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CRFM Fishery Report - 2012

Volume 2

Report of Eighth Annual CRFM Scientific Meeting - St.Vincent and the Grenadines, 20-30 June, 2012

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Fishery Management Advisory Summaries

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Foreword

The Eighth Annual Scientific Meeting took place during 20 – 30 June 2012 in Kingstown, St. Vincent and the Grenadines. During this Meeting, the five CRFM Resource Working Groups met. The CLWG completed a bio-economic assessment of the Jamaica queen conch fishery. The LPWG conducted several activities including: the evaluation of the status and availability of blackfin tuna data in the Eastern Caribbean; a preliminary assessment of the blackfin tuna fishery; and a review of the ERAEF methodology. Updates on the progress of the recreational fishery studies being conducted under the CLME project were also provided and the FAD deployment and research activities being coordinated by the MAGDELESA project were reviewed. The RSWG continued analysis of the Montserrat reef fishery data and conducted a preliminary analysis of the Jamaica reef fishery. The SCPWG reviewed the MCA study of the flyingfish fishery in the Eastern Caribbean as well as the activities of the first meeting of the joint CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean. The main output of this joint working group was an updated the sub-regional fisheries management plan for the flyingfish fishery in the Eastern Caribbean and a resolution to be presented to the CRFM Ministerial Sub-Committee on flyingfish. The SGWG updated the Atlantic seabob assessments for Guyana and Suriname respectively.

The DMTWG completed training in methods focused on graphical techniques for data quality control and on graphical approaches to data analysis. A plenary session was held to review the 2011–2012 inter-sessional activities, discuss training needs and develop the workplan for the 2012 – 2013 period.

During the plenary session of the Eighth Annual Scientific Meeting, updates were provided on relevant collaborative activities/ projects/ programmes which included: the WECAFC joint-technical working groups; a website being developed by the University of Southern Mississippi to collect data on the *Sargassum* sp. event; lionfish studies being conducted by UWI/CERMES; the MAGDELESA project being coordinated by IFREMER; and the status of the Lionfish Action Plans at the national level.

The Report of the Eighth Annual Scientific Meeting is published in two Volumes: Volume 1 contains the report of the plenary sessions and the full reports of the CRFM Resource Working Groups for 2012. Eight national reports were submitted for consideration by the Meeting in 2012, and these are published as Supplement 1 to Volume 1. Volume 2 contains part A (Overview), and the fishery management advisory summaries of individual fishery reports comprising part B of each Working Group report, where relevant. 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.

The covers for this volume were designed and prepared by Mr. Shaun Young, while the photographs were provided by Mr. Derrick Theopille, Mr. Jullan Defoe, Mr. Fujii Motoki and Mr. Tetsuya Miyahara. These contributions are gratefully acknowledged.

Contents

List of Acronyms and Abbreviations

CARIFIS	-	Caribbean Fisheries Information System
CERMES	-	Centre for Resource Management and Environmental Studies
CLME	-	Caribbean large Marine Ecosystem
CLWG	-	Conch and Lobster Resource Working Group
CPUE	-	Catch Per Unit of Effort
CRFM	-	Caribbean Regional Fisheries Mechanism
DMTWG	-	Data, Methods and Training Working Group
EAF	-	Ecosystem Approach to Fisheries
ERAEF	-	Ecological Risk Assessment for the Effects of Fishing
EU	-	European Union
FAD	-	Fish Aggregating Device
FAO	-	Food and Agriculture Organization of the United Nations
FMP	-	Fisheries Management Plan
FORCE	-	Future of Reefs in a Changing Environment
GCFI	-	Gulf and Caribbean Fisheries Institute
ICCAT	-	International Commission for the Conservation of Atlantic Tunas
IFREMER	-	Institut Français de Recherche pour l'Exploitation de la Mer
ICRI	-	International Coral Reef Initiative
JICA	-	Japanese International Cooperation Agency
LPWG	-	Large Pelagic Fish Resource Working Group
LRS	-	License and Registration System
MEY	-	Maximum Economic Yield
MSC	-	Marine Stewardess Council
MSY	-	Maximum Sustainable Yield
NGO	-	Non-Governmental Organization
NMFS-SEFSC	-	National Marine Fisheries Service – South East Fisheries Science Center
NOAA	-	National Oceanic and Atmospheric Administration
OSPESCA	-	Organization of Fishing and Aquaculture in Central America (Organización del Sector Pesquero y Acuícola de Centroamerica)
PSA	-	Productivity and Susceptibility Analysis
REEF	-	Reef Environmental Education Foundation
RSWG	-	Reef and Slope Fish Resource Working Group
SCPWG	-	Small Coastal Pelagic Fish Resource Working Group
SGWG	-	Shrimp and Groundfish Resource Working Group
SVG	-	St. Vincent and the Grenadines
TAC	-	Total Allowable Catch
TCI	-	Turks and Caicos Islands
TIP	-	Trip Interview Programme
UK	-	United Kingdom
USA	-	United States of America
UWI	-	University of the West Indies
WECAFC	-	Western Central Atlantic Fishery Commission

I. REPORT OF THE CONCH AND LOBSTER RESOURCE WORKING GROUP (CLWG)

Chairperson:	Mauro Gongora, Belize
Rapporteur:	Jasmine Parker, Turks and Caicos Islands
Other Members:	Ricardo Morris (Jamaica), Samuel Heyliger (St. Kitts and Nevis), Kris Isaacs (St. Vincent and the Grenadines), Maren Headley (CRFM Secretariat)
Consultant:	Professor Juan Carlos Seijo (Fisheries Consultant)

A. OVERVIEW

1. Review of inter-sessional activities since last meeting, including management developments during this period

This year the CLWG was rather a small group comprised of representatives of Turks and Caicos Islands, Jamaica, Belize and St. Kitts and Nevis. A representative of St. Vincent and the Grenadines also attended the meeting. The participatory nature of the meeting provided an excellent opportunity for participants to share information about the conch and lobster situations in their countries. The group discussions held with the consultant greatly benefitted the group.

During the inter-sessional period several on-going and new activities were undertaken by member countries in relation to lobster and conch fisheries research and management efforts. The chairman guided the discussions and requested participants to provide an overview of the activities carried out in their countries.

The working group chairman introduced the objectives of the meeting and presented Dr. Juan Carlos Seijo, Consultant who then made a presentation on bio-economic analysis to introduce the main parameters employed in the bio-economic analysis work that would be carried out.

The working group agreed that Jamaica's conch data set would be explored as part of the bio-economic analysis exercise that would be carried out this year.

A summary of the main inter-sessional activities carried out by country is presented below.

<u>Turks and Caicos Islands</u>

- ✓ Catch and effort data for Spiny lobster and conch and scale fish was collected at landings sites and processing facilities.
- ✓ Biological data for spiny lobster was collected.
- ✓ Fishing effort data was collected.
- ✓ No underwater conch visual census was carried out but there are plans to conduct this activity once the country budget has been approved by June 2012.
- ✓ The Governor of TCI has established the lobster fishing season for eight months from 1 August to 31 March.

- ✓ The Fisheries policies and legislation is under review and various recommendations are being considered for lobster and conch fisheries at the moment. The review process is expected to be completed shortly.

Jamaica

- ✓ A revision of the Fisheries Act and Regulations is being carried out but it is incomplete at the moment.

- ✓ Lobster research on pueruli larvae and juvenile recruitment was carried out and will continue this year.

- ✓ Research was carried out in lobster habitat enhancement structures.

- ✓ A lobster stock assessment needs to be carried out

- ✓ The exploration of diversification into other new fish species is ongoing. One species with high potential is the sea cucumber, which has attracted the attention of some persons interested in exporting this product.

- ✓ Jamaica made a short presentation on its preliminary conch bio-economic analysis. The model used was developed by Dr. Seijo to conduct an analysis of the Turks and Caicos Islands data during the 2010 Annual Scientific Meeting.

Belize

- ✓ Catch and effort data for spiny lobster, conch and scale fish were collected at fishermen cooperatives and processing facilities.

- ✓ Biological data for spiny lobster and conch were collected at fishing sites and fishermen cooperatives.

- ✓ No underwater conch visual census was carried out in the inter-sessional period but the next national conch survey is scheduled to be carried out during the period 15 August to 15 September 2012.

- ✓ The Total Allowable Catch (TAC) estimate will be ready before the opening of the conch fishing season, which starts on 1 October 2012.

- ✓ Belize implemented a Managed Access Program at two pilot sites (Glovers Reef and Port Honduras Marine Reserves). The objective of the program is to improve fisheries management, data collection and reporting, fisheries enforcement, and improve stock conditions. The program allows fishermen to be part of the decision making process.

- ✓ Belize participated at the Queen Conch Experts Workshop that was organized by the Caribbean Fishery Management Council. The workshop was held in Miami during the period 22 – 26 May 2012. The workshop report was distributed to the participants of this CRFM Scientific Meeting so that participants would be aware of the workshop findings, conclusions and recommendations. Belize pointed out some major areas of concern in the report to the participants that needed special attention by CRFM member countries; especially in light of the fact that a resolution will

be drafted and presented at a follow-up meeting in October 2012. It is anticipated that a request will then be made to table the resolution at the next CITES COP meeting in 2013.

- ✓ A technical revision of the Belize fisheries act and regulations was carried out with the help of an international consultant and an experienced local attorney. The new act named "Living Aquatic Resources Bill 2012" is currently being reviewed by the government and is expected to be passed shortly. The new act incorporates a number of provisions not considered in the old act including high seas fishery management, international conservation and management measures, fisheries fund and fisheries council among others.

St. Kitts and Nevis

- ✓ The conch fishery does not have a closed season and is for local consumption only.
- ✓ Conch minimum size limit was put in place to avoid overexploitation.
- ✓ There is no lobster fishery and catches are mostly incidental in the conch fishery.
- ✓ Conch (approximately 150 fishers) fishing is concentrated in the South East Peninsula, which is considered a conch and lobster breeding ground but it is not protected.
- ✓ The conch fishing area encompassing (20) square miles is planned to be protected.
- ✓ The channel between St Kitts and Nevis is to be declared a special management area for protection of fishery nursery grounds and will be used for tourism purposes as well.

2. General review of fisheries trends throughout the region, including recent developments.

The conch fisheries of member countries are generally considered in good conditions given the various management measures currently being implemented in each country. In the case of Jamaica, the conch fishery has seen a substantial reduction in fishing effort and the fishing mortality rate has declined from 0.22 in 1994 to 0.04 in 2011.

Belize's conch fishery is stable and is characterized as a shallow water artisanal small-scale fishery that primarily targets legal-sized pre-adult individuals in the fishing grounds. The annual high recruitment into the fishery as demonstrated in the national conch surveys in the last 10 years indicates high levels of sustainability. It is believed that the untouched deep water adult spawning stocks could be supplying seed stock to the shallow fishing grounds but this need to be corroborated. Fishing effort (number of fishermen) shows an increasing pattern and is responsible for the increase in conch meat production volume. The control of fishing effort in the conch fishery is being done through the implementation of a managed access program that has produced very good results as fishermen participate in the decision-making process and are complying with data reporting, there is increased patrols and compliance with regulations, reduced illegal fishing and greater cooperation with the authorities.

3. Fishery data preparation, analysis, and report preparation

The members of the CLWG agreed to the following work plan for the meeting.

Jamaica

A bio-economic analysis of the conch fishery was carried out as an exercise and training for the working group. Data provided by the Jamaica Fisheries Division would be validated and incorporated in the bio-economic models originally developed for the Turks and Caicos Islands by Dr. Juan Carlos Seijo.

Other

No other activities were planned.

4. Inter-sessional workplan and Recommendations

Inter-sessional workplan

The working group agreed that countries will carry out the following activities during the inter-sessional period.

Turks and Caicos Islands

- ✓ Update the conch fishery bio-economic analysis to incorporate the data for 2011.
- ✓ Continue CPUE data collection and monitoring of conch and lobster landings.

Belize

- ✓ Update the fishery-dependent lobster stock assessment to the period 2010 - 2011.
- ✓ Conduct a national conch survey (15 August to 15 September 2012).
- ✓ Continue CPUE data collection and monitoring of conch and lobster landings.
- ✓ Continue lobster biological collection.

Jamaica

- ✓ Refine the results of the conch bio-economic assessment done at this scientific meeting.
- ✓ Conduct a fishery-dependent lobster stock assessment.
- ✓ Continue CPUE data collection and monitoring of conch and lobster landings.

St. Kitts and Nevis

- ✓ Continue CPUE data collection and monitoring of conch and lobster landings.

Issues and Recommendations

1. Countries should encourage the ACP Fish II Project to expedite the execution of the two conch projects that are extremely important for conch producing/exporting countries of the Caribbean region. One of these projects is the training workshop on conch underwater visual surveys.
2. Countries' representation at regional and international conch and lobster fora is important to defend the national and regional interest, especially as it relates to management strategies promoted by international organizations that could potentially threaten the livelihoods of fishermen and their families.
3. The proposed 8% conch harvest rule and the conch density of 100 adults per hectare as presented in the Miami Queen Conch Experts Workshop report need to be carefully considered because there would be social and economic implications at the national and regional levels. There is a

need to conduct conch surveys/stock assessments in some countries before a decision can be made.

4. The financing of conch surveys through export taxes suggests that monies would be collected from the industry and placed under the control of the Fisheries Divisions of member countries. The Finance regulations do not allow for that and all monies are paid into a consolidated revenue fund and cannot be used for any fishery/marine research activity unless approved in the national budgets.
5. The prohibition on the use of compressed air for commercial fishing to protect conch and lobster stocks in deeper waters, 2- 3 month closed season, license vessels and limited entry will have some serious implications in some countries such as Jamaica and St. Kitts. The social and economic implications for such an intervention are unimaginable and should not be considered at this time.
6. Limited entry into the conch and lobster fisheries such as in the case of Jamaica was considered a better option than banning the use of compressed air.
7. The introduction of VMS for monitoring conch and lobster fishing will have serious financial implications for both the fishers and the Fisheries Divisions.
8. The tabling of a resolution on the findings, conclusions and recommendations of the Miami Queen Conch Expert Workshop (QCEW) report at the next CITES-COP meeting in 2013 will more than likely become a part of the conditions for countries involved in the international trade in conch.
9. Countries do not have the resources to complete a deep water assessment. However, a shallow water assessment and genetic research should be done to compare populations.

5. Review and adoption of Working Group report, including species / fisheries reports for 2012.

The Working Group Report was reviewed and adopted by the members of the CLWG.

6. Adjournment.

The meeting of the SGWG adjourned at 6.30 pm on 28 June 2012

B. FISHERIES REPORTS

1. The Queen Conch (*Strombus gigas*) Fishery of Jamaica

1.1 Management Objectives

The management of Queen Conch in Jamaica is guided by the Conch Fishery Management Plan as well as the National Fisheries Policy and thus aims to optimize the sustainable economic and social benefits from the fishery while maintaining the stock's biological integrity. This aim is pursued through the development and implementation of a sound management regime inclusive of; among other things, an annual Total Allowable Catch (TAC) system, regular biological assessments, a limited entry policy, a close season (July 1 to October 31), control and monitoring of fishery-related activities, and appropriate legislative arrangements.

1.2 Status of Stock

Results of the recent 2011 Jamaica Queen Conch abundance survey, which is the latest scientific assessment of the stock, were not available at the time of writing this report.

Jamaica's Queen Conch stock has benefited greatly from the implementation of a National Total Allowable Catch (NTAC) system implemented since 1994 and the 8% MSY rule used to determine the quantity of conch harvested annually. These as well as other management measures have moved the stock from being subject to open access conditions, as was the case when the fishery started in the 1980's, to where it is now a relatively well-managed fishery. This is illustrated in the fact that Jamaica has managed to maintain healthy stock densities throughout the Pedro Bank where our primary conch stock and industrial fishery are located (see Table 1).

Table 1. Estimates of density for each depth strata and total Queen Conch biomass on the Pedro Bank for each survey year. Modified from Smikle (2010).

Survey Year	Depth Strata (Metres)	Density Estimate (Conch/ha)	Biomass Estimate (Metric Ton)
1994	**0-10**	**73**	**13,325.48**
	10-20	**152**	
	20-30	**203**	
1997	**0-10**	**175**	**12,203.27**
	10-20	**88**	
	20-30	**203**	
2002	**0-10**	**175**	**15,305.85**
	10-20	**138**	
	20-30	**244**	
2007	**0-10**	**378**	**5,205.07**
	10-20	**49**	
	20-30	**50**	

Jamaica has also been successful in negotiating and implementing a 1995 agreement to reduce the NTAC to close to 1000 MT by the year 2000 (Aiken *et al.*, 2006) which has also contributed to a reduction of effort and the relatively good status of the stock. These successes are continually being threatened by

externalities, the most important of which is poaching by foreign vessels, which is thought to be significant when compared to the level of Jamaica's production.

1.3 Management Advice

The Queen Conch fishery of Jamaica is at a point where decision tables that consider alternative management decisions, possible states of nature, and the calculated performance of biologic and economic variables can now be completed. This approach will allow for consideration of the fishery uncertainties, and calculation of the corresponding risks of alternative management decisions.

1.4 Statistics and Research Recommendations

Research questions that were considered as relevant for advancing knowledge on the species and for responsible management of the fishery include:

- Are queen conch post larvae settling with different patterns in search for adequate water habitat, temperature, salinity and / or food?
- What are the possible current effects of climate change on queen conch stocks?
- Is fishery recruitment of young adults the result of immigration from deeper waters or from post larval berried individuals?
- What is the calculated effect of alternative stock rebuilding strategies aiming at bioeconomic target reference points?
- What is the risk of the biologic indicator (Bt / BMSY) falling below the corresponding LRP with alternative stock recovery strategies?

1.5 Stock Assessment Summary

The bio-economic analysis of the *Strombus gigas* (Queen Conch) fishery completed during this meeting can provide managers with the tools to consider alternative management decisions, possible states of nature, and the calculated performance of biologic and economic variables.

1.6 Special Comments

None.

1.7 Policy Summary

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

- To conserve and manage the marine capture fisheries resources of Jamaica;
- To produce the optimal sustainable yield of each major resource, which means reversal of overfishing in overexploited fisheries and increased fishing effort in under-exploited fisheries;
- To produce a vibrant and healthy capture fisheries sector; and in the process to recover resource rents to finance the fishery management process;
- To enhance suitable areas of habitat;
- To achieve sustainable development and utilization of fisheries resources in deep waters and distant shoals with due consideration to international obligations; and
- To achieve sustainable development and utilization of fisheries resources in inland waters.

1.8 References

Aiken, K., G. A. Kong, S.G. Smikle, R. Appeldoorn, and G. Warner. (2006). *Managing Jamaica's queen conch resources*. Ocean and Coastal Management 49 (5-6):332-341.

II. REPORT OF THE LARGE PELAGIC FISH RESOURCE WORKING GROUP (LPWG)

Mr. Derrick Theophile – Dominica (Chairman)
Ms. Yvonne Edwin – St. Lucia
Mr. Francis Calliste – Grenada
Ms. Cheryl Jardine-Jackson – St. Vincent and the Grenadines
Mr. Reshevski Jack – St. Vincent and the Grenadines
Mr. Christopher Parker – Barbados
Mr. Mario Yspol – Suriname
Mons. Lionel Reynal – IFREMER (Martinique)
Ms. Heloise Mathieu – IFREMER (Martinique)
Prof. John Hoenig – Consultant (Virginia Institute of Marine Science)
Ms. Nancie Cummings – NMFS, SEFSC (Miami, FL, USA)
Dr. Todd Gedamke – NMFS, SEFSC (Miami, FL, USA)
Dr. Susan Singh-Renton – CRFM Secretariat

A. OVERVIEW

The working group was assigned the following tasks:

1. Evaluate the status and availability of the blackfin tuna data among the countries represented
2. Attempt an assessment of the blackfin tuna fishery in the Eastern Caribbean
3. Review the two reports on recreational fishing submitted by the CLME consultants
4. Review of the ERAEF analysis for Large Pelagics and update information where necessary
5. Review the MAGDELESA project (FADs)

1. Blackfin tuna data analyses

Data were available for four countries: Grenada, Dominica, St. Lucia and St. Vincent. The working group focused on cleaning and compiling the data and conducting a preliminary analysis to address Items 1 and 2 above.

2. Review of Recreational Studies done for CLME project

The highly migratory large pelagic fish resources are an important contributor to employment, income and food security in the Caribbean LME and adjacent Guianas-Brazil region. These resources are exploited by countries from within the region, as well as by foreign nations for commercial and recreational purposes. The recreational fishery forms a significant component of the harvest subsector of the large pelagic fishing industry in the region. Recreational fishing can be conducted by individuals from private or charter vessels and includes sport and leisure fishing activities. Many countries in the Caribbean are known for their sport fishing activities and attract visitors for that purpose, while charter-boat fishing is a major component of the marine-based tourism activities in other countries. The main target species of the recreational fisheries in the Caribbean are: billfishes, yellowfin tuna, wahoo, king mackerel, and dolphinfish. Notwithstanding this level of importance, recreational fishing activities have received minimal fishery management attention in most Caribbean countries and data on this fishery are lacking.

In view of this, the Working Group noted that CRFM is overseeing four studies that are ongoing to

document the nature and importance of recreational fishing activities in the Caribbean region: Northern Caribbean, Southern Caribbean, Western Caribbean and Eastern Caribbean. These studies are intended to contribute to the CLME project, specifically towards improving the technical information base with regard to recreational fishing activities. Completed draft reports of the studies examining the eastern and southern Caribbean areas were available for review by the Working Group during the meeting. These two reports were discussed in general, and it was agreed that suggested specific text revisions and recommendations for improvement would be emailed to the CRFM Secretariat by the end of the meeting to facilitate finalization of the reports by the relevant consultants. It was also agreed that the CRFM Secretariat would email to the working Group members the remaining two reports (northern and western Caribbean) when these are completed in the near future.

3. Review of the work progress on ERAEF

The LPWG reviewed the ERAEF analysis that was introduced during the 2011 Scientific Meeting. The ERAEF had been expanded from considering only dolphinfish as the target, to considering all large pelagics landed in the region to follow the Ecosystem-Based Approach. Included in the updated report was the development of a Productivity and Susceptibility Analysis (PSA). This takes into account biological and ecological data from various sources to determine the productivity of the various species to recover from being depleted (their resilience), coupled with fishery information to determine the susceptibility of each species to the fishery. The LPWG agreed to work towards review and validation of the methods and various outputs produced during the meeting.

A description of ERAEF methodology and outputs from the ERAEF applied to the hook and line fishery of the Eastern Caribbean was presented to the LPWG. The group participated in the review and validation of the various outputs of the Analysis. Productivity and Susceptibility cut-offs and thresholds for determining the relative risk scores of each species were discussed and alternative attributes and methods were explored. Methods for determining selectivity of the fishing gear for multiple species was investigated in particular to determine the most appropriate method to assess this in data poor situations. General comments and recommendations were made regarding the ERAEF methodology and data improvements to be incorporated into the final technical report.

4. Review of progress of MAGDELESA Project

MAGDELESA Project was presented by IFREMER representatives. This project aims to develop together with the scientific teams and fisheries managers in the Lesser Antilles and Haiti an integrated and participatory approach to the sustainable and responsible development of the blooming anchored FAD fishery. MAGDELESA results from activities undertaken in the framework of the Lesser Antilles working group of the FAO/WECAFC, which aims at supporting conservation, management and sustainable development of the biodiversity and natural spaces, of the coastal areas and natural resources marine. The goals of the project are:

- The redeployment of the overfishing of the coastal resources (primarily fauna of the coral reefs) towards the pelagic high-sea species (tunas and tuna-like species) that still provide a reasonable possibility for catches, by the use of FAD (Fish Aggregation Device).
- To develop sustainable fishing practices for shared pelagic resources.

So far, FADS have been deployed in Dominica, Grenada, St. Kitts and Nevis and St. Vincent and the Grenadines.

5. General Recommendations

The overarching recommendations were in regards to improving data quantity, quality and availability for assessment purposes. Specific recommendations are included in the subsequent sections.

6. Any other business

No further issues were raised for discussion.

7. Adjournment

The meeting was adjourned at 7:30 p.m. on Thursday, 28 June 2012.

B. FISHERIES REPORTS

1. The Blackfin Tuna (*Thunnus atlanticus*) Fishery of the Eastern Caribbean

1.1 Management Objectives

No management objectives were available specifically to the blackfin tuna fishery.

1.2 Status of Stock

Data were evaluated from St. Lucia, Grenada, Dominica, and St. Vincent and the Grenadines and on a qualitative basis there is no evidence that overfishing is occurring on the blackfin tuna stocks. It should be noted that caution is still warranted even though an increasing trend in landings was generally observed. This could be due to a number of factors including: an increase in abundance, more comprehensive data collection, or changes in fishing behavior and techniques. Overall it is believed that data collection protocols have improved and Fish Aggregating Devices (FADs) were implemented during this time period so the increasing trend could be a reflection of these changes rather than a reflection of increased abundance.

1.3 Management Advice

Given the concerns regarding changes in data collection protocols and the use of FADs in keeping with the principles of the precautionary approach, it is recommended that catch levels not be increased above the current levels.

1.4 Statistics and Research Recommendations

As mentioned in 1.2 and 1.3 above one of the biggest concerns in the interpretation of the existing data are changes in the amount of actual landings that are being included in the databases and the fact that fishers have increasingly been fishing on FADs. To that end, two primary research recommendations are being put forward:

1) For each trip / record a data field be included which indicates whether the trip was conducted at / near a FAD, and
2) Each data collection program to conduct surveys or analysis which will indicate the proportion of total catch which is being reported in the database.
3) Length frequency data collected to assist in the definition of any migration patterns that may exist.
4) Participate in the proposed genetic studies of IFREMER to help define stock structure.

1.4.1 Data Quality

Some cleaning of the datasets was necessary. This was conducted during the workshop. Dates for records continue to be problematic, which is not uncommon. The Dominica dataset, in particular required substantial formatting and cleaning data across various database formats across 18 years.

One limitation was that the datasets among the countries were not standardized and the fact that a common database is not used. It was highly recommended that across region variable names be standardized to facilitate scripting within analytical programs e.g. R statistical package.

1.4.2 Research

Research should be done on the impact of FADs on the fishery for each country. Sampling and monitoring programmes appropriate to each country should be designed to collect relevant information on this topic. Studies need to be conducted to better understand migration patterns and stock structure in the region. The working group noticed relatively obvious patterns in peak landings on a monthly scale across islands. Further investigation of these patterns might provide insights as to migratory patterns within the region. In this context, it is recommended that countries collect length frequency data for their catches. It is noted that IFREMER will be conducting a genetic population study of the blackfin tuna.

1.5 Stock Assessment Summary

Plots of annual nominal landings for all four islands indicated a general increasing trend. In the case of St. Lucia, a standardized plot of landings was constructed. Since none of the plots exhibited decreasing trends, there was no evidence of stock depletion at current harvest levels. However, our interpretation considered changes in behavior (e.g. use of FADs) and improved data reporting were the most probable causes for the increased landings observed over time. As such, in keeping with the principles of precautionary approach, it is recommended that no significant increase in fishing effort be allowed until more information becomes available on the status of the stock.

1.6 Special Comments

None.

1.7 Policy Summary

No management regulations specifically for blackfin tuna have been found for any of the harvesting nations and there are no ICCAT regulations currently in place for this species.

III. REPORT OF THE REEF AND SLOPE FISH RESOURCE WORKING GROUP (RSWG)

Chairman: Alwyn Ponteen (Montserrat)
Co- Chair: Anna-Cherice Ebanks (Jamaica)
Consultant: John Hoenig (Virginia Institute of Marine Science)
Nancie Cummings (NOAA Fisheries, SEFSC- Miami, FL USA)

A. OVERVIEW

Inter-sessional tasks identified by the RSWG at the Fifth Annual Scientific Meeting included computerizing of the trip specific landings data for the Montserrat fisheries. These data would be used to develop an analysis set for the Sixth Annual Scientific Meeting. Although only some data were computerized, the RSWG group commenced working with these data. No other data sets were made available for the meeting from other countries until near the end of the meeting when data from Jamaica were obtained. Preliminary work began on the Jamaica data but no results became available to present here. At the opening of the Sixth Annual meeting, the Chairperson stressed the importance of the various working groups to encourage regional agencies and countries involved in similar work to make their data available in electronic form. The Working Group acknowledged the considerable work that was done by Montserrat to prepare the data.

Since that time, Montserrat has devoted considerable effort to computerizing its landings data in the CARFIS format. At the Eighth Annual meeting, data were available from Montserrat covering the years 1995 – 2011 (17 years) plus the first quarter of 2012. Jamaica also has data in the CARFIS format and five years of data, covering 2005 – 2009, were available at the meeting.

The Working Group focused on quality control of the data, exploratory data analysis, and examination of trends over time, particularly of catch rates over time. Specifically, the WG addressed 5 technical analyses: 1) summarize the salient features of the Montserrat database, 2) analyze Montserrat data on red hind from the pot fishery, 3) analyze Montserrat data on needlefishes from the beach seine fishery, 4) summarize salient features of the Jamaica database, 5) analyze Jamaica data on doctorfish from the South Coast, North Coast and Offshore Banks.

B. FISHERIES REPORTS

1.0 Montserrat Reef Fishery

The available data were collected by national scientists who sampled landings and compiled data on a trip level basis. Landings data included: date, landing site, landed weight by species, gear type and effort information. The number of trips sampled from 1995 through the first quarter of 2012 was 11,072, and 222 species or species groups were recorded. The data have been archived in the CARFIS database format.

The three main types of fishing gear used in Montserrat are pots, beach seines and lines (hand, bottom, and drift) (Figure 1). In terms of the number of trips landing a species, red hind is the most abundant species and occurs mainly in the pot fishery; needlefishes are the most important in the beach seine fishery (Annex 1). Consequently, we focus primarily on these two fisheries. The number of trips landing a species can be a misleading indication of a species' importance. Needlefishes are landed in approximately half as many trips as red hind, yet the landed weight of needlefishes (166,852 kg) is four times the landed weight of red hind (41,067 kg) and the mean weight landed per positive trip is almost 8 times higher for needlefishes than red hind (Annex 2).

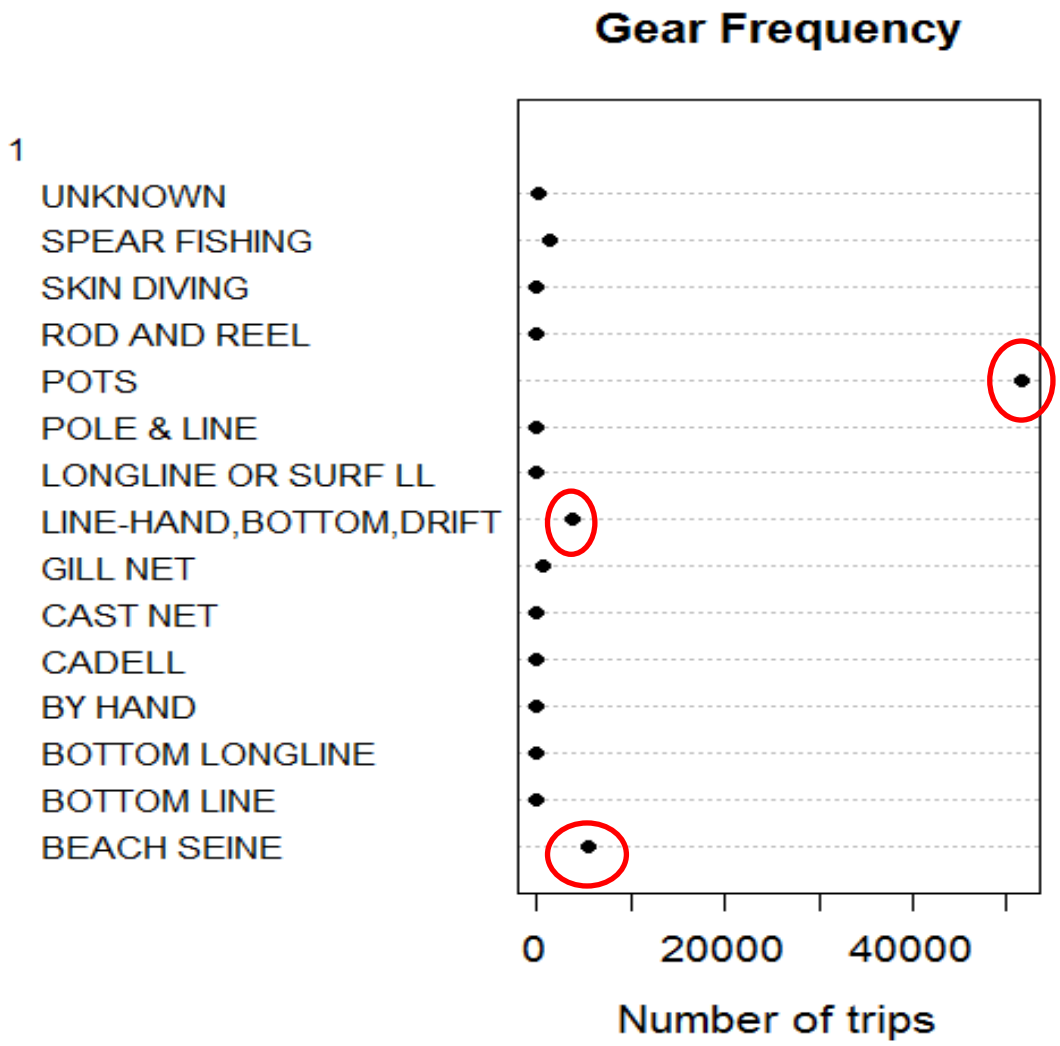

Figure 1. Frequency of gear use in the Montserrat landings database, 1995-present.

Pot fishing effort, measured as number of trips, declined to a third of its peak level from 1995 to 2000, then rose until 2005 before declining to the lowest value in 2009 (Figure 2). Effort rose in 2010 and 2011.

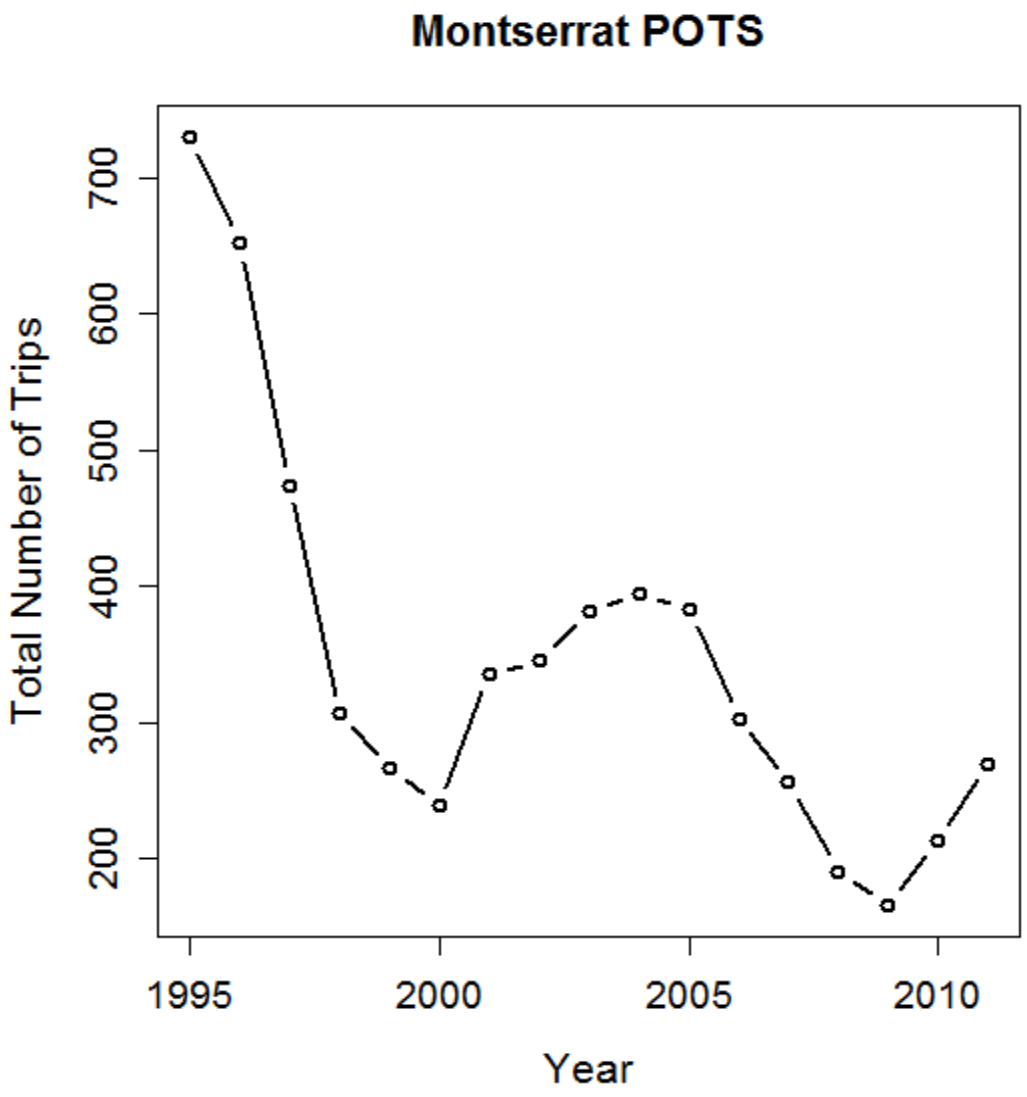

Figure 2. Pot fishing effort in Montserrat, 19995 – 2011.

Beach seine fishing effort measured as number of trips also shows a strong downward trend from 1995 to 2011 and is currently at its lowest recorded level (Figure 3).

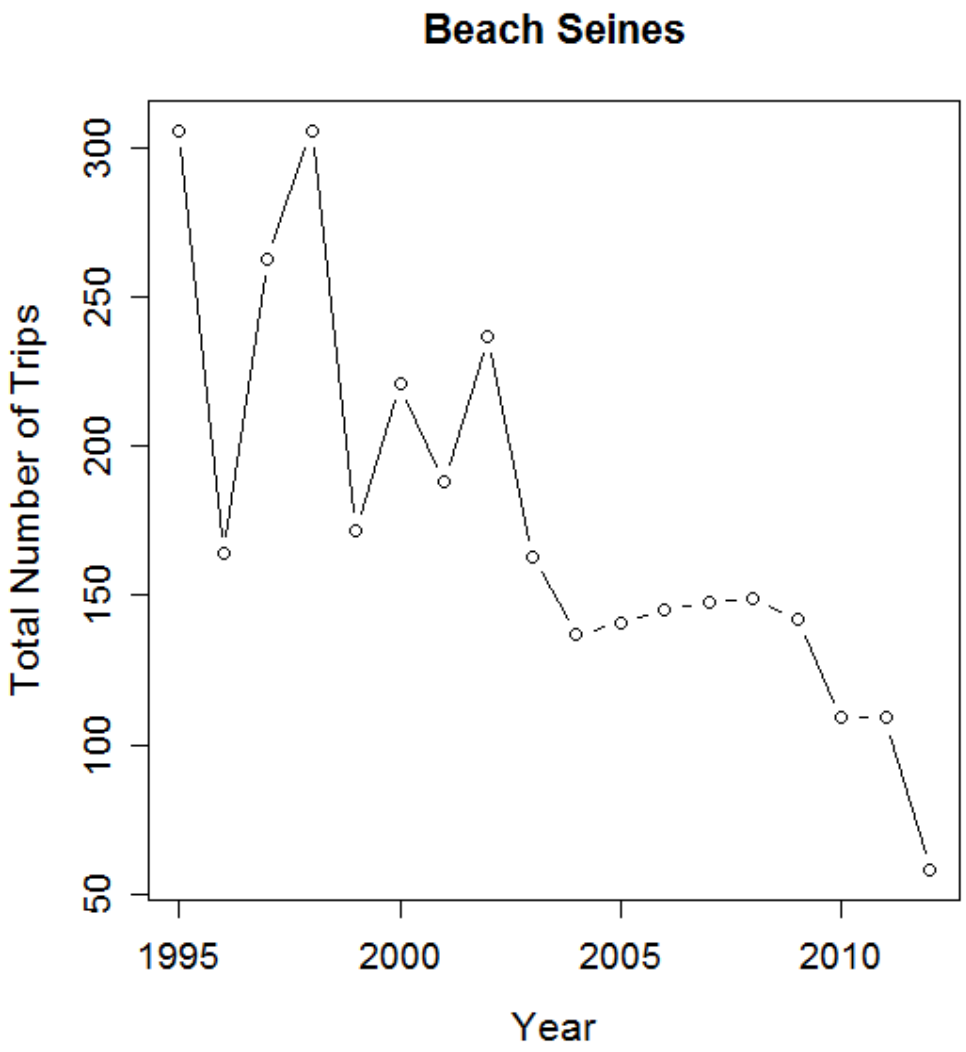

Figure 3. Beach seine fishing effort in Montserrat, 19995 – 2011.

1.1 Management Objectives

The Montserrat Fisheries Division has noted the following management objectives for the reef and slope fishery:

1. To strengthen the Fisheries Division's Management capabilities by incorporating the sub-sector concerns in the wider frame work of Coastal Zone Management and Development Planning.
2. To have more diverse species of locally fresh fish available on the market all year around.
3. Build greater awareness amongst Staff and Stakeholders of their role in ensuring that the marine resources remain sustainable.
4. Promote and regulate the sustainable use of the living and non-living marine resources
5. To increase the role of the Fisheries industry in the building of the National Economy.
6. To use the marine resources wisely so as to improve income and employment opportunities, alleviate poverty and contribute to food and nutrition security in Montserrat.
7. To ensure that the exploitation of fisheries resources and the carrying on of any related activities

are conducted in a manner consistent with the principles of ecologically sustainable development (which include the exercise of the precautionary principle), in particular the need to have regard to the impact of fishing activities on non-targeted species and the long term sustainability of the marine environment.

8. To protect the marine environment and its resources by reducing pollution and protecting the maritime area against adverse effects of human activities through enforcement, so as to safeguard human health and to conserve the marine ecosystem.
9. To design and implement training and extension program in order to improve the status and career orientation of all stakeholders in the fisheries sector and to increase public awareness of fisheries potential.
10. To improve fish landing facilities, marketing, storage, distribution and quality enhancement.

1.2 Status of Stocks

The status of the Red hind and needlefish stocks are currently unknown. However, total pot fishery effort has declined since 1995 and the catch rate of red hind has increased overall since 1995 (but declined after 2005). Similarly, the total effort (trips) in the beach seine fishery has declined since 1995 and needlefish nominal catch rates (in trips catching needlefishes) increased from 1995 to 2005 but then declined somewhat. Needlefish catch rates (all trips, including trips with zero catches) have been stable since 1999.The results suggest the stocks are not in peril but it cannot be determined at this point where the stocks are in relation to optimum exploitation.

1.3 Management Advice

Until a detailed stock assessment is conducted there are no recommended changes to the fishery. The data (time series from 1995 to 2011) are sufficient to begin more complicated and robust statistical analyses (production models, CPUE standardizations); however, the analyses would benefit greatly from having data prior to 1995 made available.

Sustainability of the RSF resources can be best achieved if the recommendations from the scientific meeting are implemented successfully within the desired time frame in order for a full evaluation of the resources to be conducted.

1.4 Statistics and Research Recommendations

1.4.1 Data Quality

Several tasks were identified which, if completed during the 2012 / 2013 inter-sessional period, should improve the data quality significantly and the management advice generated from analyses of these data.

- Obtain catch and effort data prior to 1995
- Explore obtaining data from other bays
- Continue quality control (QC) edits for data on a routine basis (as data are collected, as data are keypunched)
- Develop summary QC computer routines to identify data outliers

The following recommendations remain from the RSWG at the Sixth Annual Scientific Meeting:

- The current landings data collection form should be modified to account for discards, spatial area of catch, quantity and type of gear used;
- Develop protocols to improve the timeliness of landings data availability from fishers who may not be accessible during normal working hours;

- The fishable area for the RSF has been reduced in recent years due to volcanic activity; there is a need to quantify the current amount of RSF fishable area and to document any potential ongoing threats (e.g., mud flows, sedimentation) to the marine environment.

1.4.2 Biological data collections

Several critical needs were identified pertaining to biological data collection. These data needs are required in order to describe catch at size and to evaluate seasonal changes in maturity of the RSF species.

- Implement routine surveys of the landings for biological information collections of size and age data for primary species landed (e.g., top 10)
- Interim sampling priorities can be set using the 2010 Case Study results (total catch by species, total effort by fishery)
- Develop habitat maps and incorporate into analyses

The following recommendations remain from the RSWG at the Sixth Annual Scientific Meeting

- Routine biological data collections (length/weight, maturity, ageing), should be implemented. Species to be studied should be identified during the 2010/2011 inter-sessional period and should be based on examinations of the landings data. Attention should be given to prioritization of species at both the national and the regional level;
- Information on spawning timing and areas needs to be documented as soon as possible. It is recommended to conduct a survey of the local fishers as a starting point to obtain this information as well as investigate fishing on spawning aggregations;
- Conduct a literature search at the national and regional level to document information on growth, mortality, spawning, maturation, fecundity.

1.4.3 Other data collections

- Conduct a literature search to document and compile a list of all research in volcanic activity and the impacts it has on the marine/fishery environment;
- Consider incorporation of other data types (habitat, environmental) into future analyses.

1.5 Data Analysis Summary

The data are believed to represent a reasonably complete tally of fishing landings and catch. Consequently, in addition to providing catch rates as an index of abundance, there is the potential to use absolute catch and effort to construct more elaborate models, especially production models. The analyses therefore focused on describing landings in weight, effort and catch rate for the two most abundant single species, red hind and needlefish. Effort in the pot fishery declined steadily over the period 1995 to 2011 and, correspondingly, catch rates rose (and leveled off in the most recent years). Beach seine effort has declined steadily over the period 1995-2011 and catch rates of needlefish have increased as measured by catch per trip catching needlefish.

2.0 Montserrat Reef Fishery - Red Hind

The catch in kg per trip for those trips catching red hind ("positive trips") is shown in Figure 4; total catch by year is shown in Figure 5. From Figures 2, 4 and 5 it can be seen that the catch rate has risen over the time series. Total catch has been variable, reflecting mostly the trend in effort over time.

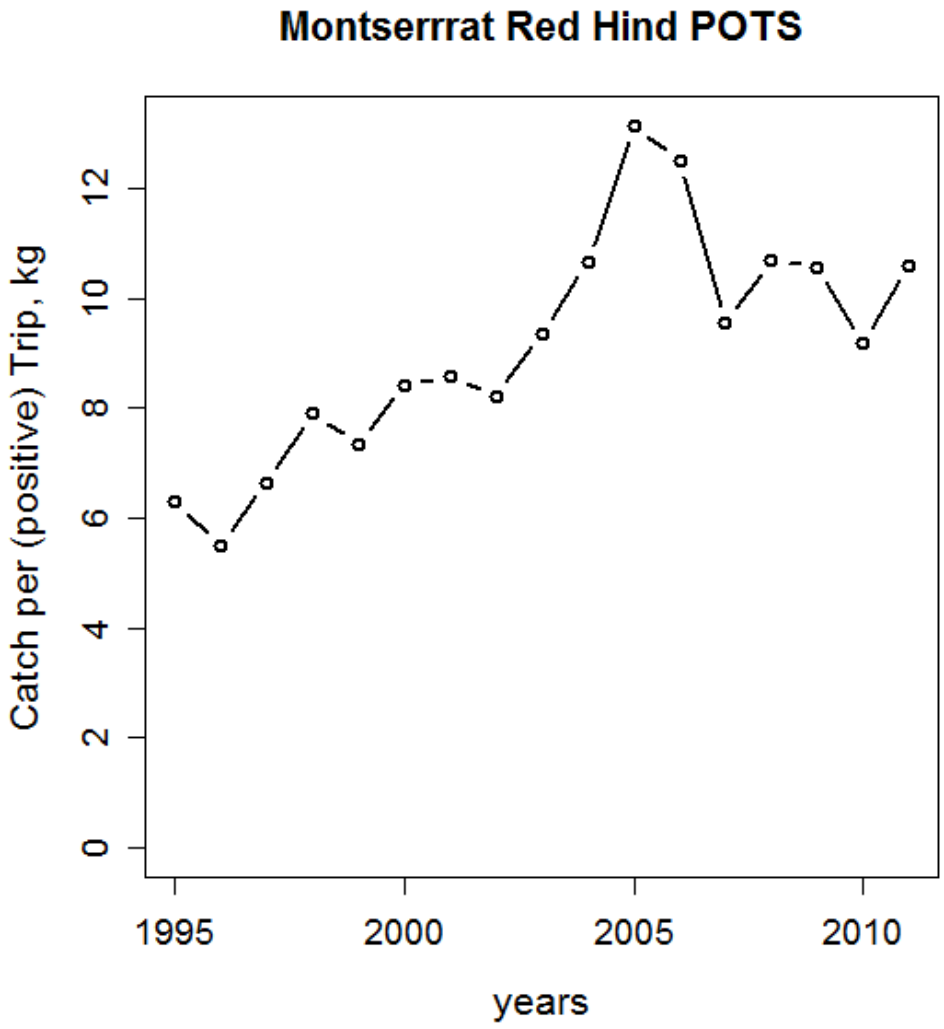

Figure 4. Catch of red hind in kg per trip for just those trips in which red hind were caught.

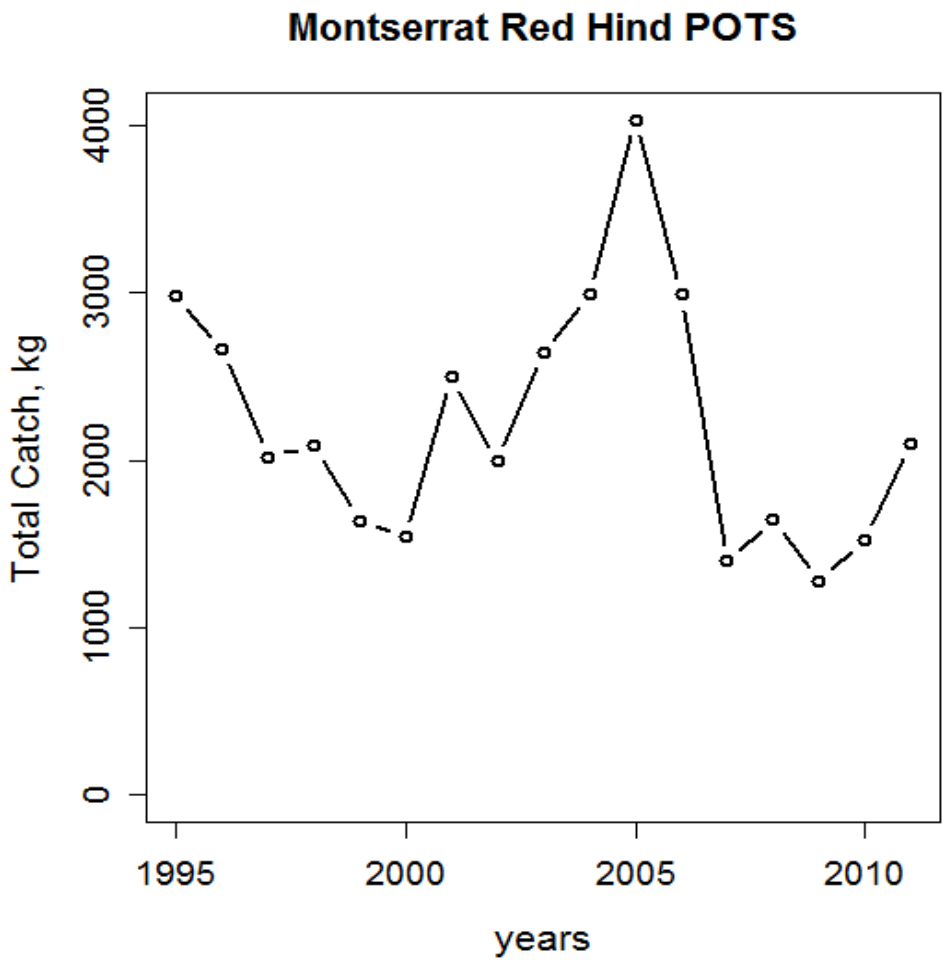

Figure 5. Total sampled landings of red hind by year.

Interpretation of catch per trip in a multispecies fishery can be complicated by changes over time in directed or targeting fishing by some fishers for particular species. For this reason, the Working Group chose to look at the magnitude of catch of red hind for those trips in which red hind were caught (positive trips). However, it is important to check whether the percentage of positive trips changes over time. We find that the percentage of positive trips has fluctuated randomly without trend over time (Figure 6). Thus, the trends in catch rate of red hind are very similar regardless of whether catch rate is calculated over all trips or over positive trips (Figure 7).

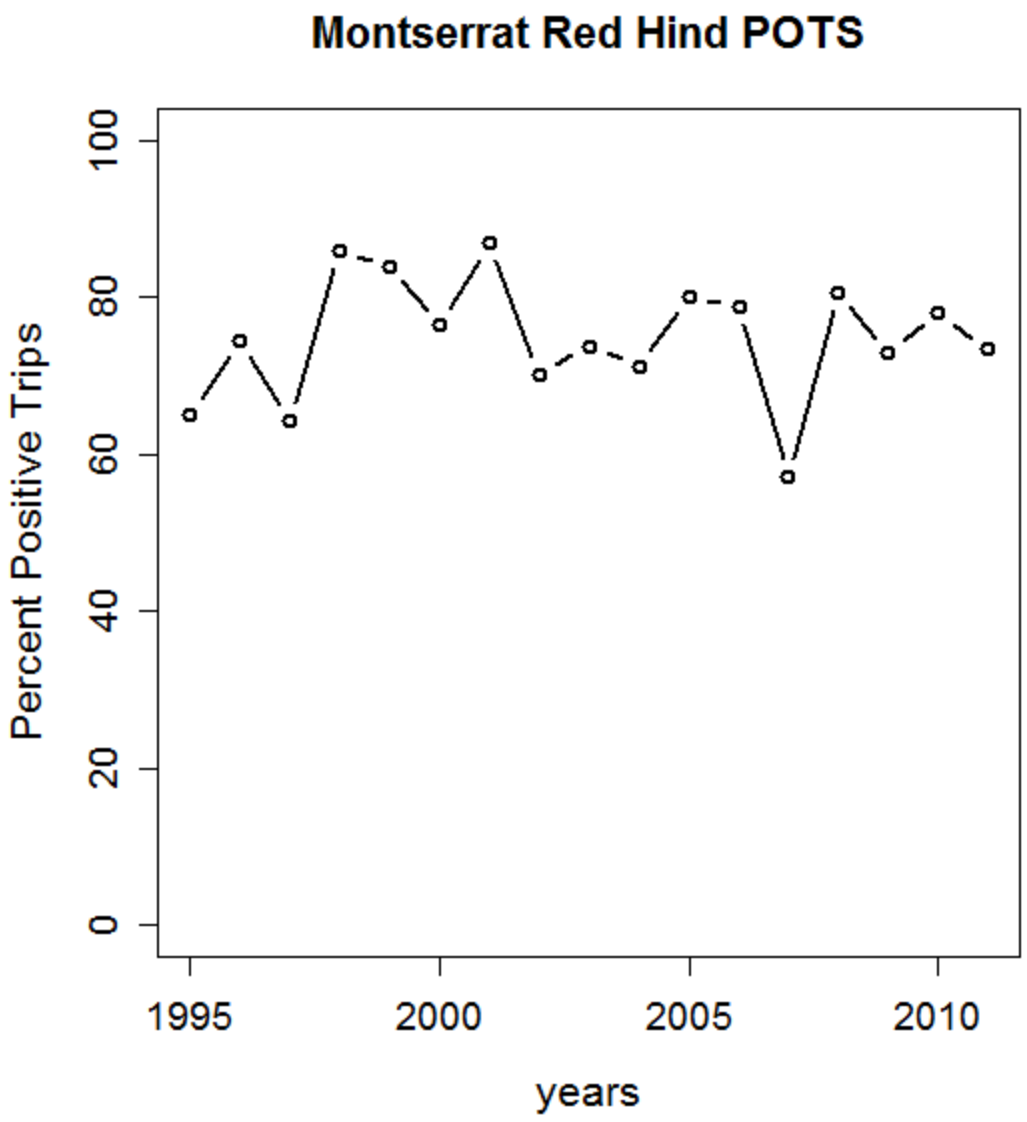

Figure 6. Percentage of trips catching red hind with pots in Montserrat.

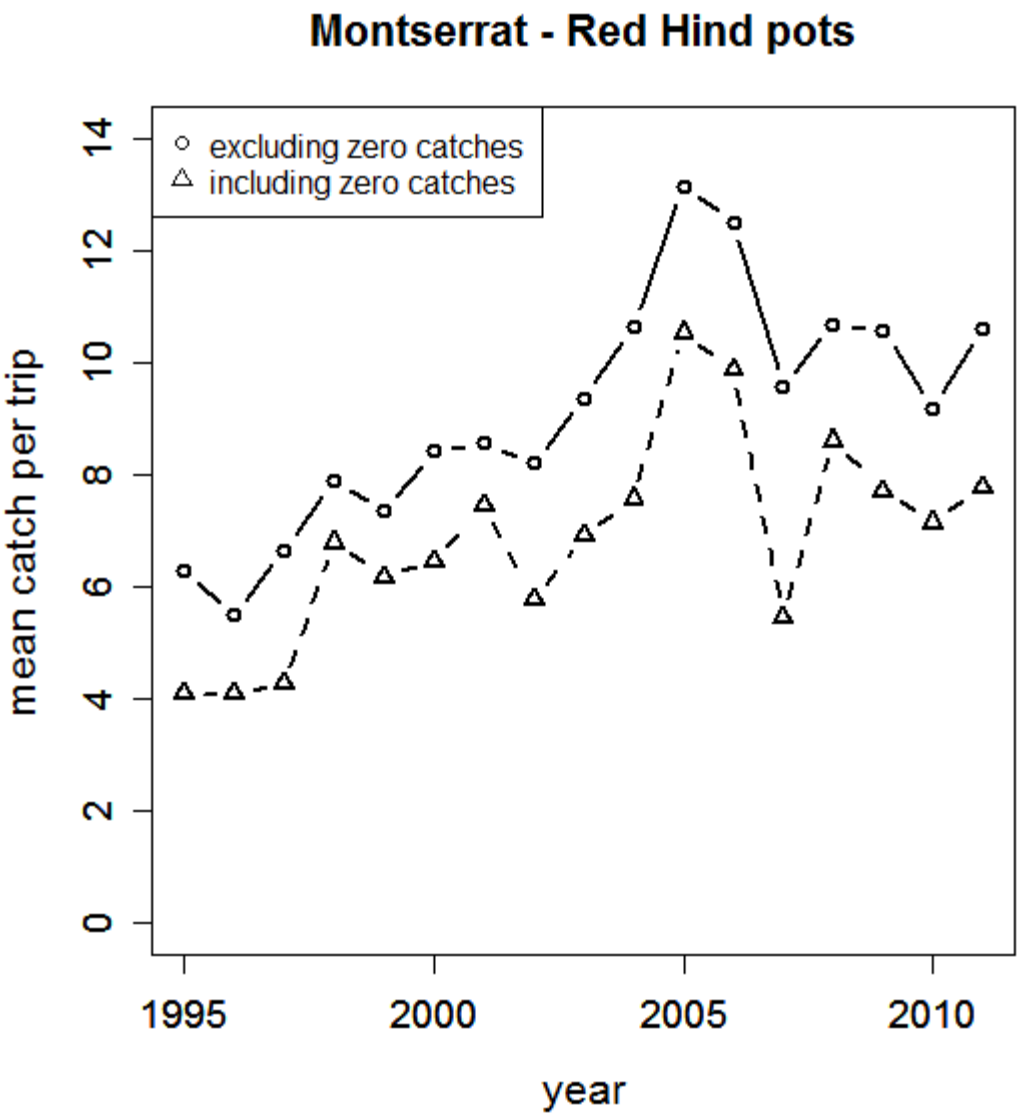

Figure 7. Comparison of two methods for calculating catch rate of red hind in the Montserrat pot fishery.

2.1 Management Objectives

There are no special management objectives for red hind or for the pot fishery. The general objectives are described in Section 1.1.

2.2 Status of Stock

Although no quantitative statements about stock status can be made at this time, the declining trend in effort in the pot fishery coupled with the increasing catch rate of red hind over time and the stable percentage of pot fishing trips reporting landings of red hind suggest that the stock is not in any danger.

2.3 Management Advice

This is one stock for which management could benefit greatly from additional analysis of the existing data. The lengthy time series (1995-2011, with more years available if the data are computerized) provides the opportunity in the future to conduct more complicated and robust statistical analyses of resource condition, e.g., via production model, CPUE standardizations, and other population models. This would enable managers to make changes to meet target (optimal) exploitation rates.

2.4 Statistics and Research Recommendations

Statistics and research recommendations for red hind and for the pot fishery are as described in section 1.4.

3.0 Montserrat Reef Fishery - Needlefish

The catch rate in kg per trip for those trips catching needlefish ("positive trips") is shown in Figure 8; total catch by year is shown in Figure 9. It can be seen that effort has trended downward strongly from 1995 to 2011 (Figure 3); catch rate has trended upward and leveled off in recent years (Figure 8). Total catch (Figure 9) has trended downward reflecting the dominant effect of declining effort over the lesser effect of increasing catch rate.

The percentage of beach seine trips catching needlefish is highly variable over the time series, ranging from about 20% to 80% (Figure 10). The differences between catch rates calculated with and without trips with catches of zero needlefish are sufficiently different (Figure 11) to warrant examination of both types of catch rate in the future.

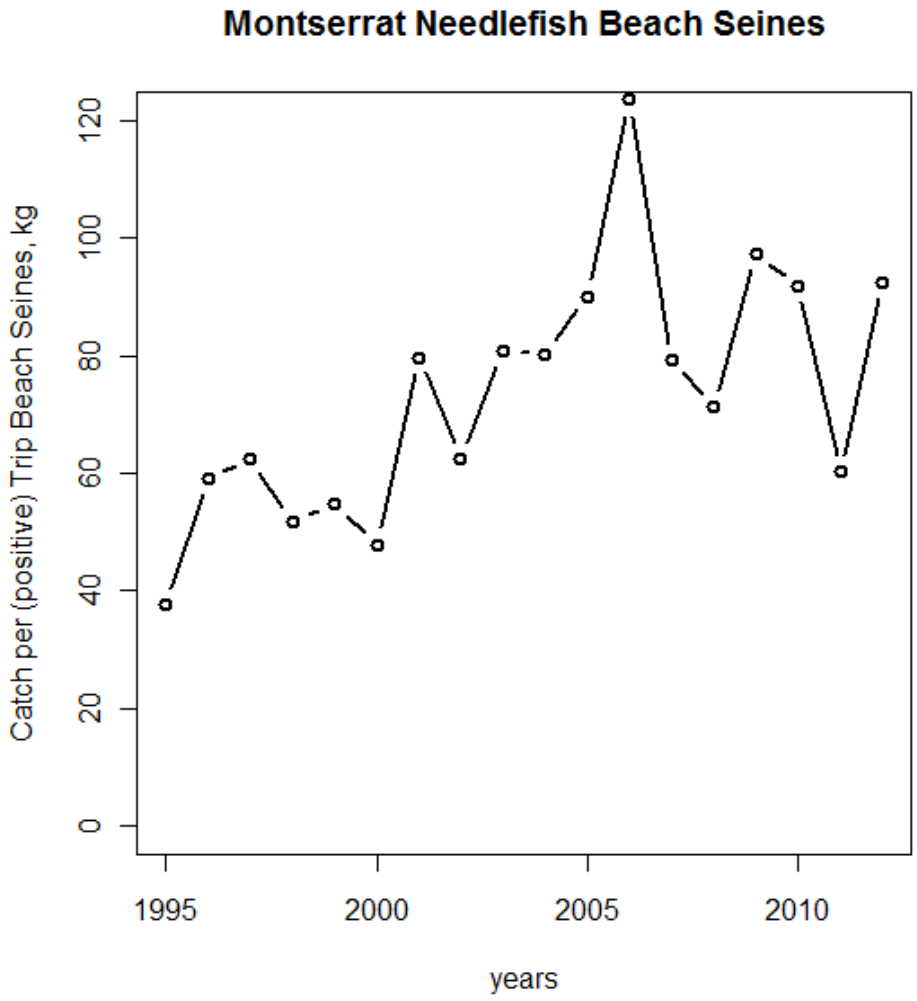

Figure 8. Catch rate of needlefish in beach seines (kg/trip) calculated for those trips landing needlefish.

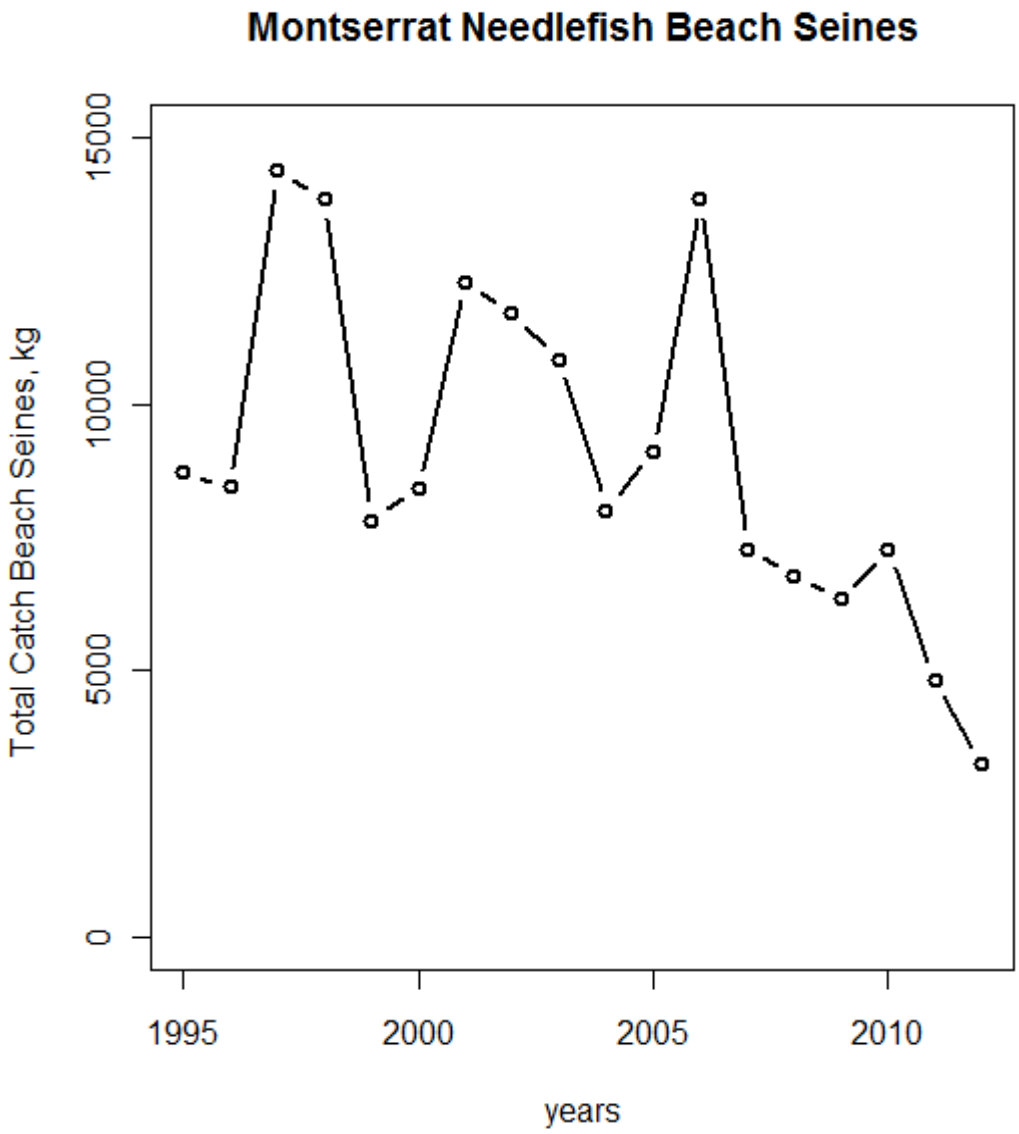

Figure 9. Total catch (kg) of needlefish in beach seines.

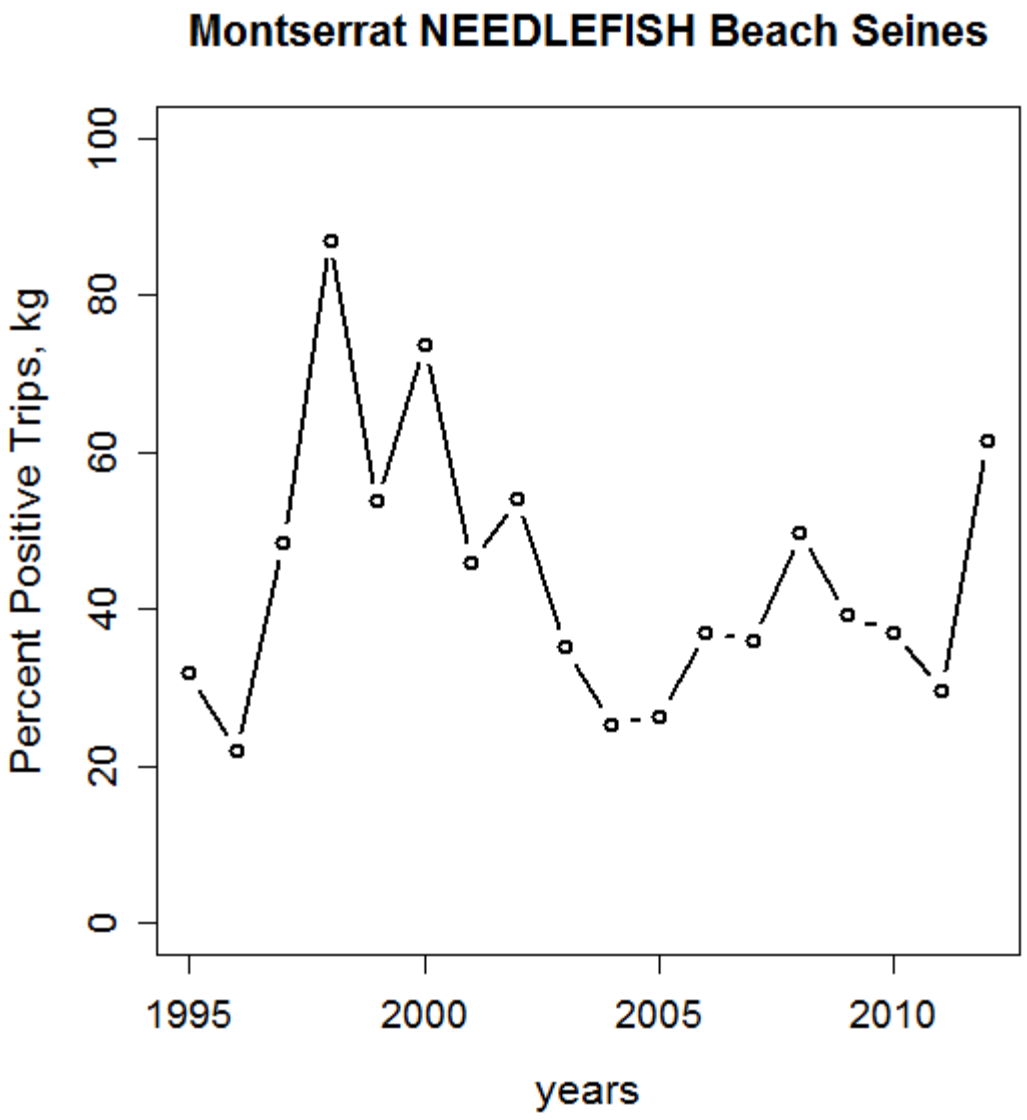

Figure 10. Percentage of beach seine trips catching needlefish.

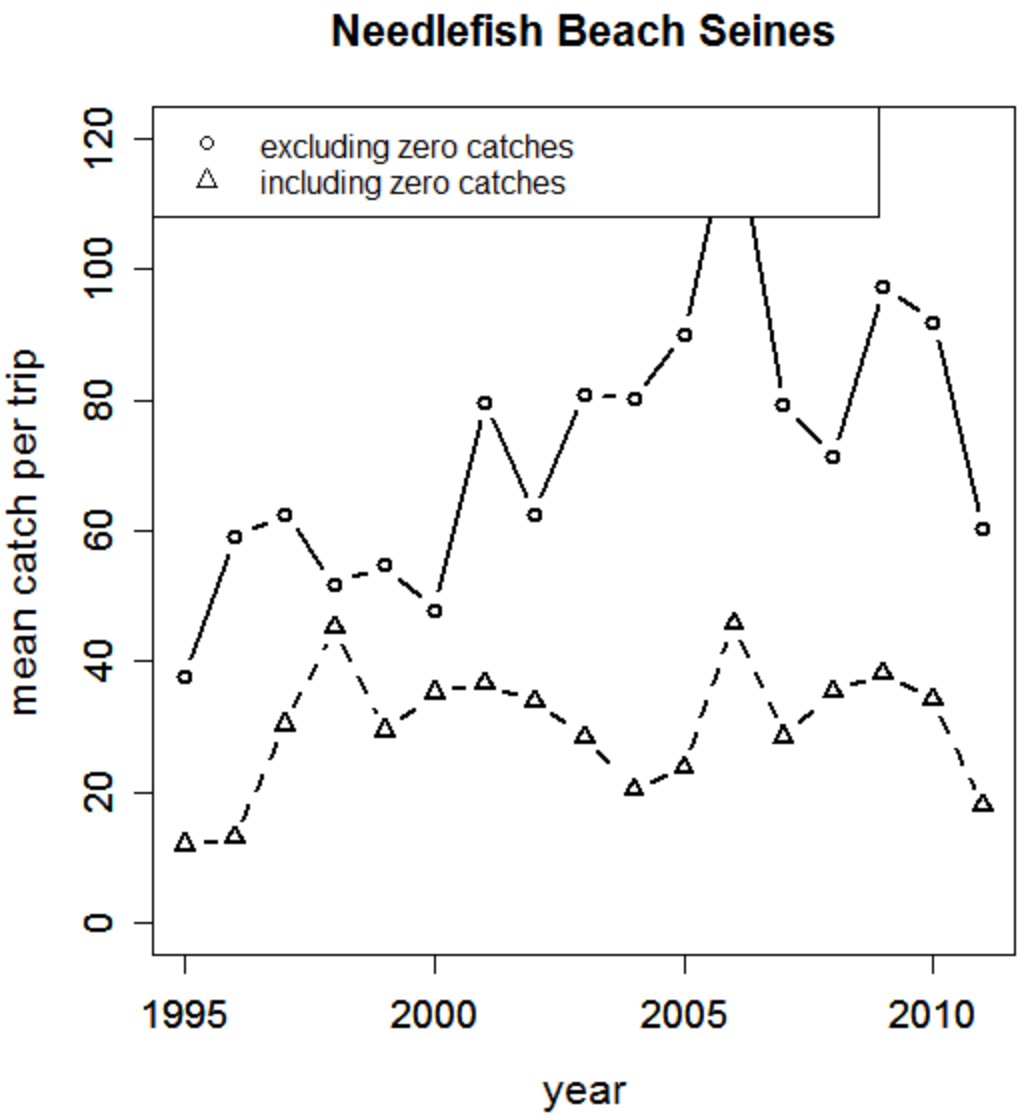

Figure 11. Comparison of two methods for calculating catch rate of needlefish in the Montserrat beach seine fishery.

3.1 Management Objectives

There are no special management objectives for needlefish or for the beach seine fishery. The general objectives are described in Section 1.1.

3.2 Status of Stock

Although no quantitative statements about stock status can be made at this time, the declining trend in effort in the beach seine fishery coupled with the increasing or stable catch rate of needlefish over time suggest that the stock is not in any danger.

3.3 Management Advice

This is one stock for which management could benefit greatly from additional analysis of the existing data. The lengthy time series (1995 - 2011, with more years available if the data are computerized) provides the opportunity in the future to conduct more complicated and robust statistical analyses of resource condition, e.g., via production model, CPUE standardizations, and other population models. This would enable managers to make changes to meet target (optimal) exploitation rates.

3.4 Statistics and Research Recommendations

Statistics and research recommendations for needlefish and for the beach seine fishery are as described in section 1.4

4.0 Jamaica Reef Fishery

Five years of data (2005 – 2009) were available to the Working Group although there are more years of data in the CARIFIS database. Data were available on 11,000 trips and there were on average three species reported per trip. A summary of the species and species groups landed with the number of trips is given in Annex 3. Annex 4 gives the total weight of the observed landings by species or species group. Unfortunately, the Working Group did not have information on the proportion of the total landings that were represented in the observed trips. Hence, total effort and total catches are not known; therefore the data are used primarily to obtain catch rates.

As with the Montserrat data, the available data were collected by national scientists who sampled landings and compiled data on a trip level basis. Landings data include: date, landing site, landed weight by species, gear type and effort information. The data have been archived in the CARIFIS database format.

Most of the observed landings were from the South Coast (15,119 trips) and North Coast (111,026 trips), with 4,365 trips coming from the offshore bank. Location was not available for 2386 trips.

Doctorfish was landed in more trips than any other species (Annex 3). In terms of landed weight, doctorfish ranked eighth (Annex 4) behind conch, lobster, parrotfishes (aggregated species), Atlantic threadfin herring, stoplight parrotfish, grunts (aggregated species) and snappers (aggregated species). Furthermore, doctorfish is landed in each region, with the number of trips with landings of doctorfish being 15,119; 11,926 and 4,365 for the South Coast, North Coast and Offshore Bank, respectively. (There were 2386 trips landing doctorfish for which there is no recorded location.) Because doctorfish is so widely encountered, the Working Group decided to examine the data for this species for each of three regions.

4.1 Management Objectives

The Jamaica Draft National Fisheries Policy (2008) provides a framework for the formulation of management strategies designed to address the important issues, challenges and opportunities facing the industry including; globalization, trade expansion, economic efficiency, industry structure and governance, and food safety and quality. The main goals of the National Fisheries Policy are:

1. Improve contribution to economic growth and reduction of poverty;
2. Improve contribution to sustainable livelihood of Jamaicans through employment in fisheries and responsible fisheries management;
3. Improve fisheries contribution to National Food Security;

Its immediate objectives are:

4. Ensure sustainable development of the fisheries sector;
5. Promote efficiency of the fishing and aquaculture industry;
6. Promote economic and social development of fisheries sector;
7. Improve systems and procedures for the management of the fishing and aquaculture industry;
8. Promote partnerships with stakeholders in the management and development of capture fisheries and aquaculture, and ensure transparency and accountability in the governance of fisheries resources.

4.2 Status of Stocks

No statements can be made about the status of the stocks because the Working Group only had access to five years of data and these did not include the most recent years. Also, the Working Group did not have information on the fraction of the fishery that was sampled and thus could not raise observed landings and efforts to the totals. The analysis was therefore exploratory in nature.

4.3 Management Advice

Complete time series of sampled statistics (catch, effort) should be made available at next annual scientific meeting for analyses to continue work conducted in 2012.

4.4 Statistics and Research Recommendations

4.4.1 Data Quality

- Aggregated species identifications limit the ability for single species assessments;
- Information is needed on sampling fractions (raising factors) so that total landings and total effort can be calculated;
- There are numerous missing locations in the database which should be investigated;
- When calculating catch rates, consideration of trips with zero catches may be influential;
- The entire times series of data (over all years) should be analyzed;
- Consideration should be made of the CARIFIS Data Server for Database Archival for facilitating data extraction and continuity in data retrieval across the Island.

4.4.2 Biological data collections

There is a fundamental need for biological data, especially size and age composition data.

4.5 Data Analysis Summary

The three main types of fishing gear used on the South Coast of Jamaica are China nets, pots (Z-traps) and handlines (Figure 12). The number of trips on the South Coast catching a given species is shown by gear type in Table 1. Unfortunately, the top seven categories are mixtures of species.

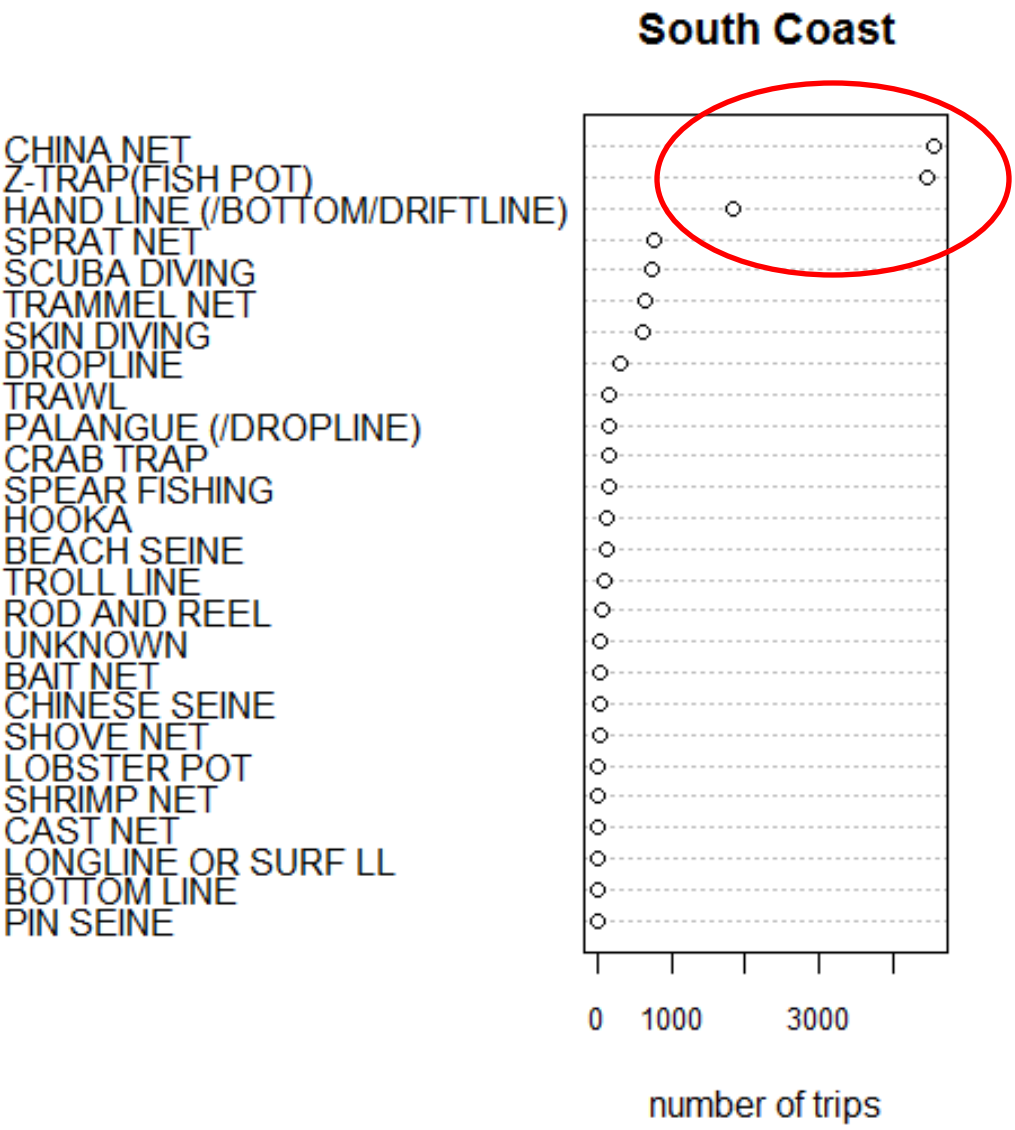

Figure 12. Use of various fishing gears on the South Coast of Jamaica, 2005-2009.

Table 1. Number of trips for each Species/Group in the three most common fishing gear categories, South Coast (2005-2009 combined).

Species/Group	Z-TRAP	CHINA NET	HAND LINE	TOTAL
UNKNOWN	408	357	75	840
SNAPPERS	208	386	104	698
GRUNTS	258	283	96	637
MOJARRAS	16	456	0	472
PARROTFISHES	317	103	16	436
JACKS	111	208	95	414
SQUIRRELFISHES	278	59	58	395
DOCTORFISH	**363**	**23**	**7**	**393**
SNAPPER, YELLOWTAIL	155	12	220	387
PENAEUS SCHMITTI	0	385	0	385
BARRACUDA, GREAT	43	100	96	239
LOBSTER, CARIB. SPINY	192	33	6	231
DRUMMER, GROUND	5	194	4	203
SNOOK, COMMON	4	190	5	199
SEA BREAM	26	164	8	198
MACKEREL, ATLANTIC	3	119	59	181
SNAPPER, RED	78	23	46	147
TUNA, BLACKFIN	14	17	115	146

The two main types of fishing gear used on the North Coast of Jamaica are pots (Z-traps) and handlines (Figure 13). The number of trips on the North Coast catching a given species is shown by gear type in Table 2. Much of the catch is not fully identified and, even when it is, interpretation of the data may be problematic. For example, redband parrotfish is commonly tallied but it is not clear what the total catch for this species may be because some of the fish tabulated as “parrotfishes” may be redband parrotfish.

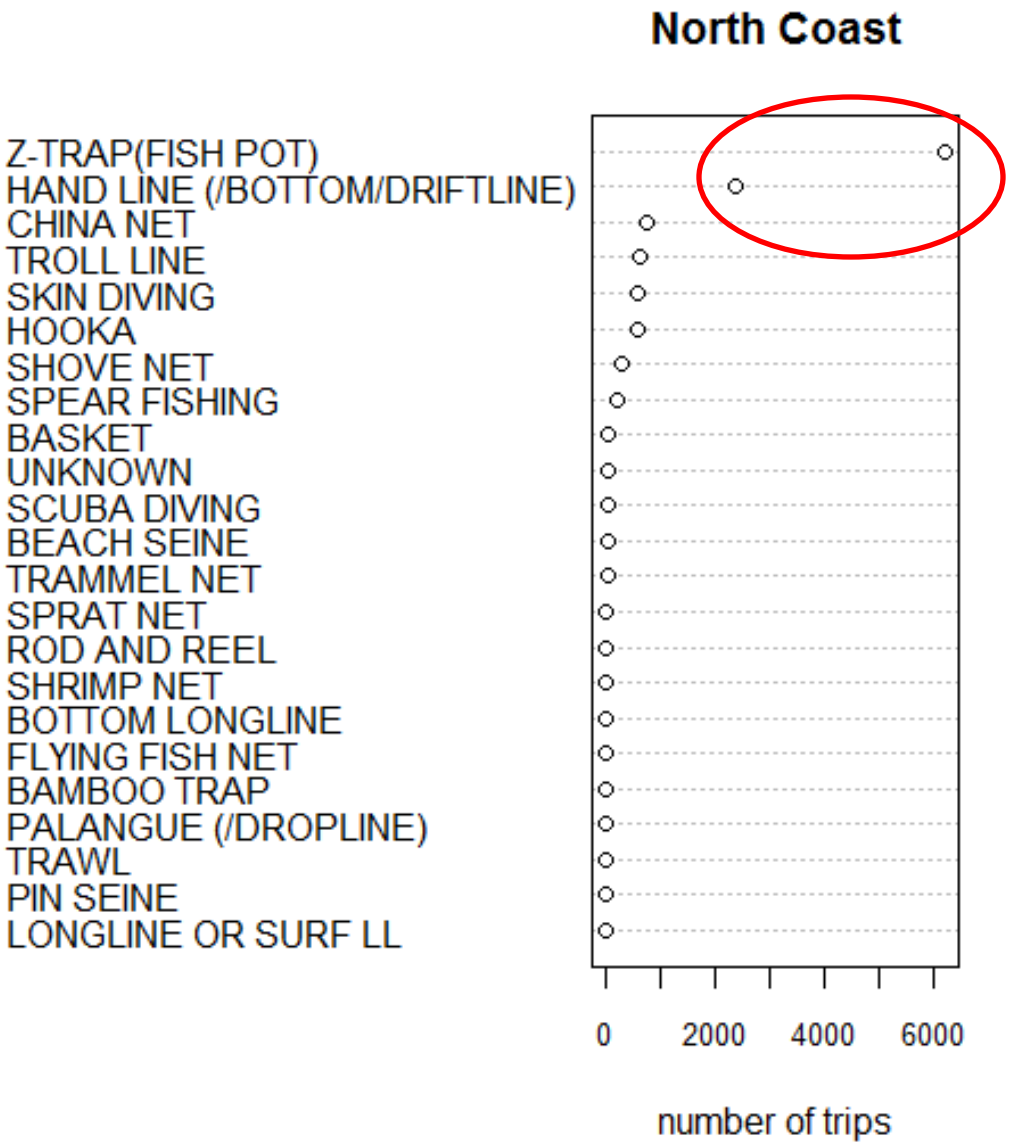

Figure 13. Use of various fishing gears on the North Coast of Jamaica, 2005-2009.

Table 2. Number of trips for each Species/Group in the three most common fishing gear categories, North Coast (2005-2009 combined).

Species/Group	Z-TRAP	CHINA NET	HAND LINE	TOTAL
DOCTORFISH	**884**	**41**	**16**	**941**
SQUIRRELFISHES	616	22	80	718
PARROTFISHES	569	40	36	645
PARROTFISH, REDBAND	360	20	17	397
MULLETS	9	42	296	347
JACKS	200	69	61	330
CRAYFISH	0	10	301	311
SNAPPER, YELLOWTAIL	244	8	41	293
GRUNTS	201	35	51	287
CONEY	211	7	68	286
SNAPPERS	178	32	66	276
PARROTFISH, STOPL.	230	25	8	263
MUDFISH	0	8	254	262
UNKNOWN	207	30	19	256
SNAPPER, DOG	190	12	14	216
LOBSTER, CARIB. SPINY	206	6	1	213
BARRACUDA, GREAT	66	11	114	191

The two main types of fishing gear used on the Offshore Bank of Jamaica are pots (Z-traps) and hookahs (Figure 14). The number of trips on the Offshore Bank catching a given species is shown by gear type in Table 3. As with the other areas, there are problems with the catch not being fully identified.

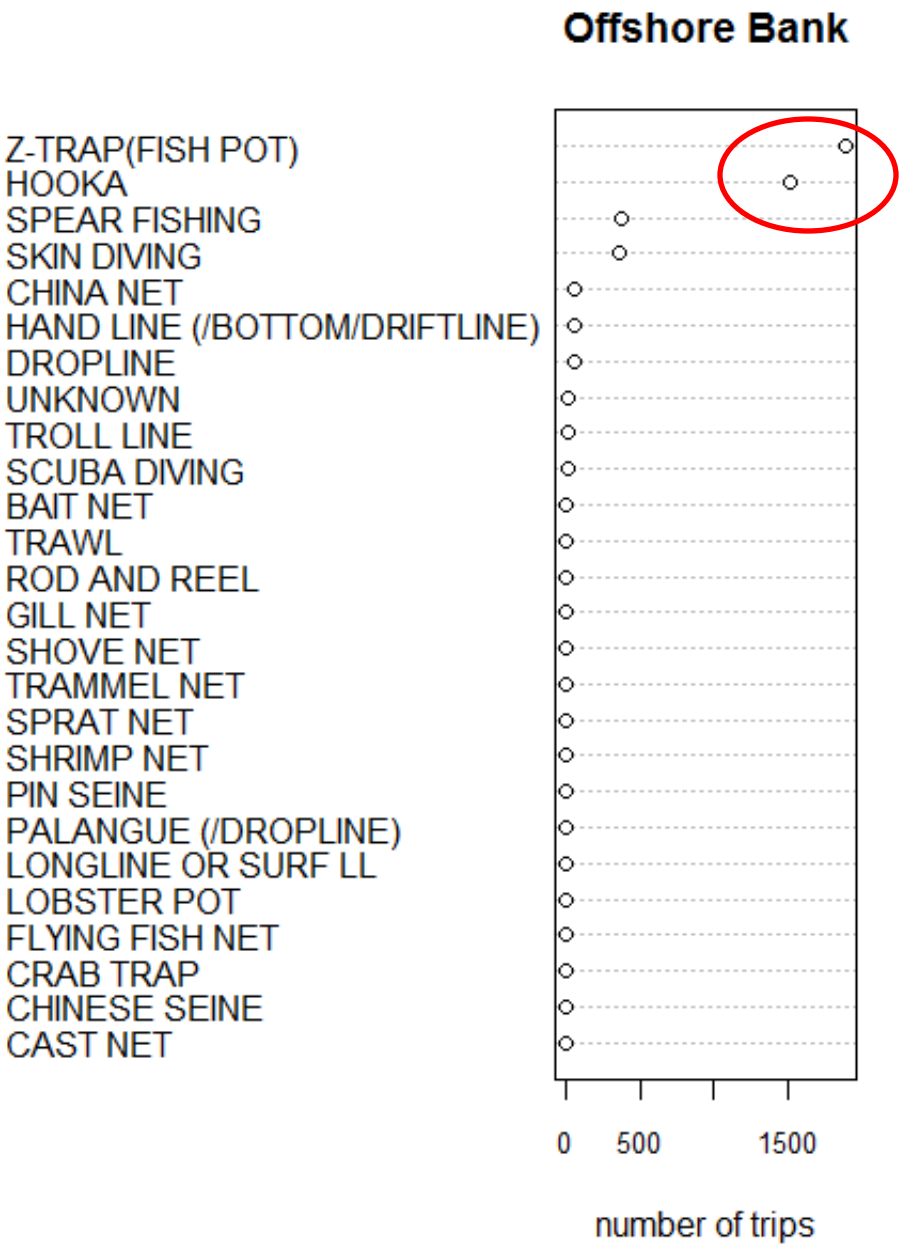

Figure 14. Use of various fishing gears on the Offshore Bank of Jamaica, 2005-2009.

Table3. Number of trips for each Species/Group in the three most common fishing gear categories, Offshore Bank (2005-2009 combined).

Species/group	Z-TRAP	HOOKA	SPEAR	TOTAL
CONCH, QUEEN	0	791	0	791
PARROTFISHES	169	103	66	338
DOCTORFISH	**205**	**48**	**48**	**301**
GRUNTS	182	74	33	289
UNKNOWN	166	53	36	255
SQUIRRELFISHES	137	33	16	186
LOBSTER, CARIB. SPINY	84	99	0	183
PARROTFISH, STOPLIGHT	78	95	5	178
GOATFISHES	106	5	10	121
TRIGGERFISH, QUEEN	72	30	7	109
LOBSTERS, SPINY	39	1	62	102
JACKS	74	21	5	100
SURGEON, OCEAN	76	6	3	85
SNAPPERS	50	16	8	74
PARROTFISH, REDBAND	46	16	11	73
BARRACUDA, GREAT	27	15	4	46
TRIGGERFISHES	33	8	4	45
BLUE TANG	30	5	7	42

5.0 Jamaica Reef Fishery - The Z-trap fishery for Doctorfish

5.1 Management Objectives

There are no special management objectives for doctorfish or for the Z-trap fishery sector. Overall management objectives are stated in section 4.1.

5.2 Status of Stocks

See section 4.2.

5.3 Management Advice

See section 4.3

5.4 Statistics and Research Recommendations

These are as given in section 4.4.

5.5 Data Analysis Summary

5.5.1 South Coast

The number of trips sampled each year was around 200 except in the most recent year (2009) when half that many trips were sampled (Figure 15). The percentage of trips landing doctorfish was around 40% in all five years (Figure 16). The trends in catch rate over time were very similar for positive trips for doctorfish and for all trips, except in the last year (2009) when the two indices diverged (Figure 17). Thus, it can make a difference whether or not trips with catches of zero doctorfish are included in the catch rate calculation. Overall, the observed landings of doctorfish declined steadily over the five year period (Figure 18). Because sampling fractions (the proportion of the total number of trips that were observed by port samplers) are unknown to the Working Group, it is not possible at this time to make a strong interpretation of the catch and the effort data; the conclusions about catch rate may be robust, however.

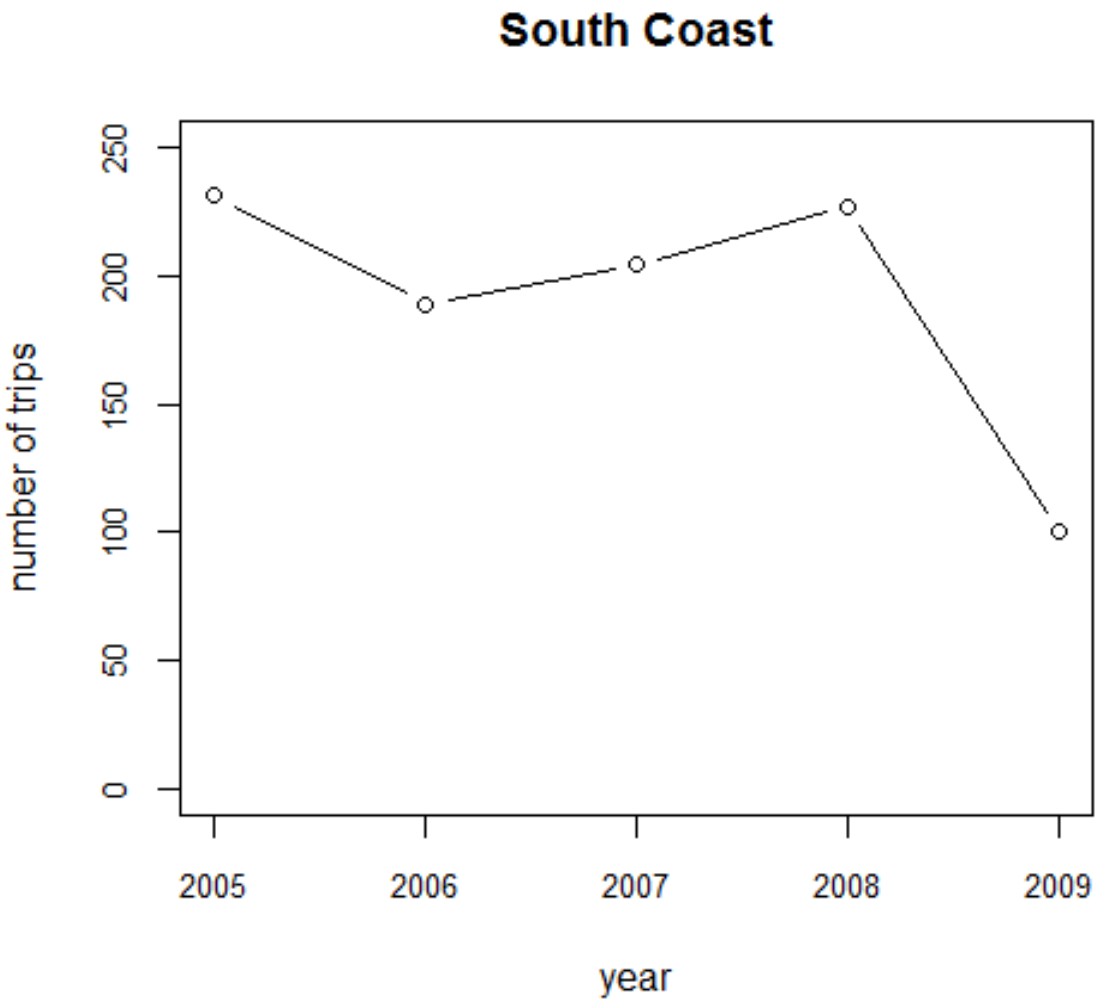

Figure 15. Number of trips sampled along the South Coast of Jamaica from 2005 through 2009.

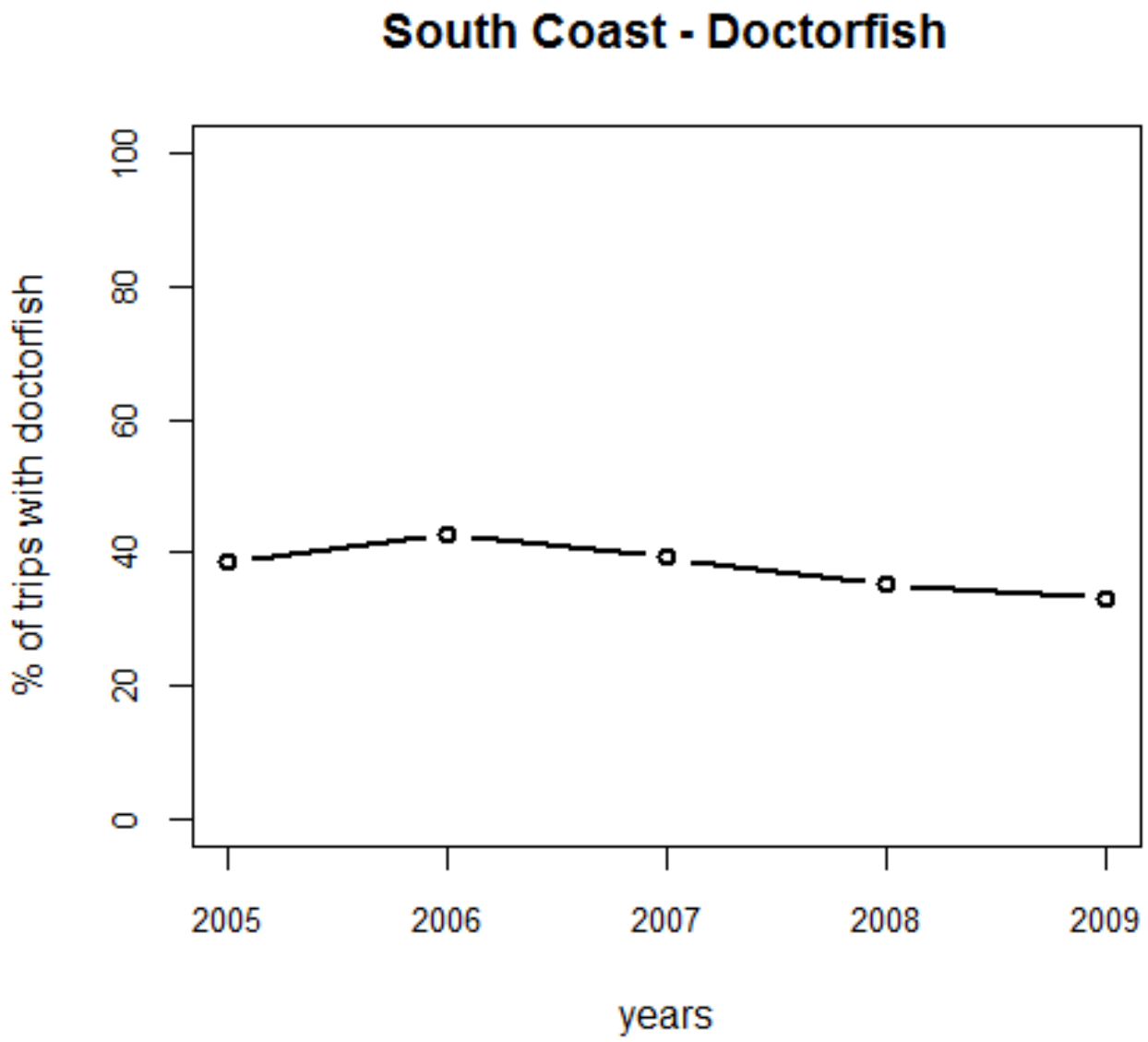

Figure 16. Percentage of positive trips for doctorfish, i.e., trips landing doctorfish, on the South Coast of Jamaica from 2005 to 2009.

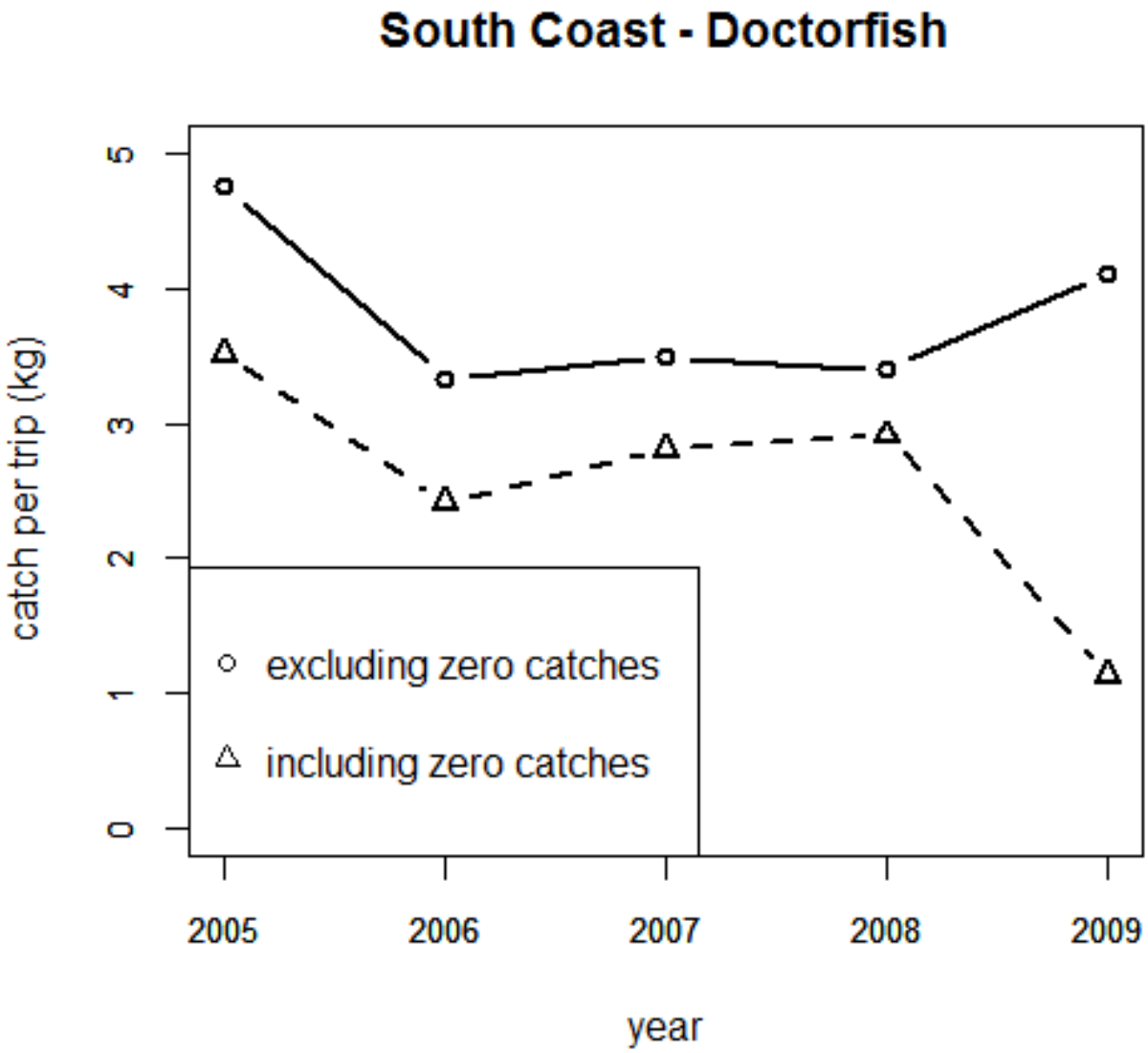

Figure 17. Comparison of two methods for calculating catch rate of doctorfish in the Jamaica Z-trap fishery on the South Coast.

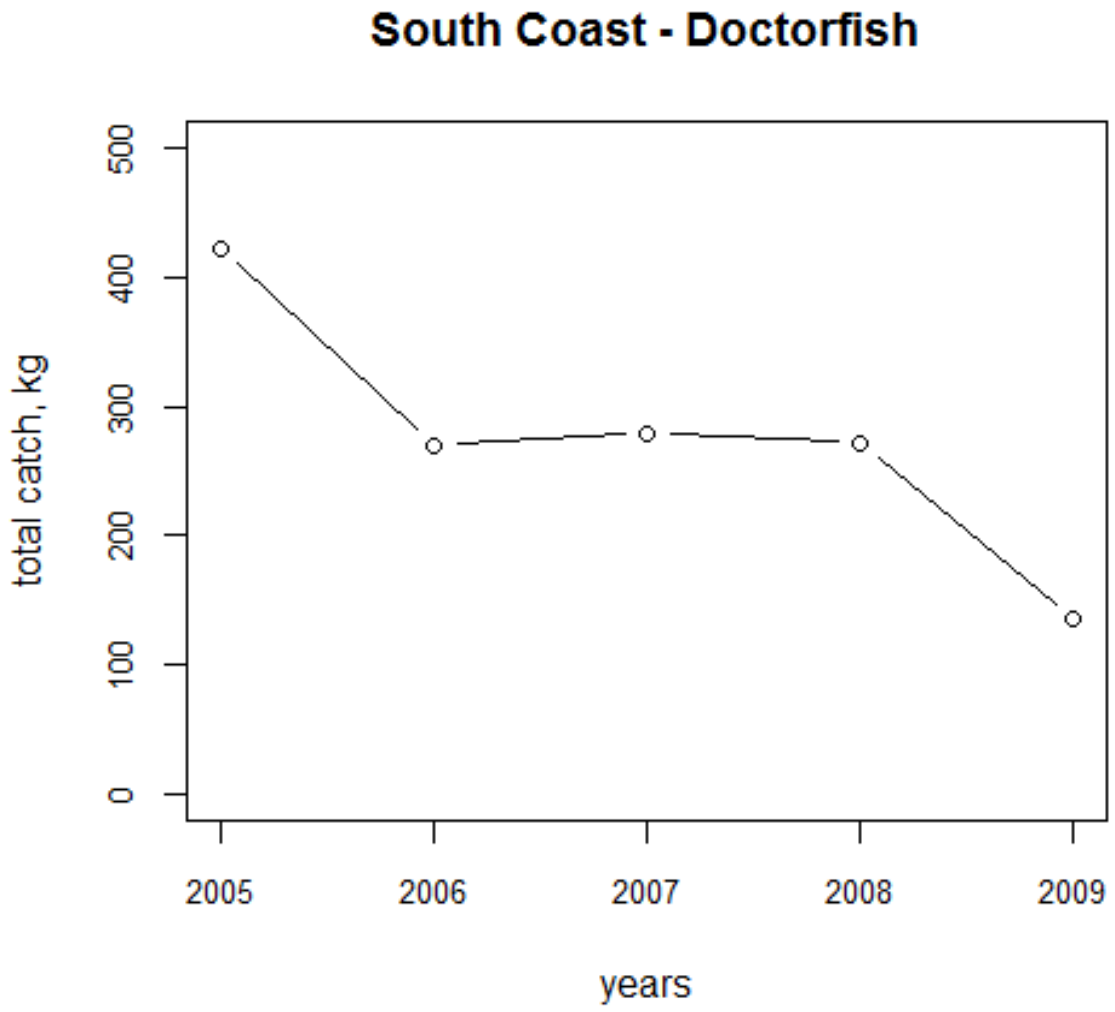

Figure 18. Total observed catch of doctorfish in the landings sampled on the South Coast of Jamaica from fishers using Z-traps.

5.5.2 North Coast

The number of trips sampled each year declined steadily over the time period 2005 - 2009 (Figure 19). The percentage of trips landing doctorfish declined slightly over the five years (Figure 20). The catch rate declined over time regardless of whether zero catches were included or excluded from the calculation (Figure 21). The observed landings of doctorfish declined sharply over the five year period (Figure 22). Because sampling fractions (the proportion of the total number of trips that were observed by port samplers) are unknown to the Working Group, it is not possible at this time to make a strong interpretation of the catch and the effort data; the conclusions about catch rate may be robust, however, and suggest catch rates should be examined for more years and for more species to see if there is evidence of sustained decline.

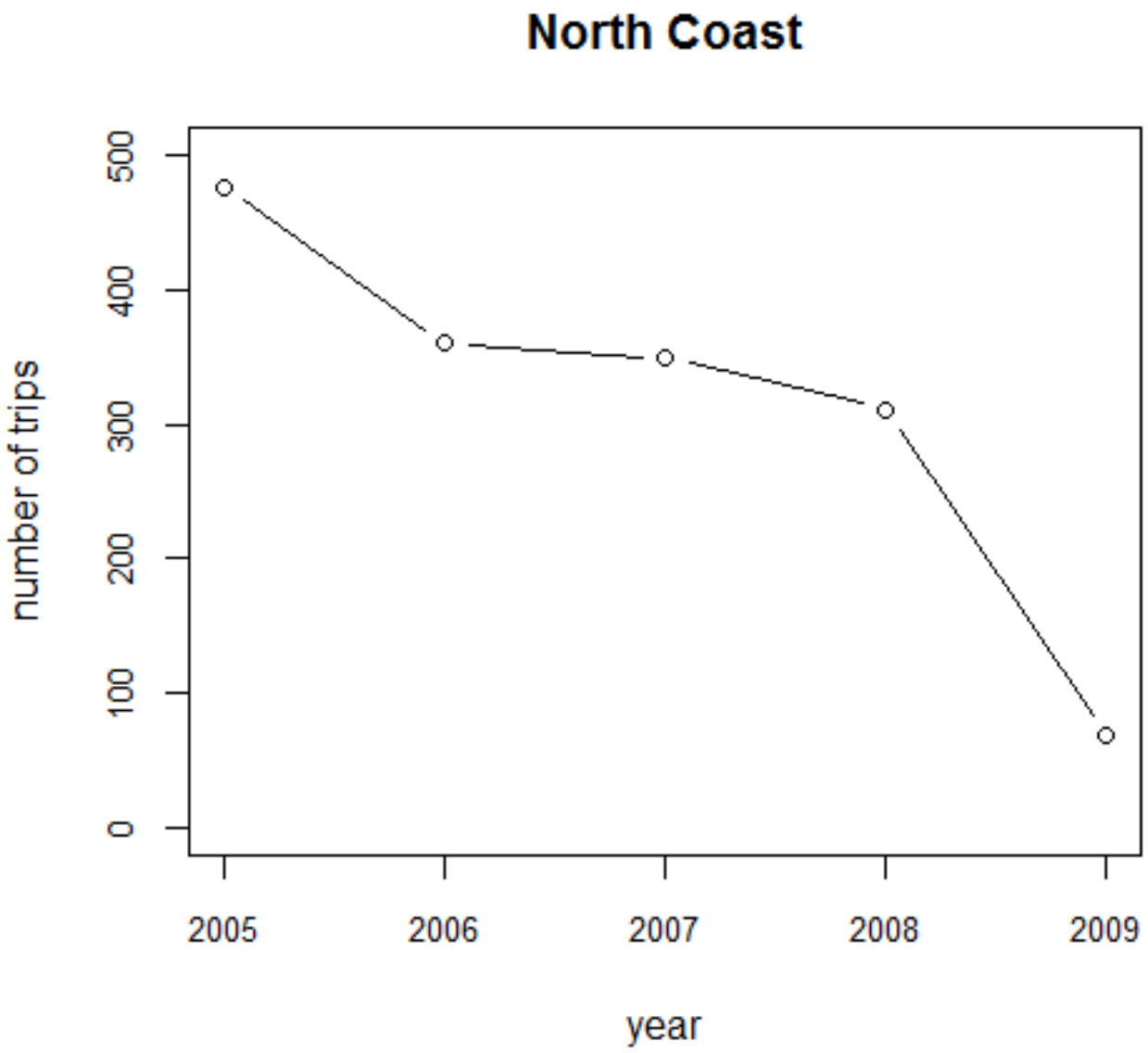

Figure 19. Number of trips sampled along the North Coast of Jamaica from 2005 through 2009.

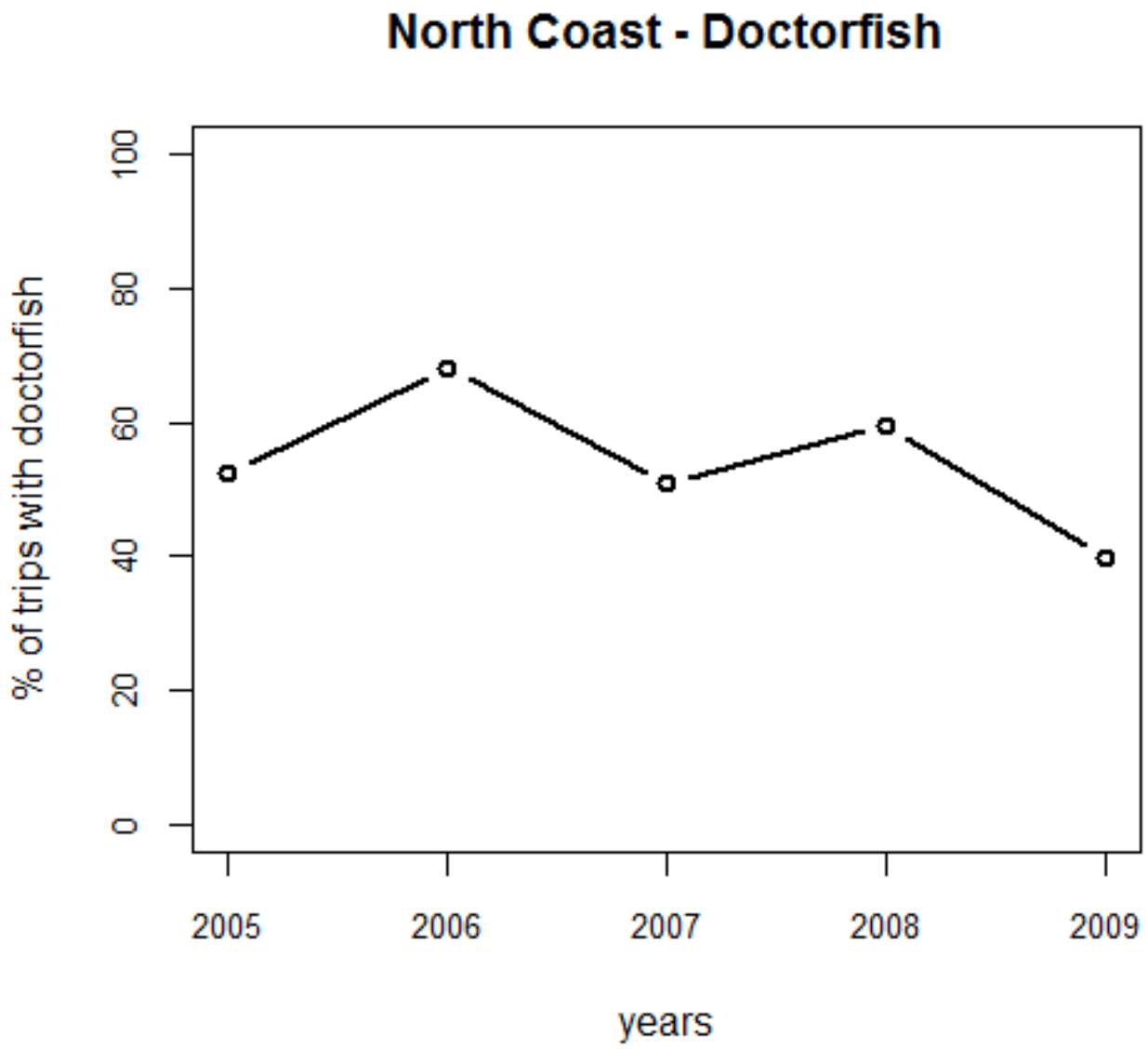

Figure 20. Percentage of positive trips for doctorfish, i.e., trips landing doctorfish, on the North Coast of Jamaica from 2005 to 2009.

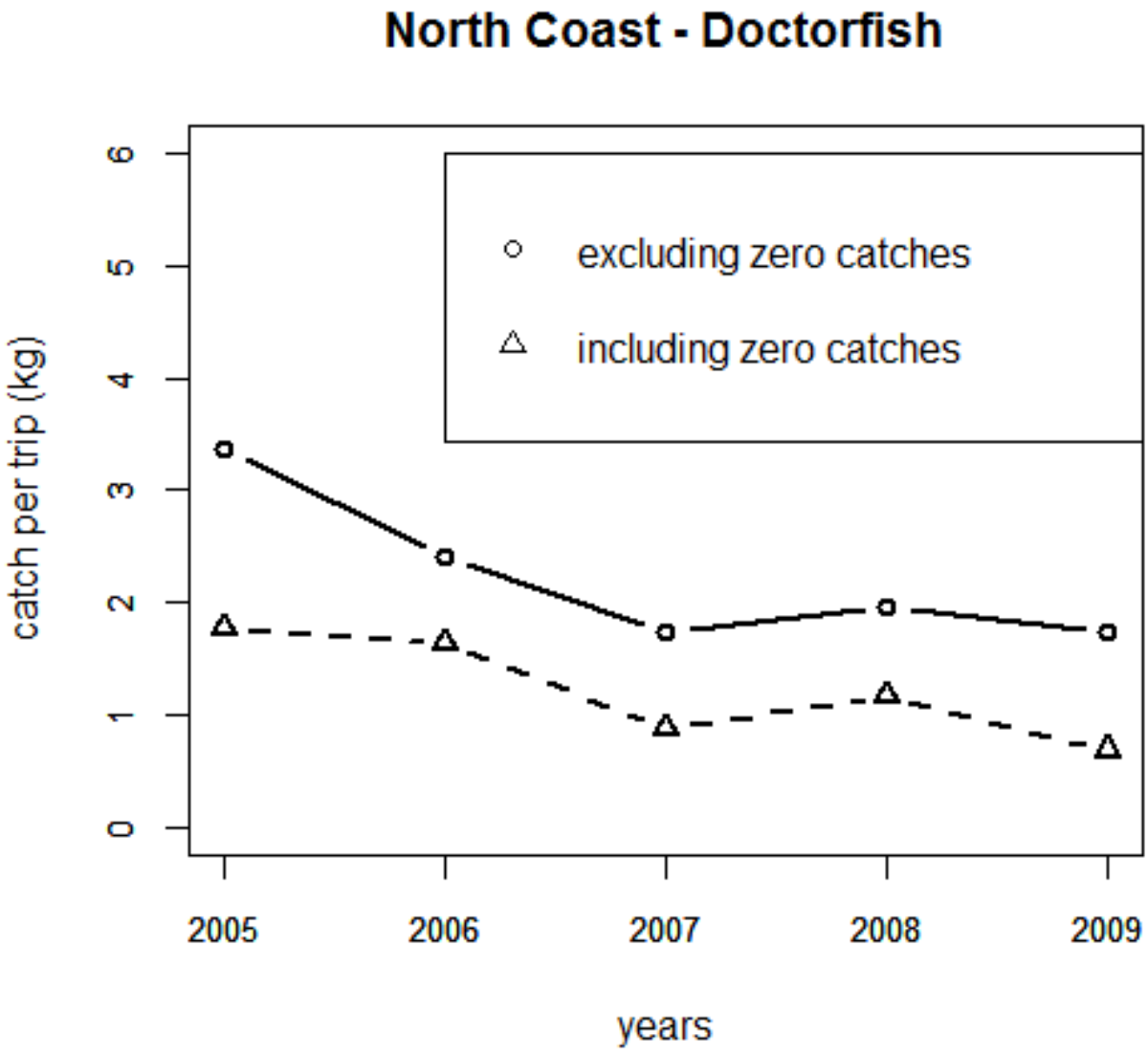

Figure 21. Comparison of two methods for calculating catch rate of doctorfish in the Jamaica Z-trap fishery on the North Coast.

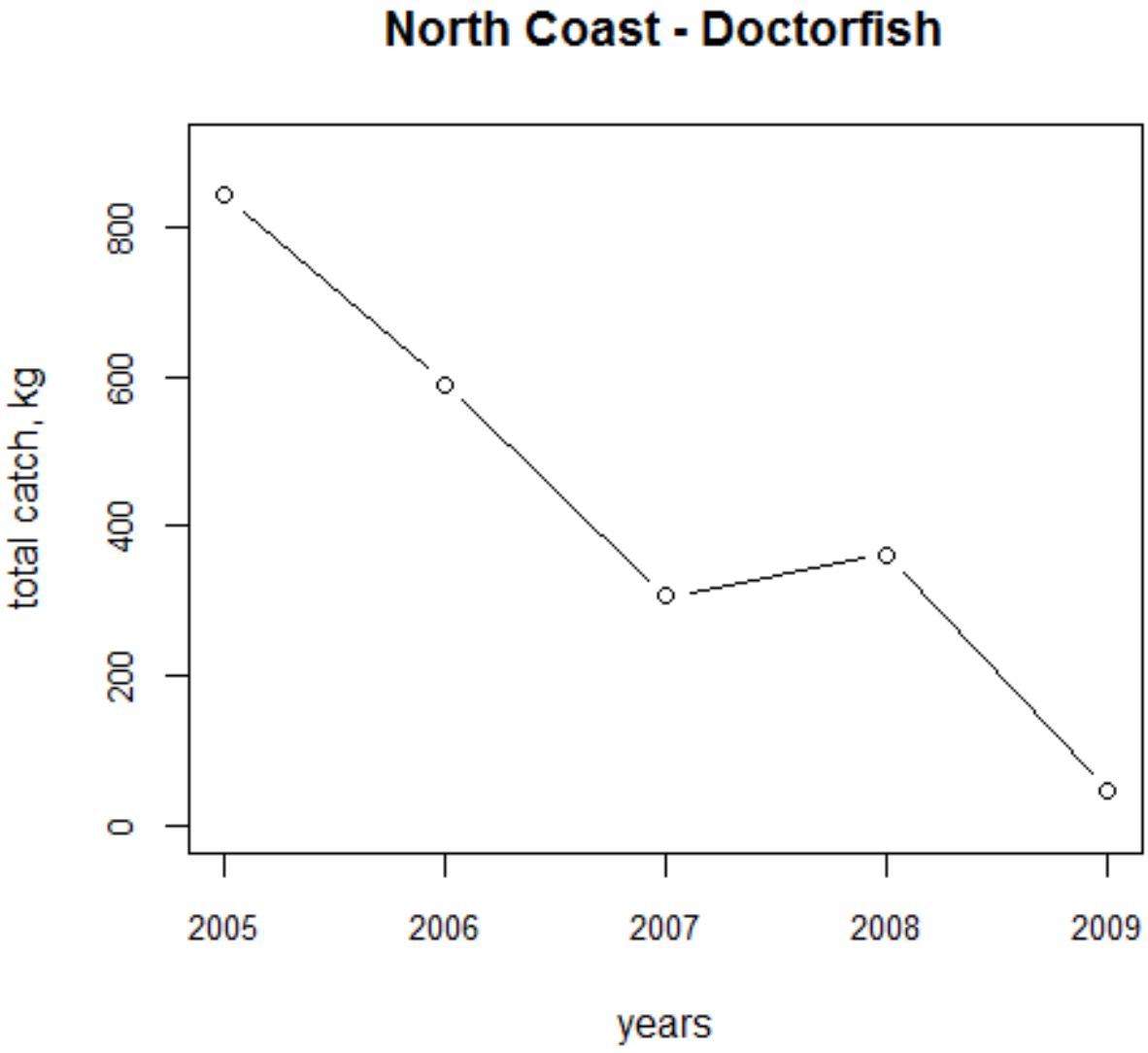

Figure 22. Total observed catch of doctorfish in the landings sampled on the North Coast of Jamaica from fishers using Z-traps.

5.5.3 Offshore Bank

The number of trips sampled each year fluctuated without trend over the five years (Figure 23). The percentage of trips landing doctorfish increased steadily from 40% to 80% (Figure 24). The trends in catch rate over time differed for positive trips for doctorfish and for all trips (Figure 25). In the former case, the catch rates were lower in 2007, 2008 and 2009 than they were in 2005 and 2006; in the latter case the catch rates did not show a clear trend over time. Thus, it can make a difference whether or not trips with catches of zero doctorfish are included in the catch rate calculation. Overall, the observed landings of doctorfish varied without trend over the five year period (Figure 26). Because sampling fractions (the proportion of the total number of trips that were observed by port samplers) are unknown to the Working Group, it is not possible at this time to make a strong interpretation of the catch and the effort data; the conclusions about catch rate depend on the method of calculation.

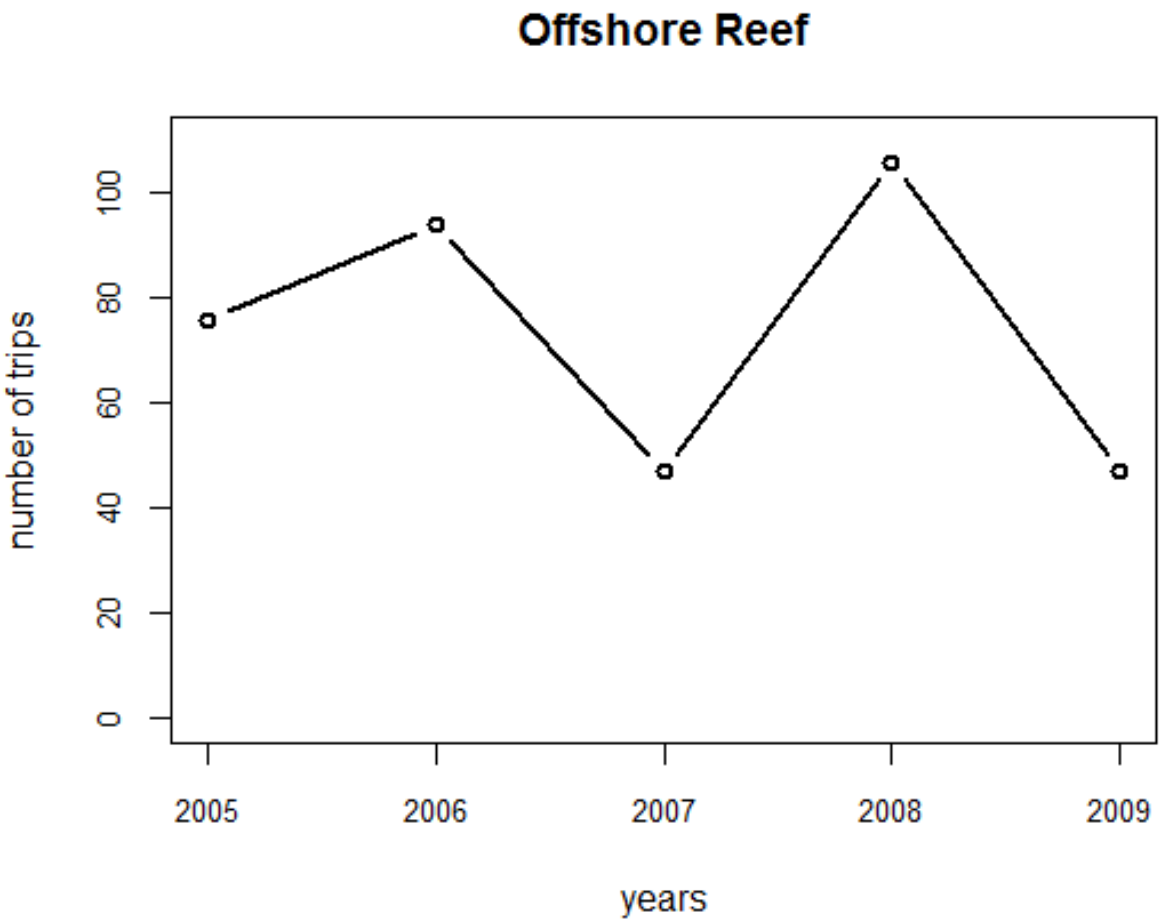

Figure 23. Number of trips sampled from the Offshore Bank of Jamaica from 2005 through 2009.

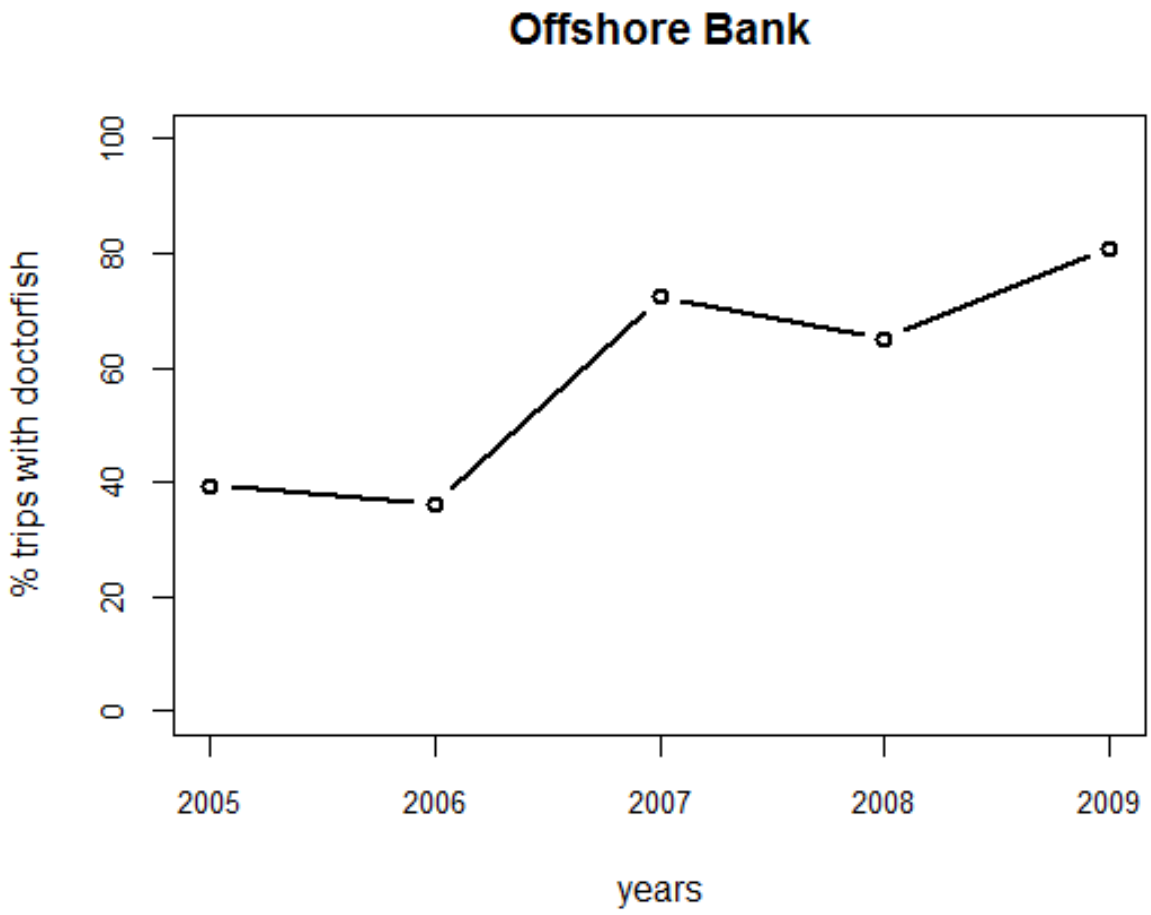

Figure 24. Percentage of positive trips for doctorfish, i.e., trips landing doctorfish, on the Offshore Bank of Jamaica from 2005 to 2009.

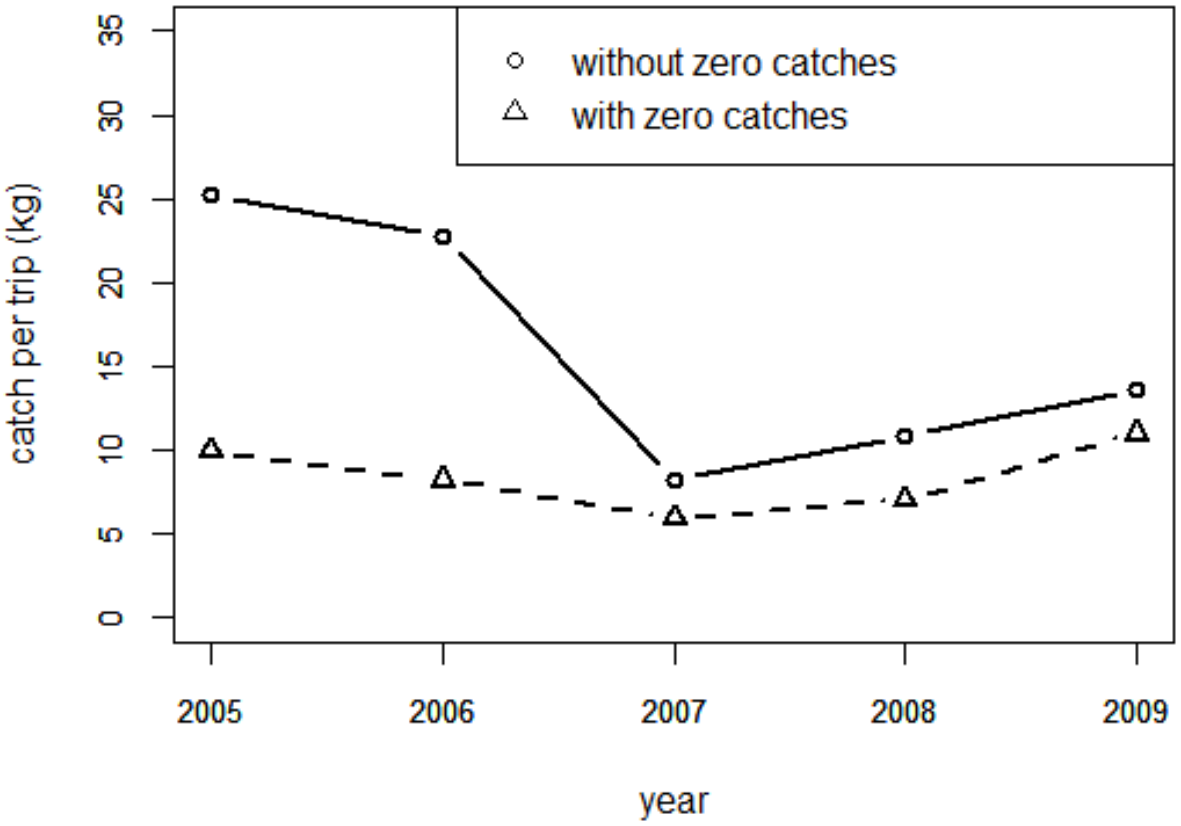

Figure 25. Comparison of two methods for calculating catch rate of doctorfish in the Jamaica Z-trap fishery on the Offshore Bank.

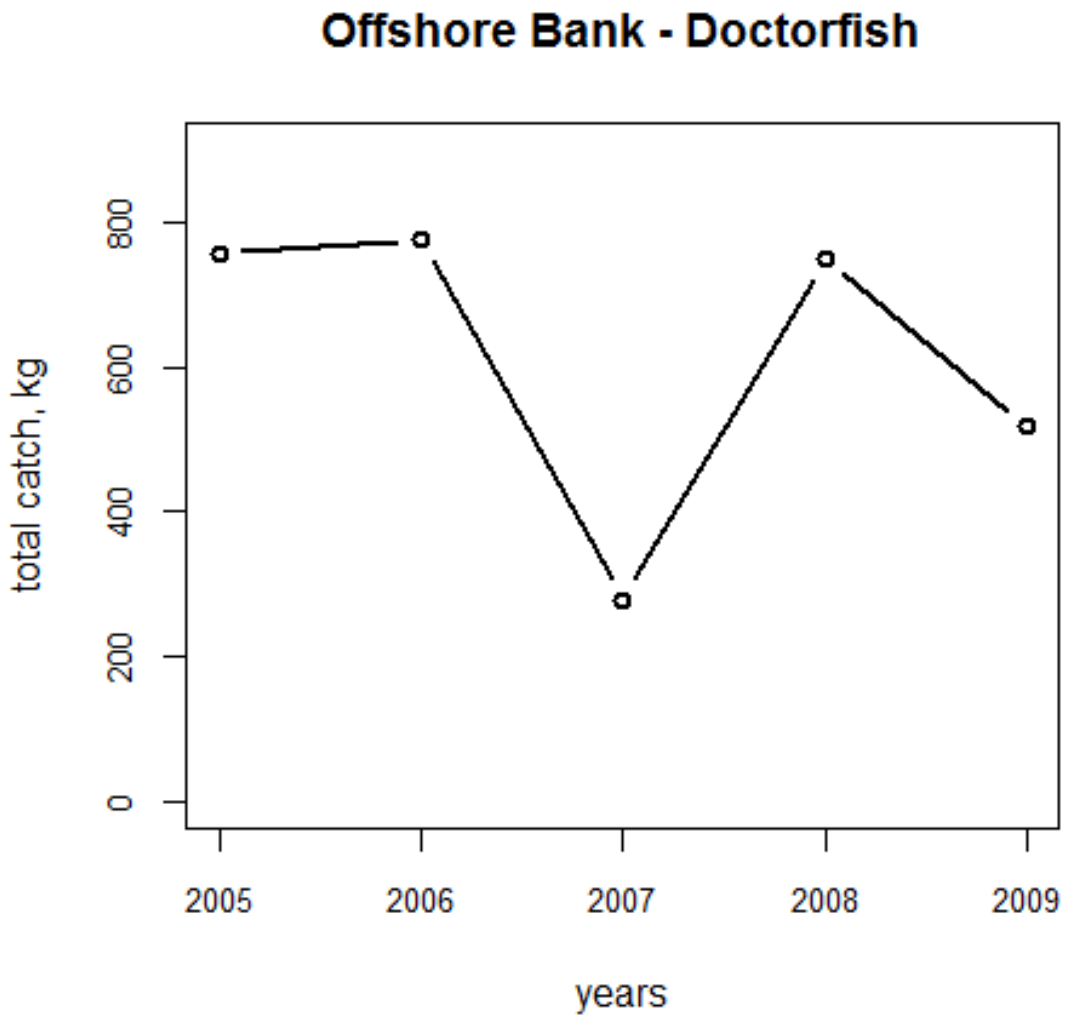

Figure 26. Total observed catch of doctorfish in the landings sampled from the Offshore Bank of Jamaica from fishers using Z-traps.

5.5.4 Discussion

General Issues and Recommendations

- The Working Group recommends CRFM national scientists consider parallel analyses of more CARIFIS databases to promote efficiency, provide mutual support, and benefit from common lessons.

- Attention should be given to improving access to data and to data quality control

    - All fisheries data should be electronically backed up nationally on the countries' servers and a copy backed up on the CRFM server.
    - Fisheries data quality control programs should be developed both at a national and regional level
    - A review of the national fisheries data collection systems should be conducted

- Training will improve data quality and promote better use of a database
- It is vital to extend the length of the time series of data by computerizing historic records

- Review and update CARIFIS data base to include other species (lion fish) and section in the data base. Also, the current landings data collection form should be modified to account for discards, spatial area of catch, quantity and type of gear used.

- In both Jamaica and Montserrat, there is a need to improve the level of identification of the catch to the species level wherever possible.

- In both Jamaica and Montserrat, habitat mapping for the coastal zones of Jamaica and Montserrat would be helpful.

- The Working Group believes it is important to establish routine biological sampling surveys for all fisheries to gather information on size composition and possibly on age composition

- There is a great need and a great opportunity to study lionfish

Fish production, including that of lionfish, depends on the species' intrinsic maximum growth rate and the carrying capacity of the environment. We can measure the maximum growth rate directly when the population size is low; we can measure carrying capacity by noting how growth slows as the population grows. Thus, it is important to institute monitoring programs now to capitalize on the opportunity to measure the critical vital rates. This will afford scientists and managers opportunities to devise and evaluate possible control strategies. In terms of directing fishing effort towards an invasive species as a means of controlling the impact of the species on the ecosystem, there are several factors that govern the efficacy of this approach. First, the species should have commercial value so that there is an incentive for fishers to target the species. However, as the stock declines, fishers lose incentive to target the species. Therefore, a second factor is that there should be non-density-dependent fishing mortality. This can occur if the species is taken as bycatch in other fisheries, e.g., lionfish are caught in lobster traps. Thus, lobster fishers will maintain fishing pressure on lionfish even if lionfish abundance declines. Another mechanism generating non-density-dependent fishing mortality can be exploitation by recreational fishers and divers who can be directed to kill all lionfish encountered. A third factor controlling the success of lionfish reduction efforts is the size at which the fish are caught. Very small lionfish may not have commercial value so some mechanism for promoting the killing/harvest of small lionfish may have to be devised.

The Working Group recommends a thorough review of lionfish plans in the intersession and coordination of efforts to enhance plans.

5.5.5 Biological data collection

Several critical needs were identified pertaining to biological data collection. These data are required in order to describe catch at size and to evaluate seasonal changes in maturity of the RSF species.

1. Catch length frequency sampling should be implemented during the 2012 / 2013 period and continued as an ongoing data collection priority;
2. Routine biological data collections (length / weight, maturity, ageing), should be implemented. Species to be studied should be identified during the 2012 / 2013 inter-sessional period and should be based on examinations of the landings data. Attention should be given to prioritization of species at both the national and the regional level;
3. Information on spawning timing and areas needs to be documented as soon as possible. It is recommended to conduct a survey of the local fishers as a starting point to obtain this information as well as investigate fishing on spawning aggregations;

4. Conduct a literature search at the national and regional level to document information on growth, mortality, spawning, maturation, fecundity.
5. Obtain all research reports conducted in the marine environment of Montserrat prior to and during ongoing volcanic activity.

Annex 1. Number of sampled trips by species for the Montserrat fishery, 1995-2012 (first quarter) combined. Results are given for the three most abundant gear types and for all gear types shown in Figure 1 combined.

SPECIES	Beach Seines	Lines	Pots	All 3 Gears
HIND, RED	110	284	4399	4793
BLUE TANG	107	30	4301	4438
BUTTERFISH	126	119	4144	4389
SQUIRRELFISH, LONGJAW	92	129	3960	4181
TRIGGERFISH, QUEEN	86	78	3946	4110
DOCTORFISH	112	37	3713	3862
COWFISH, HONEYCOMB	59	22	3098	3179
NEEDLEFISHES	2425	14	286	2725
ROCK BEAUTY	21	7	1938	1966
GOATFISHES	55	14	1875	1944
GRUNT, FRENCH	37	11	1883	1931
UNKNOWN	291	547	526	1364
PARROTFISH, STOPLIGHT	38	13	1202	1253
SNAPPER, SILK	27	550	616	1193
GRUNT, CAESAR	11	17	1097	1125
SNAPPER, RED	34	493	556	1083
PARROTFISH, BLUE	19	7	964	990
SURGEON, OCEAN	20	1	905	926
FILEFISH, SCRAWLED	17	1	729	747
BALLYHOO	680	5	51	736
LOBSTER, CARIB. SPINY	19	2	635	656
HIND, ROCK	17	20	603	640
GRUNTS	21	7	600	628

Annex 2. Number of trips, landed weight, and mean weight per positive trip for the major species in the Montserrat fishery, 1995 – 2012 (first quarter), for all gear types combined.

Species	Number trips	Landed_weight (kg)	Mean weight per positive trip(kg)
HIND, RED	**4873**	**41067**	**8**
BLUE TANG	4528	21308	5
CONEY	4241	12824	3
LONGJAW SQUIRRELFISH	4233	21999	5
TRIGGERFISH, QUEEN	4184	27580	7
DOCTORFISH	3939	19481	5
COWFISH, HONEYCOMB	3222	18919	6
NEEDLEFISHES	**2690**	**166852**	**62**
ROCK BEAUTY	1982	3359	2
GOATFISHES	1966	4653	2
GRUNT, FRENCH	1959	5231	3
UNKNOWN	1441	0	0
PARROTFISH, STOPLIGHT	1359	4596	3
SNAPPER, SILK	1204	9607	8
GRUNT, CAESAR	1178	2995	3
SNAPPER, RED	1098	9883	9
PARROTFISH, BLUE	1044	2946	3
SURGEON, OCEAN	945	3339	4
FILEFISH, SCRAWLED	762	2627	3
BALLYHOO	737	24813	34
HIND, ROCK	711	2720	4
LOBSTER, CARIB. SPINY	693	2840	4
GRUNTS	637	1496	2

Annex 3. Summary of the number of trips in Jamaica landing each species or species group, 2005 – 2009. Just the 13 most commonly encountered species are listed.

UNKNOWN	2390
DOCTORFISH	1986
PARROTFISHES	1829
SQUIRRELFISHES	1654
GRUNTS	1569
SNAPPERS	1451
LOBSTER, CARIB. SPINY	1249
JACKS	1101
CONCH, QUEEN	897
SNAPPER, YELLOWTAIL	831
BARRACUDA, GREAT	740
PARROTFISH, REDBAND	722
PARROTFISH, STOPLIGHT	684

Annex 4. Total weight of observed landings in kg by major species / species groups. Data are from 2005 - 2009 combined.

CONCH, QUEEN	545,426
LOBSTER, CARIB. SPINY	45,103
PARROTFISHES	44,082
HERRING, ATL THREAD	24,444
PARROTFISH, STOPLIGHT	23,926
GRUNTS	13,444
SNAPPERS	11,444
DOCTORFISH	10,089
ANCHOVIES	9,996
SNAPPER, YELLOWTAIL	8,691
HOGFISH	7,445
JACKS	6,723
CRAB, BLUE	6,272
SQUIRRELFISHES	6,111
PARROTFISH, REDBAND	5,647
BARRACUDA, GREAT	5,239
TUNA, BLACKFIN	5,115
MOJARRAS	4,850

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

Chairperson: Zojindra Arjune, Suriname
Rapporteurs: Rabani Gajnabi, Guyana (Shrimp)
Zojindra Arjune, Suriname (shrimp)
Consultant: Paul Medley (Fisheries Consultant, UK)

A. OVERVIEW

1. Report of Work Progress since the last Meeting

At the 8th CRFM Scientific Meeting in 2012, Guyana and Suriname each conducted a separate assessment for the seabob (*Xiphopenaeus kroyeri*) using data from their respective national fleets. Trinidad and Tobago did not participate in the SGWG in 2012. The following summarizes the progress of work by the two countries since their last meeting, respectively from 2009 for Guyana and 2011 for Suriname. The SGWG did not meet at the 2010 Sixth Annual Meeting.

Guyana

Although Guyana was not represented at the 2011 meeting, data was obtained from the two processing plants in Guyana, Noble House and BEV. The data from Noble house was collected through a program which was initiated by the company in 2007 and which includes the collection of biological data, including size composition, maturity, as well as landings and fishing effort. BEV provided similar data going back to 2005. Both companies and the Fisheries Department participate in the data collection program.

The Department of Fisheries in Guyana also obtained new rainfall and river outflow data for the period 1980 to 2010, which were obtained from the Hydro-meteorological Department of the Ministry of Agriculture, Guyana.

Suriname

The Fisheries Department in Suriname obtained landings by size category and effort data from the two seabob processing companies, namely Heiploeg Suriname (previously Guiana Seafoods), and Namoona. Landings data (peeled weight in pounds) by size category for 1997 to 2011 were obtained from Heiploeg Suriname with days at sea for 2001 to 2011, and landings data (live weight in kilograms) by size category for 1999 to 2011 were obtained from Namoona with days at sea for 2003 to 2011. Recent biological data collected by Heiploeg Suriname has also been made available to the Fisheries Department. The catch and effort data series has been extended as far back as 1989 for the seabob fishery.

Given the downward trend in deep sea shrimp trawling and concerns raised about future depletion of important stocks including the seabob, the government continues to sharpen its policy towards sustainable fisheries as described in the fisheries policy document ("White Paper for the Subsector Fisheries, 2012-2016"). Previous stock assessment and the development and implementation of a harvest control rule (HCR) for the seabob industry fit well into this policy.

In 2008, the Suriname seabob industry, particularly the Heiploeg Group, initiated the MSC certification process (www.msc.org), which was supported by the government (Ministry of Agriculture, Animal

Husbandry and Fisheries) by the establishment of a special seabob working group which is a management advisory group comprising the Government of Suriname, the two seabob processing companies, the NGO World Wildlife Fund (WWF) and other relevant stakeholders. The HCR is being reviewed monthly to monitor the status of the fishery using data provided by the seabob processing companies. The MSC certification was successfully obtained in November 2011.

Concerning the estimation of the artisanal catch, a survey was planned in 2011 for different species relevant to this subsector. Execution of this larger survey has been delayed and therefore it was decided to conduct a separate survey for the artisanal seabob fishery. This should be completed in 2012, based on information from the seabob buyers or by sampling the artisanal landings.

If it can be verified that the artisanal landings are insignificant then no further monitoring of this component of the fishery will be required in the long term. If estimates suggest these catches are significant, a time series of estimated catches needs to be developed for inclusion in the assessment.

2. Report on Relevant Activities/Plans of Other International Fisheries Organizations.

CLME / FAO

The project 'Sustainable Management of the Shared Living Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions' is a regional project financed by the Global Environmental Fund (GEF). Part of this project is a 'Case Study for the Shared Stocks of the Shrimp and Groundfish Fishery of the Guianas-Brazil Shelf'. The implementation lies with the Food and Agriculture Organization of the United Nations, FAO, the Fisheries and Aquaculture Division. Regional organisations participating in the project include the Caribbean Natural Resource Institute (CANARI), the 'Centre for Resource Management and Environmental Studies, (CERMES) and the Caribbean Regional Fisheries Mechanism, (CRFM)'. The main purpose is to acquire the unknown data for a Transboundary Diagnostic Analyses (TDA), which should serve as a base for a Strategic Action Plan (SAP). The Ecosystem Approach to Fisheries (EAF) will be applied in the management of the shrimp and bottom trawl fishery.

Furthermore it is necessary to improve management practices at the national and regional levels to optimise the benefits from the fisheries resources. There are indications of overfishing of shrimp and groundfish resources and the influence of human activities on coastal areas. However, little is known of the effects of climate change. Countries taking part in the "Case Study on the Shared Stocks of the Shrimp and Groundfish Fishery of the Guianas – Brazil Shelf" include Trinidad and Tobago, Venezuela, Guyana, Suriname, French-Guyana and Brazil.

ACP Fish II

In accordance with the Regional Action Plan of the ACP Fish 2 program the project "Support to formulate fisheries management plans for Guyana, Suriname and Trinidad and Tobago" was approved and launched in May of this year. The next Program Monitoring Workshop is planned for October in Suriname.

3. Tasks to be addressed at 2012 Meeting.

Guyana and Suriname

- Evaluate the available data particularly for Guyana for stock assessment.
- Updated assessments of Atlantic seabob (*Xiphopenaeus kroyeri*) are to be conducted for Guyana and Suriname separately as well as jointly.

- Brief introduction to stock assessment modelling.
- Effect of river outflow / rainfall on productivity is to be examined.
- Examine available size composition data for stock assessment purposes.

4. Relevant Policy / Management Objectives, Fishery Characteristics/Trends and Available Data for Fishery Analyses / Assessments Identified at (3).

Guyana

A closed season from September to October which was recommended by the trawler association has been in place since 2003. However, analyses conducted in 2007 based on the best available information suggested that a closed season in May would be effective in protecting the pulse of recruitment rather than the current closed season. Further investigations on growth rates and patterns of recruitment are required to verify and refine this advice.

Since 2011, the Guyana Fisheries Department has negotiated a capacity reduction of 20% of vessels that are targeting seabob. The Department of Fisheries, Ministry of Health Veterinary Public Health Unit, trawler operators and seafood processors are meeting regularly to discuss IUU fishing and MSC certification. There are new measures in place to reduce opportunities to fish illegally due to the implementation of a catch documentation scheme for exports to the EU.

Suriname

The Government of Suriname intends to continue monitoring and improving the sustainability of the seabob fishery, specifically the HCR and the effectiveness thereof. Other management measures include the institutionalisation of the seabob working group to improve collection and transfer of the required data, collaboration among stakeholders and annual review and, if necessary adjustment of the management plan.

Research on the effect of the seabob trawl fishery on the ecosystem including other stocks and species, in particular the longnose stingray (*Dasyatis guttata*) and the smooth butterfly ray (*Gymnura micrura*), is also of importance within the management plan.

Available Data for Assessments

Guyana

- Data received from two of the four seabob processing companies were considered complete. The other two companies failed to provide good quality data and hence the data submitted were used only for estimating total catch.
- Catch and effort for 2001 to 2011.
- Total catch for 1998 to 2011.
- Total catch for 1985 to 1997 from FAO FIGIS database.
- Biological data as described under Item (1)
- Rainfall data 1980 - 2010

Suriname

- Landings by month and size category for 1997 to 2011 available.
- Catch and effort for 1997 to 2011
- Total catch for 1997 to 2011

- Total catch for 1989 to 1997 from FAO FIGIS database.
- Biological data as described under Item (1)

5. Fisheries Statistical and Assessment Analyses Conducted

Guyana and Suriname

The following analyses were conducted for the countries separately:

- A catch and effort biomass dynamics model was fitted using Bayesian framework.
- Various other exploratory analyses were done including cross-correlations for rainfall.
- Examine size biological data collected 2008-09 and 2012

6. Other Tasks Conducted.

This agenda item was not applicable.

7. Review and Adoption of Fishery Analysis Reports and Other Technical Documents.

Reports of the assessments of the seabob (*Xiphopenaeus kroyeri*) fisheries of Guyana and Suriname were adopted by the SGWG and are provided in part B of this report.

8. Issues and Recommendations Re: Data, Methods, Training for DMTWG.

- Basic training / refresher course in data manipulation and management to include such items as: look up functions; data query tools; pivot tables; basic introduction to SQL or Microsoft Query. This training should be targeted at officers in the region involved in stock assessment work and who attend the CRFM Scientific Meetings. Such training would facilitate improved data preparation and analysis during the inter-sessional period.
- Book and/or training manual for the instruction on the use of R.
- Ageing of priority species of groundfish assessed and/or identified for assessment at previous scientific meetings would be useful for obtaining growth curves. As such, funding should be allocated to the Regional Age and Growth Lab to facilitate the ageing of these species. Funding may also be required to assist member countries in obtaining the necessary fish samples.

9. Inter-sessional Work Plan and Recommendations

General

- Although the communication has somewhat improved between last year's representatives Lara Ferreira from Trinidad and Tobago, Ranjiet Soekhradj from Suriname and the consultant Paul Medley, we still recommend greater interaction among SGWG members during the inter-sessional period to facilitate the work of the group. This can be done with little cost via electronic mail, Skype, net meeting site or video conferencing.

- The Stock Assessment Parameters Profile for five species of Western Atlantic Tropical Shrimp, first developed by the Government of Trinidad and Tobago under an FAO / UNDP Project TRI/91/001 and subsequently updated, will be circulated among the members of the SGWG for update with new information obtained from assessments conducted at this workshop as well as any other relevant information.

- Further training in the assessment methodology can also be conducted for the SGWG and other working groups to give member countries the chance to improve the basic understanding of stock assessment among more fisheries staff. This will improve the preparation of data and participation at the scientific meeting.

Guyana and Suriname

- Training in data collection and analytical methods specifically for seabob management should be undertaken by members of the working group and other government staff to take on full roles and responsibilities for the management of this species. The process applied to seabob could be developed and adapted to other species as appropriate.

- The Guyana catch and effort data series should be extended as far back as possible prior to 2005. Catch and effort data for Suriname has been verified to the extent possible. Estimates for the artisanal catch need to be completed.

- The artisanal survey has been set up for providing an accurate estimate of the artisanal seabob catch in Suriname and an estimate of 800 t was provided to this meeting as the upper limit of this catch. It is recommended that the final estimate is submitted to the SGWG for inclusion in the stock assessment to test its significance in terms the determination of stock status and scientific advice.

- Given the vulnerability of the elasmabranchs taken as bycatch in the seabob fishery (Longnose stingray, *Dasyatis guttata* and the smooth butterfly ray, *Gymnura micrura*), it is recommended that data are gathered on these species adequate for a risk assessment. This would include, but not be limited to, total catch (estimated) and the catch and effort over at least one year, size and sex composition, and data from the tagging program.

- Attempts should be made to improve co-operation and communication between the fisheries departments of Guyana and Suriname, since they have the same types of fisheries. This would be especially profitable for joint and comparative analyses of the seabob and other stocks, and joint review and update of the assessments conducted for Suriname and Guyana at the scientific meetings, including sensitivity analyses and projections. In order to conduct the sensitivity analyses, the key parameters that introduce the most uncertainty into the assessments must be identified. Size composition data can be used to estimate growth and mortality, and this information can be used to improve the assessment.

- A system should be developed for the Fisheries Department to obtain the data from the seabob processing companies in Guyana. A system must be developed for Guyana fisheries department to have access to data from the processing facilities. The establishment of a seabob management working group, as in Suriname, may be useful in this respect.

- There should be programmes for biological sampling in both countries under responsibility of the government.

- A standardized computer entry data sheet should be developed as well as a database for the catch and effort and size composition and other relevant data including by-catch for both countries. Countries also require databases to manage the increased amounts of these data they will receive from the processors and other sources.

- A comparative study between the Suriname and Guyana seabob fishery and management regimes to allow the fishery management to adapt and to improve.

- Determine other species of importance for stock assessment in both countries to be assessed at the next SGWG. This would depend upon adequate data preparation. It was suggested that the grey snapper and trout for Suriname, other penaeid shrimp for Guyana are candidates for assessment in 2013.

- For Guyana, prepare data for a re-evaluation of a potential closed season 1 – 2 months. This was conducted in 2007, but more and better data has become available since then.

10. General Recommendations

- The shrimp and groundfish resources are shared by the countries on the Brazil-Guianas Continental Shelf. As some of these countries are not members of the CRFM (Venezuela, French Guiana, Brazil), it is recommended that the CRFM network with the FAO/WECAFC ad hoc Working Group on Shrimp and Groundfish Resources of the Brazil-Guianas Continental Shelf.
- Countries should ensure that their representatives are provided with laptops powerful enough to run the assessment models at the scientific meetings.

11. Review and Adoption of Working Group Report.

The Working Group Report was reviewed and adopted by the members of the SGWG.

12. Adjournment.

The meeting of the SGWG adjourned at 7.30 pm on 28 June 2012

B. FISHERIES REPORTS

1.0 The Seabob (*Xiphopenaeus kroyeri*) Fishery of Suriname

Zojindra Arjune, (Rapporteur, Suriname)
Paul Medley (Consultant, UK)

1.1 Management Objectives

A responsible and sustainable fishery from an ecological standpoint which has minimal effect on:

1. the stock (*Xiphopenaeus kroyeri*);
2. the ecosystem; and
3. the breeding grounds of other species within the ecosystem.

A responsible and sustainable fishery from an economical standpoint which:

1. is economically viable;
2. sustains and improves the economical position of the fishermen through coordinated and self-regulation, and;
3 is cost reductive.

1.2 Status of Stock

The assessment indicates that the stock is not overfished ($B/B_{MSY} > 1.0$) and overfishing is not occurring ($F/F_{MSY} < 1.0$; Figure 1; Table 1). This conclusion depends, among other things, upon a reasonably accurate time series of total catch. Results for this update assessment remain broadly the same as those from the last stock assessment in 2011 and appears robust to likely levels of artisanal landings which have not been included in the catch data.

Table 1: Stock assessment results with 90% confidence intervals.

Parameter	Lower 5%	Median	Upper 95%
R	0.48	0.74	1.07
B_∞ (t)	39578	58462	91233
B 2010 (t)	0.66	0.72	0.78
MSY (t)	9753	10561	11928
Current Yield		7101	
Replacement Yield	7972	8492	8698
B/BMSY	1.33	1.45	1.56
F/FMSY	0.45	0.54	0.62

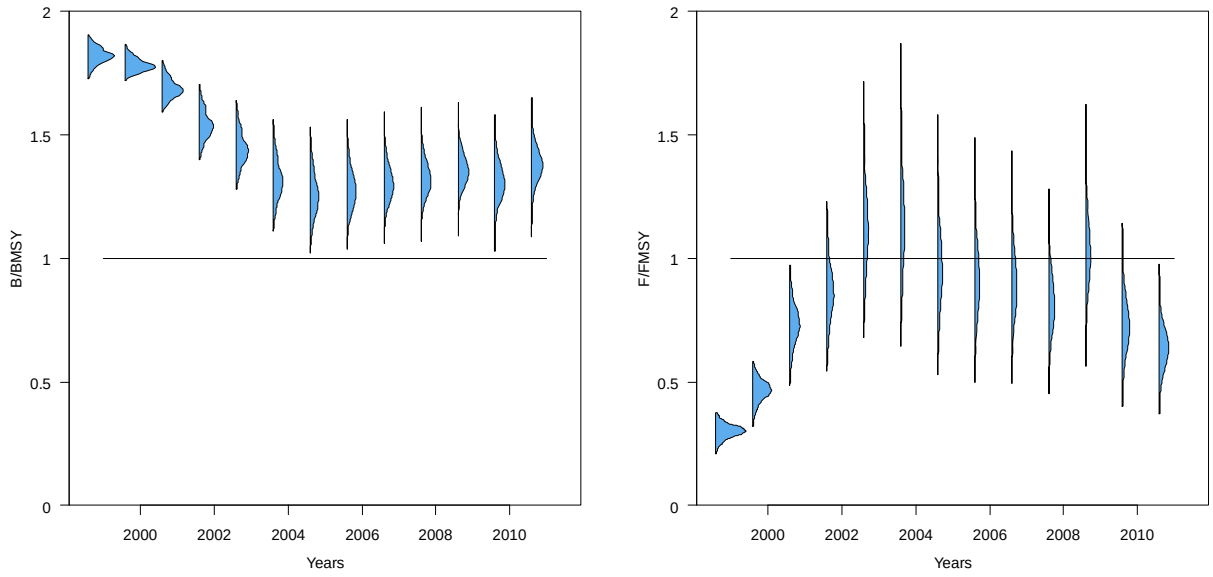

Figure 1: Probability estimates of the biomass and fishing mortality relative to the MSY value based on the Monte Carlo integration of the model posterior. The range of values is shown from 5000 random draws from the posterior probability using a Monte Carlo integration. More peaked distributions indicate greater certainty in estimates, whereas flatter distributions indicate greater uncertainty.

1.3 Management Advice

The management advice remains unchanged from 2011.

It is recommended to continue applying the current harvest control rule for several years to allow it to be evaluated. On evaluation, further scientific recommendations might be made.

Reference points and a harvest control rule have been adopted based on the maximum sustainable yield point (MSY), with the biomass limit reference point at 60% and target reference point at 120% of the MSY estimate respectively.

CPUE is used as a proxy for the biomass, with reference points based upon the 2009 stock assessment. Results from the current assessment suggest that these reference points are precautionary (Table 2). The CPUE expected at MSY is 1.38 t day^{-1}, whereas current CPUE is 1.93 t day^{-1}.

The harvest control rule uses the proxies CPUE and days-at-sea for biomass and fishing mortality, taking into account the uncertainty with which the values of interest have been estimated (Figure 2).

The most important finding with respect to the harvest control rule is to ensure the CPUE index remains valid. The greatest risk to the index is change to the fleet, including alterations to gears, vessels or operations. It is important that any and all changes are monitored and managed carefully. It should be ensured that catch and effort data can be separated by vessel, that gear and operations are recorded by vessel and if changes are to occur that these are not undertaken simultaneously across the fleet.

Table 2: Comparison between CPUE (t / day at sea) reference points for 2009 and 2011 (the most recent assessment). The trigger reference point is the expected CPUE at MSY. The 2009 values are used in the current harvest control rule, which the most recent stock assessment suggests are precautionary. The 2011 are more accurate estimates of the appropriate values, so reference point values higher than these are more precautionary.

	2009	2012
Limit	0.89	0.83
Trigger	1.48	1.38
Target	1.65	1.66

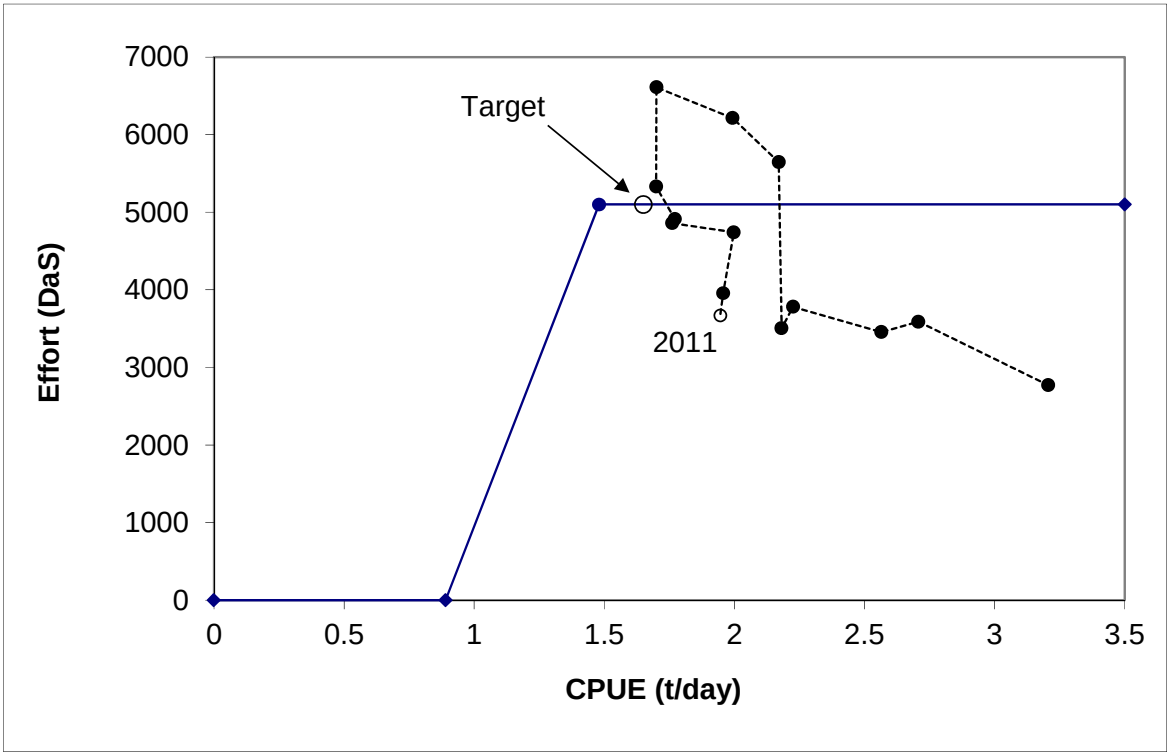

Figure 2: Harvest control rule (HCR) being applied to the fishery with historical time series of HCR CPUE calculated as a moving average and effort for the corrected data. The target CPUE is shown along with the estimated HCR CPUE in 2011 (from the 2012 assessment). This can be interpreted as the point estimates of fishing mortality are below the target level and biomass above the target level.

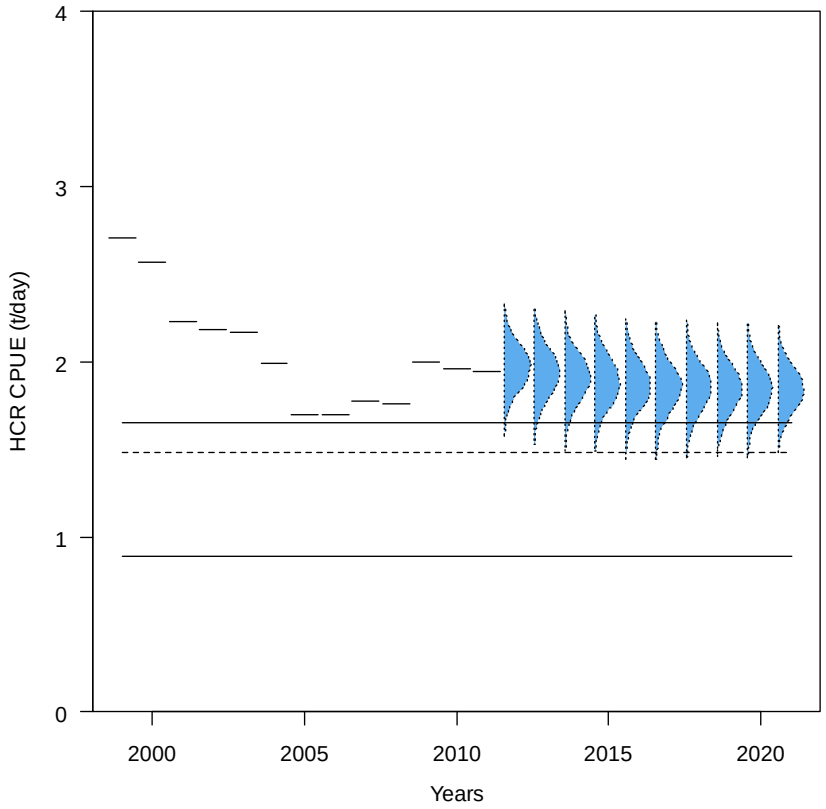

Figure 3: Observed historical CPUE (horizontal line) and projected probability distribution under the harvest control rule. The model predicts that it is highly likely that the CPUE will remain above the target level.

The harvest control rule has not been in operation long enough to allow any evaluation. However, based on the historical behaviour of the fishery, it remains the best estimate for limiting the fishery to sustainable exploitation levels and therefore should be implemented while undergoing monitoring for at least three years. The CPUE projected under the harvest control rule should on average fluctuate above the target CPUE (Figure 3).

1.4 Statistics and Research Recommendations

1.4.1 Data Quality

Annual catch and effort data were available for the period 1998-2011 (Figure 4). Although there remains some doubt over data collected before 1999, no information is available to correct it. Errors so far back in time are unlikely to have a significant impact on the stock assessment unless they are very large.

The local artisanal catches for the dried seabob market had not been estimated in time for this meeting. Nevertheless, information was sufficient to indicate the likely level of this catch, which was expected to be less than 800 t total landed weight (Yspol, pers. comm.). It was believed that this was sufficient to allow a sensitivity analysis to see what impact if any this level of catch might have on the stock assessment. However, this remains a sensitivity analysis until precise estimates come available.

1.4.2 Research

A research plan has been developed for this fishery by the Suriname seabob management working group, and this research plan forms part of the management plan. This includes new issues related to bycatch which has not been previously considered by this working group.

The primary aim for the stock assessment is to complete validation of the total catch, including estimates of the artisanal catch.

Research is continuing on growth and mortality of seabob through the collection of detailed size frequencies. A considerable data set is already available, but analysis is incomplete. The data were reviewed and some analysis completed at the 2009 meeting. The research should give estimates of growth rates, maximum size and mortality rates for independent comparison with the results obtained from the catch and effort data. It is recommended that high priority be given to the analysis of these data.

1.5 Stock Assessment Summary

Bayesian statistics and the Monte Carlo (Sample importance resample algorithm) methods were used to estimate probability distributions for Maximum Sustainable Yield (MSY)[1], Replaceable Yield[2], current biomass relative to biomass at MSY, and current fishing mortality relative to fishing mortality at MSY. The assessment used the logistic biomass dynamics model fitted to the total catch 1989-2011 and catch and effort 1998-2011.

This stock assessment updates the 2010 assessment. Catch per unit effort (CPUE)[3] was used as an index of the abundance of stock. The measure of effort used was the number of days at sea, which would include steaming time. This was the only measure of effort available, but was thought to be strongly related to the amount of fishing carried out. The CPUE index has appeared to decline each year to 2005, but has also shown a recent increasing trend (Figure 4). The results indicate a reasonable fit of the model (Figure 5), but it should be noted that although the model largely explained the trends in the CPUE, these trends formed only a small part of the variation in CPUE. The number of data points (13) was limited and with only very shallow trends, the four parameters could only be weakly estimated.

The maximum sustainable yield was estimated to be between 9 000 and 12 000 t year^{-1} (Table 1). However, in absolute terms, biomass, and therefore yield is poorly estimated (Figure 6). Hence, the harvest control rule based on CPUE and effort rather than catch will be much more reliable.

[1] **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.
[2] **Replacement Yield** is the yield/catch taken from a stock which keeps the stock at the current size.
[3] **CPUE** is the quantity caught (in number or in weight) with one standard unit of fishing effort.

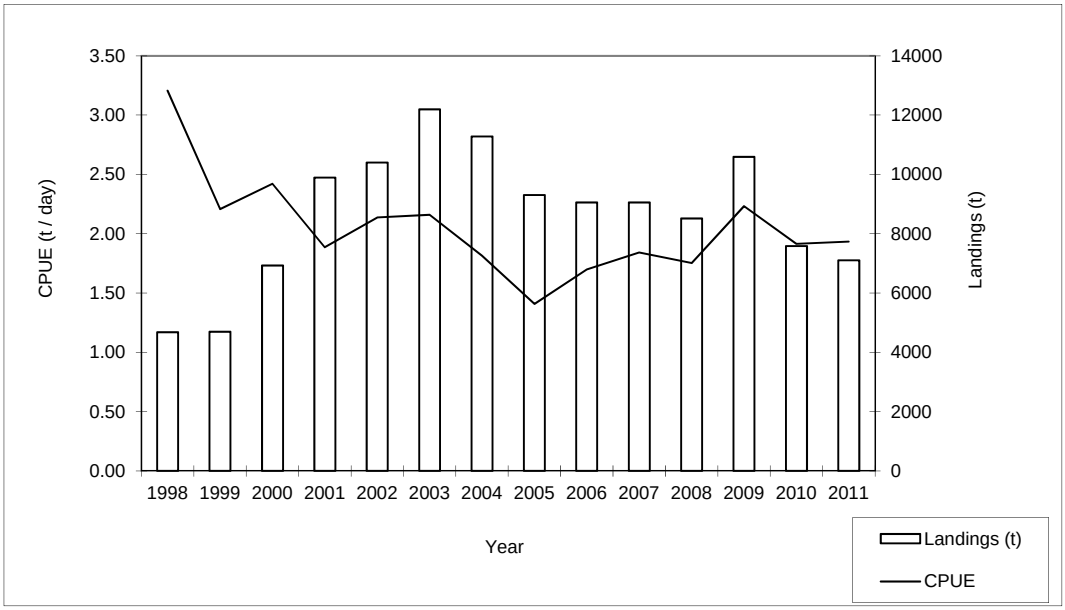

Figure 4: The CPUE abundance index shows a continuous decline since 1998 to 2006, suggesting that the stock abundance has declined over this period. However, there is some indication of more recent increase in catch rate following reduced catches after 2005, which are sustaining the CPUE close to 2 t / day.

1.6 Special Comments

In 2008 it was recommended that Suriname and Guyana have similar programs for collecting biological data. This has been achieved through a standard data collection protocol implemented in the processing facilities of Heiploeg Suriname and Noble House Seafoods (Guyana).

The Suriname seabob fishery has successfully achieved Marine Stewardship Council certification (www.msc.org).

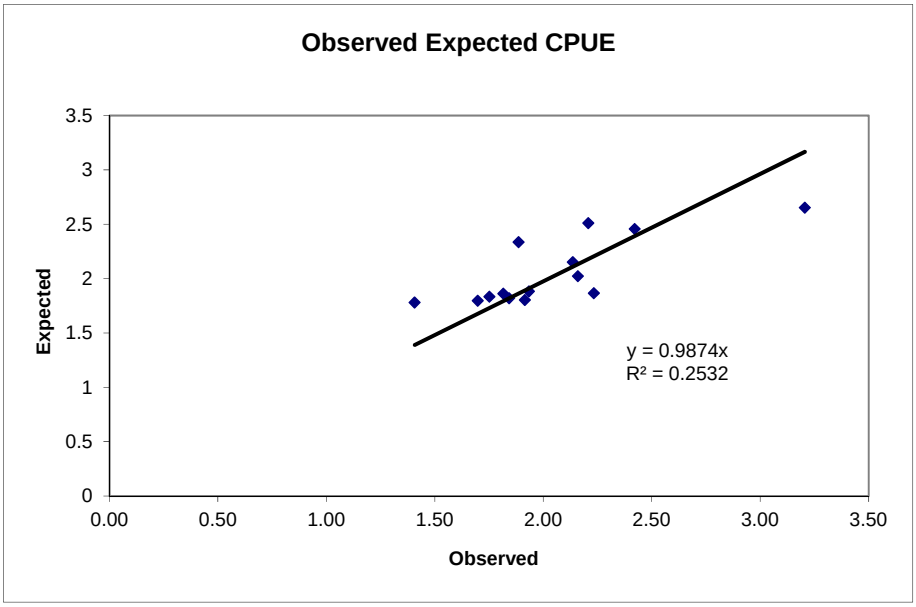

Figure 5: Observed and expected CPUE from the model fit. The residuals show no obvious pattern around the regression line going through the origin.

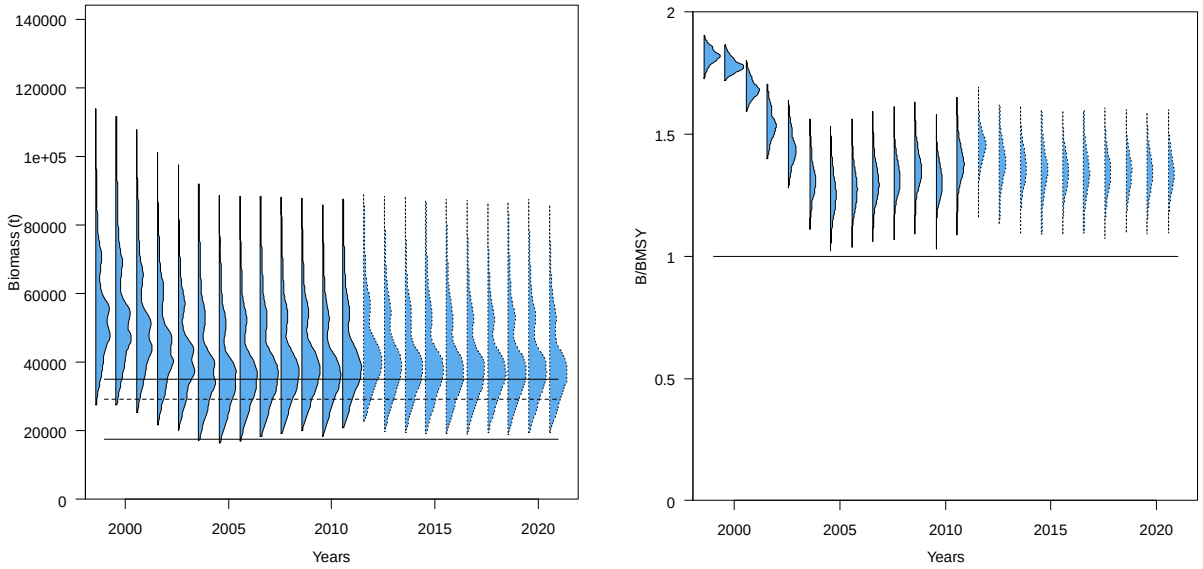

Figure 6: Absolute and relative biomass probability distributions for estimates (solid) and projections (dotted) from the fitted stock assessment model. The relevant reference points are also shown as horizontal lines with target (120% median MSY), trigger (dotted; median MSY) and limit (60% median MSY) for biomass, and MSY level for the relative biomass. Although biomass is uncertain, the relative biomass is very likely to remain above the MSY reference point.

1.7 Policy Summary

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

- Provides employment at the primary and secondary levels. The fishery also creates more alternative 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 and to provide further development opportunities.

2.0 Guyana Seabob (*Xiphopenaeus kroyeri*) Fishery

Rabani Gajnabi, Fisheries Officer, Guyana
Paul Medley, Fisheries Consultant, UK

2.1 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 stabilize 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.

2.2 Status of Stock

There is no evidence from the Guyana catch and effort data alone that the stock is overfished and or that overfishing is occurring. The CPUE time series shows a shallow decline but still remains high relative to the start of the series. Furthermore, despite much higher catches reported for 2004 and 2005, the CPUE showed little reaction with a slight dip followed by recovery.

The preliminary stock assessment suggests that the stock is well above the MSY level ($B/B_{MSY} > 1.0$) and the 2011 catch (19,433t) was well below the MSY level ($F/F_{MSY} < 1.0$; Table 1; Figure 1). However, reservations were expressed by the group due to the quality of some of the data used and the short time series of CPUE data available. In addition, catch rates are significantly lower in Guyana (1.2 t / day) compared to Suriname (1.9 t / day) and average tail weight slightly lower.

Table 1: Stock assessment results with 90% confidence intervals.

Parameter	Lower 5%	Median	Upper 95%
r	0.37	0.61	0.96
B_∞ (t)	121513	179701	263243
B 2012	0.67	0.77	0.86
MSY (t)	20347	26501	39863
Current Yield		19343	
Replacement Yield (t)	17784	19070	19170
B/B_{MSY}	1.33	1.53	1.72
F/F_{MSY}	0.32	0.51	0.73

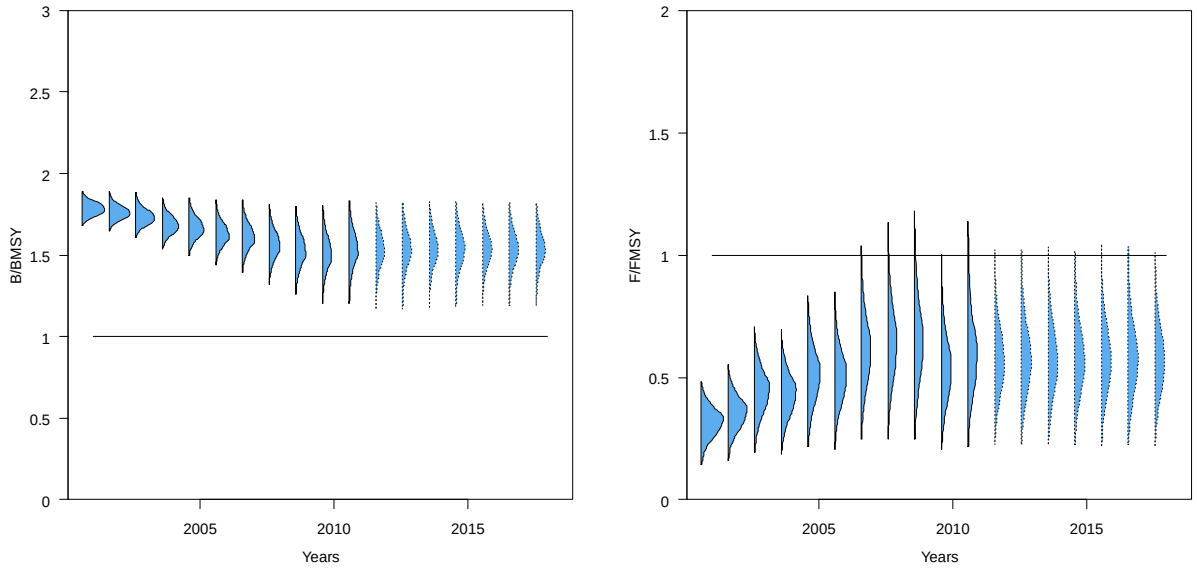

Figure 1. Probability estimates based on the Monte Carlo integration of the posterior biomass dynamics model fitted to the catch and effort data

2.3 Management Advice

The management advice remains the same as that given in 2009. Priority should be given to the development of reference points and harvest control rule based upon the available data and precautionary principle.

It is recommended to adopt reference points and a harvest control rule within the fisheries management plan to ensure that the fishing is sustainable. The following reference points and harvest control rule have been proposed based on the maximum sustainable yield point (MSY).

> Limit reference point: Biomass at 60% of the MSY estimate
> Target reference point: Biomass 120% of the MSY estimate (consistent with the management objectives).

The reference points (biomass, yield and fishing mortality at MSY) have been estimated from the annual catch and effort time series. However, given the very short time series of catch and effort data, the estimates cannot be made with high accuracy and remain uncertain. In addition, the total catch data requires further validation to ensure that it is correct. Therefore the reference points are an interim and need to be verified through further research. The results also need to be confirmed through analysis of the size composition data. It is further recommended that references points are developed as part of a harvest control rule.

Controls to maintain the stock around the target level need to be defined, as do the controls applied to reduce fishing mortality as the limit reference point is approached. These could include a closed season, export catch limits and fishing effort control.

A harvest control rule should have the following properties:

- It should maintain a harvest rate which should keep at or around the target level in the long term.

- It should reduce the harvest rate as the stock approaches the limit level.
- Fishing should be minimized if the stock falls below the limit.

In addition, the following properties may also be considered useful:

- The harvest control rule could limit year-to-year fluctuations in the control measures to levels acceptable to the fishing industry wherever possible. This will help industry to plan for and maintain a suitable level of catching and processing capacity commensurate with the productivity of the resource.

To protect recruits to the fishery and allow them to grow, a closed season may be most valuable set in September / October. However, alternative closure times may still be warranted if special protection is required for the spawning stock (May or June).

2.4 Statistics and Research Recommendations

2.4.1 Data Quality

Annual total catch data were available for the period 1985 - 2011 and monthly catch and effort data available for 2001 - 2011 (Figure 2). There remains considerable uncertainty over the data accuracy. There have been very significant increases in catch during the time series but mainly during the period when catch per unit effort was unavailable. The catch per unit effort shows a small decrease possibly corresponding to an increase in total just before the series starts. However, catch-per-unit-effort data does not cover the important period 1990-2000 when there was a significant increase in catch, which will severely limit the quality of the stock assessment.

Size frequency data were also available, but there was insufficient time at the meeting to carry out a thorough examination of these data. Some preliminary analysis was undertaken of the size frequency data covering December 2007 to June 2009, and then started again in December 2012. The data consist of random samples taken from the landed catch before processing in the Noble House processing facility. These data have been collected by the processors for the purposes of stock assessment.

Additional catch data was used obtained from the FAO FIGIS database. These data are not likely to be very accurate, but were sufficient to allow catches to be estimated back to the start of the fishery. The level of precision of these data was adequate for this analysis, but need to be improved if possible for future assessments to increase accuracy of the management advice.

2.4.2 Research

1. The biological sampling data from landings was reinstated in 2011, which is highly commended by the SGWG. The group believes that these data will prove to be particularly important in understanding the Guyana seabob stock dynamics and therefore biological data collection should continue and be extended among all main processing facilities.
2. The observer program should be reinstated in order to monitor catch onboard vessels to get catch rate information, length-frequency data, and geographic information.
3. Economic data such as price per pound for the various market categories should be documented over the course of a year.

2.5 Stock Assessment Summary

Bayesian Statistics and the Monte Carlo (Sample importance resample algorithm) methods were used to estimate maximum sustainable yield (MSY)[4], replacement yield[5], current biomass relative to biomass at MSY, and current fishing mortality relative to fishing mortality at MSY. The assessment used the logistic surplus-yield model fitted to the total catch 1985-2011 and catch and effort 2001 - 2011.

Catch per unit effort (CPUE)[6] was used as an index of stock abundance. The measure of effort used was the number of days at sea, which would include steaming time. The CPUE data were constructed from two series: processor data reported to government 2005-2011 and other data obtained directly from a processor for the period 2001 - 2008. The CPUE index appears to be declining each year (Figure 2) indicating a small decline in stock size since the start of the series.

The results indicate some problems with the fit of the model (Figure 3), and therefore this model is likely to predict CPUE changes poorly. The number of CPUE data points was limited and with only a decreasing trend, so that the priors may have influence on the results. The rate of increase is negatively correlated with the estimate of abundance, so a higher rate of increase would imply lower biomass.

The maximum sustainable yield suggested most likely values would be between 20000 - 40000 t $year^{-1}$ (Table 1). However, the assessment entirely depends upon the accuracy of the available data and is likely to be heavily influenced by the high catches in 2004 and 2005. If these are overestimates, the state of the stock may well be re-evaluated downwards.

The assessment indicates that the stock is not overfished ($B/B_{MSY} > 1.0$) and overfishing is not occurring ($F/F_{MSY} < 1.0$). The working group can not endorse this conclusion without verification of the data, improvement in the stock assessment and/or evidence from other sources.

Assuming that the stock status is correctly estimated, the current level of fishing can be sustained. However, the current catch per unit effort is significantly lower than Suriname (Figure 4). A better understanding of the relative fisheries and seabob populations in Suriname and Guyana would produce significant improvements in management advice.

[4] **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.
[5] **Replacement Yield** is the yield/catch taken from a stock which keeps the stock at the current size.
[6] **CPUE** is the quantity of fish caught (in number or in weight) with one standard unit of fishing effort.

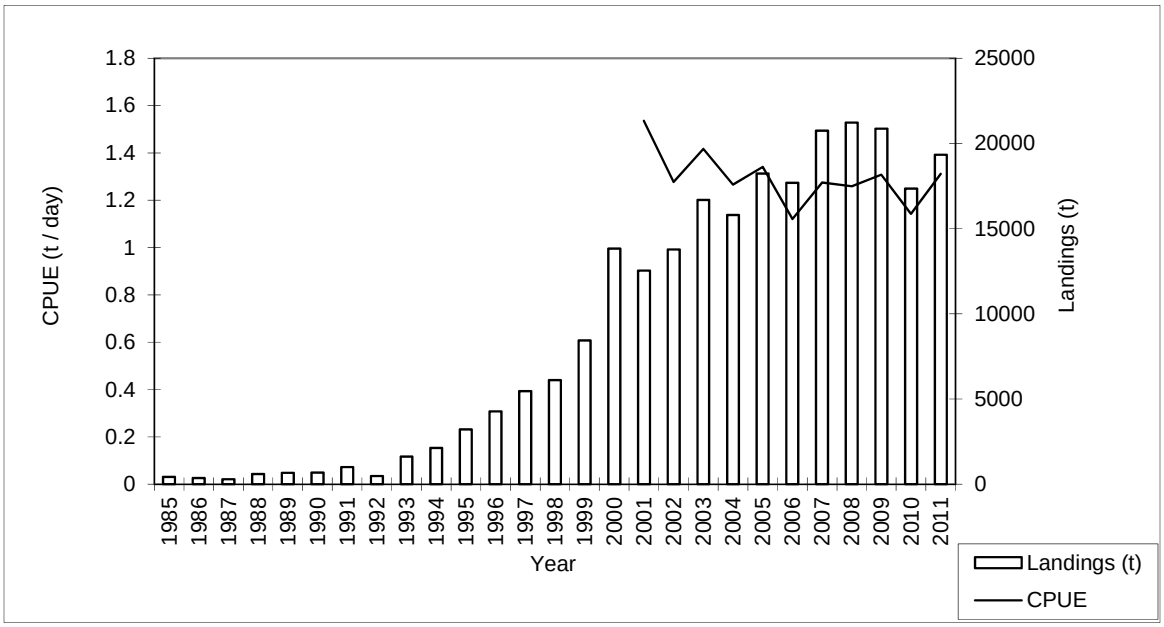

Figure 2: The CPUE abundance index and landings of seabob 1985-2011.

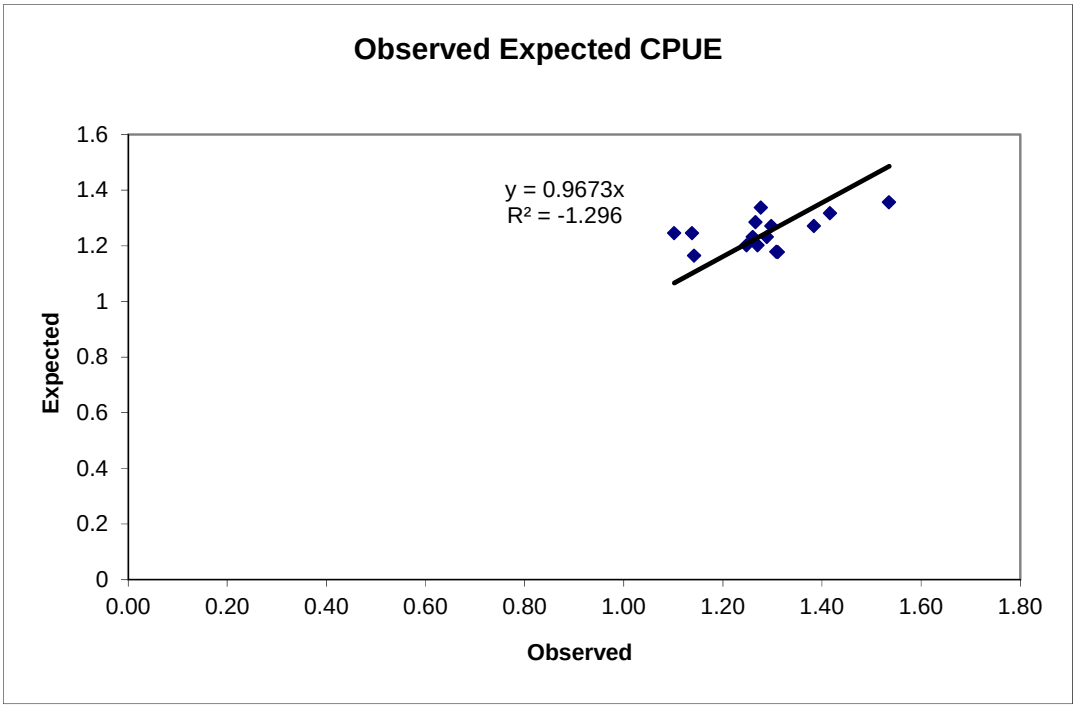

Figure 3: Observed and expected CPUE from the model fit. The residuals show some bias around the regression line going through the origin, with expected values being relatively high compared to the observed CPUE at lower values.

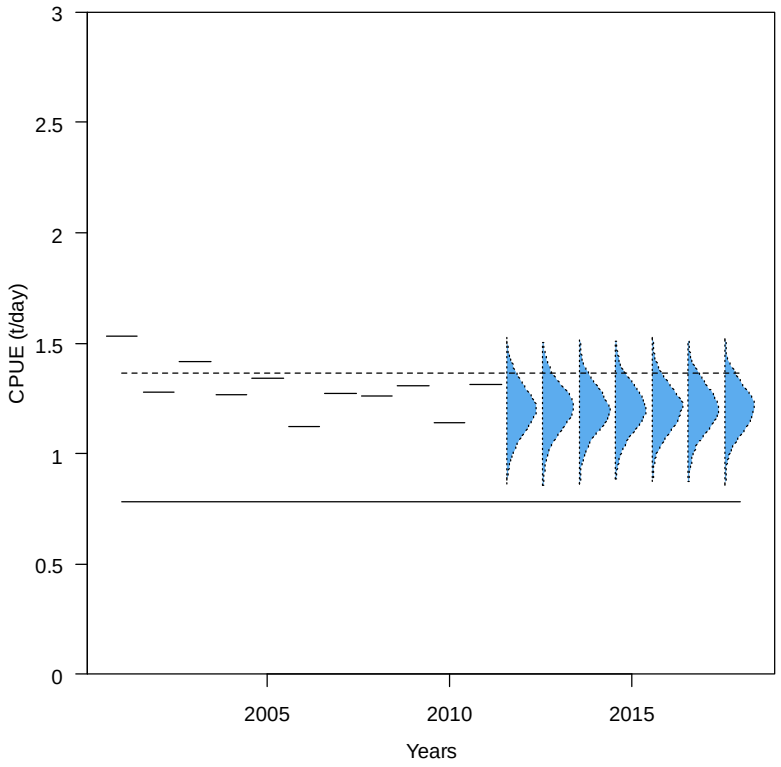

Figure 4: Observed mean CPUE (horizontal lines) and projected CPUE (probability) assuming total fishing effort is maintained as the mean observed 2008-2011. The lower solid line represents the median estimate of the CPUE expected at MSY for this fishery. The upper dotted line represents the median estimate of the CPUE expected at MSY for the Suriname fishery.

2.6 Special Comments

The working group would like to encourage on-going data collection initiatives of the biological data and continued improvements in the co-operation with the fishing industry.

It is likely with improvements in the catch and effort data and other information that the state of the stock will be revised downward. This is based on the view of the working group that the biomass estimate in this model may well be too high. Therefore, this stock assessment should not be used for decisions on the further development of the fishery or expansion in exploitation until the result can be verified.

2.7 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.

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

Chairperson: Maren Headley, CRFM Secretariat
Rapporteur: Maren Headley, CRFM Secretariat
Other Members: Dr. Susan Singh-Renton (CRFM Secretariat), Francis Calliste (Grenada), Derrick Theophile, (Dominica), Yvonne Edwin (St. Lucia), Christopher Parker (Barbados), Paul Medley (Fisheries Consultant)

A. OVERVIEW

1. Review of inter-sessional activities since last meeting, including management developments during this period

A brief review on the Multiple Criteria Analysis (MCA) Study of the flyingfish fishery in the Eastern Caribbean was provided. The study was focused on obtaining the perspectives of stakeholders on the importance of various management objectives. Regional governance of the flyingfish fishery in the Eastern Caribbean requires agreement upon management objectives as well as how important these objectives are in relation to each other. A pre-established hierarchy of objectives can guide governance of the fishery and significantly assist decision-making processes. This hierarchy is critical to manage the complexity of a multi-species regional fishery, because it is rarely possible to optimize multiple and competing objectives. Field work was conducted with fishers, fish processors, and fisheries division staff in Barbados, St. Lucia and Tobago to determine their perception of the relative importance of a range of management objectives drawn from fisheries management plans and reports relating to the Eastern Caribbean Flyingfish fishery. Respondents from landing sites conducted a modified pairwise comparison technique which involved sorting cards with a description of each management objective. In this technique, respondents were asked to arrange the cards according to their importance.

An enquiry was made on the type of Pair-Wise comparison utilized in the study and it was pointed out that various methods existed. Clarification was sought on the development of the operational objectives and it was indicated that a draft was prepared and shared with the shareholders who then added to them. The meeting was reminded that the study was intended to provide a decision analysis tool for managers.

A query on the length of time it took to complete the stakeholder surveys in each country was made and it was pointed out that this took one week each. Some of the limitations of the study included inadequate identification of all fishers and funding to complete more stakeholder surveys.

There was some discussion on the usefulness of the study results and the importance of keeping the interview data up to date and linking them to the current situation to ensure a direct influence at the management level was highlighted. It was pointed out that the relative weights of the objectives showed the importance attributed by the stakeholders. The importance of choosing meaningful indicators to which stakeholders can relate to was also raised.

The Meeting was reminded that the final management decisions were made at the political level and if congruence amongst stakeholders was achieved, then this would be fine, however if there was disparity, it could create problems. The importance of providing feedback to stakeholders to ensure that they were well informed was pointed out. The meeting was also informed that cluster analyses had been done to determine if particular groups had identified specific issues.

The group was informed that once the indicators and reference points were agreed on, the MCA could be tested. It was agreed that the spreadsheet would be circulated by email inter-sessionally and explored during the next Scientific Meeting

A verbal update was provided on the formation of the various joint technical working groups during the 14th WECAFC session in Panama, 2012. The group noted that the first meeting of the joint CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean occurred during 18 – 19 June 2012. The main tasks completed during the Meeting were:

- An update of the sub-regional fisheries management plan for the flyingfish fishery in the Eastern Caribbean
- A discussion on the national consultation process for review of the sub-regional fisheries management plan for the flyingfish fishery in the Eastern Caribbean
- Drafting of a resolution on the Sub-regional Fisheries Management Plan for the flyingfish fishery in the Eastern Caribbean to be presented to the Ministerial Sub-committee on flyingfish
- Discussion of an inter-sessional workplan

The second meeting of the joint working group will be held next year before the Ninth Annual Scientific Meeting.

2. Inter-sessional workplan and Recommendations

Inter-sessional workplan

The Group noted that the joint CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean meeting was convened and recognized the need for countries to provide support for the implementation of the inter-sessional plan.

Recommendations

It was recommended that the MCA should be completed to allow full exploration of the tool and its usefulness.

3. Review and adoption of Working Group report for 2012.

The group adopted the meeting report.

4. Adjournment

The meeting was adjourned at 6:00 pm.