFM Secretariat
Belize
2008

CRFM FISHERY REPORT – 2008. Volume 2 – Fishery Management Advisory Summaries. Report of Fourth Annual Scientific Meeting – Kingstown, St. Vincent and the Grenadines, 10-20 June 2008

Correct Citation:
CRFM 2008. Report of Fourth Annual Scientific Meeting – Kingstown, St. Vincent and the Grenadines, 10-20 June 2008 – Fishery Management Advisory Summaries. *CRFM Fishery Report – 2008*, Volume 2, 54 pp.

ISSN: 1995-1426
ISBN: 978-976-8165-23-7

Published by the Caribbean Regional Fisheries Mechanism Secretariat,
Belize and St. Vincent and the Grenadines

Foreword

CRFM's Fourth Annual Scientific Meeting took place during 10-20 June, 2008. During this Meeting, CRFM Resource Working Groups examined data from nine fisheries: the crevalle jack (*Caranx hippos*) fishery of Trinidad and Tobago; the spiny lobster (*Panulirus argus*) fisheries of The Bahamas and Jamaica; the queen conch (*Strombus gigas*) fishery of St. Lucia; the reef and slope fisheries of the Turks and Caicos Islands and St. Kitts and Nevis; the whitemouth croaker (*Micropogonias furnieri*) fishery of Trinidad and Tobago; and the Atlantic Seabob (*Xiphopenaeus kroyeri*) fisheries of Guyana and Suriname. A plan of action was developed for strengthening the information base necessary to inform the establishment of management and conservation measures for small coastal pelagic fisheries. In addition, the Large Pelagic Working Group conducted a review of the region's fisheries in order to evaluate assessment priorities and to develop a workplan for addressing required assessments and improving collaboration with ICCAT. The Meeting reviewed and adopted the Report of the Third Meeting of the CRFM Ad Hoc Working Group on Methods. A proposal to establish a Working Group on Data, Methods and Training was considered and endorsed by the Meeting.

The Report of the Fourth Annual Scientific Meeting is published in two Volumes: Volume 1 contains the proceedings of the plenary sessions and the full reports of the CRFM Resource Working Groups for 2008. National reports, submitted for consideration by the Meeting, are published as Supplement 1 to Volume 1, while the Report of the Third Meeting of the Ad Hoc Working Group on Methods is published as Supplement 2 to Volume 1. Volume 2 contains the general reports of each Working Group and the fishery management advisory summaries for completed fishery assessments. These fishery management advisory summaries are the same as the first 7 sections (sections 1 to 1.7) of each of the fishery assessment reports that are provided in full (sections 1 to 1.8) in Volume 1.

Volume 1 is intended to serve as the primary reference for fishery assessment scientists, while Volume 2 is intended to serve as the main reference for managers and stakeholders. Sincere thanks to Mr. Greg Franklin for providing the photographs which appear on the covers these two volumes.

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List of Acronyms and Abbreviations

ASPIC	-	Argumentation Service Platform with Integrated Components
CARICOM	-	Caribbean Community
CARIFIS	-	Caribbean Fisheries Information System
CFRAMP	-	CARICOM Fisheries Resource Assessment and Management Programme
CFP&R	-	Common Fisheries Policy & Regime
CL	-	Carapace Length
CLWG	-	Conch and Lobster Fishery Resource Working Group
CPUE	-	Catch Per Unit of Effort
CRFM	-	Caribbean Regional Fisheries Mechanism
FAD	-	Fish Aggregating Device
FAO	-	Food and Agriculture Organization of the United Nations
FL	-	Fork Length
GLM	-	General Linear Model
GSI	-	Gonadosomatic Indices
ICCAT-STWG	-	International Commission for the Conservation of Atlantic Tunas – Small Tuna Working Group
IFAD	-	International Fund for Agricultural Development
IUU	-	Illegal, Unreported and Unregulated fishing
JICA		Japan International Cooperation Agency
LAPE	-	Lesser Antilles Pelagic Ecosystem Project
LCCC	-	Length-converted-catch-curve
LJFL	-	Lower Jaw Fork Length
LOA	-	Length Overall
LPWG	-	Large Pelagic Fishery Resource Working Group
MSY	-	Maximum Sustainable Yield
NIS	-	National Insurance Services
NMFS-SEFSC	-	National Marine Fisheries Service – South East Fisheries Science Center
NOAA		National Oceanic and Atmospheric Administration
RFMO	-	Regional Fisheries Management Organization
RSWG	-	Reef and Slope Fish Resource Working Group
SCPWG	-	Small Coastal Pelagic Fish Resource Working Group
SCRS	-	Standing Committee on Research and Statistics
SGWG	-	Shrimp and Groundfish Resource Working Group
TAC	-	Total Allowable Catch
TCDC	-	Technical Cooperation among Developing Countries
TCI	-	Turks and Caicos Islands
TOR	-	Terms of Reference
UNDP	-	United Nations Development Programme
UNU-FTP	-	United Nations University – Fisheries Training Programme
USA	-	United States of America
UWI	-	University of the West Indies
VPA	-	Virtual Population Analysis
VMS	-	Vessel Monitoring System
WECAFC	-	Western Central Atlantic Fishery Commission

I. REPORT FOR THE LARGE PELAGIC FISH RESOURCE WORKING GROUP

A. OVERVIEW

1. General Introduction

As agreed at the plenary session of the 3rd Annual CRFM Scientific meeting held in St. Vincent and the Grenadines in 2007, the Large Pelagic Fisheries Working Group for this the 4th Scientific meeting consisted of Christopher Parker (Barbados) as Chairman, Ms. Louanna Martin (Trinidad and Tobago), Ms. Cheryl Jardine (St. Vincent and the Grenadines), Ms. Elizabeth Mohammed (Trinidad and Tobago), species rapporteur for Crevalle Jack, Dr. David Die, consultant assigned to work with the LPWG, Ms. Nancie Cummings and Dr. Todd Gedamke, both scientists from the National Marine Fisheries Service (NMFS) of the USA. Dr. Susan Singh-Renton also contributed significantly to the work of the group.

The group adopted and followed the agenda as recommended by the CRFM secretariat. This report will document the discussions and recommendations for the relevant items as per the agenda. This year's meeting focused heavily on charting the directions for the LPWG, specifically in the context of identifying which large pelagic species should be assessed and identifying the most appropriate fora for such assessments.

2. Review of the progress of proposed inter-sessional activities to gather additional data and information

2.1 King and Spanish Mackerel Data

The Working Group was informed about some additional data on king mackerel from Venezuela that had been presented at a recent ICCAT meeting (Arocha *et al*., 2008) and which provided observer data coverage for several areas. The Working Group identified several neighbouring countries that also fished the mackerels, including Grenada, and Guyana. Although data on total catch and/or landings may be available, it was desirable to obtain CPUE data and size data, when available. It was also pointed out that data collected during the FAO LAPE project, including size data, could be useful and should be examined. The Working Group also noted that the ICCAT database was a valuable source of at least Task I nominal fleet and catch data, as all countries that reported their data to ICCAT would appear in the ICCAT database. Some Task II data were also known to be available, but these had not yet been processed within the ICCAT database.

2.2 Crevalle Jack

The Working Group noted that this species was carried over as proposed, and the fishery was evaluated during the 2008 meeting.

2.3 Evaluation of Management Priorities for the Large Pelagic Fisheries of CRFM States

Instead of a letter dispatched to Member States during the inter-sessional period, a data reporting form was developed for completion by countries. This data form was aimed at gathering data on fleet size and annual catches of large pelagic fish species to facilitate evaluation of fisheries and priorities. Few countries had responded to the request for data, and so it was agreed to examine

different data sources to help in the identification of important fisheries and associated management issues.

3. Review of implementation of general recommendations made in 2007

3.1 Participation of non-CRFM countries in CRFM scientific meetings.

The CRFM continued its efforts to promote participation in scientific meetings by non-CRFM States, which, during the inter-sessional period, included informing the 2007 ICCAT SCRS meeting of current CRFM efforts with regard to assessment of small tuna species. ICCAT's SCRS recommended that scientists from the ICCAT Working Group on Small Tunas should participate in CRFM scientific meetings in order to build the collaboration required for advancing research and assessment of small tuna species. Despite these efforts, ICCAT small tuna scientists were not in attendance at this year's scientific meeting.

The Working Group considered and recommended that a joint meeting of the CRFM LPWG and ICCAT Small Tunas Working Group should take place in the near future and that it would be best to hold it at the same time as the annual on-site meeting of the CRFM LPWG. There was considerable discussion about timing of the joint CRFM LPWG –ICCAT Small Tuna Working Group meeting, the need for preparatory work by CRFM scientists, and the need for acceptance of the strategy/proposal by the Caribbean Fisheries Forum. The LPWG also acknowledged that there was competition for ICCAT resources and the timing would be dependent on the scheduling of ICCAT inter-sessional meetings. In consequence, it was agreed that it would be more prudent to aim for a joint CRFM LPWG – ICCAT Small Tuna WG meeting in 2010, and focus in 2009 on preparations of data for the joint meeting. There was some concern about national level understanding about ICCAT data reporting requirements, in preparation for this type of meeting. It was noted that the CRFM-ICCAT training workshop should address this to a large extent.

3.2 Development of Bilateral Agreements

At the technical level, the Working Group noted that FAO WECAFC had been successful at facilitating collaboration with Venezuela in the assessment of shrimp fisheries that were shared by countries located along the Brazil-Guiana shelf. Generally speaking, no formal bilateral agreement, involving neighbouring non-CRFM countries, had been established by the CRFM. The Working Group acknowledged that such agreements would require support at very senior levels of government and would depend on the priority that the Caribbean Fisheries Forum attached to these agreements.

3.3 Promotion of assessment of large pelagic resources by other regional organizations

WECAFC currently does not undertake assessment of large pelagic fish resources. At present, ICCAT is the only RFMO that undertakes assessment of several large tuna and billfish resources. During the 2007 annual meeting of ICCAT SCRS, CRFM had informed ICCAT of the analyses being undertaken during the CRFM scientific meetings.

3.4 Regional Database

The Working Group was reminded of the proposed JICA-funded project to develop a regional database for CRFM. This project had not yet begun. However, the Working Group noted that

JICA was interested in examining the CARIFIS database so as to ensure that the regional database followed a similar structure.

4. Management Developments

Developments based on management advice and other developments pertaining to these fisheries (include management plans, fisheries monitoring, database management, diversifications, regulations, MCS, legislation).

4.1 National developments

4.1.1 Trinidad and Tobago – A draft fisheries policy was developed in 2007.

4.1.2 Barbados – Draft high seas and fish handling legislation were still awaiting finalization and enactment. A new Fisheries Management Plan was being drafted, but there were no anticipated changes to the section referring to large pelagic fisheries. A review of past and existing methodologies for sampling and raising catches had recently been undertaken.

4.1.3 St. Vincent and the Grenadines – A national fleet expansion program was being implemented, sponsored by the government, the National Insurance Scheme and the National Commercial Bank. The Working Group noted that applicants had to satisfy a range of criteria in order to be considered, e.g. owners and operators were to be contributors to the National Insurance Scheme (NIS) and vessels had to be registered with the Fisheries Division. To date, mostly longline fishing vessels had been registered, although gears other than longline gear were possible. These vessels were about 40 ft in length. There were about 3-5 longline vessels included in the program so far. Vessels were being sourced from Mexico and the USA. Joint ventures were being facilitated, and licensees were obliged to report data. A Vessel Monitoring System (VMS) was in effect for these vessels. Regarding its High Seas fleet, St. Vincent and the Grenadines noted that 31 vessels had been in operation during 2007, 13 of which were over 24 m LOA.

4.2 Regional developments in management – CARICOM's Common Fisheries Policy & Regime

The CARICOM Fisheries Policy and Regime (CFP&R) is being formulated to complement the Agreement establishing the CARICOM Single Market and Economy as it relates to the management of the fishing industry in CARICOM Member States. To date, a draft legislation framework had been developed, based on consultations, both national and regional. The regional consultations have been coordinated by the CRFM Secretariat, and have included legal and socio-economic reviews. The CFP&R is expected to facilitate regional collaboration in all aspects of fisheries management, including statistics, research, harvest and post-harvest technology, and monitoring, control and surveillance. The establishment of a common fishing zone and regional fishing register are also included in the present framework. CRFM Member States are still in the process of reviewing and finalizing the framework.

5. General review of fisheries trends throughout the region.

It was noted that many of the national reports submitted by countries during the course of the 4 scientific assessments did not include any reference to large pelagic fisheries. As such, little information could be garnered about the present characteristics and trends of the large pelagic fisheries for much of the region from the cadre of national reports. The group was forced to rely

on more dated reports that offered some pertinent information and fleet statistics from the ICCAT database. Based on this information, a summary of trends in the development of the region's pelagic fleet was written.

The group also discussed the importance of the region's recreational fleets in harvesting large pelagics. It was noted that ICCAT was becoming increasingly interested in the activities of these fleets and as such, efforts should be made to assess this component of the fishery and to monitor these fishing activities. The CRFM secretariat had distributed a questionnaire to countries earlier in the year as a first attempt at characterizing recreational fisheries. Response was again very poor and the questionnaire was submitted for review by the group before recirculation to member countries. This activity was not completed during the course of the meeting but will be undertaken again early in the inter-sessional period.

6. Review of fisheries to be assessed.

This agenda item was of particular relevance to planning for the future work and direction of the LPWG. As noted before, most national reports did not provide enough information on the large pelagic fisheries to allow determination of catch trends. In addition to this, because of the poor response, the results of the questionnaire submitted earlier in 2008 to garner information on national catch rates could not be used primarily in prioritizing the pelagic species to be assessed. As such, the group had to resort to generating other selection criteria to suggest a regional prioritized list of species to be assessed. Based on this list, the group also offered suggestions regarding the appropriate forums and timetable for stock assessments for each species identified.

7. Review of management objectives and possible management strategies.

Most national management plans and policies were not available for review at the time of the meeting. However, this topic was touched on in the first agenda item through personal communication with country representatives within the working group. It was therefore agreed that the focus would instead be on enunciating existing relevant management recommendations by ICCAT.

8. Fishery data analysis and assessments.

Given the unavailability of significant new information for the species assessed at previous meetings (viz. dolphinfish, serra Spanish mackerel, king mackerel and wahoo), no assessments of these species were attempted at this meeting.

Ms. Mohammed, with the assistance primarily of Dr. Gedamke and Ms. Cummings attempted an assessment of Crevalle jack (*Caranx hippos*). The results of this assessment are detailed in section B of this report.

Reviews of existing scientific knowledge of large pelagic species currently harvested by CRFM countries, but which are not currently assessed by ICCAT, were conducted. Summary reports were produced for Atlantic bonito (*Sarda Sarda*), frigate tuna (Auxis sp.) and blackfin tuna (*Thunnus atlanticus*). It should be noted that similar summaries for other species were provided in the reports of the previous assessments of wahoo (*Acanthocybium solandri*), dolphinfish (*Coryphaena hippurus*), serra Spanish mackerel (*Scomberomorus brasilensis*) and king mackerel (*S. cavalla*).

9. Any other business

9.1 CRFM Working Group on Data and Methods

The LPWG acknowledged that the establishment of a permanent CRFM Working Group on Data and Methods would offer the advantage of formal recognition of the role and functions of the Working Group within the overall CRFM structure. It was agreed that the Working Group on Data and Methods should have on-site meetings only when requested to do so in order to address specific tasks assigned to it by the Annual Scientific Meetings. This arrangement would make the best use of the available resources and also guarantee quality outputs.

Despite the ongoing challenge of limited work progress during the inter-sessional period, the LPWG believed that inter-sessional data preparatory tasks should, in general, not be assigned to the Working Group on Data and Methods. This was not considered feasible, as such tasks were best undertaken by national representatives who could access and study their national databases in country over a longer time period. Nevertheless, it was agreed that the Working Group on Data and Methods could be asked to resolve specific issues pertaining to data and assessment preparations.

In its review of the Terms of Reference (TORs), the LPWG recommended the omission of the first TOR and modifications to other TORS, in order to address the following concerns.

(i) Confusion of the role of the Working Group on Data and Methods with the role of the Annual Scientific Meetings in respect of primary responsibility for the interpretation of management advice needs and the provision of management advice.

(ii) Repetition of TORS covering similar tasks for data management and assessment methodologies.

9.2 UNU-FTP stock assessment course

In discussing this item, the LPWG assumed that the target audience for the short course would be the fisheries officers in CRFM countries, as this would address a more immediate need. The delivery format, duration, content, and timing of the course would depend on the target audience.

9.2.1 Target audience, delivery format and duration

Fisheries officers would be the preferred target audience. In this case, it would be more appropriate to offer a short course with a modular delivery format: this would address the need to offer a range of training, depending on the needs of officers, e.g. basic and advanced. It was pointed out that the basic training module could run for a longer period of time without negative impact on the work commitments of junior fisheries officers. There was also some discussion about the period for repeating the training modules; it was suggested that the full set of modules could be delivered either over a 1 or 2 year period, after which time the course would then be repeated.

To ensure that trainees were able to benefit from the short course, it was agreed that prerequisites would be necessary. Moreover, if UWI was to be involved, consideration should be given to agreed forms of UWI accreditation.

9.2.2 Course Content

It was suggested that a basic training module should include topics such as: data management; data handling and standardization, including how to have variables set up; fisheries CPUE

standardization; and stock parameter estimation. If possible, data managers should also be given the opportunity to receive this basic training.

The LPWG recognized that a wide range of topics could be covered in an advanced training module, for example, advanced statistics, production models, VPA (length and age-based), and multi-species approaches. Given the range of possible topics, the LPWG recommended that a priority list be developed, based on immediate application needs across the region.

It was further noted that training needs could change over time, and so course planning should include periodic review and revision. Consideration should also be given to the possibility of linking the UNU-FTP training course with additional training opportunities offered by other institutions and agencies.

9.2.3 Timing

There were no suggestions about the timing of the course, although the LPWG recognized that it should not conflict with the Annual Scientific Meetings.

9.3 ICCAT-CARICOM/CRFM Training Workshop

The LPWG recalled that the goals of the workshop, as proposed by ICCAT, were to improve the data reported to ICCAT by CARICOM Member States and to improve the participation of these countries in the technical activities of ICCAT. It was also pointed out that the training workshop format was similar to that successfully used by ICCAT for such training in West Africa.

The LPWG reviewed the format and content proposed by ICCAT and found it to be acceptable. As such, there were no modifications.

9.4. Data Policy Outline

The LPWG made no further additions to the Data Policy Outline, but noted that the policy should not impose additional burdens on countries in respect of data collection and data management activities.

10. Recommendations

Specific recommendations have been included in each of the detailed agenda item reports. Following is a summary of these recommendations.

- CRFM countries are encouraged to monitor the activities of their recreational fleets with the aim of collecting sound landings records that can contribute to future stock assessments.

- Historical fleet statistics are important data necessary for understanding landings trends. Neither the FAO nor ICCAT databases provide sound records of national fleet statistics. CRFM countries are therefore urged to gather whatever historic data they can on their fleets and provide these to the CRFM secretariat to advise future fishery and stock assessment work.

- Based on the prioritization exercise, the Working Group recommends that:
    - A dolphinfish assessment be conducted in 2009, and;

    - Assessments of serra Spanish mackerel and blackfin tuna be conducted in 2010 at a joint meeting of the CRFM LPWG and the ICCAT Small Tunas Working Group.

- In relation to ICCAT, it is recommended that CRFM countries continue to cooperate with ICCAT at all levels possible at least in the collection and provision of relevant data of species of interest. To this end, the group was supportive of the proposed regional training workshop in data collection and reporting being offered by the ICCAT secretariat.

- For blackfin tuna, although no solid information is available on stock structure, it is suggested that assessments proceed based on a Western Central Atlantic stock hypothesis. In this case, collaboration of CRFM with the French Antilles islands and the US should at least be sought. Ideally, collaboration with other countries that land large quantities of blackfin tuna such as Venezuela and Cuba in this regard would be much preferred. It should also be noted that a significant proportion of scientific studies of this species has been conducted in the French Antilles and Cuba.

- A genetic study, specifically intended to assess the stock structure of blackfin tuna across the region should be conducted. The UWI should be approached in this regard and CRFM should consider seeking funding for the study.

- CRFM countries, particularly Grenada, involved in the blackfin tuna fishery, should encourage assessment of the status of this species and to this end, it is suggested that the following data and information be collected:
    - Collection of new catch and effort data and collation of any other historically available records that may allow for the estimation of relative abundance indices.
    - Focused morphometric studies that would include collection of data such as length, weight, gonadosomatic indices (GSI) and reproductive state covering a period of at least one year.
    - All historic catch and effort data should be supplied to the CRFM Secretariat for consideration during future stock assessments.

- Before assessments of frigate tuna (Auxis sp.) or bonito (*Sarda sarda*) could proceed, accurate estimates of total harvest for the stocks need to be obtained; it is therefore urgently needed to review landings of this species for the entire Caribbean area. In this regard, it is important that species be properly identified and catches appropriately reported.

- Reconstruction of historical landings has been carried out by Mohammed and national scientists for Barbados, St. Lucia, Trinidad and Tobago, St. Vincent and the Grenadines and Grenada. Although these authors have not provided landings by species in their publications, these are available and could be made available to the CRFM and ICCAT.

References

Arocha F., Ortiz, M. and Silva, J. (2008). Update of standardized catch rates for sailfish (*Istiophorus albicans*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and adjacent areas: Period 1991-2006. ICCAT SCRS/08/039. 11 p.

B. FISHERY REPORTS

1. Assessment of the Crevalle Jack (*Caranx hippos*) fishery of Trinidad and Tobago

Rapporteur: Elizabeth Mohammed (Fisheries Division, Trinidad)
Consultants: Dr. Todd Gedamke (US National Marine Fisheries Service, Miami Laboratory)
Dr. Nancie Cummings (US National Marine Fisheries Service, Miami Laboratory)

1.1 Management Objectives

Crevalle jack (*Caranx hippos*) is a coastal pelagic species caught mainly in the multi-fleet, multi-gear fisheries that target mackerels in Trinidad and Tobago. The general policy goal for the fisheries sector of Trinidad and Tobago is to promote sustainable management and growth of the sector within a diversified economy, by improving conservation outcomes, increasing industry self-reliance, creating systems that allow for efficient access to and allocation of resources, facilitating transparent decision-making and promoting shared stewardship (Fisheries Division, 2007).

The management objectives for the coastal, pelagic fishery are to maintain biological diversity and to ensure that the exploitation of the fisheries resources and conduct of related activities are consistent with ecological sustainability (i.e. for target and non-target species as well as marine environments), (Fisheries Division, 1992, 2007).

1.2 Status of Stocks

Although the distribution of the species has been reported, the specifics of stock delineation have not been addressed. Therefore, this working group assumed that information from the fisheries in Trinidad and Tobago was representative of the entire stock.

In our analysis of the Trinidad fisheries data for recent years (since 1995), there is no obvious trend in either the CPUE (landings per trip) or length-frequency data. The lack of contrast in CPUE prevented fitting of a non-equilibrium production model to standardized CPUE and estimated landings data for 1995 to 2007. Hence, the results were inconclusive. There is no strong evidence to suggest that the population size has changed. However, without contrast in the data, it is also difficult to fully assess the stock status.

Between 1995 and 2006, the average annual landing of *Caranx hippos* in Trinidad was 245 tonnes from the artisanal multi-gear and trawl fleets. Annual landings varied between 153 and 400 tonnes (Figure 1a). Point estimates of landings for 1963 and 1975 were 135 and 189 tonnes respectively. Although no clear long-termed trends in landings are apparent, higher landings have been observed in recent years compared to 1963. Landings of Crevalles 'nei', reported by Caribbean countries in the Western Central Atlantic Region (FAO FishStat Database), have increased since 1950, but in recent years appear to have stabilized (Figure 1b). At this time there is no evidence of overfishing of this group.

1.3 Management Advice

The Working Group noted that limitations in available data and uncertainties in parameter estimates influenced the quality of the assessment results. The management advice is therefore precautionary in nature and considers the recommendations from previously assessed, more important commercial species (Serra Spanish mackerel and King mackerel) in this multi-species

fishery. It is therefore recommended that fishing pressure not be allowed to increase until the dynamics of the stock are better understood.

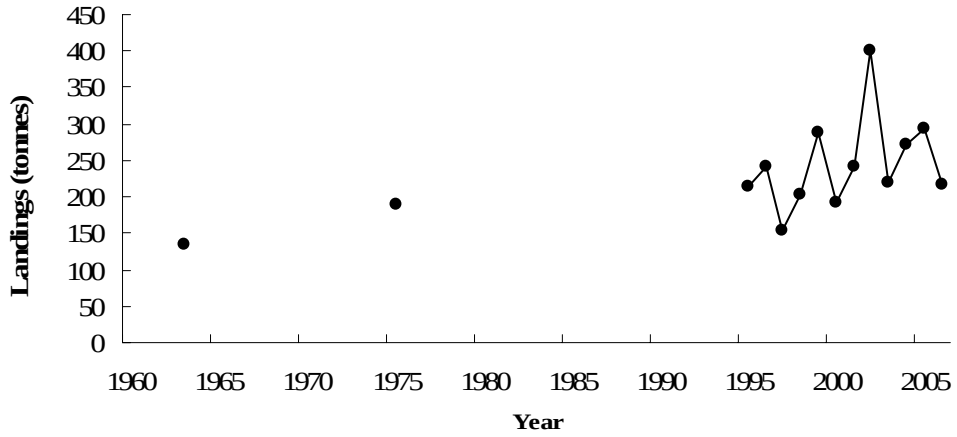

Figure 1a. Annual landings of *Caranx hippos* in Trinidad. Recorded catches are available for additional years, however, these data are not included as the corresponding total catches have not yet been estimated.

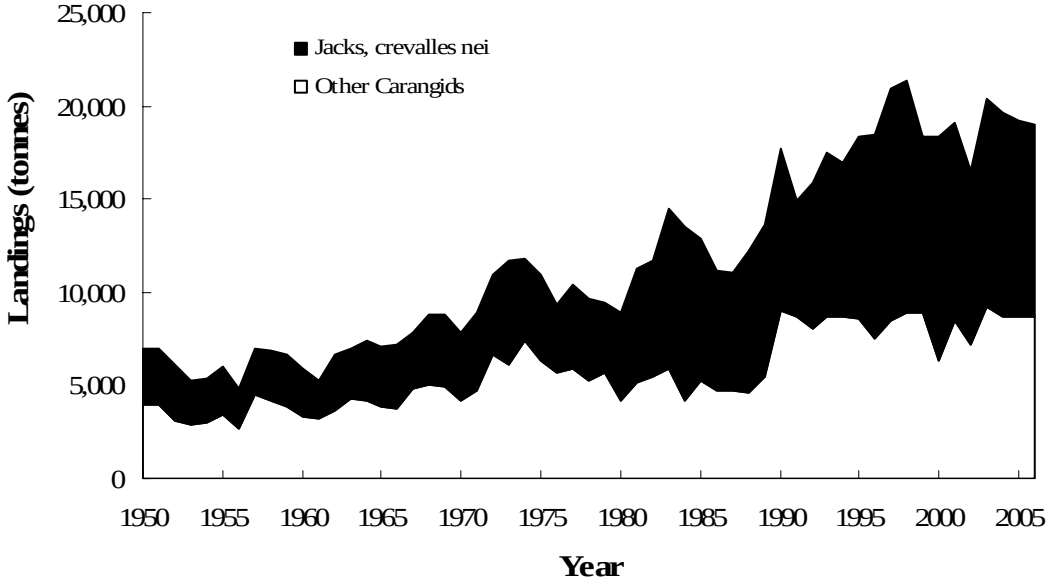

Figure 1b. Annual landings of 'Jacks, crevalles nei' by Caribbean countries in the Western Central Atlantic Region.

1.4 Statistics and Research Recommendations

Due to data limitations, resulting uncertainties in parameter estimates and inconclusive results, the following are recommended:

1.4.1 Data quality

Specific to *Caranx hippos*

1. The sampling strategy for collection of length frequency data should be evaluated to maximize the benefit of data collected given the limited resources. The goal of the sampling strategy should be to investigate selectivity of the gears and provide a reliable estimate for the mean length of the population. Sub-sampling strategies which account for temporal and spatial distribution of effort within the different fisheries will increase the likelihood of successful sampling trips and therefore minimize the work necessary to provide reliable results. An alternative approach may be to generate estimates of mean length from a single, consistent, annual sampling event (e.g. large number of samples taken from the same locations and gears at the same time of year). Collection of length frequency data should commence in 2009.

2. The time series of CPUE data should be extended prior to 1995 (at least ten years back or corresponding to about one life span) as this information could be useful in explaining trends in local abundance of the stock. This activity should commence within the next three months.

3. Catch and effort data collection in Trinidad and Tobago should be expanded to include the semi-industrial multi-gear fleet, trawl fleets (by-catch) and recreational fleets, as well as artisanal fleets in Tobago. In addition, catch and effort data from other countries in the Eastern Caribbean should be obtained. Current data in the FAO FishStat database for the Western Central Atlantic Region should be disaggregated to the species level to facilitate better estimation of total removals of *Caranx hippos* due to fishing.

General

1. A number of errors were identified in the Trinidad catch and effort database. Efforts should be undertaken to audit the current database and protocols should be developed for future data collection and computerization to facilitate analysis of data for all species. This activity should commence at the soonest possible time.

1.4.2 Research

1. Continued analyses of the CPUE data should be conducted in the intercessional period to investigate possible causes for the overestimation of CPUE by the model. More work is needed to identify fishing trips that provide a representative sample of the catch and effort for evaluating the local abundance of the stock.

2. Physical and ecological indices related to productivity and mortality should be compiled to investigate whether fluctuations in local abundance can be explained. Since indices are already available this activity can provide an inexpensive and potentially useful alternative to prediction of future catches and more specific management advice.

3. Due to the multi-species nature of the fisheries in Trinidad and Tobago it is recommended that future analyses take into account the impacts of proposed management measures for the coastal pelagic fishery on *Caranx hippos*.

1.5 Stock Assessment Summary

The analyses utilized estimated total landings from 1963, 1975 and 1995 to 2006 for the artisanal multi-gear fleets and trawl fleets (excluding by-catch), catch per trip data from 1995 to 2007 for fishing trips utilizing monofilament and multifilament gillnets; a-la-vive; trolling; switchering; beach seines; banking; fishpots and trawl nets. Biological data comprised length data for 2,294 fish collected between July 1995 and June 1998 and March to December 2004. Growth parameters were taken from a modified report of Kishore and Solomon (2004).

The length weight parameters estimated for *Caranx hippos* in Trinidad are: a = 0.025 ± 0.00139; b = 2.805 ± 0.01502 for the sexes combined. There was no significant difference in the relationship between length and weight for males and females.

Total mortality (Z) was estimated from length frequency data and ranged between 0.441 and 0.959 $year^{-1}$. Although the estimates of Z varied depending on parameter inputs, the analysis evaluated both the upper and lower bounds of total mortality.

Natural mortality was estimated to be between 0.12 and 0.33 $year^{-1}$ using six different methodologies. Growth parameters from a study in Trinidad (Kishore and Solomon, 2004) were the most reliable life history information available and therefore used to estimate a natural mortality of 0.23 $year^{-1}$ from the Pauly (1980) model.

Fishing mortality was calculated as the difference between total and natural mortality and ranged between 0.211 $year^{-1}$ and 0.708 $year^{-1}$ for the lower and upper bound estimates of total mortality respectively.

The catch per unit of effort (CPUE) data from the commercial landings between 1995 and 2007 were used to generate a standardized index of local abundance using a general linear model (Figure 2). Although the observed data suggest a slight increase in CPUE may have occurred, standardized CPUE's remained noisy over the time series. The confidence intervals around the standardized estimates were large and no strong evidence for changes in CPUE exists.

1.6 Special Comments

None.

1.7 Policy summary

The Working Group agrees with the Trinidad and Tobago Government (Fisheries Division, 1992) that management for the coastal, large pelagic species should be coordinated among neighbouring countries sharing these sub-stocks. More information and guidance from the CRFM Forum is required on the regional policies for management of the *Caranx hippos* resources.

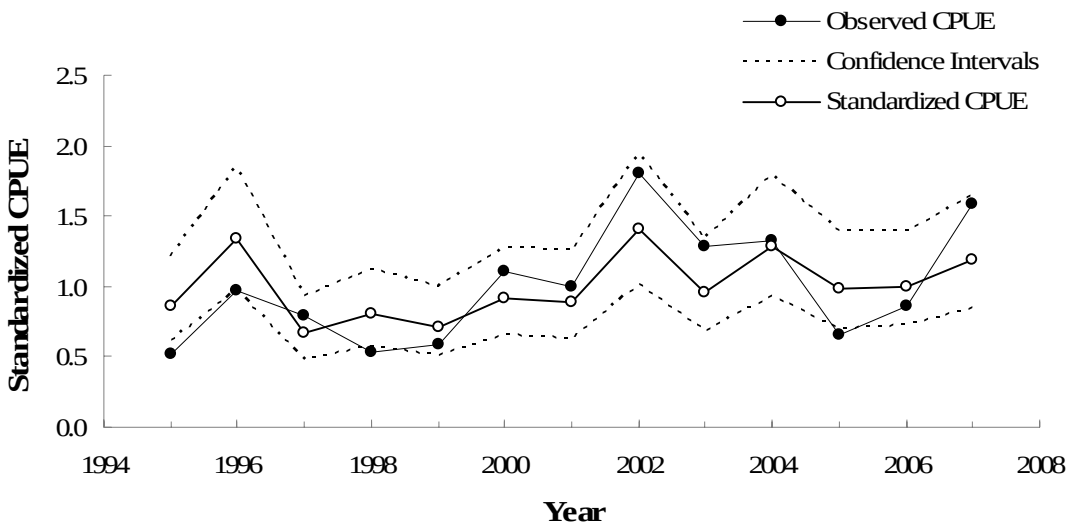

Figure 2. Standardized CPUE (catch per trip) trends for *Caranx hippos* in Trinidad.

1.8 References

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II. REPORT OF THE CONCH AND LOBSTER RESOURCE WORKING GROUP/REEF AND SLOPEFISH RESOURCE WORKING GROUP

Chairman: Lester Gittens (CLWG)
Chairperson: Kathy Lockhart (RSWG)
Rapporteurs: Ramon Cacarmo (Belize), Kishmo Clarke (St. Kitts and Nevis), Lester Gittens (The Bahamas), John Jeffers (Montserrat), Kathy Lockhart (Turks and Caicos Islands), Anginette Murray (Jamaica), Sophia Punnett (St. Vincent and the Grenadines), Sarita Williams-Peter (St. Lucia),
Other group members: June Masters (CRFM Secretariat), Paul Medley, PhD (Consultant)

A. OVERVIEW

It was deemed necessary for the CLWG and RSWG to combine efforts during the current workshop, and hence a joint report was produced. Analyses completed at the current meeting included a preliminary stock assessment (production model) for the Caribbean spiny lobster fishery of Jamaica, development of preliminary carapace length to tail length conversion equations for Caribbean spiny lobster for Jamaica, an updated stock assessment (production model) for the queen conch fishery of St. Lucia, refinement and exploration of catch per unit effort data for the Caribbean spiny lobster fishery of The Bahamas, estimation of fishing mortality trends using a length-converted-catch-curve method for the Caribbean spiny lobster fishery of The Bahamas, the development of proposed minimum size limits for grouper and snapper for the Turks and Caicos Islands as well as quantification of their impacts on fishermen based on fishing gear utilized. St. Vincent and the Grenadines fortified plans for a visual survey for Caribbean spiny lobster and queen conch fishing grounds whereas Montserrat and St. Kitts made plans for data collection. In the case of Belize, a cohort analysis for the Caribbean spiny lobster fishery was completed before the current meeting and presented to the CLWG.

The analyses completed largely fulfill and exceed the proposed analyses promulgated for the Conch and Lobster Working Group for the Fourth Scientific Meeting. The only exception was the refinement of the lobster Total Allowable Catch (TAC) for the Turks and Caicos Islands. This refinement was conducted inter-sessionally.

Recommendations made by the CLWG and RSWG include:-

1. Long-term consideration should be given to making the annual scientific meetings less demanding. Possible avenues for addressing this include the shortening of the plenary session by one day and limiting the scope of the Meeting.
2. Assistance in obtaining funding for small scale research and data collection for individual countries is needed. Recognizing that countries are ultimately responsible for the resources allocated towards managing their fisheries, there is still the occasional necessity of obtaining funding from external sources. Possible avenues of assistance include training in the writing of funding requests and drafting of such requests by the CRFM.
3. There needs to be greater emphasis placed on transfer of knowledge between country representatives and their compatriots in order to facilitate the continued and efficient work of the working groups when there are changes in country representatives from

meeting to meeting. This includes where persons leave their department altogether and where circumstances dictate that a different person attend the meeting from year to year.

4. A long-term goal is to maximize the amount of analysis done between meetings and to utilize the meeting for fine tuning, review and planning. This depends heavily on the time that can be spent on such activities between meetings and the abilities of the individuals involved.
5. Greater attention needs to be placed on the inter-sessional work of the working group in order for countries to gain maximum benefit from the meeting.
6. Further training on basic analytic and data handling skills is needed, for example use of pivot tables. The suggested timing of this training in basic skills is during the first day of the meeting so that there is a greater chance that the skills learnt will be retained as they will be used immediately. In addition, the person receiving the training would be the one attending the meeting.
7. Efforts to obtain all data useful in fisheries analysis should resume. This includes sources outside of the agencies that the various representatives work such as visiting researchers, weather departments and universities.
8. The work of organizations that provide eco-labels, such as the Marine Stewardship Council, should be considered by the working groups as there is a possibility that such labels will be needed for continued access to particular markets. Adherence to MSC standards also promotes improved stock assessments and management. The course of action for incorporating such organizations should first be addressed by the Caribbean Fisheries Forum.
9. A consultant, familiar with incorporating socio-economic data into resource assessments, should be invited to the next meeting to provide technical support during the work sessions.

Based on the data that are expected to be available and subject to the approval of the Caribbean Fisheries Forum, the proposed resource assessments for the Fifth CRFM Scientific Meeting are noted below.

Table 1: Proposed Species to be assessed at the Fifth Scientific Workshop

Country	Species	
	CLWG	RSWG
Belize	lobster, conch	mutton snapper
Jamaica	conch, lobster	
Montserrat		red hind, queen triggerfish
St. Lucia	*conch	multiple species
St. Kitts and Nevis		parrotfish
St. Vincent and the Grenadines	lobster	
The Bahamas	lobster, conch	
Turks and Caicos Islands	lobster, conch	

* dependent on presence of consultant to link socioeconomic analysis to status of the resource

B. FISHERY REPORTS

1. The spiny lobster (*Panulirus argus*) fishery of The Bahamas

Rapporteur: Lester Gittens
Consultant: Paul Medley

1.1 Management Objectives

Officially endorsed management objectives specific to the spiny lobster fishery are under development. However, the Department of Marine Resources has based management actions on the understanding that export earnings and employment are to be maximized within the limits necessary for sustainable harvests.

1.2 Status of the Stock

The status of the stock is unknown. While length-converted-catch-curve (LCCC) analysis indicates little change in total instantaneous mortality and fishing mortality over the last 9 seasons, the status of the fishery is classified as unknown due to a large degree of uncertainty in the LCCC estimates as well as estimates based on the available catch per unit effort data.

1.3 Management Advice

Efforts to improve assessments of the fishery need to continue as a priority. Aspects of this should include improvements to data collected, research and continued utilization of expert assistance provided through avenues such as the CRFM, the FAO, suitably qualified consultants, research organizations and highly trained staff members.

1.4. Statistics and Research Recommendations

1.4.1 Data Quality

The data utilized for the LCCC analysis was of good quality. However, detailed information on gear selectivity is needed to further advance length-based stock assessments. This is further addressed in Section 1.4.2.

The catch per unit effort (CPUE) data utilized was of limited use for the stock assessment attempted. It remains to be seen whether it accurately functions as an index of abundance. Further refinement of the CPUE is likely to lead to bias. Other avenues of improvement need to be explored such as expansion of landing sites sampled, refinements to data collection methodology for landing sites already sampled and the introduction of log sheets for long fishing trips.

1.4.2 Research

More information on selectivity of fishing gear is needed in relation to the LCCC method. In particular the gear selectivity of traps needs to be compared to the lobster hook-casita combination. This information may serve to explain the excessively high mortality estimates obtained using the LCCC method and improve the reliability of results obtained from this method.

The time delay between catches and exports needs to be quantified and elucidated in order to improve stock assessment options. This includes the delay between catching and selling to processing plants and the delay between purchase by processing plants and exports. This

information is needed because there is currently great difficulty in assigning landings to the date that the lobsters were actually caught and landed when monthly export records are utilized.

1.5 Stock Assessment Summary

1.5.1 Length-converted-catch-curve-analysis

A length-converted-catch curve analysis was updated and yielded an estimate of total instantaneous mortality and fishing mortality for the 2007-2008 season based on size-frequency data obtained from processing plants. These mortality estimates do not show a major trend since 1999-2000 thus indicating a degree of stability in the fishery (Figure 1). However, the mortality estimates are unrealistically high and contain enough uncertainty that they do not allow for the status of the fishery to be accurately determined. Evidence of the unrealistic nature of the estimates is seen when one applies the total mortality estimates to a hypothetical fishery. After 5 years the hypothetical fishery would collapse. However, the true fishery continues to exist after the nine seasons depicted.

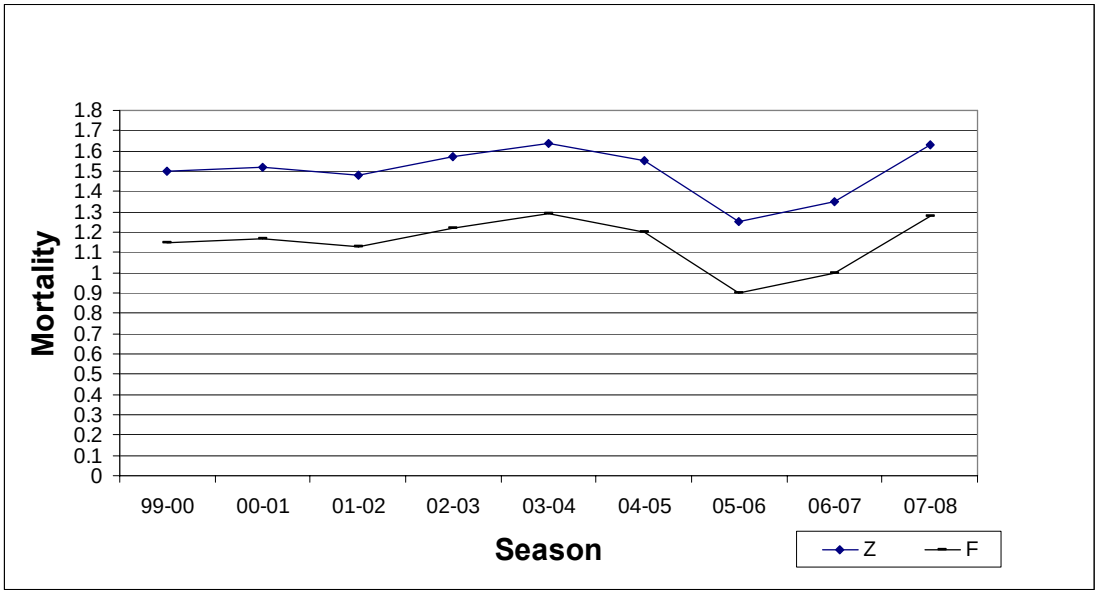

Figure 1: Mortality Estimates Based on Length-Converted-Catch-Curve Analysis

1.5.2 Catch per Unit Effort (CPUE) Analysis

Analysis of CPUE data that were collected between 1988 and 2007 indicated that there was a strong relationship between catch and effort and thus the likelihood that models involving CPUE would be appropriate (Figure 2). However, an attempt to apply an in-season depletion model to the data showed that the CPUE data did not serve as a good index of abundance for the fishery.

Further refinement of the CPUE data is likely to introduce bias; however this should still be explored given the absence of any other index of abundance for this fishery and the unknown status of the fishery.

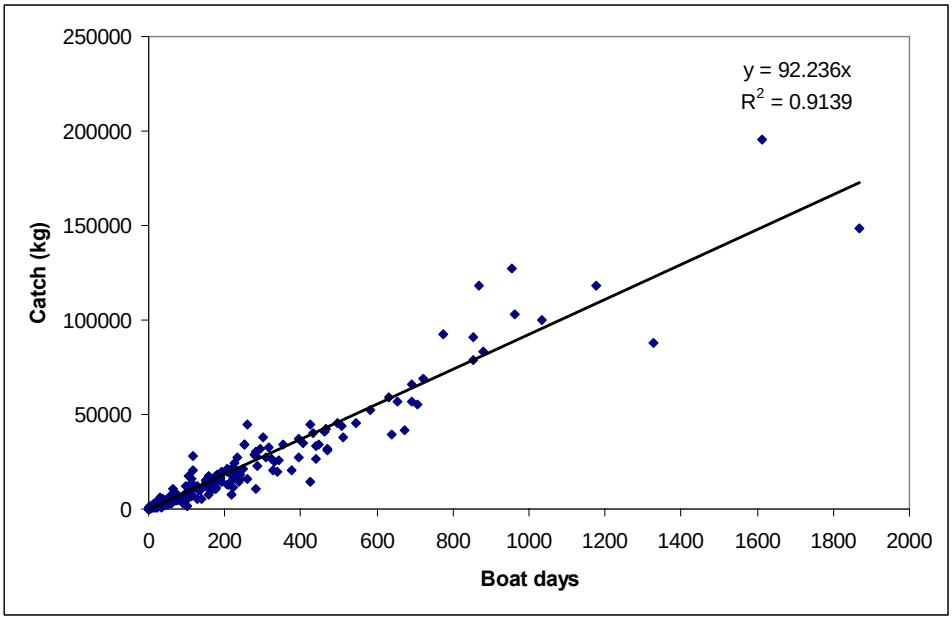

Figure 2: In Season Catch vs. Effort for the Spiny Lobster Fishery

1.5.3 Monthly Export Records Analysis

The time it takes between catching and purchasing of lobsters by processing plants, as well as the time it takes between purchasing of lobsters by processing plants and actual exportation currently confounds allocating the amounts of lobsters exported to actual catch dates. Analysis of monthly export records is potentially useful in stock assessments if a method can be developed to allocate exports to catch dates.

1.6 Special Comments

During the Second CRFM Scientific Meeting (two years ago), The Bahamas was able to convert commercial export data obtained from processing plants into length-frequency data for one season. Since then, progress has been made in converting data from the 1999-2000 season through the 2007-2008 season to length-frequency data for use in length based assessments such as length-converted-catch-curve-analysis. This yielded total instantaneous mortality and fishing mortality estimates for the period specified. Current efforts are now focused on improving the estimates obtained from the LCCC method and exploring methods that utilize an index of abundance.

1.7 Policy Summary

Much work remains to be done to determine whether spiny lobster harvests are at all sustainable. From that point onward, determinations can be made on whether maximum export earnings and employment are being accomplished within the limits of sustainable harvests.

2. The Spiny Lobster (*Panulirus argus*) fisheries of Jamaica

Rapporteur: Anginette Murray

2.1 Management Objectives

The management objective for the spiny lobster fishery of Jamaica is "Biological sustainable use of the fishery resources in order to ensure present and future economic earnings from the fishery" (CFRAMP, 2000).

To achieve this, current management measures include a closed season for the months of April to June for all lobster fishers. Enforcement includes end-of-season declarations of lobster by the processors and inspections of fish processing plants, hotels, beaches, and restaurants. Also, the industrial fishery operates under a limited access system that controls the numbers of industrial vessels.

2.2 Status of Stock

An assessment was carried out on the industrial lobster fishery of the Pedro bank. The results, due to limitations of the available data, were not conclusive, but provide some indications of the status of the fishery.

There is no evidence that the stock is currently overfished. However, the assessment indicates that recent catches might be unsustainable, and total catch of spiny lobster from the Pedro Bank should be limited to around 200 t. The catch in 2004 was 450t, and catches of this level are very likely to be unsustainable for this stock.

2.3 Management Advice

Jamaica should consider implementing a total allowable catch of around 200 t for this fishery, enforced through an export quota. The maximum sustainable yield is likely to be in the range of 78 – 1098 t, with 200 t being the median. The last available information suggests that the most recent catch (450 t) is likely to have exceeded the maximum sustainable catch from this stock. If this level of catch should continue, the stock is likely to become overfished.

The Government should also consider establishing minimum tail weight and length regulations, so that these size regulations can still be enforced after processing. A minimum tail size, consistent with the minimum legal carapace length, could not be determined at this meeting, as the data presented did not cover some of the required length frequencies. More observations of the carapace and tail lengths, along with tail weight, should be acquired before detailed recommendations can be made.

2.4 Statistics and Research Recommendations

2.4.1 Data Quality

The annual total catches that were used in the assessment included data from the industrial fishery from Pedro Bank. Total catches of lobsters from the industrial fleet were estimated to be equal to total exports. Export data were available from 1979 – 2004 with three years missing (1982, 1983, 1990). CPUE was obtained for lobster pot fishing operations on Pedro Bank for 10 years

(CARIFIS database). The major challenges posed by the data were the gaps in the data series, and uncertainty in the CPUE index as a good index of abundance.
The following activities will need to be undertaken to improve the assessment:

- Obtain missing catch and CPUE data for the periods 1982-3, 1990 and 2005-7, completing the time series used in the most recent assessment and check the CPUE data for errors.
- Obtain exports by size category from the processors for as long a time series as possible. Historical data will be important in assessing the stock.
- Obtain size compositions from tail measurements within the size categories. This can only be done for current and future landings.
- Consider ways to improve the catch and effort data. These data still present a problem with missing data and suspected significant errors in recording and collection.

2.4.2 Research

During the 1980s about 60 percent of total lobster landings came from the Pedro Bank but that declined to 20 percent in 1996-1997. The contribution of lobsters landed in Jamaica that come from the island shelf and the banks have not been recently quantified (Kelly, 2002).

According to Munro (1983), the lobster populations in Jamaica have changed considerably since 1983. Kelly (2002) noted that fishing effort had increased significantly in the preceding recent years and that the level of fishing mortality at that time appeared to be greater than the optimum recommended for the fishery in 2002. FAO (1993) declared that from a biological perspective, fishing mortality should be reduced to minimize the risk of over-exploitation.

More intense specific monitoring should be carried out on a single lobster fishery to determine the detail necessary for a full assessment, as well as the seasonal patterns in landings, estimates of current fishing mortality etc. The work could be conducted as a single one or two year project, although it would need to be conducted as a continuous activity during this period by dedicated staff to avoid any breaks in the time series.

Another aim of such monitoring would be to establish a conversion factor from carapace length to tail length, so that a minimum tail length could be established which is consistent with the minimum carapace length.

2.5 Stock Assessment Summary

The most important new data to be used in the assessment of the Pedro Bank spiny lobster fishery were the total exports since 1979 (Figure 1). These have increased since 1979 when the stock was likely to have been only lightly fished.

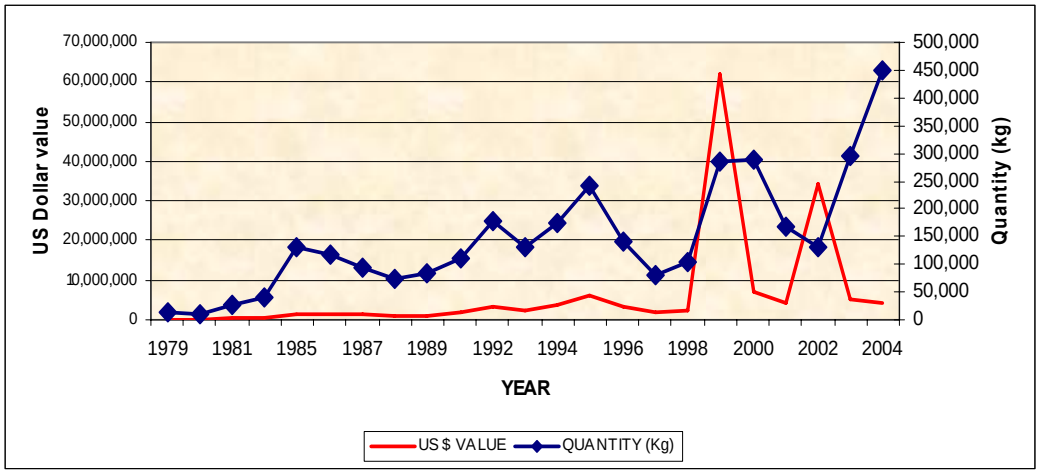

Figure 1. Export quantities and US$ value of the spiny lobster for Jamaica period 1979 – 2004 (Data Source: Statistical Institute of Jamaica)

Attempts were made to assess the status of the lobster stock using a surplus production model fitted using maximum likelihood (ASPIC software), which was unsuccessful. ASPIC requires index of abundance series (such as CPUE) and total yield (catch) data. ASPIC was run, fitting a logistic model conditioned on catch. ASPIC software was unable to interpret the data due to a lack of contrast in the CPUE series.

The same surplus production model was then fitted in a Bayesian framework. The Bayesian statistical analysis offers a method in which uncertainty can be explicitly incorporated in inference, and decision making, and external information can be used formally to improve the fit through providing priors. Priors were derived from previous Turks and Caicos Islands and The Bahamas assessments.

However, results from this assessment were highly uncertain (Table 1), with confidence intervals being wide for the indicators and reference points of interest. The general indications were that the stock was not likely to be overfished, but the most recent catches were too high to be sustainable.

Table 1 Parameter estimates and reference point estimates from the Jamaica assessment. The confidence bounds are generally wide illustrating the uncertainty in the assessment. The main information contribution for the assessment was the priors (based on information from the Bahamas and Turks and Caicos Islands) and the total catches. The CPUE index was relatively uninformative.

90% Confidence Intervals (percentiles)	5%	Median (50%)	95%
r	0.06	0.21	0.71
B_∞ (t)	2280	4415	10734
$B_{current} / B_\infty$	0.34	0.66	0.92
MSY (t)	78	207	1098
Observed Yield in 2004 (kg)		450807	
Replacement Yield (t)	73	187	352
B/BMSY	0.69	1.31	1.84
F/FMSY	0.25	1.63	6.64

Though the results were not conclusive, preliminary indications are that catches could have already exceeded MSY and be unsustainable.

Minimum tail length

Figures 2 a, and b illustrate the relationship that tail lengths have with carapace length in male and female lobsters respectively. The minimum tail length that a male lobster should have that corresponds to the minimum legal size carapace length (CL) of 76.2 mm is 140 mm, while for female lobsters, it is 146 mm. These values were calculated from the linear equations generated from the data provided.

In both instances the correlation coefficient indicates that the relationship between the carapace and tail length are reliable. However due to the data supplied being biased towards lobsters over the minimum legal CL it is strongly advised that more data be collected to include the size category down to 60 mm CL for both male and females, prior to consideration of this in management decisions.

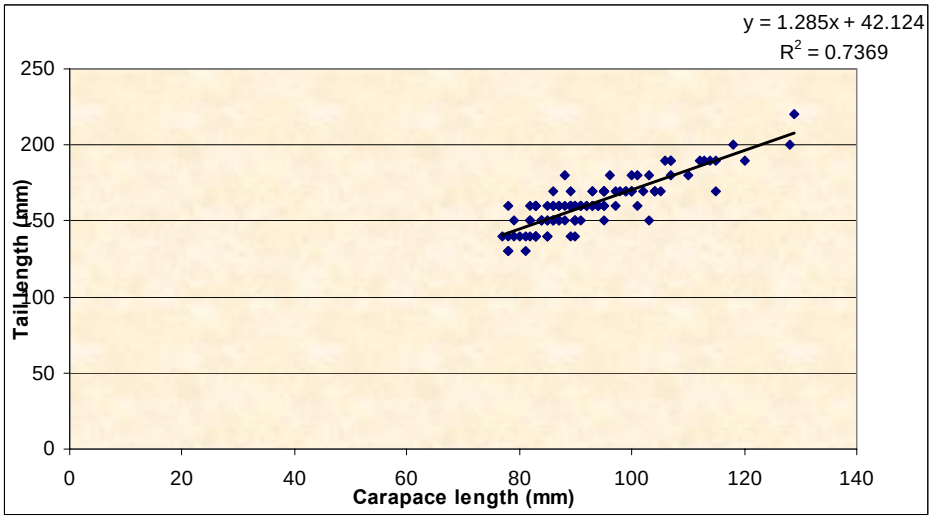

Figure 2a Linear regression analysis of male spiny lobster

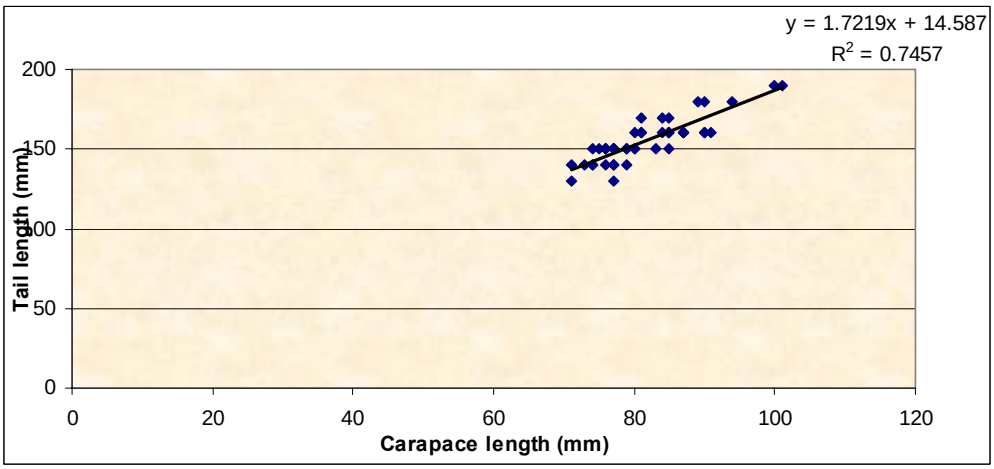

Figure 2b Linear regression analysis of female spiny lobster

2.6 Special Comments

A significant problem with surplus production models in assessing spiny lobster is it is assumed that the population is self-recruiting, whereas it is generally thought that lobster recruitment is spread widely across islands. This will add considerably to the uncertainty of this assessment. With better data, alternative approaches to assessment would need to be considered.

2.7 Policy Summary

The goal to be achieved for management of the marine fisheries of Jamaica is the sustainable use of fisheries resources for the maximum benefit of the people of Jamaica. In the draft management plan for the lobster fishery, the stated management objective is to restore/rehabilitate the fishery through protection of lobsters, and protection and enhancement of their habitat.

The management tools of gear restrictions, effort reduction, and enforced closed season and co-management arrangements, should be examined for use in this fishery. There is already legislation in place to prevent the taking of berried lobster, and to prohibit the landing of lobsters during the closed season. However, monitoring data suggest that these regulations are not being strictly respected.

2.8 References

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Kelly. R. (2002). Report on the spiny lobster fishery in Jamaica *In* Report of the Second Workshop on the Management of Caribbean Spiny Lobster Fisheries in the WECAFC Area Havana, Cuba, 30 September - 4 October 2002. FAO Fisheries Report/FAO Informe de Pesca. No. 715. Rome, Roma, FAO. 2003. 273p.accessed on June 12, 2008 at http://www.fao.org/DOCREP/006/Y4931B/y4931b0e.htm#fn22

Munro, J.L. (1983). Caribbean coral reef fishery resources. ICLARM studies and reviews 7, Manila, Philippines.

3. Queen Conch Fishery in Saint Lucia

Rapporteur: Sarita Williams-Peter
Consultant: Paul Medley

3.1 Management Objectives

The management objectives for the conch fishery in Saint Lucia (Department of Fisheries, 2006) are to:

- Rebuild queen conch stocks, particularly in the near shore;
- Ensure sustainable use of the queen conch resource.

3.2 Status of the Stock

The abundance of the stock continues to decline. The 2007 landings were beyond the thirty-five (35) tonnes recommended by the Third Annual CRFM Scientific Meeting; hence, the stock is likely to be over fished. The status of the stock appears to have worsened compared to the assessment conducted in 2006.

3.3 Management Advice

In order to ensure the sustainability of the queen conch fishery and to rebuild the density of the stock over time, the following are recommended:

1. Fully enforce existing regulations, which make it illegal to harvest immature conch and which allow for a closed season by:
   - Developing and implementing a National Plan of Action for IUU[1] Fishing.
   - Improving on monitoring, control and surveillance capabilities of the enforcement agencies (Department of Fisheries, Saint Lucia Royal Police Force, Coast guard etc.)

2. Establish and enforce the total allowable catch (harvest quota), which, initially, should not be beyond 30 tonnes per year. The reduction of the catch should speed recovery and reduce the risk of further over fishing.

3. Limit entry into the fishery to traditional fishers, in order to control the fishing effort.

3.4 Statistics and Research Recommendations

3.4.1 Data Quality

- The catch and effort data appear generally very reliable.

- The data were not sufficient to conduct the assessment alone; therefore, in addition to catch and effort data from Saint Lucia, information from Jamaica and the Turks and Caicos was used to estimate key values used in the assessment for Saint Lucia.

- There is a need for the collection of additional data on the density and habitat of conch in Saint Lucia to improve estimates of stock status.

[1] IUU - illegal, unreported and unregulated fishing

- The socioeconomic importance of the conch fishery needs to be assessed because it is likely to influence the implementation of the harvest quota, the entry limit into the fishery and a closed season.

3.4.2 Research

- As suggested by the Third Annual CRFM Scientific Meeting, the inclusion of the following data may improve the reliability of the assessment:
  - Catch and effort
  - Abundance /Density survey
  - Habitat mapping (both fished and non fished areas)

- At present, with funding from the European Union Special Framework of Assistance (2003) a conch assessment project is being conducted to gather data on the density of conch in fished areas and the socioeconomic importance of the conch fishery in Saint Lucia.

- The collection of catch and effort data on the conch fishery should be continued to include depth estimates.

- In the medium term, the conch habitats in Saint Lucia should be mapped.

- In the long term, it is recommended that data on the density of conch in Saint Lucia be conducted regularly as to estimate better the existing biomass and the rate of increase of the conch stock in Saint Lucia.

- With the current location of the conch stock in Saint Lucia, it would be difficult to conduct density surveys and habitat mapping in areas which are not currently fished because the depth becomes a limiting factor.

3.5 Stock Assessment Summary

- The assessment of the conch stock in Saint Lucia was updated using the Schaefer surplus-yield model to include catch and effort data collected in 2007.

- Catch per unit effort (CPUE)[2] was used as an index of stock abundance. We attempted to use *crew hours at sea* as a measure of effort to calculate the CPUE index. However, an assessment of the linearity of the relationship revealed that it was, in fact, not appropriate. The measure of effort used was *number of used tanks*.

- The CPUE index appears to be declining each year (Figure 1). The CPUE for 2007 was estimated at 11.13: this is an indication that for every one unit of effort (SCUBA tank) the fishers are catching approximately 11 pounds (5 kg) of conch.

[2] **CPUE** is the quantity of fish caught (in number or in weight) with one standard unit of fishing effort.

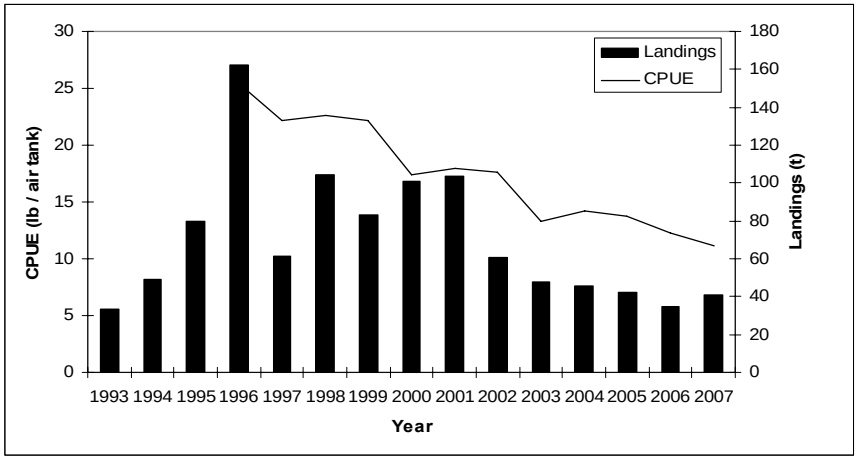


Figure 1. The CPUE abundance index shows a continuous decline since 1996, suggesting that the stock abundance has declined over this period. The catch time series 1993-2001 has some uncertainty as to the recorded data (see Section 1.4.1).

- Bayesian Statistics and the Monte Carlo (rejection algorithm) methods were used to estimate Maximum Sustainable Yield (MSY)[3], replacement yield[4], current biomass relative to biomass at MSY, and current fishing mortality relative to fishing mortality at MSY.

- The results indicate that the current biomass of the stock is below the biomass of the stock at MSY (Figure 2) and the current catch of 41.1 tons is likely to result in over fishing.

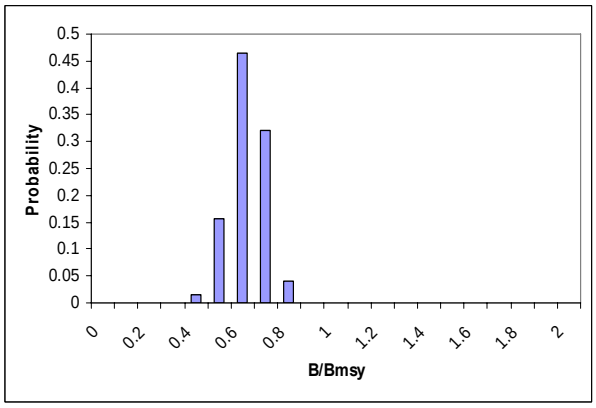


Figure 2 There is a high probability that the current biomass of the stock is below the MSY target of 1 ($B/B_{MSY} < 1$).

[3] **Maximum Sustainable Yield** or **MSY** is, theoretically, the largest yield/catch that can be taken from a species' stock over an indefinite period. Any yield greater than MSY is thought to be unsustainable.
[4] **Replacement Yield** is the largest yield/catch than can be taken from a species stock when the current biomass is below the biomass at MSY.

3.6 Special Comments

- The Bayesian priors[5] may be estimated to be too high because values used in their calculation are believed to be higher than what really exist. That is, there is concern that comparing bank areas without taking account of the local habitat leads to greater uncertainty in the assessment.
- Improved prior information, based on actual conch habitat areas in St. Lucia, compared with use of data from TCI and Jamaica, is expected to increase the accuracy of the assessment.

- There is a need for management to apply measures such that the CPUE for this fishery increases. This, as a by-product, would also lead to better parameter estimates.

3.7 Policy Summary

The policy of the Government of Saint Lucia is the commitment to the conservation and sustainable use of its fisheries resources for the long-term benefit of the people of Saint Lucia (Department of Fisheries, 2006).

The overall goals for fisheries management are:

- Maintain or restore populations of marine species at levels that can produce the optimal sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among various species.

- Preserve rare and fragile ecosystems, as well as habitats and other ecologically sensitive areas, especially coral reef ecosystems, estuaries, mangroves, seagrass beds, and other spawning and nursery areas.

- Protect and restore endangered marine and freshwater species.

- Prevent the use of destructive fishing gear and methods.

- Take into account traditional knowledge and interests of local communities, small-scale artisanal fisheries and indigenous people in development and management.

- Develop and increase the potential of living marine resources to meet human nutritional needs, as well as social, cultural, economic and development goals in a manner which would ensure sustainable use of the resources.

- Ensure effective monitoring and enforcement with respect to fishing and other aquatic resource uses.

- Promote relevant scientific research with respect to fisheries resources.

- Ensure that the fishing industry is integrated into the policy and decision-making process concerning fisheries and coastal zone management.

[5] A prior is a probability distribution for a variable with an uncertain quantity. The value assigned is based on probability.

- Promote a collaborative approach to freshwater and marine management.

- Co-operate with other nations in the management of shared and highly migratory fish stocks.

3.8 References

Department of Fisheries (2006). *Draft Plan for the Management the Fisheries of Saint Lucia* Department of Fisheries Saint Lucia.

4. The Reef and Slope Fishery of St. Kitts and Nevis 2008 (Brief Overview Only)

Rapporteur: Kishmo Clarke

4.1 Management Objectives

The main management objectives for St. Kitts and Nevis are:

- To rebuild the reef and bank/deep slope fish stocks.
- To stabilize the net incomes of the operators in the fishery.
- To include as many of the existing participants in the fishery as is possible given the biological, ecological and economic objectives listed above.
- To promote co-management

In addition, management will focus on:

- Reduction in the catch of juveniles
- Regulation enforcement and conservation measures

4.2 Status of Stocks

The status of the stocks is unknown. However, declines in average fish size and algae overgrowth of some reefs suggest that shallow shelf fishes are over-exploited in most areas. A precautionary approach is warranted since fishing effort cannot be quantified, and some species are extremely vulnerable to over exploitation when these aggregate for spawning.

The fishing effort by spear fishers has increased over the past few years; the catches of these spear fishers have also increased while the catches of trap fishers have decreased. The catches of spear fishers are dominated by the parrotfishes (Scaridae), which constitutes one of the most important and heterogeneous groups of fishes and plays a very important role in this highly specialized ecosystem.

4.3 Management Advice

At present the data available are inadequate to make recommendations. The fisheries department should set up a data collection program at the Basseterre Fisheries Complex over the next year. Data such as catch and effort by species, fork length, total length and weight should be collected. This would enable some analysis to be done at the next meeting that could determine if it will be possible to have size limits included in our management plan.

4.4 Statistics and Research Recommendations

4.4.1. Data Quality

The fisheries department has two data collectors currently employed who collect catch and effort data at each landing site on a daily basis. Most of the spear fishers land their catch at one landing site and most of the landings are sold to the government complex there. Unfortunately, species are grouped by price and sold by weight, and so catch by species data are unavailable.

4.4.2. Research

Determine catch rates by examination of data on catch (lbs.) and effort (boat days and Man power)

- Improve understanding of size composition of catches by examination of data on fish size

4.5 Stock Assessment Summary

No stock assessment was conducted for this fishery.

4.6 Special Comments

None.

4.7 Policy Summary

The government of St. Kitts and Nevis is committed to the conservation and sustainable use of fisheries resources for the benefit of the people of St. Kitts and Nevis.

5. The Reef and Slope fishery of the Turks and Caicos Islands 2008/2009 Fishing Season

Rapporteur: Kathy Lockhart

5.1 Management Objectives

The overall management objective is to promote sustainable development of the fin-fish fisheries resources by adopting cautious conservation and management measures in conjunction with the 'Guidelines on the precautionary principle' (FAO *Technical guidelines for Responsible Fisheries.* No.2. Rome, FAO. 1996). More specifically, the main management objectives are:

a. Maintain high stock levels,
b. Develop management guidelines for the conservation and sustainable exploitation of the fishery,
c. Improve our understanding and knowledge of the stocks.

5.2 Status of Stocks

The reef and slope fishery resources also known as "finfish" in the Turks and Caicos Islands (TCI) are believed to be under-utilised, but healthy enough for commercial exploitation. Ninnes, 1990 as cited by TCI Government Department of Environment and Coastal Resources (2004) reported a potential yield of 70-140 kg/km of shelf perimeter of the Turks and Caicos banks (Caicos Bank, Turks Bank and Mouchoir Bank).

The belief of an under-utilised fishery is based on a poor catch history. Finfish are sold directly to hotels, restaurants and fish markets, which cater for local consumption. However, some of the catch is sold to processing facilities who report these data to fisheries department. The catch is not exported, but is sold locally to restaurants and hotels. In previous attempts, the TCI Government has been unsuccessful in collecting individual measurements of catch and effort data. In 2006, a program to collect individual measurements of finfish was started to support monitoring and assessment of these resources.

5.3 Management Advice

In order for management to meet the objectives of a sustainable development of the fin-fish fisheries, the TCI government must look to adopt cautious management measures (Department of Environment and Coastal Resources, 2006). The Turks and Caicos Islands are in a fortunate position that data collection can be started before these species reach full-exploitation. A better understanding and knowledge of the stocks requires that more data be collected on the catch and effort directed at these species, as well as individual fish measurements (total length, fork length and weight).

With the available information, the TCI can look at the potential of setting a minimum size for capture (U.S. Fish and Wildlife, 2008). Because the fishery is multi-species, there should be more than one minimum size. Based on currently available scientific information, the following minimum sizes are recommended:

- Minimum size for grouper set at 50 cm fork length (International reference range from 48-51 cm).
- Minimum size for snapper at 35 cm fork length (International reference range 31-61 cm).

5.4 Statistics and Research Recommendations

5.4.1. Data Quality

In 2006, catch and effort data commenced at the local processing plants. Individual measurements are also being collected from the processing facilities, local market buyers and local fishermen. The current data are limited, which does not allow for a full stock assessment to be conducted.

5.4.2. Research

There is a need to improve and enhance current data collection, specifically:

- Collect individual measurements of fin-fish: species, total length, fork length, and, where possible and appropriate, weight, sex, and eye diameter
- Collect catch (lbs) and effort (boat days and man power) from processing facilities and at dock side, to improve coverage and hence understanding of fishing activities.
- Determine the minimum size at maturity for fin-fish species.

5.5 Stock Assessment Summary

A full stock assessment of the reef and slope fishery was not possible because of the limited data. The objective of the present analysis of the data was to determine if a minimum size could be proposed, specific to the fishery. This involved producing a frequency of the available fork length sizes and comparing it to an established proposed minimum fork length based on maturity of the various species. The analysis provides management with an estimate of the impact of different minimum sizes on both the species conservation and the short-term catches (Figures 1 and 2).

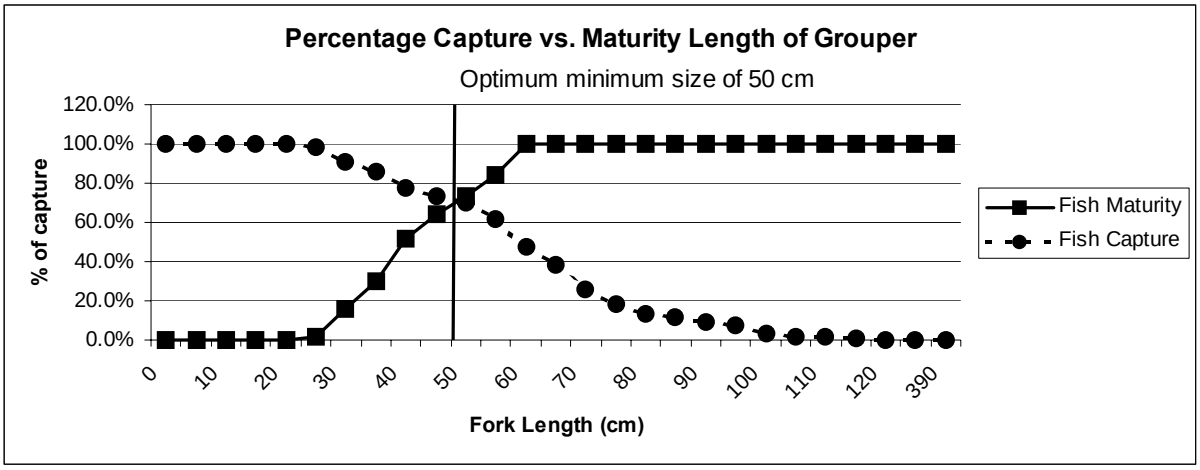


Figure 1. Optimum length for cost and benefit of Grouper.

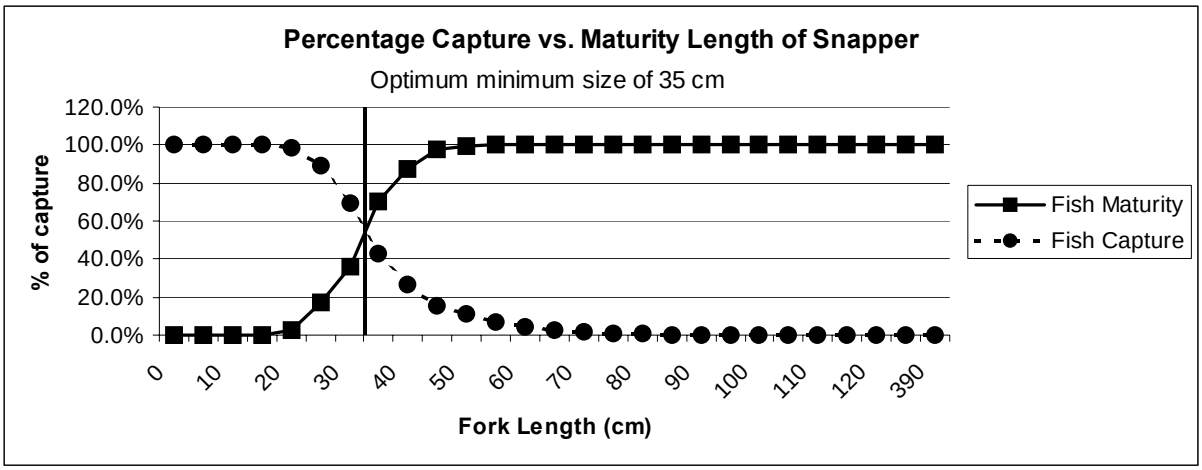


Figure 2. Optimum length for cost and benefit of snapper.

5.6 Special Comments

None.

5.7 Policy Summary

Although protection of fisheries resources is implicit in the overall development strategy of the TCI, the importance of the fisheries sector in present and future development and the fragility of the resource base warrant the establishment of a specific policy for the industry.

The Fisheries Policy aims to ensure the sustainable use of the living marine resources and ecosystems through increased cooperation and collaboration with all the stakeholders for the improved welfare of the people of the TCI.

Inclusive to the policy is the ability to promote sustainable development of the fin-fish fisheries resources by adopting cautious conservation and management measures. Developing specific management measures/ regulations, such as minimum size, can assist in the conservation and sustainable exploitation of the fishery.

5.8 References

Department of Environment and Coastal Resources (2006). Fisheries Management Plan 2005-2010, Turks and Caicos Island Government. Executive Council approved Internal Document.

FAO (1996). Precautionary Approach to Capture Fisheries and Species Introduction. *Technical Guidelines for Responsible Fisheries.* No.2. Rome, FAO. 1996

Fishbase (2008). Length at Maturity for Fin-fish species. Internet- www.fishbase.org

School for Field Studies, Center for Marine Resource Studies (2006-2008). Fin-Fish Individual Species Data. Unpublished.

TCI Government Department of Environment and Coastal Resource (2004) Fourth Draft Policy for the Management and Development of the Fisheries Sector. Internet- http://www.environment.tc/fisheries/management/docs/4rd%20Draft%20TCIFisheries%20PolicyWCleveauxTCP311204.doc

U.S. Fish and Wildlife. (2008). Wildlife and Fisheries: Chapter VI Fishery conservation and management, National Oceanic and Atmospheric Administration, Department of commerce,

Part 622 Fisheries of the Caribbean, Gulf and South Atlantic, Subpart C. Management Measurers, Sec 622.37 size Limits. pgs 227-228.

II. REPORT OF THE SHRIMP AND GROUNDFISH RESOURCE WORKING GROUP (SGWG)

Chairperson: Suzuette Soomai, Trinidad and Tobago
Rapporteurs: Colletta Derrell, Guyana (Shrimp)
Ranjitsing Soekhradj, Suriname (Shrimp)
Suzuette Soomai, Trinidad and Tobago (Groundfish)
Consultants: John Hoenig (Virginia Marine Institute of Science)
Observer: Nadine Hoenig (USA)

A. OVERVIEW

1. Review of assessments conducted in 2007 and inter-sessional activities

At the 3rd CRFM Scientific Meeting in 2007, assessments were completed for three species of groundfish fished in Guyana: sea trout (*Cynoscion virescens*), bangamary (*Macrodon ancylodon)*, butterfish *(Nebris microps*). With regard to shrimp, one assessment was completed for the seabob (*Xiphopenaeus kroyerii)* fishery in Guyana and one assessment was completed for the penaeid shrimp fishery in Suriname using data for *F. subtilis.*

At the 2007 meeting it was recommended that the seabob fishery in Guyana and Suriname should be studied at the 2008 meeting based on morphometric data which should be collected during the inter-sessional period. One of the major goals was to evaluate whether the population dynamics of seabob in Guyana and Suriname were similar. If this was seen to be true there would be advantages to conducting a joint assessment; otherwise, the assessments for both countries would be conducted separately. A list of the types of data to be collected and a standard format for data files were developed to facilitate easy interpretation of catch, effort and biological data at future meetings. Of special note is that an offshore industrial fishing company, with plants in both Suriname and Guyana, has initiated a privately funded project to collect morphometric data for the seabob and the respective Fisheries Departments have been invited to participate in the analysis of the fishery.

2. Review of Fisheries to be Assessed at the 2008 meeting

At this 2008 workshop, two stock assessments for shrimp and one stock assessment for groundfish were completed. Guyana and Suriname each conducted a separate assessment for the seabob (*Xiphopenaeus kroyerii*) using data from their respective national fleets. Results from the morphometric data collection programmes were compared but the data were still of limited quantity. Trinidad and Tobago conducted an assessment of the whitemouth croaker (*Micropogonias furnieri*) exploited by local fleets. Guyana did not complete proposed assessments for groundfish since the species rapporteur for groundfish was unable to attend this meeting.

3. Recommendations

Specific recommendations with regard to the seabob and croaker are given in the respective assessment reports which were completed at this meeting. The following general recommendations are however considered to be of high priority and will impact greatly on the progress of work within the SGWG.

- The Working Group can progress more efficiently if training and/or assistance in data preparation can be completed in the inter-sessional period. It was recommended that new species rapporteurs within the working group can benefit from short-term, in-house training from more experienced species rapporteurs within the SGWG or other species working groups of the scientific meeting. It is recommended that the CRFM can assist countries with this activity through facilitating attachments and technical co-operation (TCDC) arrangements between countries.
- It is recommended that profiles for the shrimp and groundfish species of main commercial importance, which were initially listed as priority species for assessment, should be completed in the inter-sessional period. These profiles will compile bibliographic information, and extract relevant information on the distribution and biology of the various species being assessed by the SGWG. These profiles would also capture relevant social and economic information for the shrimp and groundfish species in the region. This will serve to better inform consultants and species rapporteurs and ensure that assessments proceed with the best available information.
- It is proposed that attempts can be made to conduct short national and/or bilateral meetings to discuss and review data collection. These activities should be given priority within national work programs and will facilitate the progress of inter-sessional activities. The Methods WG meetings have previously provided the opportunity for countries of the SGWG and consultants to overview progress of work.
- The species being assessed under this Working Group are shared by the countries on the Brazil-Guianas Continental Shelf. Many of these countries are not members of the CRFM (Venezuela, French Guyana, Brazil). However there is an urgent need to include data from the relevant countries in future assessments for shrimp and groundfish species. The Working Group aims to conduct joint analyses for shrimp and groundfish between and among countries on the Brazil-Guianas continental shelf. It is therefore recommended that CRFM enter into arrangements with these other states to facilitate their participation and exchange of data at future Scientific Meetings, as necessary, and during the inter-sessional period. It is also recommended that consideration be given to networking with the FAO/WECAFC ad hoc Working Group on Shrimp and Groundfish Resources of the Brazil-Guianas Continental Shelf. This recommendation was previously recorded at the 2006 and 2007 scientific meetings but is reiterated here since it remains relevant.

4. Proposed assessments for 2009

The participating countries within the SGWG were not able to make final decisions on the species to be assessed at the next Scientific Meeting in 2009. However both Suriname and Guyana are interested in continuing assessments for the seabob given the economic importance of the fishery and the strong involvement of the industry in management and data collection.

Specific activities with regard to shrimp assessments:

Suriname: Seabob

More length data and morphometric data will be collected in the inter-sessional period to be able to get better growth parameters. Suriname has VMS (vessel monitoring system) data which may

be a source of effort data (hours fished). Technical assistance may be required in extracting these data.
Guyana: *Xiphopenaeus kroyerii* (seabob)
Attempts will be made to sample by market categories to be able to interpret data received by the processing plants which are recorded according to market categories.
Trinidad and Tobago: Assessment priorities are to be determined during inter-sessional period (*Penaeus spp, X. kroyerii*)

Specific activities for groundfish assessments:
Suriname: Assessment priorities are to be determined during inter-sessional period
Guyana: *Cynoscion acoupa* (acoupa weakfish)
Trinidad and Tobago: Assessment priorities are to be determined during inter-sessional period
A production model for whitemouth croaker is suggested for future analysis of the species. This can however be done during the inter-sessional period based on further refinements to the catch and effort database.

1. Guyana Seabob (*Xiphopenaeus kroyeri*) Fishery

Rapporteur: Colletta Derrell
Consultant: Dr. John Hoenig
Observer: Nadine Hoenig

1.1 Management Objectives

The Draft Fisheries Management Plan of Guyana states that the objectives for seabob management are:

1. To maintain the seabob stock at all times above 50% of its mean unexploited level.
2. To maintain all non-target species, associated and dependent species above 50% of their mean biomass levels in the absence of fishing activities.
3. To stabilise the net incomes of the operators in the fishery at a level above the national minimum desired income.
4. To include as many of the existing participants in the fishery as is possible given the biological, ecological, and economic objectives.

1.2 Status of Stocks

The current data are not sufficient to fully determine the status of the stock. However, there has been a concern that the seabob fishery is fully- to over-exploited. It was noted in a past assessment that the mean size of animals has decreased over the years suggesting increasing fishing mortality. In the 2007 assessment, the monthly mean lengths did not continue the trend of decline but were stable at the low end of the observed range of mean lengths. It was not possible to continue this analysis this year.

1.3 Management Advice

Currently, there is a closed season from September to October which has been decided on by members of the trawler association since 2003. The 2007 analysis suggested that the current closed season occurs at the least effective time for reducing fishing mortality and for protecting recruitment. It was recommended, based on the best available information, that the closed season be placed in May to protect the pulse of recruitment until it reaches the next market category in June. Further work needs to be done on growth rates and patterns of recruitment to verify and refine this advice. A new program of collecting biological data including length frequencies, maturity and catch rate data was initiated in December 2007, and it should be continued. However, these data are not available at present so the best information continues to be that the closure should be in May.

1.4 Statistics and Research Recommendations

1.4.1 Data Quality

1. Collection of length frequency data every month needs to be continued to be able to determine seasonal changes in size, sex and maturity compositions, and to determine growth rates. The landings by market category are too broad to enable determination of growth, recruitment patterns and appropriate placement of the closed season.

2. Data need to be recorded in a standardized form to ensure that it is easily interpreted and of sound quality. There is a need to revise the format of the data sheets used for recording catch and effort data. A standard spreadsheet or database for computerizing catch and effort and length data needs to be developed.

3. The landings and effort data from the processing plant need to be computerized for inclusion into future analyses. The effort data are not well documented and/or sparse, which makes evaluating impacts of the closed seasons difficult.

4. Morphometric data being collected by the processing plants are critical for the 2009 assessment.

1.4.2 Research

1. The observer program should be reinstated in order to monitor catch onboard vessels to get catch rate information, length-frequency data, and geographic information.

2. Economic data such as price per pound for the various market categories should be documented over the course of a year.

3. Analyses of length frequencies to determine growth; catch rates to determine abundance, and landings data need to be refined once the additional data specified in section 1.4.1 have been obtained. This will lead to improved understanding of the role of closed seasons in fisheries management.

4. If a major reduction in fishing effort occurs (due to high fuel prices or other factors) there will be an important opportunity to learn how the stock responds to changing fishing effort. To learn from such an opportunity it is essential that the fishery be monitored, including catch rates, fishing locations and size composition data.

1.4.3 Management

Further scientific studies on the seabob fishery need to be conducted to determine the most appropriate period in which to implement a closed season. The results of these studies will be incorporated into national regulations and should be included in the granting of licenses. Plans should be made to document the effects of a major reduction in fishing effort (should one occur) in order to learn about the response of the stock to changing fishing effort.

1.5 Stock Assessment Summary

In the corresponding 2007 assessment report, it was noted that there was a peak in recruitment in May (Figure 1) and this peak could be followed over time as the recruits grew into successively larger market categories. Thus, it was suggested that a closed season be placed in May to protect the recruitment until the shrimp achieved a larger and more valuable size and thus increased the value of the landings.

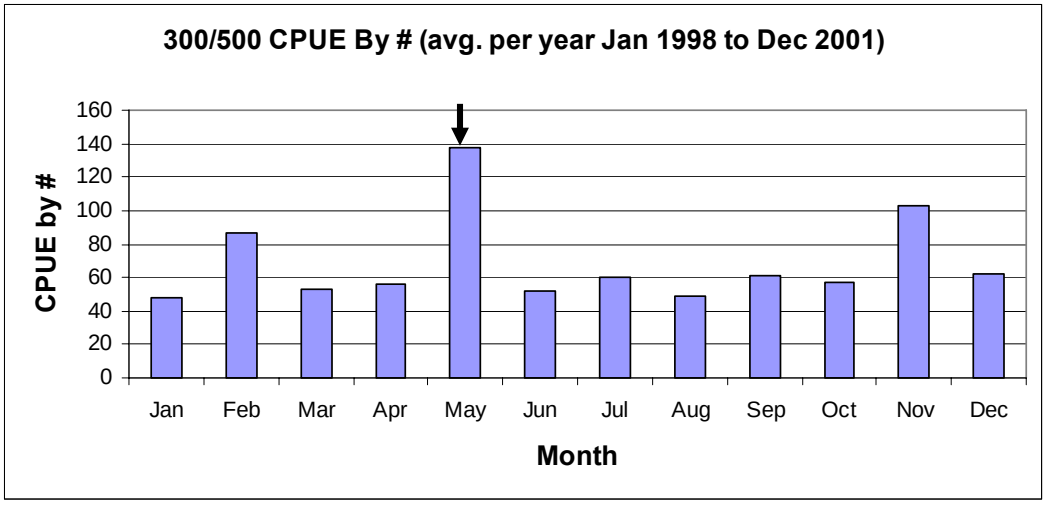


Figure 1. Trends in CPUE by number for commercial size 300-500 tails/lb by month of the year.

The suggestion in last year's report was based on uncertain growth and recruitment information from market category data. It was suggested that detailed biological data should be collected, and such a program began in December 2007. It is too soon to estimate growth rates and recruitment patterns from this program.

Examination of size-maturity relationships is also important because it sheds light on how harvesting shrimp affects spawning biomass, and because seasonal changes in maturity can provide insight into recruitment patterns over time of the year. A maturity curve was generated from the December biological sampling data (Figure 2).

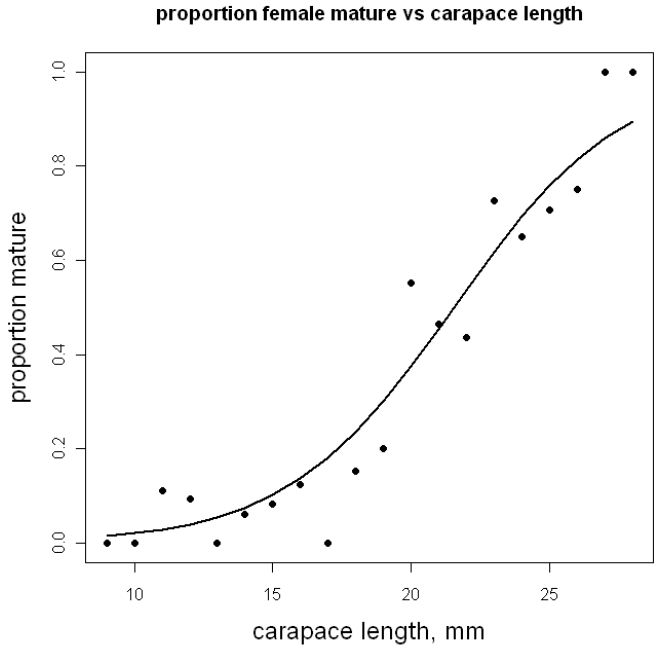


Figure 2. Logistic curve showing proportion mature versus carapace length.

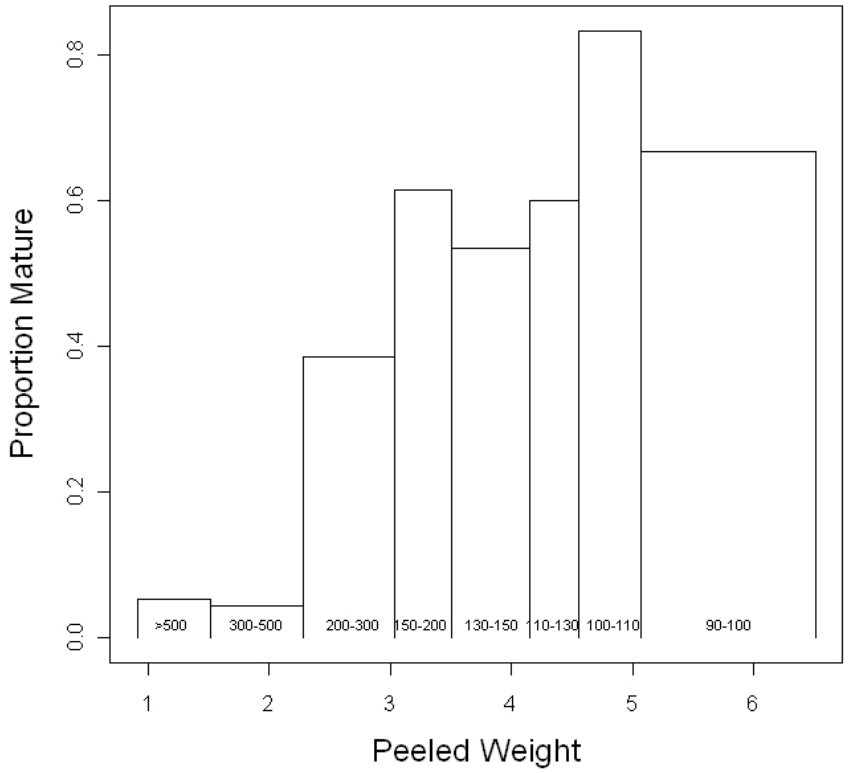


Figure 3. Proportion of female Seabob that are mature by weight (g). The weight bins correspond to market categories (tails per pound), as marked.

Figure 3 shows that the three smallest market categories harvest mostly immature Seabob. A number of analyses were done to develop conversion factors from one measurement to another.

1.6 Special Comments

Data on length frequency and growth parameters need to be collected to ascertain which month is best for the closed season. From the current data, May is the suggested month. This would protect the pulse of smaller recruits for the next month.

1.7 Policy Summary

To manage, regulate and promote the sustainable utilization of Guyana's fishery resources for the benefit and safety of all stakeholders in the sector and the nation as a whole.

1.8 References

Fisheries Department (2001). Guyana Report. In *Fisheries Management Data System Terminal Workshop "The Way Forward... A Review and Planning Session*, 25-28 November, 2000, Castries, St. Lucia. Fisheries Department, Guyana.

2. The seabob (*Xiphopenaeus kroyeri*) fishery of Suriname

Rapporteur: Ranjitsing Soekhradj
Consultant: John Hoenig
Observer: Nadine Hoenig

2.1 Management Objectives

- This fishery sustains a large number of families, and is also one of the few profitable occupations in some rural areas. Preservation of this source of income, and of the living standards of the population involved, are important objectives.
- The way fishermen themselves are managing their activities, adjusting effort in accordance with expected (net) benefits, can be seen as a way of optimising economic yield.
- Fresh and dried shrimp are traditional commodities for the local market, and also an indispensable contributor to the domestic protein supply.
- Frozen seabob flesh, produced by the seabob factory, is exported and dried shrimp might have export potential (not demonstrated yet). Generation of foreign currency must therefore be taken into account in management.

2.2 Status of the Stock

In a previous assessment of this stock (Babb-Echteld and Medley 2004), it was concluded that the status of the seabob stock was uncertain, but that the yield per recruit could be increased by reducing fishing effort. The current assessment indicates that effort has increased by approximately 2/3 (from 3000 to 5000 days at sea) over the period 1998 to 2006 (Figure 1). Landings have also increased so that catch rate has remained almost constant (Figures 2 and 3). There does not appear to be any cause for alarm; however, the suggestion that yield per recruit could be increased by decreasing effort remains a consideration.

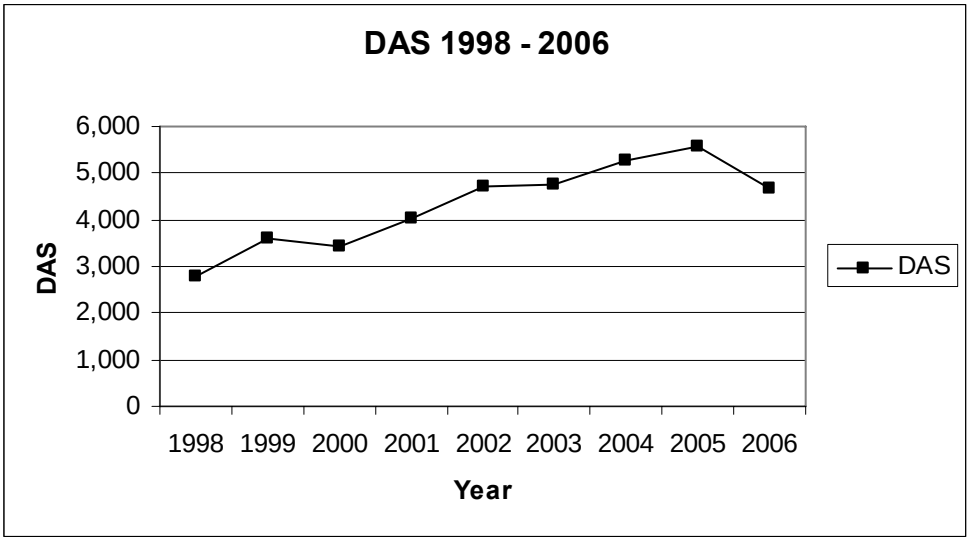


Figure 1. Fishing effort in days at sea (DAS) versus year.

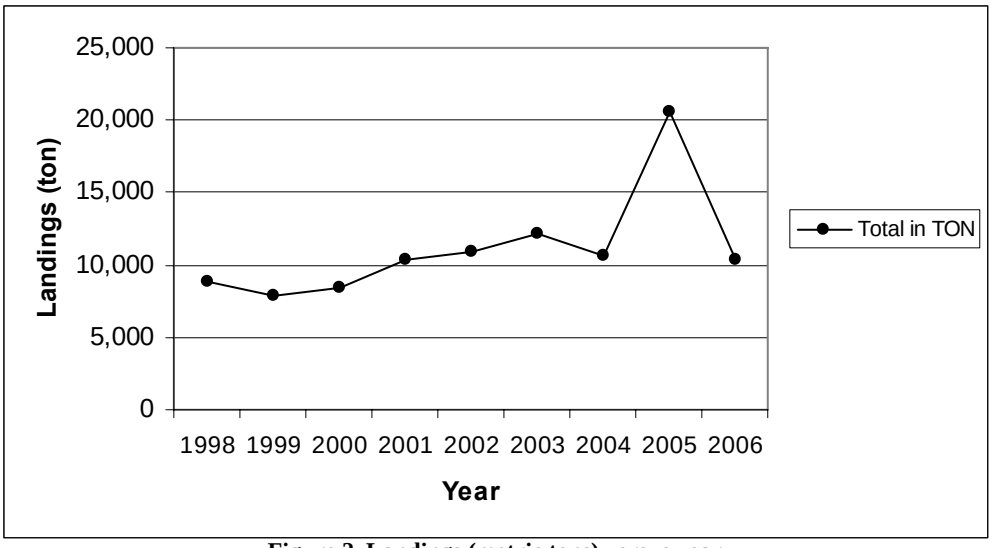


Figure 2. Landings (metric tons) versus year.

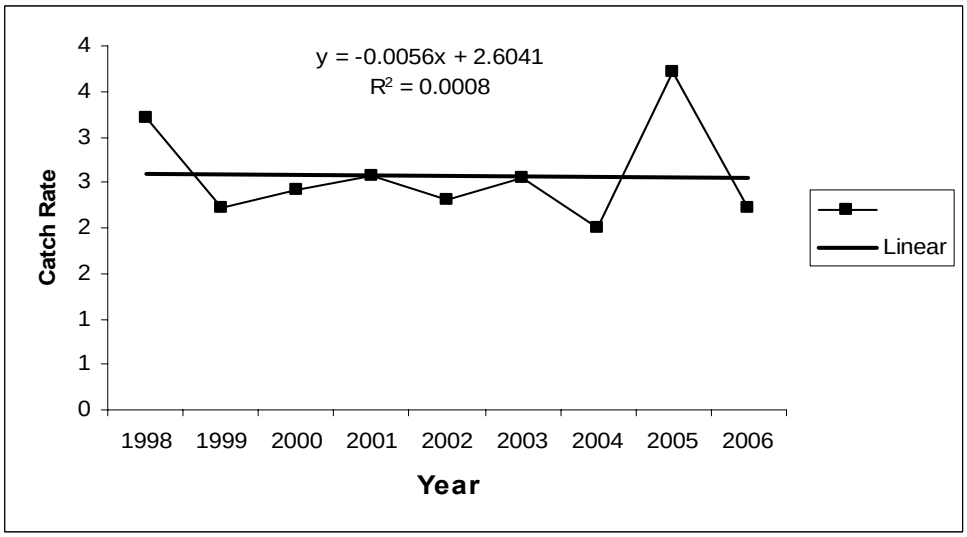


Figure 3. Catch rate (catch/effort) versus year, with linear regression line.

2.3 Management advice

Examination of landings data by market category by month failed to show peaks of recruitment and growth of cohorts over time. Similarly, examination of length-frequency sampling data over a six month period did not shed light on growth and recruitment. It may be that seabob spawn and recruit throughout the year, in which case a closed season may not be an effective tool for increasing yield. However, continued examination of biological data (lengths, sexes, maturity) and fishery data (catch rates, effort) over a period of at least one full year are advisable. This is because information on growth, reproduction and recruitment are needed to assess the stock and evaluate management options.

To address the loss of yield indicated by the yield per recruit analysis, it is necessary to reduce fishing effort or to harvest shrimp at larger sizes. A seasonal closure will reduce effort. This is especially effective if there are clear pulses of recruitment that can be protected. However, a time of year has not been identified for which a closed season will protect small, rapidly growing shrimp. No particular time of year can be recommended as the best time for a closure, based on the limited data collected to date. An option for increasing yield per recruit is to require a larger mesh size.

Data collection under the newly implemented sampling programme conducted by the industry in the processing plants should be continued. However, these data have not been made available for stock assessment through the CRFM and this limits what can be achieved. It is advisable to analyze the vessel monitoring system (VMS) data to quantify fishing effort and determine geographical patterns in effort.

Progress in determining the relationships between fishing effort, yield and recruitment would be greatly enhanced if observations could be made at fishing levels that differ from what has already been observed. For example, if fuel prices or other factors were to cause a reduction in fishing effort there would be an excellent opportunity to observe the response of the stock. However, the ability to gain insights into the stock dynamics is contingent on data being collected to document the nature of the catch before, during and after changes in fishing effort.

2.4 Statistics and Research Recommendations

2.4.1 Data Quality

Catch and effort data were available from 1998 to 2006. But the catch data for the different market categories were available from 2003 to 2006.

Length frequency and maturity data were available from June 2006 to December 2006. Thus, observations are not available for the first half of the year, and observations have not been made over years to provide information on year-to-year variability.

Detailed biological data (lengths, weights, maturity) collected by the industry in 2007 and 2008 have not been made available and consequently could not be examined for this report.

2.4.2 Research

More detailed information and data should be obtained on the life history of this species. Thus, length measurements of the different size categories, observations on unsorted catches, information on factors affecting productivity and price data should be obtained.

Growth parameters need to be estimated to improve assessment of the seabob stock. Growth parameters can be derived from length frequencies. Length data is the basis for construction of many population assessment models and for evaluating the effect of closed seasons.

2.5 Stock Assessment Summary

Landings, effort (days at sea) and catch rate (i.e., landings divided by days at sea) were examined for temporal trends. Both effort and landings have been increasing over the time series. Thus, the catch rate has remained quite constant over time.

Graphs of catch in number per unit of effort versus year were prepared for each market category. The goal was to examine patterns of recruitment over the year and to track growth of cohorts to create a growth curve. However, the patterns seen in this kind of analysis for Guyana seabob (Derrell *et al*., 2007) were not seen in the Suriname data. Length frequency data from monthly samples taken from June to December of 2006 were also examined and, again, they did not show the patterns seen in the Guyana data. It may be that recruitment in Suriname occurs throughout the year rather than seasonally. Further collection of data is essential because recruitment patterns are important for establishing closed seasons, and improved estimates of growth are needed for yield per recruit analysis (Babb-Echteld and Medley, 2004).

Maturity at length data were examined to try to establish maturity curves. Logistic curves were fitted to the data for each month but the fits were not good, with maturity rising only slowly with size and with many large animals being immature. The significance of the maturing and mature (green vein) conditions is not clear and needs investigation. It may be that signs of maturity are actually signs of imminent spawning and that between spawning events a mature female may appear immature.

2.6 Special Comments

To benefit from a joint assessment of the seabob fishery, Suriname and Guyana must have similar programs for collecting biological data. Thus, sampling programs should be coordinated by the two fisheries departments or through the CRFM or FAO.

2.7 Policy Summary

The role of the fisheries sector could be expressed as follows:

- Provides jobs (primary and secondary level). Creates more qualitative job opportunities and reasonable incomes. Diversity of the sector is also important
- Creates a balance of payment through export of fish and shrimp products
- Contributes to the GDP of the country
- Contributes to the national budget through fees and income tax.

The main policy is to manage the fish and shrimp resources in a sustainable manner to generate revenues on a long term basis.

2.8 References

Babb-Echteld, Y. and Medley, P. (2004). Suriname Seabob Fishery Report. In *Report on the shrimp and groundfish workshops conducted in Guyana (November 2003), Belize (December 2003) and Trinidad (January 2004)* (P. Medley). pp 61-67. Unpublished report submitted to Caribbean Regional Fisheries Mechanism, Belize City, Belize.

Derrell, C., J. Hoenig & Waterhouse, L. (2007). Guyana Seabob (*Xiphopenaeus kroyeri*) In CRFM Fishery Report – 2007 Volume 1. Report of Third Annual Scientific Meeting, 17-26 July 2007, Kingstown, St. Vincent and the Grenadines (In prep.)

3. Status of the whitemouth croaker (*Micropogonias furnieri*) resources of Trinidad and Tobago

Rapporteur: Suzuette Soomai
Consultant: Dr. John Hoenig
Observer: Dr. Todd Gedamke
Observer: Nancie Cummings

3.1 Management Objectives

General management objectives for the marine fisheries of Trinidad and Tobago were used as a guide to this assessment (Fisheries Division 2007). Of particular note were the objectives to ensure sustainable management and conservation of fisheries resources; to conduct any related activities consistent with the Precautionary Approach; to conduct research and implementation of related data collection systems; to investigate the impact of fishing activities on non-target species; to realize an economically viable and diverse industry and the achievement of nutritional self-sufficiency and food security.

3.2 Status of Stocks

Results of the assessment suggest a high but sustained fishing mortality rate which exceeds a sustainable level estimated in an earlier assessment of the species. The catch per day of gillnets, lines and trawlers has been stable since 1996, suggesting that the conditions of the fishery have generally remained constant.

3.3 Management Advice

The croaker population appears to be experiencing high levels of fishing mortality. Expansion of the fishery is not advisable. The risk associated with the current open access fishing regime has not been quantified and an analysis of spawning biomass per recruit is advisable. However, a precautionary approach is advisable and fishing effort should be maintained at current levels with a view to reduction in effort over time.

3.4 Statistics and Research Recommendations

3.4.1 Data Quality

This assessment used catch and effort data from 1995 – 2007. Apart from this time period, catch and effort data were collected at landing sites and markets prior to 1996. These records need to be reviewed and computerized since examining a longer time series will result in more informative assessments.

Catch per trip information for *M. furnieri* collected at mainly trawl landing sites is considered an under-estimate since small quantities of *M. furnieri* are aggregated with other bycatch and landed as broad market categories. Alternative data sources for monitoring trawls can be developed to assist with providing better estimates of total catches. A modified observer programme for all fleets, at a level that can be sustained over time, also needs to be established to collect information on the species while at sea.
Additional review of the basic raw fisheries statistics needs to be done in the inter-sessional period to identify and remove data entry and/or recording errors.

A formal sampling protocol for biological data collection in Trinidad and Tobago should be established. For the croaker specifically, length frequency sampling from trawl gear has provided valuable insights; continuing this time series, and possibly increased sampling to cover gillnet and line gears is recommended.

3.4.2 Research

Samples of whitemouth croaker from the landings of all gears need to be aged using hard parts, such as scales or otoliths (ear bones) to better characterize those ages that are being exploited and to develop an improved growth curve. This can be achieved through collaborative work with the Institute of Marine Affairs (IMA).
Collaboration with Venezuela in conducting stock assessments is essential since the whitemouth croaker is considered a shared stock between Trinidad and Tobago and Venezuela.

3.5 Stock Assessment Summary

The analysis utilized catch per unit effort (CPUE) levels for artisanal gillnets (monofilament and multifilament), trawl fleets (artisanal and semi-industrial) and artisanal line gear (banking, palangue, a-la-vive) operating in Trinidad and Tobago waters over the period 1995-2007. It also utilized monthly length frequencies from the artisanal, semi-industrial and industrial trawl fleets for 2005 and 2006 and length data collected in May 2007 from an industrial trawl survey. Biological parameters were obtained from a previous assessment on the whitemouth croaker using data collected over the period 1977-1982 (Manickchand-Heileman and Kenny, 1990).

The assessment involved the estimation of total mortality on the species based on (i) Beverton and Holt (1956, 1957) mean size mortality estimator (ii) length-converted catch-curve analyses (iii) standardized CPUE information.

(i) Mean size Model:
Mean lengths from the trawl samples showed that selection of fish began from a mean length of 32 cm. Natural mortality was taken as 0.36 yr^{-1} from Manickchand-Heileman and Kenny, 1990. Total mortality (Z), which is the sum of fishing mortality (F) and natural mortality (M), was estimated at 0.99 yr^{-1} in 2005 and 0.8 yr^{-1} in 2006.

(ii) Length-converted catch-curve Model:
The length frequency data from the trawl samples were converted to relative age using the growth parameters estimated in Manickchand-Heileman and Kenny, 1990 (K=0.145, Linf=74.1).
The results indicated mortality rates that were similar to the values estimated by the mean length method with a Z value of 0.92 recorded for the year 2005 and Z of 0.68 in 2006.

(iii) Standardized catch per day
An abundance index was developed to evaluate the stock relative abundance. The catch per unit of effort (CPUE) data from the commercial landings database were incorporated into a standardized index of abundance model for unbalanced data using the general linear model (GLM). Observations from 1995 to 2007 were included in the analysis. The final CPUE model included variables for 13 years (1995-2007), 12 months (January-December), 6 gear types (banking, palangue, a-la-vive, artisanal and semi-industrial trawl, multifilament gillnets, monofilament gillnet), and 9 fishing areas (east, north-east, north, north-west, west, south-west,

south, south-east, Venezuela). The results indicated that abundance has not fluctuated greatly over the time series of observations.

There was an observed increase in landings over time. However both the observed and standardized CPUE trend does not reveal large changes in CPUE over the time series (Figure 1a, b, c). The analysis suggests the need for additional review of the raw data to investigate a disparity in the 2003 predicted point. In addition, the confidence intervals are large suggesting large uncertainty associated with the point estimates.

3.6 Special Comments

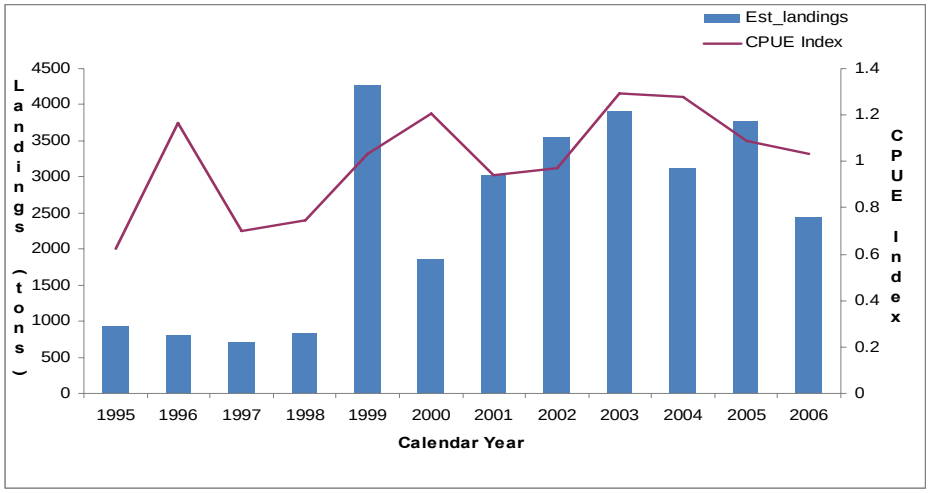
The present assessment includes new information (catch, effort and length data) since earlier assessments conducted for the whitemouth croaker in 1999 and 2000. The results of this current 2008 assessment support the results of previous national and joint assessments conducted by Trinidad and Tobago and Venezuela (see Alio *et al.*, 1999 and Soomai *et al*., 1999).

3.7 Policy Summary

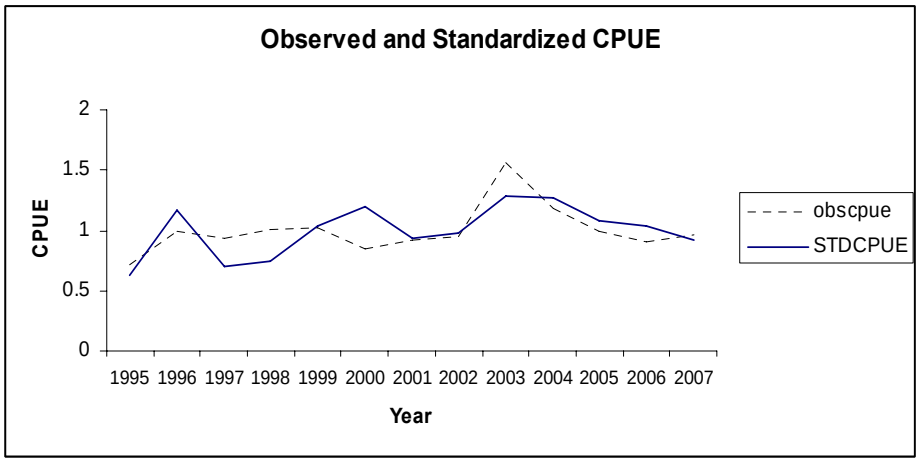
The present assessment is considered one of the implementation strategies in achieving the policy objectives with regard to the promotion of sustainable management listed in the draft Marine Fisheries Policy (Fisheries Division, 2007). These are:

- to promote research on the status of resources, socio-economic performance of the fisheries, gear selectivity and technologies; and
- to ensure that the productive capacity of marine habitats is increased or maintained, such that fish may be harvested for the benefit of present and future generations.

(a)



(b)



(c)

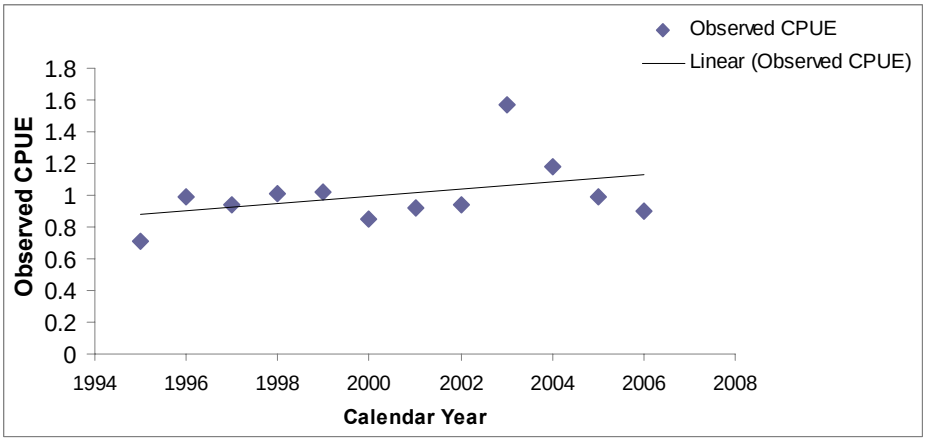


Figure 1. Annual landings and CPUE for croaker obtained from gillnets, trawls and lines for the period 1995 – 2007. (a) Landings of croaker and CPUE index for 1995 - 2006; (b) Observed and standardized CPUE in tonnes per day for 1995 - 2007. (c) Observed CPUE showing a trend line over the period 1995 to 2006.

3.8 References

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V. REPORT OF THE SMALL COASTAL PELAGIC FISH RESOURCE WORKING GROUP (SCPWG)

(Crafton Isaac, Kris Isaacs, John Jeffers, Maren Headley, Susan Singh-Renton)

1. Introduction

1.1 Review of Fisheries

Small coastal pelagic (SCP[6]) fish resources constitute a significant portion of fish landed in the CRFM region. In some instances these resources make up between 30% and 55% of total fishery landings (Jardine and Straker, 2003; Jeffers, pers. comm.). Small coastal pelagic fish resources supply an important source of affordable, high quality proteins for many individuals throughout the region. In the northern Leeward Islands, the high prevalence of ciguatera poisoning, associated with the consumption of reef-associated predator species, has increased dependence on small coastal pelagic fish species as a food source. The population of Montserrat is also heavily dependent on small coastal pelagic fish resources as a food source since many reef fishing sites have been lost due to volcanic activity (Jeffers, pers. comm.).

In recent years, the demand for small coastal pelagic fish species as bait particularly in the longline fishery has increased dramatically. This has drastically decreased the amount of these catches available to the local markets as both food and bait, as higher prices for these species are obtained from the foreign longline vessels. During early 2008, apparent dramatic declines in the availability of small coastal pelagic fish to the local consumption market was believed to be directly linked to the diversion of fish supplies to foreign longline vessels. In a move to alleviate public concerns, fisheries managers in St. Vincent and the Grenadines took a decision to impose a 1-year ban on the sale of these fish as bait to the foreign longline vessels.

Flyingfish resources are included in the scope of this Working Group. A stock assessment of the four-winged flyingfish will be conducted by the WECAFC Ad Hoc Flyingfish Working Group in July 2008. The report of the WECAFC assessment will be reviewed during the next on-site meeting of the Working Group in 2009.

Small coastal pelagic fisheries in the CRFM region have certain characteristics which make collecting data and management a challenge. These characteristics include:

- The widespread subsistence nature of the fisheries which militates against a structured data collection programme;
- The remoteness of some landing sites, with difficult access for data collection;
- The temporal dispersal of fishing operations which makes them difficult to predict;
- The lack of exact knowledge of the marketing and disposition of catches;
- The inability of data collectors to segregate catch by species in some instances.

1.2 Working Objectives

Acknowledging the contribution of small coastal pelagic fisheries to social and economic stability and food security, especially of rural communities in Eastern Caribbean islands, and recognizing

[6] In this context, small coastal pelagic (SCP) fish resources refer to small schooling pelagic fish found in sheltered bays and targeted by coastal gears.

the growing demands for such resources both as food and bait, together with recent concerns about their state of health and the potential imbalance between demand and supply, the Working Group agreed to develop a plan of action for strengthening the information base used to inform the development of management and conservation measures for small coastal pelagic fisheries. The development of the overall action plan was based on addressing the following specific objectives.

- To review trends in the fisheries.
- To review the status of data collection and management activities within CRFM Member States.
- To develop a plan of action to improve data and information systems and management of the fisheries concerned.

In view of the recent one year ban imposed in St. Vincent and the Grenadines in respect of the sale of small coastal pelagic fish as bait to foreign vessels, the Working Group was also asked to make recommendations for a 6-9 month study of the local fishery. The results of this study were required to assist stakeholders and managers to gain a better appreciation of the continued need for/relevance of the ban.

2. Data Collection and Management Activities

To inform a preliminary review of data collection and management activities for small coastal pelagic fisheries within the CRFM region, a questionnaire was prepared and circulated to national representatives to the 2008 CRFM scientific meeting. The information gathered was considered in the development of the action plan to improve data and information systems and management discussed in section 4.0 of this report.

3. Fisheries Trends

Data on the annual landings of small coastal pelagic fish resources were obtained from the FAO database (FAO, 2008). Data for CRFM countries were only available in the database for the following species: Atlantic bonito, Atlantic thread herring, big eye scad, Brazilian sardinella, broad striped anchovy, Carangids, Clupeoids, Crevalle jacks, halfbeaks, Atlantic black skipjacks, needlefishes, rainbow runner, scads, scaled sardines and snook (*Robalo*). In several instances, the catch data showed marked fluctuations from year to year, which may likely have been mainly due to inconsistencies in accuracy and levels of reporting, not only at the individual species level, but also instances where more than one species were lumped together for reporting purposes. Nonetheless, the catch data were useful in providing an indication of existing fisheries for the various species, and afforded a preliminary appreciation of the relative importance of targeted species to the various reporting countries.

4. Action Plan to Improve Data and Information Systems and Management

In order to ensure sustainability of these fisheries, given their increasing importance both as a source of food and bait, it is necessary to improve overall understanding of this fishery. The following individuals were invited to join in the discussions for developing the action plan: Elizabeth Mohammed (Trinidad & Tobago); Christopher Parker (Barbados); Nancie Cummings (NMFS, SEFSC); Todd Gedamke (NMFS, SEFSC); Bruce Lauckner (UWI, St. Augustine).
The discussion focused primarily on two major issues:

1. Challenges experienced with data collection/sampling of these fisheries and possible solutions;

2. The need for St. Vincent and the Grenadines to conduct an evaluation of its beach seine fishery before the expiration of the one year national ban on the sale of bait to foreign longliners. This one year ban was imposed in April 2008. In the absence of a regular and consistent sampling programme, this evaluation was considered necessary to provide updated management advice.

4.1 Data collection – challenges

Certain commonalities among small coastal pelagic fisheries in the CRFM region were identified:

- The complexity of fishing and post-harvest activities, including the extensiveness and difficulty of accessing fishing areas/ landing sites, and the possible time span and unpredictability of fishing and landing operations;
- The informal nature of the fishing practices where fishing opportunity, conduct and marketing are often influenced by traditional and cultural norms.

In addition, in countries such as Trinidad, Guyana, and Suriname, the gears were more diverse, and consequently, accurate determination of total removals by species has proven to be difficult. Depending on the fleet type, gear used and hence target species, the treatment and also recording of removals (catches) at the individual species level were inconsistent over time. There may also be an unknown amount of discards.

Based on the challenges highlighted, several ideas were discussed.

- The need to develop both short and long term plans for improving data collection and management of the fisheries;
- In the short-term, the need to identify and list all the essential components comprising the sampling frame so as to facilitate at least estimation of total removals and short term patterns in these;
- The need to design an appropriate long-term sampling programme.

Arising out of the above, there were some specific suggestions on sampling approaches. Based on the questionnaire responses, the Working Group recognized that there were human resource, as well as financial, constraints, and therefore acknowledged that each country would have to consider what would be feasible at the national level.

4.2 Proposed Action Plan

Based on the review and discussion of present available data and information on the nature and dynamics of these fisheries, the agreed proposed action plan identified the following tasks to be undertaken.

1) In the short-term, and certainly before the next meeting of the Working Group, countries should develop complete lists of the fishers, fishing units (including vessels and vessel owners), landing sites, fishing areas, gears and gear owners, species harvested, and market routes. These data would facilitate the establishment of a sampling frame. The sampling should be accomplished through the use of a simple data/interview form. A suggested data/ interview form is provided as Addendum 1 to this report.
2) In the long-term, fishing activity data should be gathered using weekly or fortnightly on-site interviews. During on-site interviews, data collectors should take the opportunity to collect samples for biological analysis. All data collected should be quantifiable to some extent, even if not directly measurable, e.g. low, medium, high. In instances of interval data, actual measurements of a few samples should be taken from time to time, to provide a guide for interpretation.
3) Where fishing units combine gears to facilitate capture of large fish schools, this would need to be recorded as a different type of fishing effort.

4) Given the important contribution of these fisheries to overall landings and food security in several countries, countries should ensure that appropriate human and financial resources are made available to implement the proposed sampling programmes. It should be noted that key informants and fishers in the respective communities could be utilized to assist with sampling of the fisheries.
5) Countries should engage fishers in consultations prior to commencing the proposed sampling programmes, to inform them of the intentions of the national fisheries authority. This should be conducted as a goodwill gesture and to nurture co-operation from fishers during data collection activities.
6) Countries should undertake a survey to quantify the social and economic importance of these fisheries. Such a survey should be designed to provide information on the contribution of these fisheries to food security on local and national scales, employment, and the relationship of the supply of fresh fish with the consumption of other non-local sources of animal protein, e.g. chicken.
7) If funds are available, countries should conduct research to improve understanding of the biology and ecology of these resources.

4.3 Proposed action plan –specific recommended tasks for St. Vincent and the Grenadines

In view of the one year ban imposed in St. Vincent and the Grenadines, in April 2008, regarding the sale of small coastal pelagic fish as bait to foreign-owned longline fishing vessels, and

Noting the request to the Working Group to make recommendations for a 6-9 month study of the local fishery that would provide a better appreciation of the continued need for/relevance of the ban, the Working Group identified the following specific tasks to be undertaken over the next 6-9 months.

1) The sampling frame should be completed as soon as possible, followed by establishment of the long-term sampling programme and completion of the socio-economic survey. The socio-economic survey should also include a survey of the needs of the foreign-owned longline vessels.
2) In conducting its sampling programme, St. Vincent and the Grenadines would need to consider ways of avoiding double counting of the beach seine catch and of sampling effectively those small coastal pelagic catches taken in the Grenadines. With regard to catches taken by fishers in Union Island, Grenada should assist with sampling, since a substantial portion of the catch from Union Island is landed and sold in Grenada.
3) Following completion of tasks (1) and (2) during the inter-sessional period, the available data from sampling and surveys should be analysed to facilitate a review of the need for retaining the ban on the sale of small coastal pelagic fish as bait to foreign-owned longliners.

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