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CRFM Fishery Report - 2014

Volume 1

Report of Tenth Annual CRFM Scientific Meeting - St.Vincent and the Grenadines, 10-14 June, 2014

CRFM Secretariat, Belize
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FOREWORD

The Tenth Annual CRFM Scientific Meeting took place during 10 to 17 June 2014 in Kingstown, St. Vincent and the Grenadines. During this Meeting, the reconstituted Pelagic Fisheries Working Group (PWG), Reef and Slope Fisheries Working Group (RSWG), Continental Shelf Fisheries Working Group (CSWG) and Data, Methods and Training Working Group (DMTWG) met. CRFM Member States represented at this meeting included Anguilla, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, The Bahamas, Trinidad and Tobago and the Turks and Caicos Islands. The meeting also benefitted from technical support of Professor John Hoenig, Consultant based at the Virginia Institute of Marine Science as well as the assistance of Ms. Nancie Cummings, Fisheries Expert, US National Marine Fisheries Service and Professor Hazel Oxenford from the Centre for Resource Management and Environmental Studies, UWI, Cave Hill campus; and Dr. Paul Medley, International Fisheries Consultant from the UK, facilitated through electronic means.

Each Working Group reviewed the respective new Terms of Reference and provided recommendations to inform amendments in future. Changes in the meeting format focused on basic statistical training, conduct of simple fisheries or species analyses, development of biennial work plans with assigned responsibilities and timelines and mandatory submission of all powerpoint presentations, cleaned data sets and annotated spreadsheets for future reference.

The PWG conducted species/fisheries analyses for the scad fishery in Dominica, the dolphinfish fishery in St. Lucia, the large pelagic fishery in St. Vincent and the Grenadines, the pelagic fishery in St. Kitts and Nevis and the non-artisanal longline fishery in Trinidad and Tobago and provided recommendations for fisheries management, statistics and research to the extent possible. Data collection, quality control, data preparation for analysis and analytical methods were general areas highlighted for attention during the inter-sessional period. Specific priority areas include: improving the quality of regional data for the blackfin tuna in support of the CRFM's contribution to the 2015 stock assessment to be conducted by the International Commission for the Conservation of Atlantic Tunas; improving data collection systems to facilitate implementation of the Sub-regional Fisheries Management Plan for the Eastern Caribbean Flyingfish endorsed by the CRFM Ministerial Council on 23 May 2014 and development of a data collection and information system for fisheries that use fish aggregating devices.

The RSWG developed specific weight conversion factors for the Queen Conch in The Bahamas and Belize to fulfill trade requirements under the Convention on International Trade in Endangered Species of Wild Fauna and Flora and intends to conduct further analyses in the inter-sessional period. It also reviewed and endorsed the 2013 assessment of the Pedro Bank (Jamaica) Queen Conch fishery and the respective, estimated total allowable catch and provided scientific inputs to a proposed draft regional declaration for management, conservation and sustainable use of the spiny lobster. The RSWG also conducted species/fisheries analyses for the reef fishery in Anguilla, the mutton snapper fishery in Belize and the Queen Conch fishery in the Turks and Caicos Islands and provided recommendations for fisheries management, statistics and research to the extent possible. Data collection on the lionfish to facilitate analysis at the 2015 Scientific Meeting was considered high priority.

The CSWG, in support of Guyana's attempts to boost trade through 'sustainable fishery certification' by the Marine Stewardship Council, through e-meeting reviewed and endorsed the Harvest Control Rules developed for management of the Guyana seabob fishery. The Group considered specific measures to improve data collection and monitoring of the fishery as well as addressing issues of by-catch in trawl gear.

A two-day training workshop in statistical and basic analysis using the R- software was convened under the DMTWG. As part of its biennial work plan the DMTWG also committed to updating existing, or developing new, national sampling plans, to improve the quality of data available for fisheries analyses and stock assessments in the coming years; training of data collectors and identifying the ten most important commercial target fisheries stocks in the region for regular assessment, analysis and monitoring. In addition, the DMTWG is to assume responsibility for pre-screening and approval of data sets for analysis at the annual scientific meetings with the respective protocol to be developed during the inter-sessional period. The DMTWG provided recommendations for further R-training, formal recognition of the R-statistical software as a tool for fisheries data analysis by the CRFM and use of available ICT tools to share information on best practices in the use of statistical software for fisheries analyses.

The Report of the Tenth Annual CRFM Scientific Meeting is published in one volume instead of the usual two volumes published for such meetings. This volume (Volume 1) contains the report of the plenary sessions and the full reports of the CRFM Data Methods and Training Working Group, the Pelagic Fisheries Working Group, the Reef and Slope Fisheries Working Group and the Continental Shelf Fisheries Working Group for 2014. Nine national reports were submitted and these are published as Supplement 1 to Volume 1. The report of the combined meeting of the previous Small Coastal Pelagic Fisheries Resource Working Group and the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean which was convened via GoToMeeting between March and April 2014 is published as Supplement 2 to Volume 1. Volume 2 usually contains part A (Overview), and the fishery management advisory summaries of individual fishery reports comprising part B of each Working Group report. However, only basic fisheries analyses were conducted in 2014, and hence there was insufficient material to warrant publication of a separate Volume 2.

The covers for this volume were designed and prepared by Mr. Shaun Young, while the photographs were provided by the CRFM Secretariat. These contributions are gratefully acknowledged.

CONTENTS

ACRONYMS AND ABBREVIATIONS

ACP	-	African, Caribbean and Pacific states
ANOVA	-	Analysis of Variance
CARIFICO	-	Caribbean Fisheries Co-management project
CARIFIS	-	Caribbean Fisheries Information System
CARICOM	-	Caribbean Community
CCCFP	-	Caribbean Community Common Fisheries Policy
CERMES	-	Centre for Resource Management and Environmental Studies
CFRAMP	-	CARICOM Fisheries Resource Assessment and Management Programme
CFMC	-	Caribbean Fisheries Management Council
CIDA	-	Canadian International Development Agency
CITES	-	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLME	-	Caribbean Large Marine Ecosystem
CPUE	-	Catch Per Unit of Effort
CRFM	-	Caribbean Regional Fisheries Mechanism
CSWG	-	Continental Shelf Working Group
DMTWG	-	Data, Methods and Training Working Group
ECROP	-	Eastern Caribbean Regional Ocean Policy
ELEFAN	-	Electronic Length Frequency Analysis
EU	-	European Union
FAD	-	Fish Aggregating Device
FD	-	Fisheries Department/Division
FAO	-	Food and Agriculture Organization of the United Nations
FMP	-	Fisheries Management Plan
IAS	-	Invasive Alien Species
HCR	-	Harvest Control Rule
ICCAT	-	International Commission for the Conservation of Atlantic Tunas
ICT	-	Information Communication Technology
IDB	-	Inter-American Development Bank
IMO	-	International Maritime Organization
IUU	-	Illegal, Unreported and Unregulated fishing
JDMIP	-	Japan Data Management and Improvement Project
JICA	-	Japanese International Cooperation Agency
LFDA	-	Length Frequency Distribution Analysis
LPWG	-	Large Pelagic Fish Working Group
LRP	-	Limit Reference Point
MAGDELESA	-	Moored fish AGgregating DEvice in the LESser Antilles
MoU	-	Memorandum of Understanding
MSC	-	Marine Stewardess Council
MSY	-	Maximum Sustainable Yield
NEPA	-	National Environmental Policy Act
NGO	-	Non-Governmental Organization
NMFS-SEFSC	-	National Marine Fisheries Service – South East Fisheries Science Center
NOAA	-	National Oceanic and Atmospheric Administration
NTFP	-	National Technical Focal Points
OECS	-	Organization of Eastern Caribbean States
OSPESCA	-	Organization of Fishing and Aquaculture in Central America (Organización del Sector Pesquero y Acuícola de Centroamerica)

PWG	-	Pelagic Fisheries Working Group
REBYC	-	Reduction of Environmental Impact from Tropical Shrimp Trawling through the
	-	Introduction of Bycatch
RSWG	-	Reef and Slope Fish Resource Working Group
RWT	-	Round Weight
SCP	-	Small Coastal Pelagics
SCPWG	-	Small Coastal Pelagic Fisheries Resource Working Group
SCRS	-	Standing Committee on Research and Statistics
SICA	-	Central American Integration System (Sistema de la Integración Centroamericana)
SLCA	-	Shepherd's Length Composition Analysis
SVG	-	St. Vincent and the Grenadines
TAC	-	Total Allowable Catch
TCI	-	Turks and Caicos Islands
TIP	-	Trip Interview Programme
ToR	-	Terms of Reference
UK	-	United Kingdom
UNEP-RCU	-	United Nations Environment Programme Regional Coordinating Unit
UNU-FTP	-	United Nations University – Fisheries Training Programme
US	-	United States
UWI	-	University of the West Indies
VMS	-	Vessel Monitoring System
WECAFC	-	Western Central Atlantic Fishery Commission

1. OPENING OF MEETING

The meeting was opened by the Deputy Executive Director of the CRFM Secretariat, Dr. Susan Singh-Renton. Dr. Singh-Renton welcomed all the participants to the Tenth Annual Scientific Meeting and she gave a special welcome to the participants joining the meeting for the first time. She remarked that this Tenth Annual Scientific Meeting marked a turning point in the life of the CRFM Scientific Meetings. She related to the meeting participants that during the early life of CFRAMP (precursor to the CRFM), funds were made available for the collection of data, quality control and assurance checks, and associated stock assessments. She also noted that many outstanding scientific meeting reports were published in previous years placing the CRFM in good standing in the international scientific community. However, as funds for data collection were reduced by CFRAMP, and have not improved in recent years, both the quantity and quality of data have deteriorated, resulting in some stagnancy of the work for the Scientific Meetings in recent years. Dr. Singh-Renton encouraged the participants to take ownership of the Annual Scientific Meetings and to work with their peers from across the region to find solutions to national and regional problems.

Additionally, this year's 10^{th} anniversary marked another change, as this year's Meeting was being coordinated and led by the new Programme Manager, Research and Resource Assessment, Ms. Elizabeth Mohammed bringing new energy and enthusiasm to the programme. In this regard, she encouraged the Member States and partners to give their full support to Ms. Mohammed.

Dr. Singh-Renton informed the group that this year the Scientific Meeting utilized a new format as evidenced by the following:

(1) Each working group was asked to develop a biennial work plan.

(2) The number of days allotted to the meeting had been reduced relative to former years due to funding constraints and efforts must be made to utilize the time most effectively at the on-site meeting.

(3) At the recently concluded CRFM/UNU (United Nations University) Workshop, to Develop a Strategy to Improve Fisheries Data Collection and Management (CRFM, 2014), held in St. Vincent and the Grenadines during February 2014, selected, experienced Data Managers from across the region met with a team from the UNU and the CRFM Secretariat to discuss steps toward the development of a long term strategy for data collection, analysis, and management for CRFM Member States. The meeting concluded that the region's progress with regard to fisheries data collection and management issues had been far too slow and it was important to address, as a first priority, basic capacity building needs in the areas of sampling and basic statistical analyses. The meeting further recommended that the region should use its own human resources as far as possible to build capacity in data collection, management and analysis, as this would reinforce the skills for those concerned.

(4) The working groups had been reorganized and consolidated to represent ecosystems (rather than species groups), consistent with the approach taken under the Caribbean Large Marine Ecosystem Project (CLME). Consequently, the terms of reference for the working groups had also been updated and responsibilities assigned at various levels of the fisheries management process, e.g., the technical focal points, Member States, the Forum and the Secretariat.

(5) New criteria were being applied by the Secretariat in respect of participation in the onsite annual Meeting. The criteria included that all data to be considered during the Scientific Meeting must be cleaned and submitted prior to the onsite meeting. Implementation of this measure was aimed at inspiring participants to improve their performance and to optimize the analytical considerations of the countries' data.

(6) To improve accountability, the CRFM Secretariat would be reviewing the performance of the working groups.

(7) Communication with, and engagement of, the various publics was to be encouraged, and the work of the Scientific Meeting was to be shared with all stakeholders. To this end, the working groups and participants were asked to prepare PowerPoint presentations that could be shared with the Fisheries Divisions on their return home. Participants were also asked to begin to think of other ways to communicate the scientific messages effectively to stakeholders.

In concluding, Dr. Singh-Renton informed the meeting that there were two very important outputs which were endorsed at the last Ministerial Council Meeting that participants should take note of. These outputs were: (i) the Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean, which was to be dealt with by the Pelagic Fisheries Working Group at this year's Scientific Meeting; and (ii) the Regional Coral Reef Plan of Action which was aimed at improving the outlook for the Caribbean coral reef.

Ms. Patricia Medar-Hubert, the St. Lucia representative, then delivered the opening prayer for the meeting.

2. ADOPTION OF MEETING AGENDA AND MEETING ARRANGEMENTS

The Deputy Executive Director of the CRFM Secretariat, Dr. Susan Singh-Renton, served as the Chairperson of the plenary meeting.

Dr. Singh-Renton invited the Meeting to review and adopt the agenda. She stated that the agenda was similar to previous scientific meeting agendas perhaps with the exception of new agenda Item 8 (Recognition of scientific meeting achievements by Working Groups and Participants) - in this case, tokens of appreciation would be given to individuals and working groups to acknowledge their achievements during the meeting.

Ms. Mohammed indicated that Professor Hazel Oxenford, Centre for Resource Management and Environmental Studies (CERMES), University of the West Indies, would deliver a presentation on the Caribbean Fisheries Open-Data Initiative at the end of the plenary session.

Mr. Alwyn Ponteen, the Montserrat representative, also asked that a round table discussion on the Eastern Caribbean Regional Ocean Policy (ECROP) be added at any other business. Dr. Singh-Renton asked that Mr. Ponteen provide the meeting with a short presentation at that time in order to facilitate a meaningful discussion.

Mr. Crafton Isaac, the Grenada representative, moved to adopt the agenda. Ms. Cheryl Jardine-Jackson, the St. Vincent and the Grenadines representative, seconded the motion.

The adopted meeting agenda is given in ***Appendix 1***.

3. INTRODUCTION OF PARTICIPANTS

Dr. Singh-Renton invited the participants to introduce themselves and to indicate their expectations of the meeting. Thirteen CRFM Member States participated in this year's Scientific Meeting sessions. Listed in alphabetic order, these 13 Member States were: Anguilla, Belize, Dominica, Grenada, Guyana, Jamaica,

Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, The Bahamas, Trinidad and Tobago and the Turks and Caicos Islands.

The following institutions and organizations also attended in observer capacity and participated in both working group and plenary meeting sessions: National Marine Fisheries Service – South East Fisheries Science Center (NMFS, SEFSC), and University of the West Indies (UWI-CERMES, Cave Hill Campus).

Professor Hoenig, Consultant, was contracted by the CRFM to deliver the training course *Introduction to Statistical and Basic Analysis in R* as an activity under the Data, Methods and Training Working Group and to serve as a fisheries assessment expert for the Reef and Slope Fisheries Working Group.

A list of participants is provided in ***Appendix 2***.

4. PRESENTATION OF NATIONAL (COUNTRY) REPORTS

The meeting was informed that seven national reports had been received from the following countries: Anguilla, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. The other Member States were encouraged to submit all other outstanding national reports as the reports were particularly important to the work of the scientific meetings, and in particular, where regional assessments were to be undertaken. Anguilla was commended for being the only Member State to submit its report by the deadline stipulated. Subsequent to the meeting, Montserrat and the Turks and Caicos Islands also submitted national reports.

The national reports are published as Supplement 1 to this report.

5. REPORTS OF THE CRFM FISHERIES WORKING GROUPS

5.1 Continental Shelf Fisheries Working Group (CSWG)

The Chairperson for the CSWG was Mr. Seion Richardson, who was also the representative of Guyana. There was no Vice-Chairperson identified for this Working Group. Mr. Richardson presented to the plenary session the report of the CSWG. The detailed report of the CSWG is given in ***Appendix 3***.

Plenary discussion of CSWG report

Dr. Singh-Renton thanked Mr. Richardson for his excellent presentation and remarked that she was glad to see Guyana moving towards Marine Stewardship Council (MSC) certification. The Chairperson queried how the harvest control rule (HCR) had affected the fishers, particularly, whether or not fishers had been forced out of the fishery, or if some other compromise had been reached in regard to the number of fishing days. The meeting was informed that in the past there had been 100 seabob vessels, but this number was reduced by 20% in years prior to the assessment. After the assessment seven vessels were removed from the fleet. The problem experienced was the disproportionate removal of vessels per fisher. For example where a fisher had only one boat then his fishing fleet could not be reduced by 20%. The HCR proposed that the effort should be 80 boats fishing for 235 days however at that time 87 vessels were working in the fishery. The compromise decision was therefore made that the 87 boats would continue to operate, the closed season would be increased by two weeks and the number of fishing days reduced to 225.

A further query was raised as to the number of fishing days required for a vessel to remain in business. The meeting was informed that most of the vessels fished for approximately 195 days and that none of the vessels fished more than 200 days. Arising from a query, the meeting was also informed that Suriname and Guyana did not have the same seasonal closures, since the two fisheries were exploiting different stocks.

Concern was expressed that even though there was a limit on the number of vessels and the number of days allowed for fishing, if fishers chose to fish only when catches would be maximised the fishing season could be more intense than was anticipated, resulting in a "derby like" fishery and could lead to overfishing. Mr. Richardson felt that the measures in place were adequate to address this concern. Nonetheless the meeting participants noted this was a valid concern and it was suggested that additional information on the times and areas of current and past fishing operations be compared to examine the respective effort-related impacts. However, Mr. Richardson explained further that such data were already being collected and analyzed on a monthly basis. He indicated that currently catch and effort data were being collected monthly and CPUE calculated and analyzed by area. VMS data were also collected on a monthly basis and used to cross-check catch and effort data.

Queries were also raised as to the origin of the closed season and its purpose, and how the by-catch in the fishery was being recorded. The meeting was informed by Ms. Dawn Maison, the trawl fishery industry representative of Guyana, that the closed season was chosen by the industrial fishers of the seabob fishery and was so chosen because during that period the fishers found that the seabob were small (juveniles). Thus the closed season could be said to be economically driven by the industry. With regard to by-catch coverage, it was explained that the data on quantity sample of by-catch taken were collected from the industry, by observation (landed by-catch) and interview (discards at sea). Additionally, the industrial fishers were asked to bring in the last trawl catch of the fishing trip, and this was analyzed and the data collected by the Fisheries Department and industry personnel. It was however noted that figures for discards at sea were not verified as an observer programme was not yet in place.

Professor Oxenford was asked if the UWI could assist Guyana with conducting by-catch studies. Professor Oxenford indicated that the UWI would be happy to look at the issue via a CERMES MSc. research project or even a PhD study. The representative noted that finding funding for the study would likely be the greatest constraint.

Mr. Richardson was asked to discuss the challenges being faced with the monitoring of the HCR in Guyana. He informed the meeting that a Seabob Working Group had been established. The group consisted of a wide cross-section of the industry including the Fisheries Division and company players. It had been doing monthly reviews and monthly reports and the Minister of Agriculture was also aware of the monthly progress of the industry. Mr. Richardson is optimistic that the Group would be supported by the stakeholders (including the Minister of Agriculture) as long as it kept doing what was required of it. The meeting was also informed by Ms. Maison that all 87 seabob vessels have had VMS installed and a logbook system was in place, all of which assisted the Fisheries Department with the monitoring of the industry. In addition, all vessels were expected to be issued a health certificate by the Ministry of Health as a requirement for being licensed. It was reported that the Minister had endorsed current efforts toward achieving MSC certification and given all these positives Mr. Richardson was optimistic that the industry would continue to improve and be supported in its move towards sustainable management.

A final question was raised on the size of the vessels operating in the industry and whether or not an observer system was in place. The meeting was informed that the vessels were stern trawlers with a catch storage capacity of about 40,000 pounds per trip and that an observer system was not yet in place in the industry.

Plenary discussion of CSWG Biennial Workplan

Regarding the time for submission of data, the group had stipulated that data should be submitted by the end of April 2015. Ms. Mohammed pointed out that it might be necessary for data to be submitted earlier to allow sufficient time for screening prior to the Annual Scientific Meeting. She proposed that the data be submitted by the end of March instead and the meeting agreed to the proposal.

The group was also asked to consider including the following activities into the workplan of the CSWG:

i. Activities of the WECAFC-IDB, CLME and REBYC II projects;
ii. Regular electronic meetings (GoToMeetings) of the working group;
iii. Review of project documents related to the continental shelf fishery; and
iv. Establishment of linkages with related groups of other organisations.

The working group agreed to incorporate these activities into the biennial workplan.

5.2 Pelagic Fisheries Working Group (PWG)

In the absence of the PWG Chairperson, Mr. Christopher Parker (Barbados), the Vice-Chairperson of the PWG, Mr. Derrick Theophille, and representative of Dominica, chaired the 2014 on-site PWG meeting. Mr. Theophille also presented the 2014 report of the PWG. The detailed report of the PWG is given in ***Appendix 4***.

Plenary discussion of PWG report

Analysis of the Scad Fishery of Dominica (Appendix 4, Section 1) – Presenter: Derrick Theophille

Ms. Mohammed enquired as to the impact on the observed trend in landings from any important occurrences, for example changes in the sampling plan, as well as the impact of the FAD fishery on the trend. Mr. Theophille informed the meeting that the FAD fishery relieved the fishing pressure on the coastal fishery. He noted that there were no major changes in the sampling plan that would have impacted the sampling coverage. However, within the past decade coastal development and environmental disasters would have impacted the coastal environment.

Dr. Singh-Renton also asked Mr. Theophille to discuss or examine the outliers indicated in a boxplot of scad landings by month over the period 2000 to 2013, included in his presentation. Mr. Theophille agreed to investigate the outliers more closely, when he had opportunity to review the original data books and speak to the data collectors for the respective regions.

Analysis of Large Pelagic Fish Catch and Effort Data for Grenada (Appendix 4, Section 2) – Presenter: Crafton Isaac

Mr. Ponteen noted that training of data collectors seems to be a common problem for a number of Member States. He further noted that St. Lucia had offered to assist with short attachments of personnel to the St. Lucia Fisheries Department for training in data collection methodology. He suggested that St. Lucia develop a schedule to indicate the number of persons and the time schedule within which the attachments could be done.

Ms. Martin, the Trinidad and Tobago representation, asked for an explanation with regard to Trinidad and Tobago longliners accessing bait from the Grenada small pelagic fishery. Mr. Isaac explained that the Grenadian owners had to obtain a permit for the sale of bait from the Fisheries Division and once the foreign boat owners entered the country legally, the transaction would be cleared by the Fisheries Division. He further explained that these measures were put in place in an effort to sustain the small

pelagic fishery for both food and bait, but not for bait at the expense of food. Dr. Singh-Renton pointed out that a study of the effect of a ban on selling small coastal pelagic as bait in St. Vincent and the Grenadines was done by the Secretariat in 2008/2009 (Singh-Renton *et al*., 2012). The study showed that a quantity of the small coastal pelagics (jacks and robins) could be used for bait without adversely affecting the amount available to satisfy the food demand on the fishery. She indicated that the study was still valid and that the Secretariat would circulate the study to the participants.

With regard to a proposed upgrading of the sampling plan of Grenada, Dr. Singh-Renton enquired of the representative whether or not the government of Grenada was ready for such an activity and also if there was support for this activity at the higher levels of decision-making. She also suggested that a valuation of the fishery should be done. The Grenada representative indicated that the data collection systems for small coastal pelagic and conch (which will form the core of the data collection system) had already been approved and that was an indication that there was support for the upgrade. Additionally, the Flyingfish Management Plan was endorsed by the Ministerial Council, and with the support of the Secretariat and the working group even more support could be garnered.

Analysis of the Catch and Effort data for the Dolphinfish Fishery in St. Lucia (Appendix 4, Section 3) – Presenter: Patricia Hubert-Medar

Prof. Oxenford, making reference to the graph presented of monthly landings of dolphinfish from 2004 to 2013, noted that the unusual peak in landings recorded for the month of August, coincided with the invasion of Sargassum in 2011. She enquired whether or not size frequency data were collected which could indicate if the landings consisted of mainly large or small fish. Ms. Hubert-Medar responded that size frequency data were not collected; however from anecdotal information the high landings recorded in August consisted of mainly small fish.

Prof. Hoenig suggested that perhaps the phenomena of the high levels of Sargassum, which attracted high levels of juvenile dolphinfish in particular, could have promoted, or was indicative of, a long term event or a permanent shift. Dr. Singh-Renton also suggested that the event may be causing a lowering of the earlier peak and an increase of the later peak. Prof. Oxenford cautioned as to interpretation of the data as presented because it was plotted to show landings by calendar year, rather than by year group. This meant that the earlier peak would represent the adult cohort, whilst the later peak represented the juveniles of the following cohort in the next fishing season. This situation highlighted the need to acquire samples of individual fish size from the fishery. In conclusion, all agreed that new patterns were apparent, and also of course, that additional data would be required to explain them more fully.

Mr. Morris queried whether or not there was a relationship between price and landings in the dolphinfish fishery and whether or not St. Lucia had plans to undertake an economic assessment of the fishery. Ms. Hubert-Medar responded that there had been a slight increase in price over the years however as far as she was aware there did not seem to be a link between demand/landings and price. She agreed to look into this issue further. She also indicated that an economic analysis had not been done and as some vital economic data were not consistently collected perhaps such an analysis could not be undertaken at this time.

Analysis of Pelagic Fishery Data of St. Kitts and Nevis (Appendix 4, Section 4) – Presenter: Kharim Saddler

Dr. Singh-Renton commended the efforts of Mr. Saddler given that it was the first time that he was participating in the Annual Scientific Meeting and that time constraints did not permit the level of preparation required for the meeting.

Analysis of Large Pelagic Fish Catch and Effort Data for St Vincent and the Grenadines (Appendix 4, Section 5) – Presenter: Cheryl Jardine-Jackson

Regarding a statement made by Ms. Jardine-Jackson that it was unlikely that large pelagic fish were being caught in the gillnets used in St. Vincent and the Grenadines, Mr. Saddler pointed out that in his experience the event was possible.

Ms. Jardine-Jackson in her presentation had also mentioned that different formats were often used to record dates in the excel spreadsheets used for storing data and this had caused difficulties when the data was retrieved for assessments. Mr. Isaac enquired about the cause of this problem. Ms. Jardine-Jackson responded that the problem occurred due to a function in/of Excel; i.e. there were certain preset date formats (usually the American way of writing the date) programmed into the software and if this was not in agreement with what was to be entered then it must be changed by the user. The Dominica representative pointed out that this problem could be solved by using a database in which the date format would be preset to the specification of the user.

Dr. Singh-Renton thanked the presenter and encouraged St. Vincent and the Grenadines to start looking for ways to combat the challenges being experienced. She noted that there seemed to be a common thread in all the presentations of wanting to re-examine the data collection systems. She therefore encouraged participants to consider submitting proposals to the DMTWG to source funding for such an activity. She however warned that supporting data collection systems was not an area that was popular with donors at this time.

Mr. Ponteen pointed out that the region has had training in data collection methodology in the past. The challenge however, seemed to be continuity, as usually the training was not extended to senior personnel. He expressed the opinion that at least one senior personnel from each Fishery Department should be trained in data collection methodologies and such persons would act as resource personnel in the Departments to train new and incoming data staff.

Mr. Richardson suggested that the DMTWG should develop a training manual for data collection. On the issue of the training of data collectors Dr. Singh-Renton suggested that where Fisheries Divisions had training manuals/materials available, the DMTWG could examine, compile and distribute the information to facilitate the training of statistical data collectors.

Ms. Jardine-Jackson indicated that over the years the data collectors have lost interest in carrying out their duties and they are sometimes not receptive to the training offered by other members of staff. Ms. Jardine-Jackson expressed the opinion that training from an external source and external site would act as an incentive to the data collectors and encourage them to improve the quality of their work.

Analysis of Biological Data for the Longline Fishery in Trinidad and Tobago (Appendix 4, Section 6) – Presenter: Louanna Martin

Dr. Singh-Renton noted that Trinidad and Tobago and ICCAT had embarked on a one year pilot port sampling survey which should have lasted for the year 2013. However Trinidad and Tobago was not able to collect one full year of data as required under the survey design. She enquired of Ms. Martin whether or not there was feedback from ICCAT on this matter. Ms. Martin responded that the project had begun in December 2012, followed by training in data collection methods in January 2013. However, setting up of the project took longer than was expected and data collection only began in August 2013, thus the survey would continue into 2014. She stated that ICCAT had no issues with the situation and indicated that they would fund one additional year of the project. In the meantime Trinidad and Tobago had decided that they would fund the project themselves.

Dr. Singh-Renton enquired whether or not the length data obtained could be used for comparison to similar data in other areas of the Atlantic and Ms. Martin responded in the affirmative.

Ms. Mohammed suggested that for completeness a description of the fleet characteristics, trip reporting system, biological sampling plan and challenges in implementing the data collection programme should be included in the final powerpoint presentation and report, since these outputs will be shared with other Member States.

Ms. Martin indicated that the analyses presented were based on measurements of processed lengths and weights and there was need to develop conversion factors to adjust these measurements to total length and weight, consequently the results presented were not meaningful at this point. The focus of the analyses of the Trinidad and Tobago data set at the scientific meeting was to practice use of the R-software. She also noted that insufficient time to analyze data, validation of data in the trip reporting system and the need for a Vessel Monitoring System and a Scientific Observer Programme as significant challenges in implementing the programme.

Review of Fisheries Statistical System for FAD Fisheries for Caribbean Regional Fisheries Mechanism Member States (Appendix 4, Section 6) - Presenter: Sherill Barnwell

Dr. Singh-Renton stated that the FAD fisheries of the region were in their early stages of development and it would be prudent to start out with a proper data collection system for the FAD fisheries.

There was no further discussion on this item due to time constraints. It was agreed that further discussions on implementation of a data collection and information system for FAD fisheries would continue throughout the inter-sessional period.

Plenary discussion of PWG Biennial Workplan

Prof. Oxenford enquired whether or not Grenada had made any progress with recording the flyingfish used as bait by their longline vessels, as lack of knowledge of this bait fishery was noted as a constraint in the last flyingfish assessment. Mr. Isaac indicated that they would be focusing on flyingfish as bait. Prof. Oxenford further emphasized the need for improvements in the data collection systems of most countries with respect to this species. Ms. Mohammed advised that the respective work plan would be circulated to all Member States to allow for their inputs in this regard, given its importance to implementation of the Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean.

5.3 Reef and Slope Fisheries Working Group (RSWG)

The 2014 Chairperson for the RSWG was Mr. Lester Gittens, who was also the representative of The Bahamas. The Vice-Chairperson was Mr. Alwyn Ponteen, who was also the representative of Montserrat. Mr. Gittens presented the 2014 report of the RSWG. The detailed report of the RSWG is given in ***Appendix 5***.

Plenary discussion of RSWG report

Lobster Declaration (Appendix 5, Section 1.1)-Presenter: Lester Gittens

Ms. Mohammed suggested that the rationale and scientific references associated with the changes made should be included in the final report. The presenter indicated that this would be done.

Lionfish (Appendix 5, Section 1.2) –Presenter: Lester Gittens

Dr. Singh-Renton expressed appreciation regarding the request for a standard reporting format for lionfish data especially given that the Secretariat had been trying to collect lionfish data from Member States since

2012. She suggested that all participants be kept informed on the progress of this work so that a decision can be made on the CRFM's readiness for an assessment of the lionfish at the next Scientific Meeting. Dr. Singh-Renton also cautioned the group on the use of the term "sustainable fishery" in conjunction with a fishery for the lionfish, which is an invasive alien species. She indicated that perhaps the preferred mode of operation would be to fish down the lionfish (try to eliminate the lionfish). She acknowledged other expert opinion that noted that it probably would be impossible to eliminate the lionfish. Also, based on the available information the "eat it to beat it" campaign had not been as successful as expected. In some Dutch Islands, though they had not been successful in eliminating the lionfish, they have been able to keep the numbers down via regular, routine directed fishing expeditions.

Prof. Hoenig also gave some suggestions to assist with the fishing down of the lionfish. He suggested that commercial exploitation of the species be encouraged, as massive fishing effort was required to fish down the stock. However, when the stock is fished down, it may become unprofitable to fish for lionfish. At this point, sport fishers and divers can apply pressure to the lionfish stock that is not tied to the abundance of the fish, to keep the population low. The success of these efforts will depend in part on whether lionfish in very deep water (beyond the reach of fishers) can contribute to the reproduction of the stock.

Climate Change Project (Appendix 5, 1.3) –Presenter: Lester Gittens

The meeting acknowledged that there was currently no budget for implementing the 2014-2019 Coral Reef Action Plan.

Other Documents Presented to the Group (Appendix 5, 1.4) - Presenter: Lester Gittens

The synthesis of the document prepared by Professor Seijo and Ms. Headley - *A review of the methodologies used for monitoring and evaluation of the spiny lobster stocks in the WECAFC countries and the development of a common methodology* was conducted and this synthesis is to be reviewed by the RSWG during the inter-sessional period.

Bahamas and Belize Conversion Factors for the Queen Conch (Appendix 5, 2.1) - Presenter: Lester Gittens

With regard to the sensitivity analyses conducted and depicted in Table 2, Appendix 5, Section 2.1) Prof. Hoenig suggested that instead of using the extremes in the calculation that the mean value should be used to ascertain the effect of differing conversion factors between sites. He also suggested that for sensitivity analyses the percentage difference should be used instead of the absolute difference between total exported weight and estimated total exported weight.

Dr. Singh-Renton noted that based on the analysis presented, conversion factors seem to be area specific and therefore perhaps more information was required. She further noted that specific recommendations in terms of getting information from other countries were not highlighted or made clear in the presentation/report. She also enquired whether or not the work done would assist with satisfying CITES requirement. In response, Mr. Gittens pointed out that other Member States should have provided data for the conversion factor exercise. He informed the Meeting that the plan as discussed at the previous year's scientific meeting was that CRFM Member States would collect the data and send it to the Working Group for analysis during this meeting. However, the Working Group would seek to have the necessary data collected by December 2014, analyse the data and report on the analyses before the 2015 scientific meeting. Alternatively, data from additional countries could be collected in time for the 2015 meeting, bearing in mind that the conversion factors were supposed to be implemented during 2015.

Anguilla Analyses (Appendix 5, Section 2.2) – Presenter: Remone Johnson

Clarification was sought concerning the amount of scads landed for the year 2009. It was clarified that the amount was about 400 lbs per trip, and about 38,000 lbs in total for the five year period 2009-2013.

Ms. Nancie Cummings, analyst from the NMFS, SEFSC, who assisted Mr. Johnson with the analyses and presentation, noted that there remained a large number of data quality issues with the data brought to the meeting. Ms. Cummings suggested priority be given to the cleaning of the data. Prof. Hoenig informed the meeting that he and Prof. Oxenford had written a manual on how to clean data and he suggested that the participants access the manual to assist them. The group was informed that the manual was available on the DGroups of the CRFM DMTWG and the Secretariat agreed to circulate the manual to all participants. The manual is provided at Annex 2 of the report of the DMTWG.

Jamaica 2013 Pedro Bank Queen Conch Fishery Assessment and TAC Recommendation (See Annex 2 of RSWG Report) - Presenter: Ricardo Morris

Mr. Gittens offered congratulations to Jamaica on the good job of managing their conch fishery and he further expressed agreement with the measures employed by Jamaica. He made special mention of the measure employed whereby even though the conch density estimated using the catch per unit effort analysis had increased, as a precaution the quota was still held at the level of the previous years when the densities were lower, at least until a new visual survey is completed. Dr. Singh-Renton enquired whether or not size frequency data were collected on a continuous basis. The Jamaica representative indicated that this was the case. Dr. Singh-Renton also queried whether or not a chart displayed in the presentation reflected juveniles. She made reference to previous plans in Jamaica to monitor the movement of juvenile conch into deeper waters to inform whether or not a good harvest was expected. The Jamaican representative indicated that the chart displayed in the presentation reflected the density of juveniles. However in the detailed survey report other charts showing densities of exploited stock, the entire stock, and adults were also available. He was unaware of the plans to monitor movement of juvenile conch.

Mr. Morris thanked the CRFM for helping him to hone the skills that he used in the analysis and presentation of the report.

Population Dynamics of the Red Mutton Snapper of Belize (Appendix 5, Section 2.3) - Presenter Ramon Carcamo

Mr. Gittens enquired whether or not the sizes revealed in the length converted averages were being affected by gear selectivity, since at the end of the catch curve corresponding to the smallest animals there was an abrupt cutoff point, but no minimum size limit was in place (was there gear selectivity in operation). Mr. Carcamo informed the meeting that the gear used was capable of taking any fish however the fishers do adjust their number of hooks per line and mostly utilize hook sizes # 3 or # 4 to capture the mutton snapper at the spawning aggregation site.

Mr. Carcamo indicated that Belize would like to establish a size limit for mutton snapper, with the help of Prof. Hoenig, and to regulate hook size in this regard. He indicated that further analyses on the species would include examination of maturity data.

Montserrat ASPIC Production Model - Presenter Alwyn Ponteen

There were no questions after this presentation and Dr. Singh-Renton commented that she was not surprised at the lack of questions from the participants as the group was not quite ready for the level of assessment presented. She indicated that in the future such an assessment could be undertaken inter-sessionally. Ms. Cummings, who assisted with the assessment, indicated that significant work had gone into the assessment, all of which could not be presented due to time constraints. However those additional tables, etc., would be available in the final document for publication. The report was however, not submitted by the presenter for publication.

Prof. John Hoenig expressed surprise at Dr. Singh-Renton's comment that the assessment was above the understanding of the group, as surplus production models (ASPIC was just another method of doing a surplus production model) had been used quite frequently for assessment over the life of the CRFM

Annual Scientific Meeting. He also noted that other presenters (Bahamas conch, Suriname seabob) had used similar methods in their analysis as well over the years. Dr. Singh-Renton indicated that the concern she was expressing was based on the review done by the expert working group on statistics and information capacity earlier in 2014. The expert review had noted that the surplus production model had been used frequently at the CRFM Scientific Meeting, but the participants have not understood the model. She stated that where such models would to be used in future the Secretariat should know well in advance of the onsite meeting so that the working group would have enough time to discuss and understand the model. Prof. Hoenig expressed concern at the seeming addition of new layers, if the model was to be discussed in the working group, as there was limited time in which the assessments must be completed. Dr. Singh-Renton noted that she was being misunderstood, but as the report of the expert working group had not been shared yet with all scientific meeting participants, she noted that it was perhaps not useful to pursue further debate on the CRFM's assessment activities at that time.

Mr. Carcamo stated that this year's scientific meeting was not at the level of previous Scientific Meetings. He expressed concern at the number of items placed on the agenda for discussion and review which shortened the time that was spent on assessments. He also expressed concern that only one consultant was provided for the groups.

Turks and Caicos Islands Queen Conch Data Analysis and Overview (Appendix 5, Section 2.4) – Presenter: Luc Clerveaux

Prof. Hoenig congratulated Mr. Clerveaux on his presentation given the fact that this was his first experience with a surplus production model. The model applied was the ASPIC model, the same model as applied to the Montserrat needlefish population. He indicated that an independent index of biomass was obtained and that he was very excited about the possibilities of including this in the model.

Plenary discussion of RSWG Biennial Workplan

The Meeting agreed that the workplan of the RSWG would be refined inter-sessionally and submitted to the Secretariat.

5.4 Data, Methods and Training Working Group (DMTWG)

The 2014 Chairperson for the DMTWG was Ms. Patricia Hubert-Medar, who was also the representative of St. Lucia. The Vice Chairperson was Mr. Ricardo Morris, who was also the representative of Jamaica. Ms. Hubert–Medar presented the 2014 report of the DMTWG. The detailed report of the DMTWG is given in ***Appendix 6***.

Plenary discussion of DMTWG report

Ms. Mohammed reminded the participants of the DMTWG that the assignments given by Prof. Hoenig were due in two weeks. Assignments were to be sent directly to Prof. John Hoenig. Prof. Hoenig stated that participants should feel free to send questions and queries to him, particularly where problems were encountered with the assignment. He also pointed out that the assignment was to demonstrate that participants were able to use R.

Ms. Mohammed also pointed out that the biennial work plan of the DMTWG (and by extension the work plans of all the fisheries working groups) should be developed based on extensive discussion among CRFM Member States and submitted to the Secretariat by the end of July.

Ms. Hubert-Medar encouraged the participants to work on the assignments as soon as possible on their return to their respective countries before they became too immersed in their everyday work activities.

Dr. Singh-Renton remarked that some of the issues mentioned by the group were not new issues and also some of the recommendations made were not new recommendations. Thus she enquired of the group if new approaches to these old problems were considered. One such issue was the recommendation for a separate meeting of the DMTWG. Dr. Singh-Renton indicated that a separate meeting of the DMTWG was not possible at this time due to funding constraints and she enquired of the group if an electronic meeting was considered. Ms. Hubert-Medar indicated that the group considered convening electronic meeting(s) for the purpose of preparing for the onsite Annual Scientific Meeting. These meetings would facilitate the cleaning of data or the review of data, offer opportunity to ensure data formatting issues were addressed and to encourage consistent use of formats, particularly given the recommendation about helping each other. The Dominica representative also added that the group considered convening further "R" training via electronic means.

Plenary discussion of DMTWG Biennial Workplan

The meeting discussed the completion of the budget for the working group(s). It was discussed whether or not the budget should be completed simultaneously with the compilation of activities of the working group. Ms. Mohammed pointed out that it would probably be practical to focus on deciding on the activities of the working group and, then consider the budgetary needs; particularly given that some of the activities will be aligned to budgets of the Fisheries Divisions. However Ms. Hubert-Medar pointed out that some items of the DMTWG working group were new and were not in the budgets of the Fisheries Divisions. Dr. Singh-Renton pointed out that the exercise of thinking through the budget would be a valuable activity, as this would provide information on what budgetary lines would be available from the Fisheries Divisions and those that would not be available. The meeting agreed that the budget should be completed simultaneously with the compilation of activities of the working group.

With regard to development of the list of the 10 most important commercial species for regular analysis/assessment/monitoring at the regional level, it was agreed that the list developed by the DMTWG would be circulated to all CRFM Member States for their input and indication of the criteria used for identification of the species. Although Dr. Singh-Renton suggested that the criteria for the 10 most important species should be developed in the inter-sessional period, it was also noted that the criteria for selection of the species among Member States may vary depending on the priority placed on certain issues e.g., food security, economic gain, poverty alleviation.

With regard to the screening of data to ascertain suitability for analysis at the scientific meeting, the protocol (procedures, guidelines, confidentiality issues, etc.) was still to be formulated. It was agreed that a committee be established within the Working Group to screen the data. Derrick Theophille (Dominica), Lester Gittens (The Bahamas), Patricia Hubert-Medar (St. Lucia) and the Programme Manager, Research and Resource Assessment (CRFM Secretariat) would serve on the committee in the first instance. The committee was assigned the task of developing a first draft of the protocol early in the inter-sessional period.

6. ANY OTHER BUSINESS

Eastern Caribbean Regional Ocean Policy (ECROP)

Mr. Ponteen drew the attention of the meeting to the issue of Eastern Caribbean Regional Ocean Policy (ECROP). He indicated that the Heads of States of OECS Member States endorsed the Eastern Caribbean Regional Ocean Policy. He encouraged the participants to become familiar with the document and the issues surrounding the policy so that the matter could be discussed at another suitable opportunity.

Caribbean Fisheries Open Data Initiative

Prof. Oxenford made a short presentation on the Caribbean Fisheries Open Data initiative. This presentation pertained to a four-month research project (June to September 2014) implemented by the Caribbean Open Institute and partners, CERMES being one of the partners, and focusing on six countries in the region. The project is exploring the opportunities for the use of open data, in particular bio-physical, socio-economic and governance data in fisheries and the benefits to be derived. Prof. Oxenford noted the potential benefits to the CRFM in the areas of improved data sharing, management planning as well as bridging the gap between science and policy and providing support to regional projects. A copy of the presentation is provided in ***Appendix 7***. Participants were asked to contact Dr. Patrick McConney of CERMES, UWI for further information.

7. REVIEW AND ADOPTION OF MEETING REPORT

It was agreed that the report of the plenary sessions would be adopted via email.

Given that the reports of the working groups were at varying stages of production it was agreed that the present available drafts would be considered the first drafts, and that second drafts (more complete drafts) would be submitted to the Secretariat by 31 July 2014.

8. RECOGNITION OF SCIENTIFIC MEETING ACHIEVEMENT BY WORKING GROUPS AND PARTICIPANTS

Two tokens of achievements were awarded: (i) best individual technical presentation which was given to Mr. Luc Clerveaux and (ii) Best Working Group technical presentation which was received by the Reef and Slope Fisheries Working Group.

Two participants who had completed their "R" assignments also received their R training certificates. These recipients were Ms. Patricia Hubert-Medar, St. Lucia and Mr. Kharim Saddler, St. Kitts and Nevis.

9. ADJOURNMENT

Ms. Mohammed expressed thanks and appreciation to the individuals who had served as chairpersons for the working groups, recognizing their commitment and tremendous efforts during the course of the meeting. She assured them of the Secretariat's continued support as they strive to undertake the activities of the Working Groups during the inter-sessional period and at future scientific meetings.

She thanked Prof. John Hoenig for developing and delivering the R training course and for offering his assistance to all participants in use of the R statistical software to analyze their countries' fisheries data during the Working Group sessions of the meeting. She also thanked Ms. Cummings for her assistance to participants in the Reef and Slope Fisheries Working Group and her support to the scientific meetings over the years. She assured her that as a region the CRFM would like to develop institutional capacity and in keeping with the proposed new format for the Annual Scientific Meetings will proceed from basic to more advanced training in statistical analysis and stock assessment, cognizant of the technical capability of the Fisheries Officers in the region. Ms. Mohammed also thanked Prof. Oxenford for her continued interest and contribution throughout the years and for keeping the participants informed on regional projects of relevance. She also thanked all the participants, and reminded them of the importance and great value of the inter-sessional work to be undertaken. She thanked the Staff of the CRFM Secretariat: Ms. Gibson for arranging flights and other logistics, Ms. Masters for assisting with rapporteuring of the plenary sessions, Mr Francis for rapporteuring of the DMTWG session and the plenary sessions as well as

support with the use of electronic equipment and photography, Mr. Cyrus for transportation and other logistics, Ms. Williams for a clean and comfortable working environment. She also thanked Dr. Singh-Renton for her continued guidance, support and encouragement.

Ms. Louanna Martin of Trinidad and Tobago, on behalf of the participants, thanked Ms. Mohammed for a wonderful meeting.

Dr. Singh-Renton also expressed thanks to Ms. Mohammed, and acknowledged her efforts to ensure a successful meeting. She indicated that Ms. Mohammed brought fresh ideas and energy to the scientific meeting and was poised to be an inspiration in the coming years. Dr. Singh-Renton also thanked the participants for their patience with the evolving format of the Scientific Meeting and stated that she looked forward to the implementation of activities during the inter-sessional period. She wished all participants a safe journey home.

The meeting was adjourned at 6:14 p.m.

10. REFERENCES

CRFM, 2014. Report of Workshop to Develop Draft Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information, 10-12 February 2014, St. Vincent and the Grenadines. *CRFM Technical & Advisory Document*, No. 2014 / 1. 135p.

Singh-Renton, S., Headley, M. and Isaacs, K. 2012. Using available data and stakeholder knowledge to resolve a management dilemma for a data-poor seine fishery in St Vincent and the Grenadines. *Proceedings of the Gulf and Caribbean Fisheries Institute* 64: 82-91.

APPENDIX 1: AGENDA

TENTH ANNUAL SCIENTIFIC MEETING
PLENARY MEETING AGENDA

(Kingstown, Saint Vincent and the Grenadines – 17 June 2014 – 0900 – 1700h)

1. Opening of the meeting.
2. Adoption of meeting agenda and meeting arrangements.
3. Introduction of participants.
4. Presentation of national (country) reports.
5. Working Group Reports (listed in alphabetical order):
    a. Continental Shelf Fisheries (CSWG);
    b. Data, Methods and Training (DMTWG);
    c. Pelagic Fisheries (PWG);
    d. Reef and Slope Fisheries (RSWG);
6. Any other business.
    a. Eastern Caribbean Regional Ocean Policy (ECROP)
    b. Caribbean Fisheries Open Data Initiative
7. Review and adoption of meeting report.
8. Recognition of scientific meeting achievements by Working Groups and Participants.
9. Adjournment.

APPENDIX 2: LIST OF PARTICIPANTS

Caribbean Regional Fisheries Mechanism
Tenth Annual Scientific Meeting, 10-17 June 2014

List of Participants

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APPENDIX 3: REPORT OF THE CONTINENTAL SHELF FISHERIES WORKING GROUP (CSWG)

Chairperson: Seion Richardson, Guyana
Rapporteur: Seion Richardson
Other Members: Dawn Maison (Guyana industry), Lara Ferreira (Trinidad), Shandira Ankiah (Trinidad), Yolanda Babb-Echtel (Suriname), Mario Yspol (Suriname), Ranjitsingh Soekradj (Suriname), Paul Medley (Consultant)

The CSWG was represented at the Scientific Meeting by two representatives from Guyana. The Working Group did not undertake any fisheries or species analyses or assessments in 2014. Instead, an electronic meeting was convened in two sessions on 13 and 16 June to: (1) discuss, review and endorse the proposed harvest control rules for the Guyana Seabob fishery; and (2) discuss and agree on activities to be included in the Working Group's biennial work plan for the period 2014 to 2016. The Working Group and the electronic meeting agendas are attached at Annex 1 and Annex 2 respectively followed by the detailed CSWG biennial work plan (2014-2016) in Annex 5.

1. Review of inter-sessional activities and management decisions since last meeting

Some of the inter-sessional activities and management decisions from the last meeting included:

- Frequent Seabob Working Group meetings
- Monitoring of the Seabob CPUE on a monthly basis
- Improved data collection and entry
- Data cleaning
- Harvest Control Rule Proposal (Inter-sessional)

2. Review and endorse report of assessment of seabob fishery in Guyana

The electronic meeting on 13 June 2014 noted that the 2013 seabob assessment was already presented and endorsed at the Ninth Annual Scientific Meeting. However, it was necessary to review the assessment so as to place the proposed harvest control rules in context. Dr. Paul Medley delivered a powerpoint presentation. A copy of the presentation is attached at Annex 3.

Discussion on 2013 assessment of seabob fishery of Guyana

Currently, the stock is close to a default precautionary target level and can be considered "fully exploited". The assessment suggests that the stock has recovered somewhat from a state where it might have been considered over-exploited, that is the stock was at greater risk of recruitment overfishing. Based on the current assessment, fishing mortality has only rarely exceeded fishing mortality at maximum sustainable yield (MSY), so overfishing has rarely taken place.

However, FMSY is poorly estimated as it depends on a parameter in the stock-recruitment relationship, which had to be assumed. Therefore, it should represent an upper limit until more information on an appropriate fishing mortality can be obtained. An appropriate MSY based reference point for fishing mortality still needs to be determined. The processing facilities routinely collect average count data from the commercial categories. This data should assist in monitoring the average size within each category. This information should be useful within the stock assessment model to fit to changes in mean size within the category if such changes are significant. One processing facility provided average counts recorded by the quality control staff. (CRFM 2013).

3. Evaluate and suggest adjustments if necessary, to the harvest control rules for the seabob fishery in Guyana

A detailed review of the harvest control rules was undertaken at the electronic meeting on 16 June 2014, followed by a presentation of these rules by Dr. Paul Medley. A copy of the power point presentation is attached at Annex 4.

However presentation #2 (HCR proposal) sparked a lot of questions from associate country representatives i.e. Suriname, Trinidad and Guyana and hence subsequent discussions ensued.

Table 1 below records the questions that stemmed from the latter presentation and the possible answers supplied to same.

Table 1: Record of the questions that stemmed from presentation #2 (HCR proposal) and the possible answers supplied to same.

Names of countries that posed questions	***Questions asked***	***Answer given***
Guyana	*What is the likelihood of implementing conservation methods such as longer closed seasons and closed areas?*	*Very probable but is only likely to work within the context of the other controls applied e.g. mesh size, vessel size. It was also recommended that details of such controls be documented in fisheries management plan along with approved HCR.*
Trinidad	*Is it better to employ the days at sea or catch factor as a HCR?*	*It's better to use DAS which in this case would be 225 per licensed vessel which can be lowered depending on annual catch over time. Gives better accountability and can be more easily measured and adjusted.*
Suriname	*Was the current closed season considered in the allocation of the total allowable days at sea per vessel?*	*Yes it was. The closed season will fall somewhere outside of the total allowable fishing days per vessel annually.*
Guyana	*What is the reason behind the implementation of an empirical harvest control rule and how can this become more sophisticated overtime?*	*The main reason is because it uses a single index which can be easily applied and monitored locally. However current data collected are minimal but may become more detailed in years to come.*
Guyana	*Will the proposed HCR be valid for five (5) years or directly dependent on results from stock assessments?*	*It' s currently valid for five (5) years however depending on changes (drastic/gradual) in results from annual stock assessments this rule may or may not be revised.*
Guyana	*Regarding the HCR application, on what basis should actions be taken with respect low levels of catch?*	*Annually, since no significant change is likely to occur before, providing that the rule is correctly applied.*
Suriname	*Does the stock assessment model take account for other species caught by trawler*	*No, However, it is recommended that a total effort quota be looked at along with gear selectivity and area fished*

Names of countries that posed questions	*Questions asked*	*Answer given*
	vessels especially the ETP species e.g. Rays?	*to monitor the capture of such species.*

Conclusion
*Meeting outcome**:** Proposed HCR was endorsed by the CSWG members*

4. Identification of species/fisheries to be analyzed in 2015 and 2016

A list of Guyana's top ten (10) priority species was drafted and subsequently submitted to the Data, Methods and Training Working Group. These were as follows:

GUYANA`S LIST OF TOP TEN SPECIES

Common names	**Scientific names**
Bangamary	*Macrodon ancylodon*
Bashaw	*Micropogonias furnieri*
Butter fish	*Nebris microps*
Cuirass	*Sciades (Arius) proops*
Gillbacker	*Sciades parkeri*
Grey snapper	*Cynoscion acoupa*
Southern red snapper	*Lutjanus purpureus*
Seabob	*Xiphopenaeuskroyeri*
Sea trout	*Cynoscion virescens*
Spanish mackerel	*Scomboromorus brasiliensis*

Fisheries Management Plan (2013-2018) Pgs 9 - 10.

Please note:
The total annual landing was the main criteria used for prioritizing species except in the case of Seabob, Bashaw, Butterfish and Red Snapper which were selected based on collection and availability of data and economic value.

5. References

CRFM 2013. Report of Ninth Annual CRFM Scientific Meeting – Kingstown, St. Vincent and the Grenadines, 10-14 June 2013. *CRFM Fishery Report - 2013*. Volume 1. 85p.

Annex 1

(A) DRAFT AGENDA OF 2014 MEETING OF
CONTINENTAL SHELF FISHERIES WORKING GROUP

(Kingstown, Saint Vincent and the Grenadines – 12 to 16 June 2014)

Chair: Guyana (Seion Richardson)
Possible Vice-Chair: not identified
At 2014 Scientific Meeting

1. Review of inter-sessional activities and management decisions since last meeting;
2. Review and endorse report of assessment of seabob fishery in Guyana (likely to be addressed along with 3. below);
3. Evaluate and suggest adjustments if necessary, to the harvest control rules for the seabob fishery in Guyana (proposed e-meeting of Friday 13 June 2014);
4. Identification of species/fisheries to be analyzed in 2015 and 2016, consistent with the ecosystem, participatory and precautionary approaches to fisheries management - identification of national fisheries management priorities and objectives; identification of available data sets; review of the associated data sets (if available); identification of types of analyses/assessments to be conducted; identification of specific activities regarding preparation of data for analysis as well as any required preliminary analyses;
5. Develop detailed inter-sessional work plan (2014 to 2016);
6. Any other business.

Inter-sessional (period leading up to and following 2014 Scientific Meeting)

1. Review and "clean" data set(s) to be analyzed.
2. Review of Fisheries Management Plans for Suriname, Guyana and Trinidad and Tobago developed under ACP Fish II Programme – identification of scientific/research responsibilities and proposed actions;
3. Review of FAO-IDB Project Document - *Investing in ecosystem-based shrimp and groundfish fisheries management of the Guianas -Brazil Shelf* – identification of scientific/research responsibilities and proposed actions;
4. Review of FAO Project REBYC-II LAC - Strategies for trawl fisheries bycatch management – identification of scientific/research responsibilities and proposed actions;
5. Review of CLME Project Document (Second Phase – Implementation of Strategic Action Programme- Pilot Project for Shrimp and Groundfish Fisheries in the Guianas-Brazil Shelf) – identification of scientific/research priorities and proposed actions;
6. Review of IDB Strategic Program for Climate Resilience - Marine Component and CIDA Project proposal on Increasing Resilience of the Fisheries Sector in the Caribbean Region - identification of scientific/research priorities and proposed actions.

Annex 2

MEETING OF CSWG WORKING GROUP
REVIEW OF GUYANA`S HARVEST CONTROL RULES FOR THE SEABOB FISHERY
CRFM'S TENTH ANNUAL SCIENTIFIC MEETING
Electronic Meeting – To commence at 10:30 a.m. ECT on Friday, 13 June 2014
(GoToMeeting ID: 329 852 829)

Meeting Agenda

1. **Call to order**
   The call to order will effectively inform all participants that the meeting has commenced, and this action is particularly important if an electronic meeting is being held.
2. **Registration of attendance/ participation**
   This agenda item is expected to serve as the electronic parallel to participants' introductions, and serves to confirm who are the national and regional representatives expected to contribute for the duration of the electronic meeting.
3. **Meeting protocol**
   This agenda item is intended to familiarize participants with the mode of operation in the conduct of electronic meetings.
4. **Review and adoption of agenda**
   This agenda item is intended to facilitate any required amendments to the proposed agenda prior to its formal adoption.
5. **Presentation on the last year`s stock assessment for Guyana`s Seabob fishery by Dr. Paul Medley.**
   This agenda item is intended to inform the meeting participants on the basis upon which the current Harvest Control Rules (HCR) were formulated.
6. **Presentation on the Guyana`s current Harvest Control Rules by Dr. Paul Medley.**
   This agenda item is intended to facilitate review of and feedback on the validity of the current Harvest Control Rules, with the aim of the rule being endorsed by the CSWG/CRFM level.
7. **Discussion**
   This agenda item is intended to obtain feedback from the participating audience, in the form of comments, recommendations, and clarifications regarding presentations made.
8. **Any other business**
   This agenda item is intended to facilitate discussion of any other issues that need to be addressed.
9. **Adjournment**
   The meeting will be adjourned following completion of the agenda of activities.

Annex 3

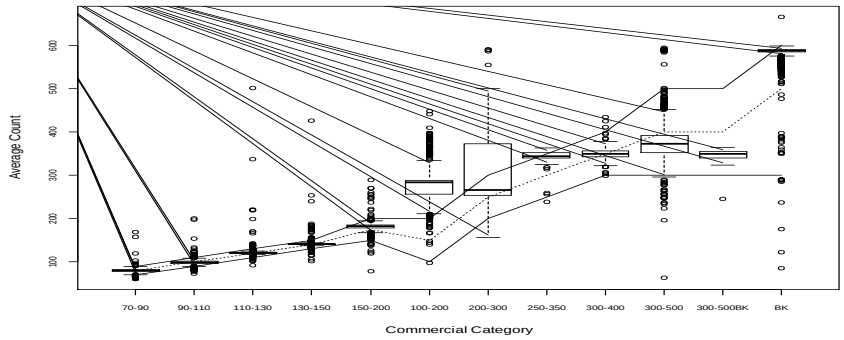
POWERPOINT PRESENTATION DELIVERED BY Dr. PAUL MEDLEY ON 2013 SEABOB STOCK ASSESSMENT

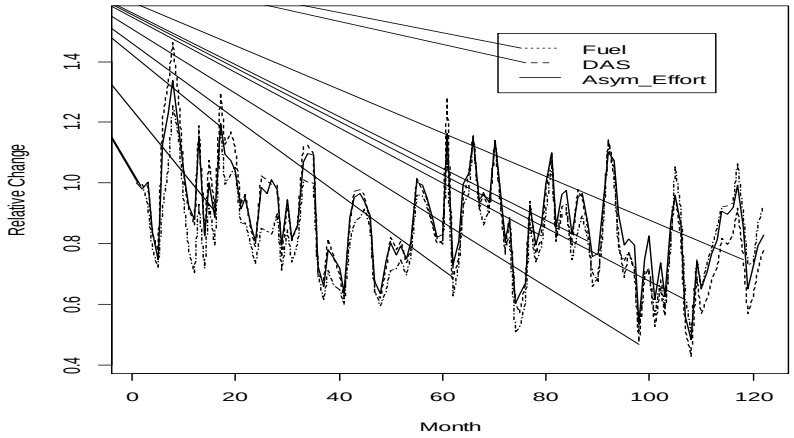
Seabob Weight and Age Structured Stock Assessment

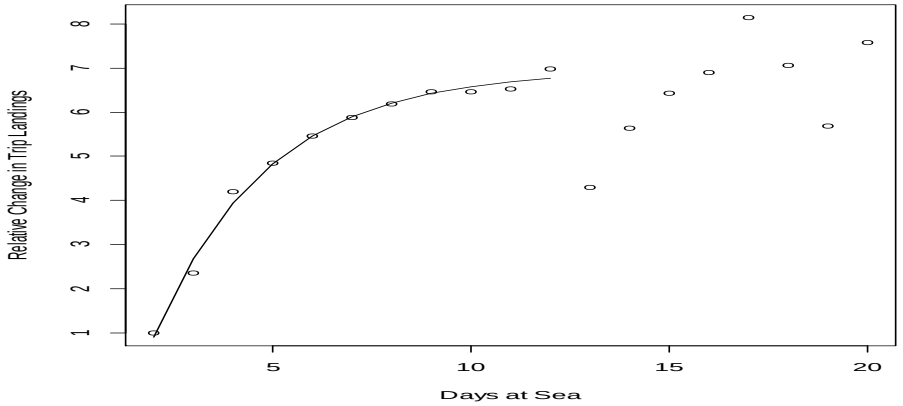
Data Used

- All data combined into months
- Random Sampling Data
  - 30 0.2g weight bins separate males and females
- Average Count Data
  - Over defined weight bins for each grade
- Landings and standardised effort (by grade)
- Total landings by grade
- Annual landings before 2002

Commercial Categories



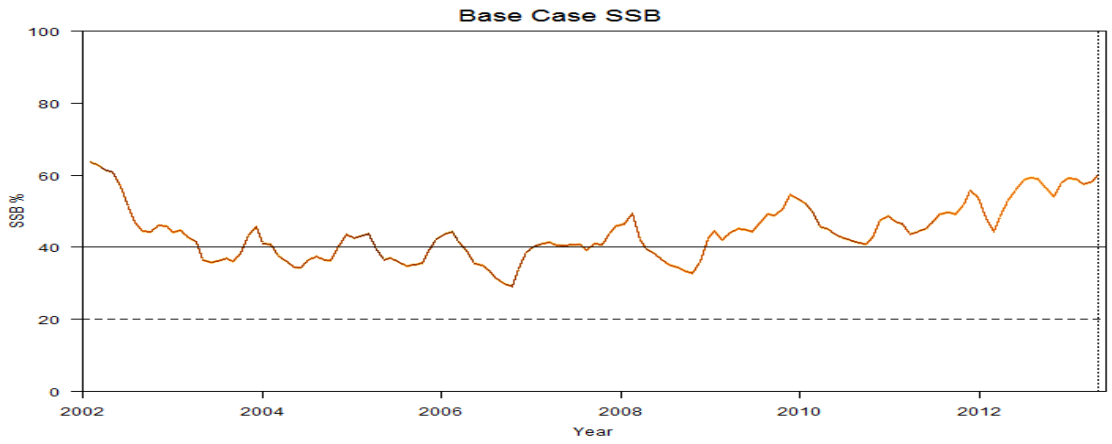


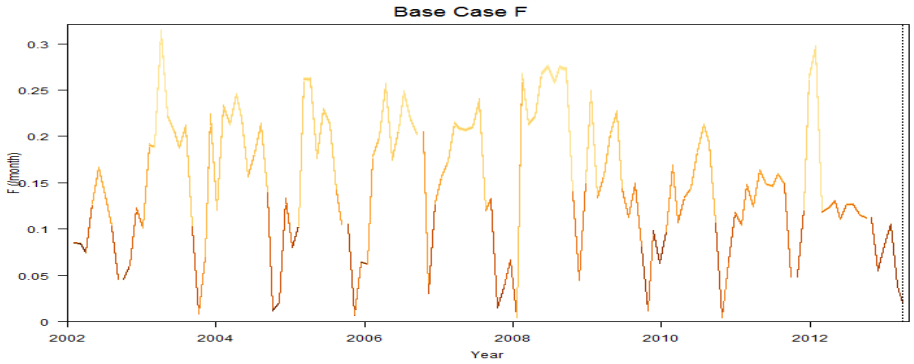


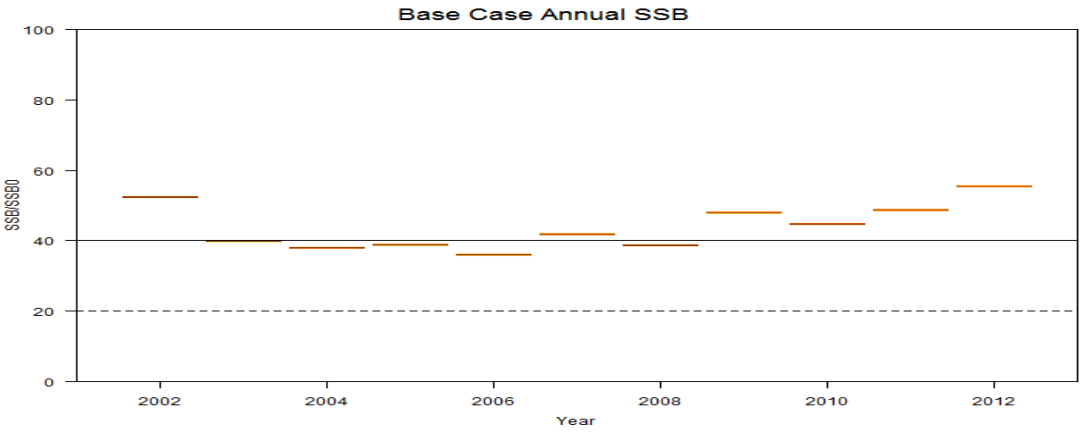
Stock Assessment Model

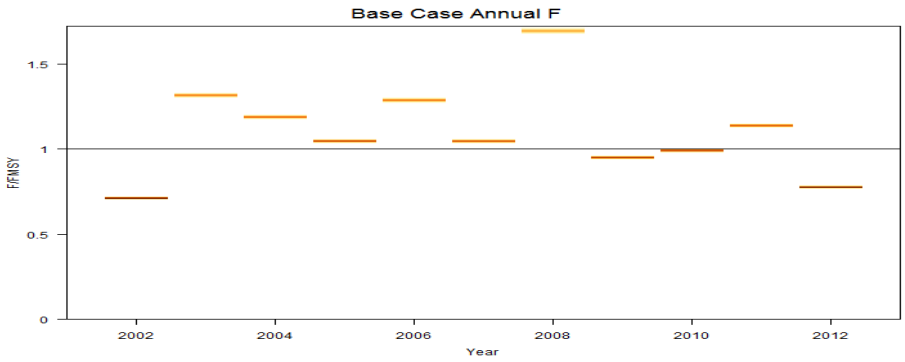
1. It is complicated!
2. Model fitted with very advanced software (www.admb-project.org)
3. Standard sex and age structured population model with recruitment and fishing mortality estimated.
4. Fitted to catch and fishing effort
5. Fitted to commercial category and catch sampling tail weight data.
6. Assumptions: Model uses external maturity, growth rate, stock recruitment relationship.
7. Model estimates maximum size, gear selectivity, observed recruitment, fishing mortality.

RESULTS




Base Case F
F (/month)
0
0.05
0.1
0.15
0.2
0.25
0.3
2002
2004
2006
2008
2010
2012
Year


Base Case Annual SSB
SSB/SSB0
0
20
40
60
80
100
2002
2004
2006
2008
2010
2012
Year


Base Case Annual F
F/FMSY
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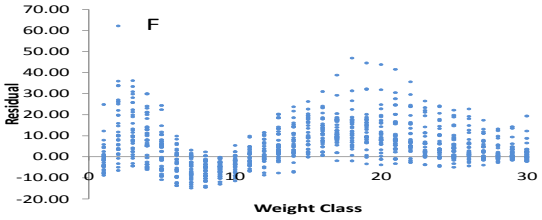
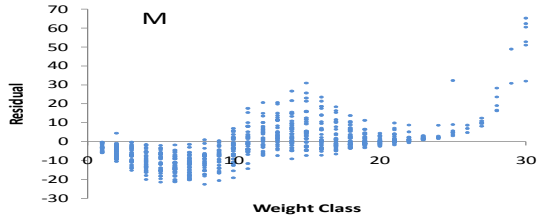
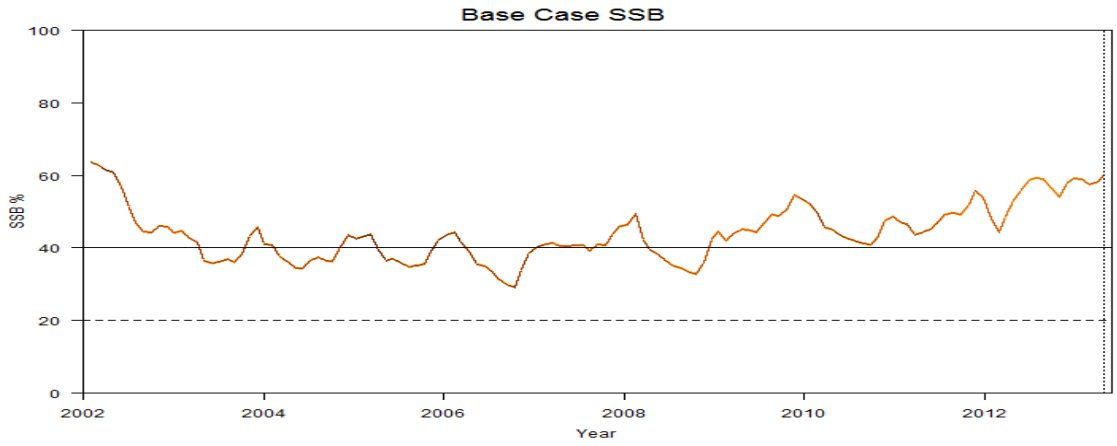
0.5
1
1.5
2002
2004
2006
2008
2010
2012
Year

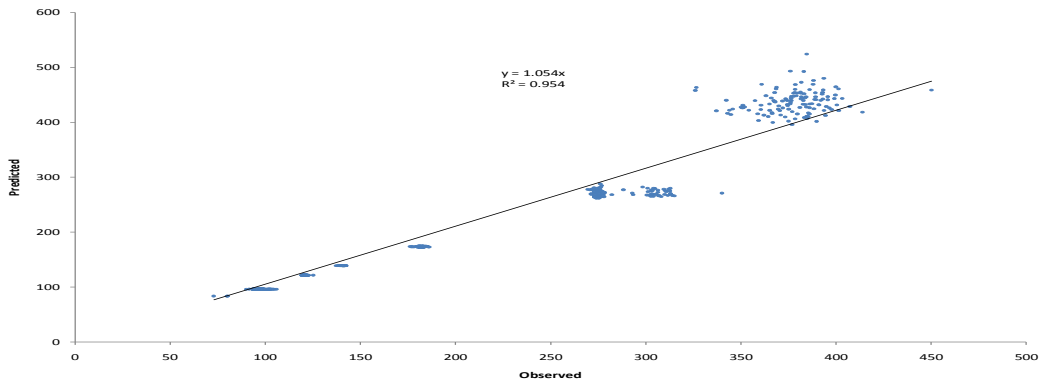
DIAGNOSTICS

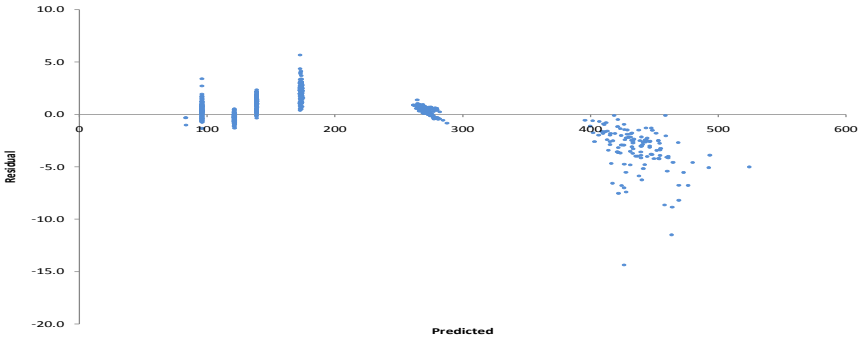
Random Sampling











Stock Assessment Development

- Passed by SGWG – External Review?
- In 2014, need to:
  - improve recruitment estimation
  - avoid "overfitting"
  - Improve selectivity function
- Stock status unlikely to change
- But PRECAUTION required.

Annex 4

POWERPOINT PRESENTATION DELIVERED BY Dr. PAUL MEDLEY ON EVALUATION OF HARVEST CONTROL RULE FOR GUYANA SEABOB FISHERY

HCR Evaluation

Guyana Seabob

What to Decide

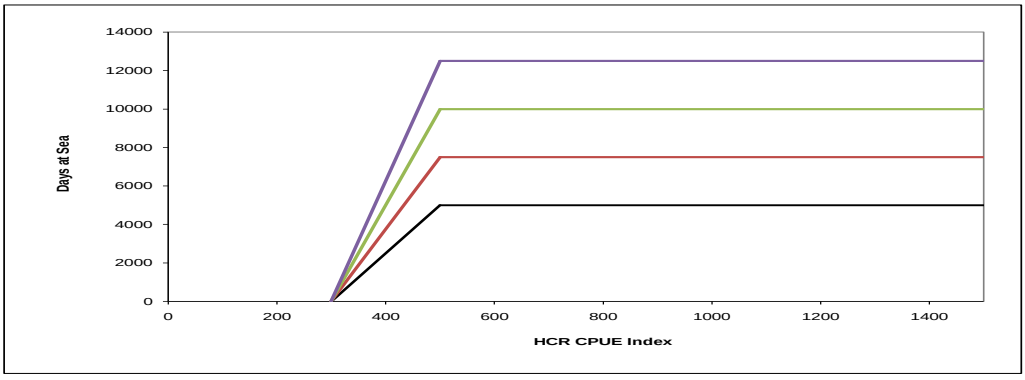
- Harvest Control
  - Days at Sea
  - Total Catch
  - Other measures
- Stock Status Index
  - CPUE
  - {Mean Weight}

What to Decide (continued...)

- Harvest Control Limits and Response
  - Maximum fishing level
  - Minimum fishing level
- Stock Status Index
  - Target (what we want)
  - Trigger (when we take precautionary action)
  - Limit (recruitment at risk: fishery minimised)

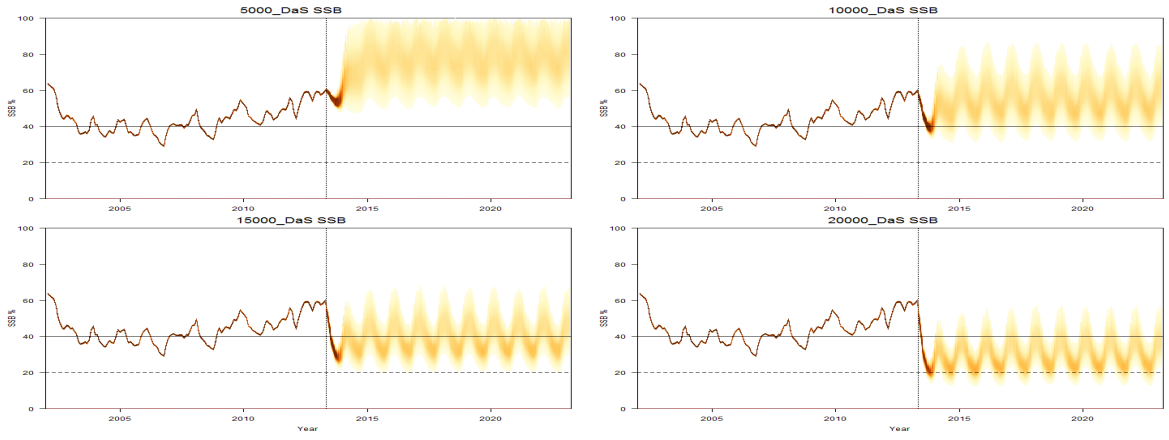
EFFORT CONTROL

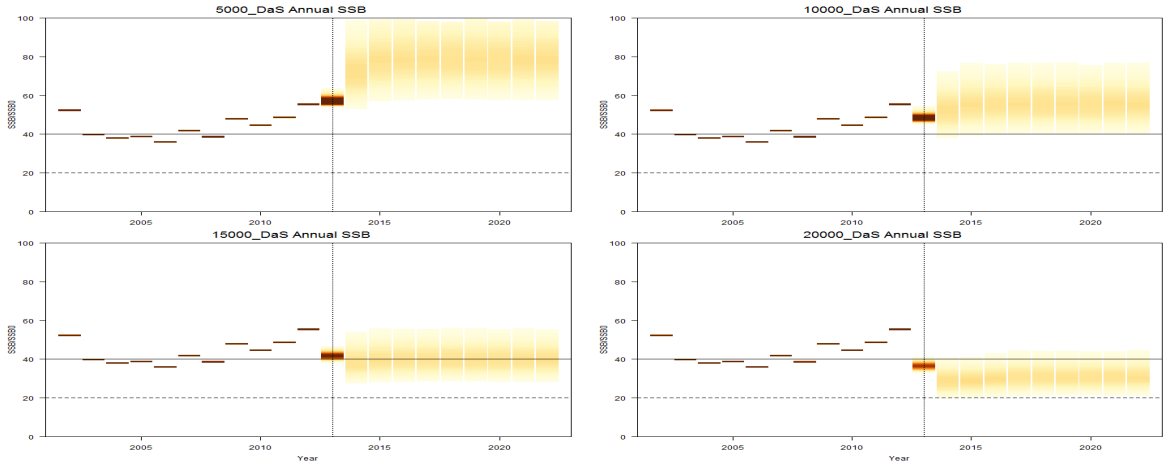
Harvest Control Rule

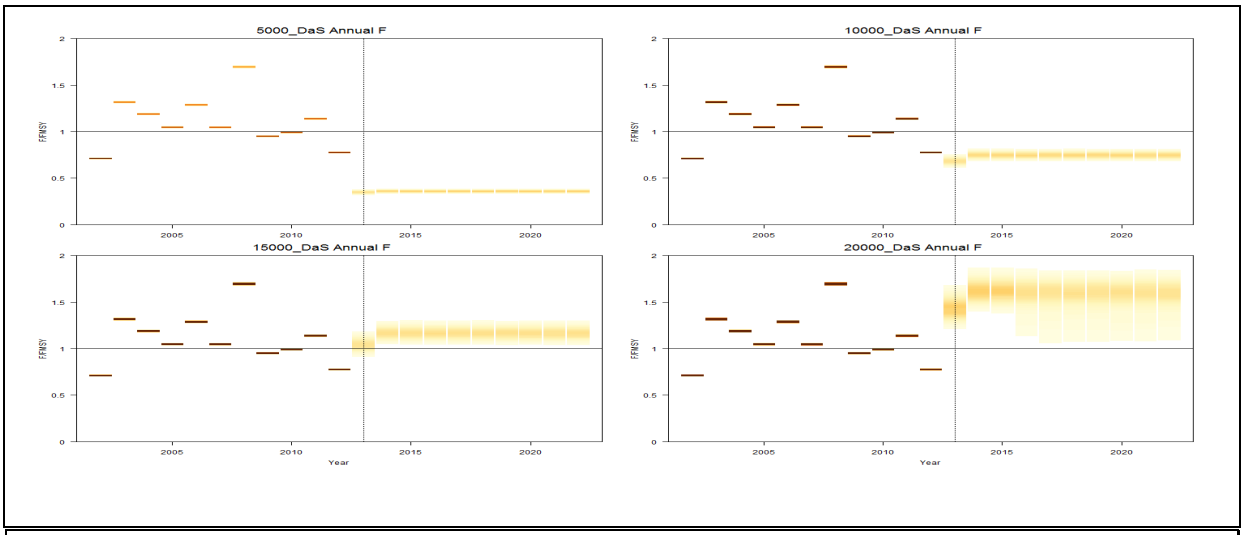


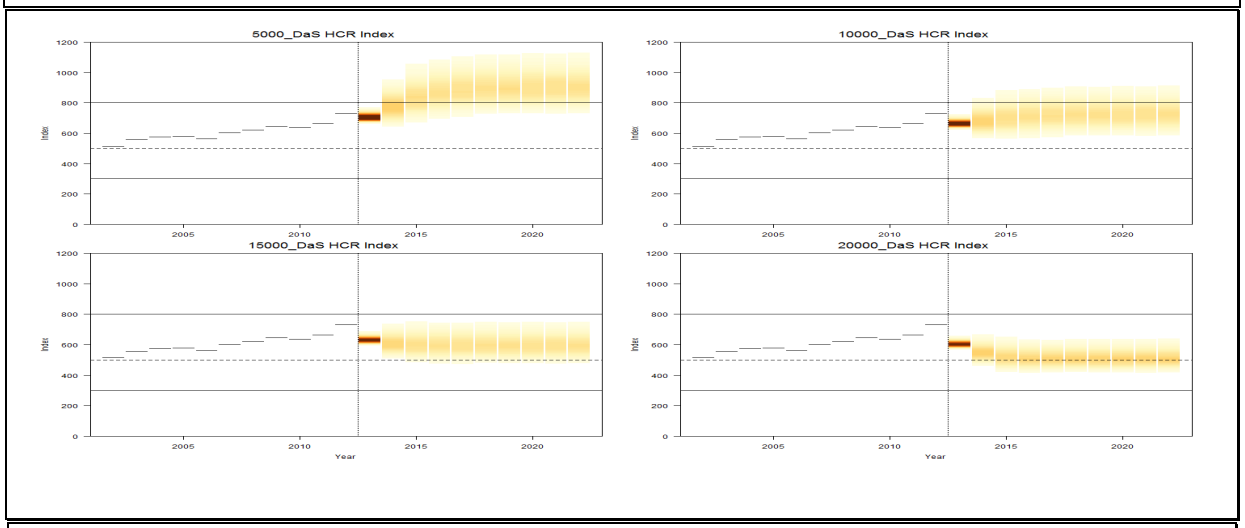
Effort Quota

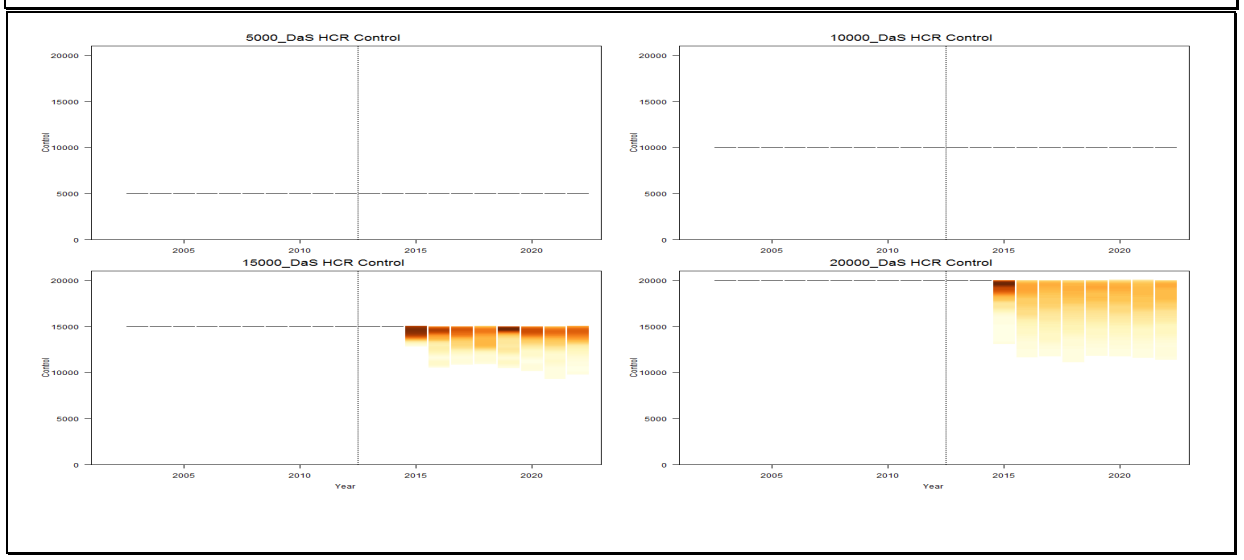
	DaS Fishing			
Active Vessels	5000	10000	15000	20000
70	71	143	214	286
75	67	133	200	267
76	66	132	197	263
80	63	125	188	250
85	59	118	176	235
87	57	115	172	230
	DaS			
Trips	5000	10000	15000	20000
70	11	23	34	46
75	11	21	32	43
76	11	21	32	42
80	10	20	30	40
85	9	19	28	38
87	9	18	28	37
	DaS + Steaming			
Trips	5000	10000	15000	20000
70	93	186	280	373
75	87	174	261	348
76	86	172	257	343
80	82	163	245	326
85	77	153	230	307
87	75	150	225	300

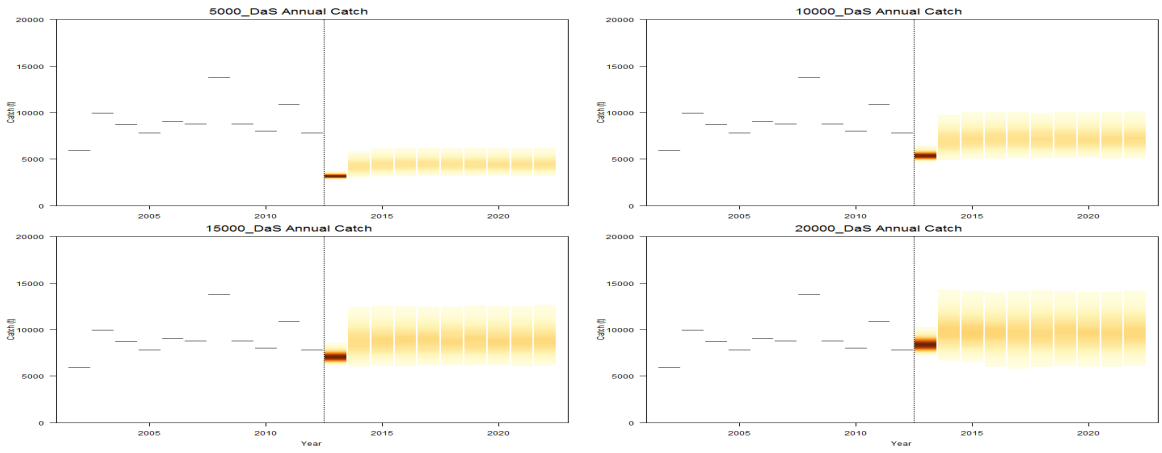


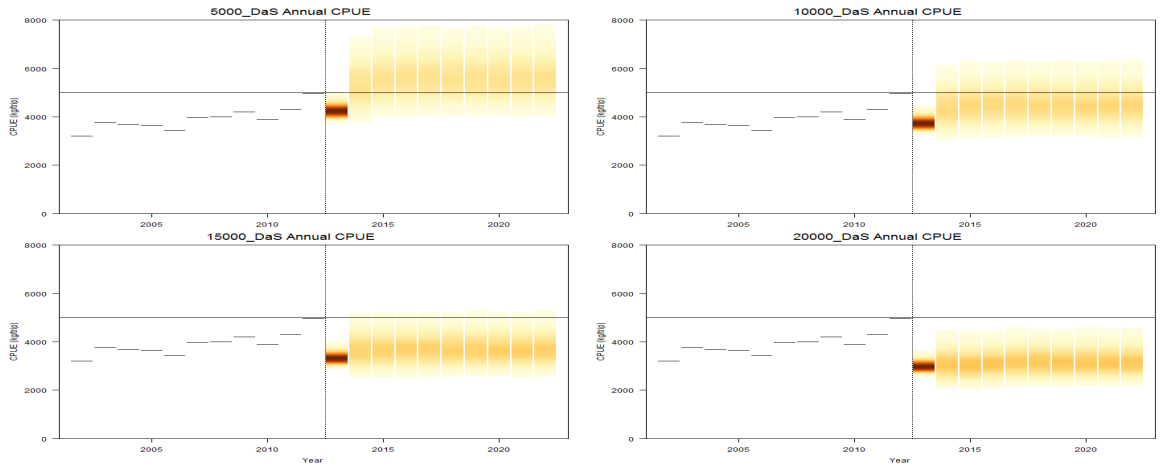



5000_DaS Annual F
10000_DaS Annual F
15000_DaS Annual F
20000_DaS Annual F
F/FMSY
Year


5000_DaS HCR Index
10000_DaS HCR Index
15000_DaS HCR Index
20000_DaS HCR Index
Index
Year

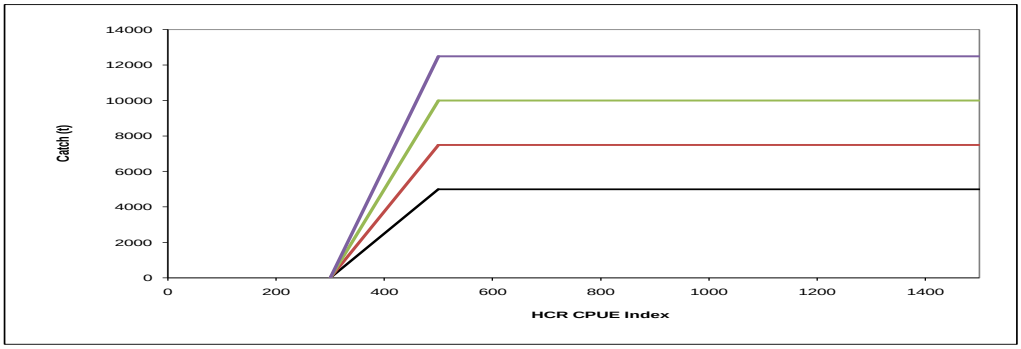

5000_DaS HCR Control
10000_DaS HCR Control
15000_DaS HCR Control
20000_DaS HCR Control
Control
Year

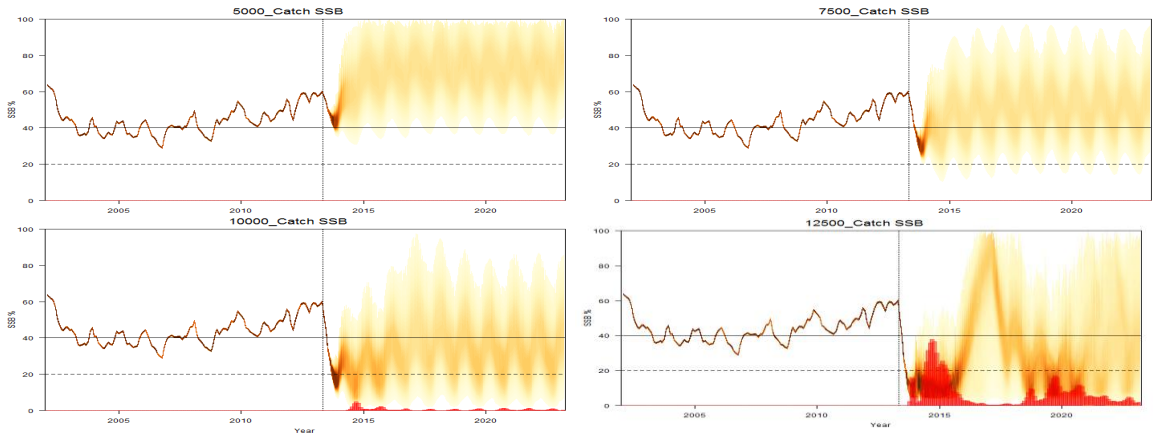


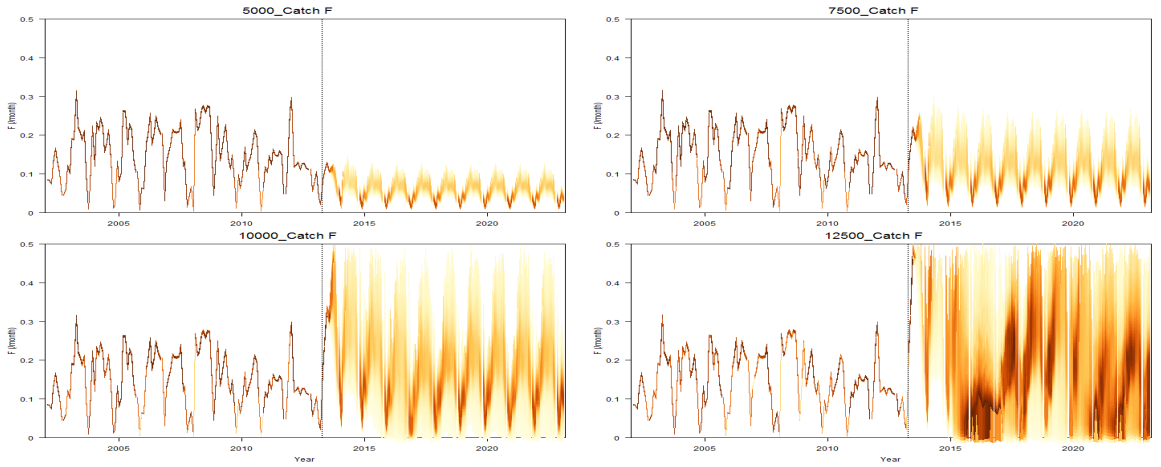


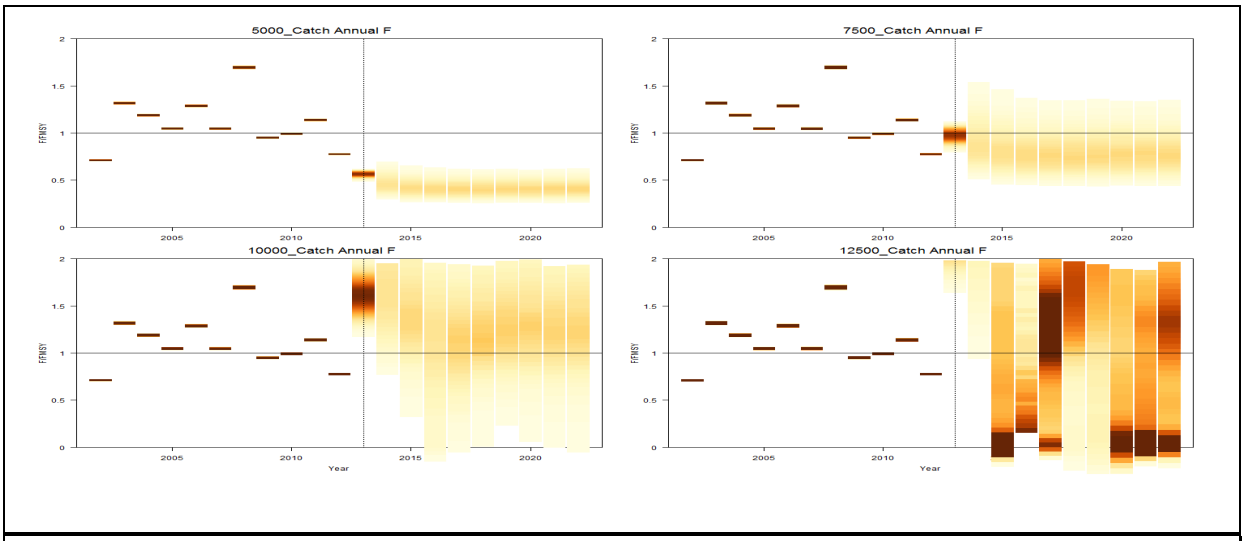
CATCH CONTROL

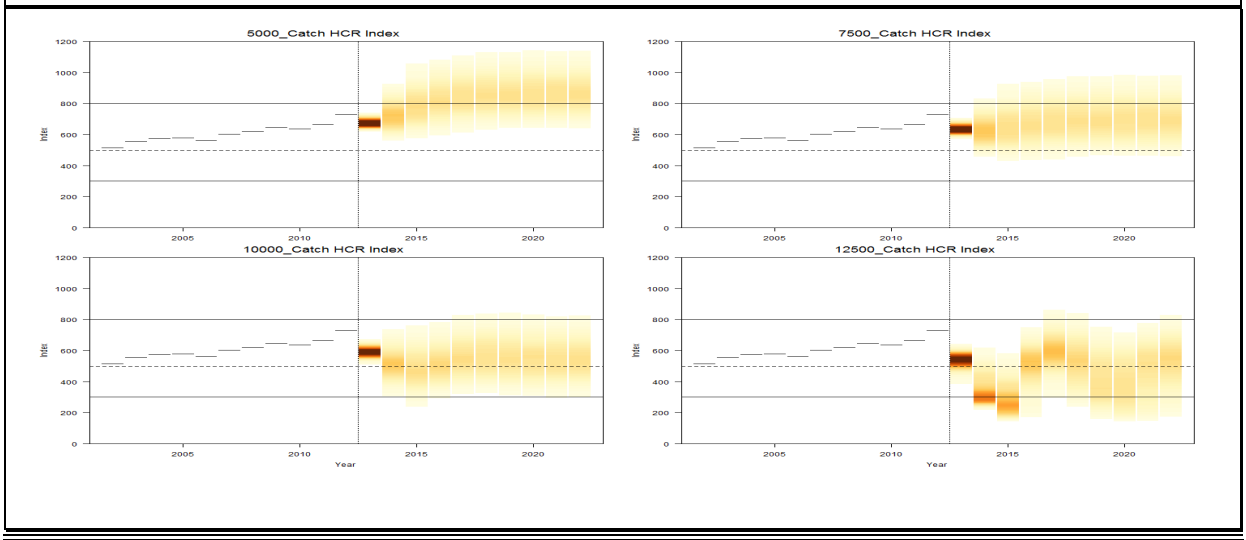
Harvest Control Rules








5000_Catch Annual F
7500_Catch Annual F
10000_Catch Annual F
12500_Catch Annual F
FFMSY
Year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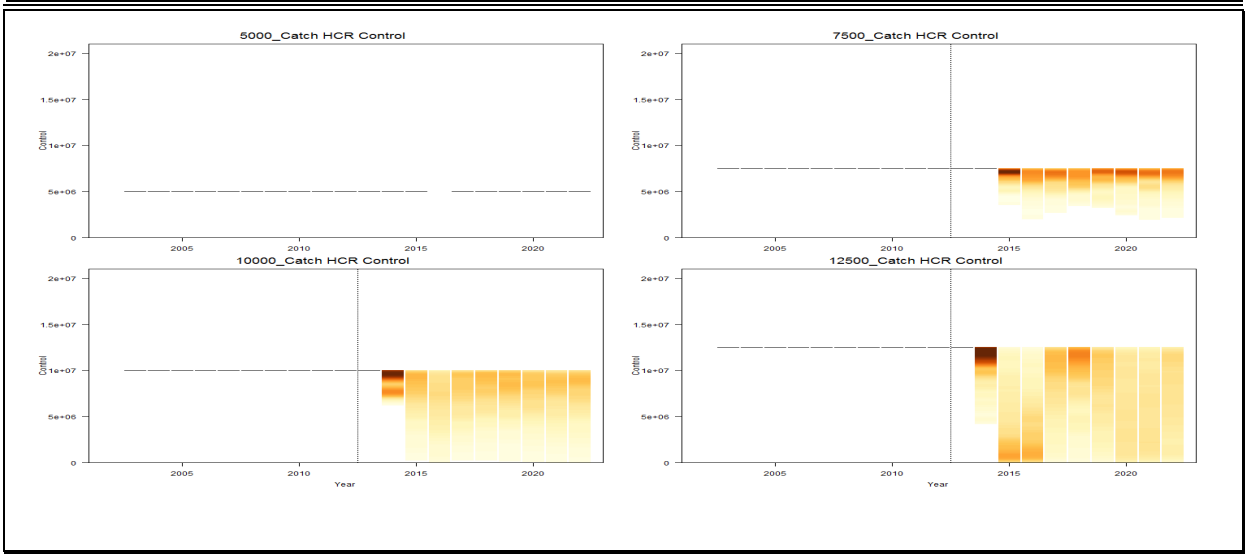
7500_Catch HCR Index
10000_Catch HCR Index
12500_Catch HCR Index
Index
Year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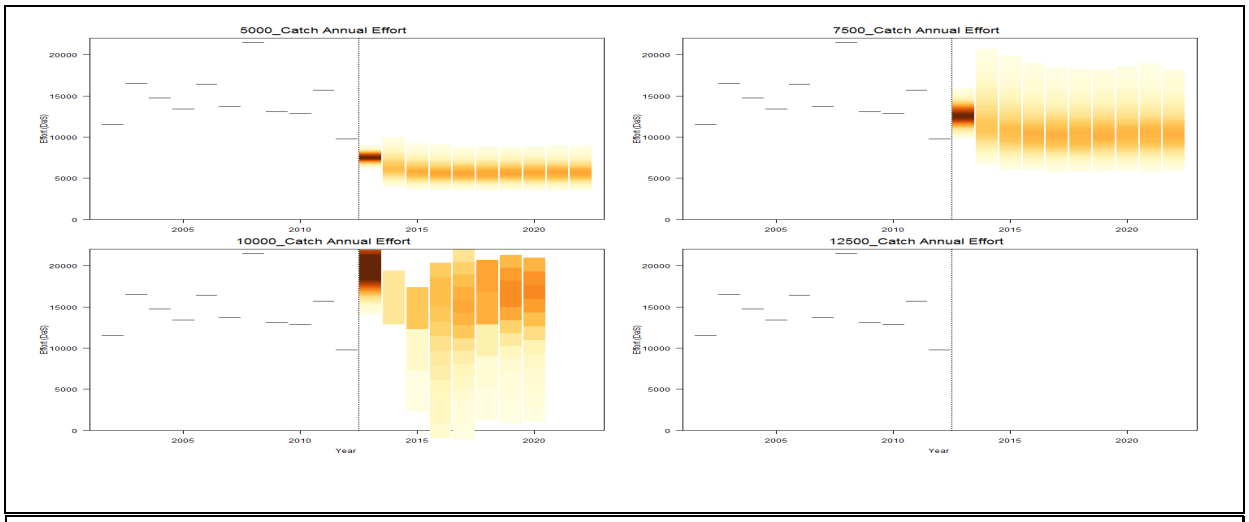
7500_Catch HCR Control
10000_Catch HCR Control
12500_Catch HCR Control
Control
Year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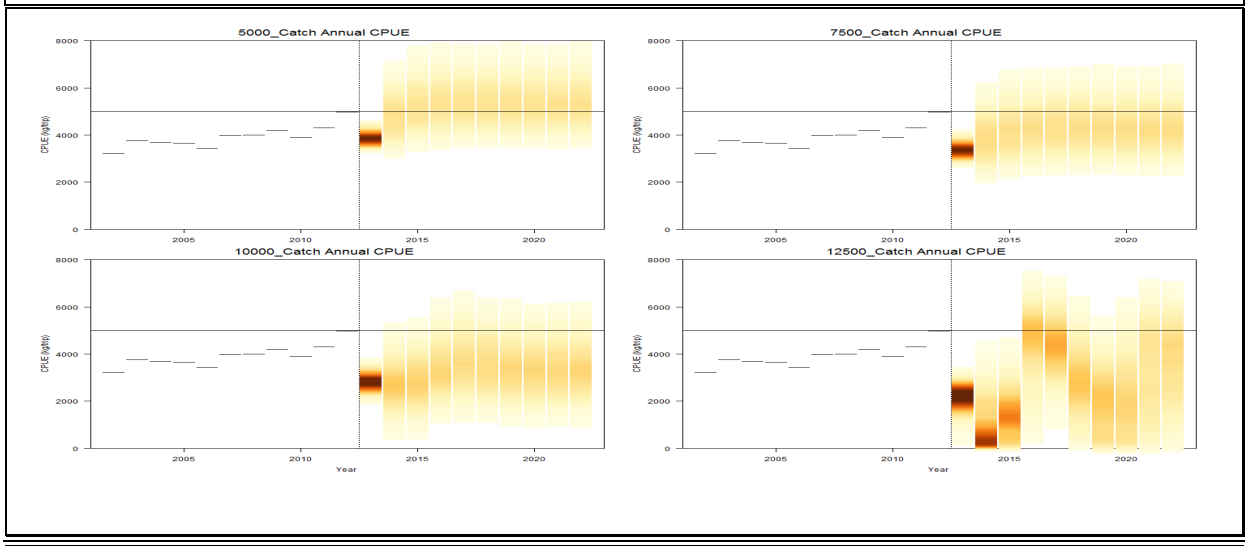
10000_Catch Annual Effort
12500_Catch Annual Effort
Effort (DaS)
Year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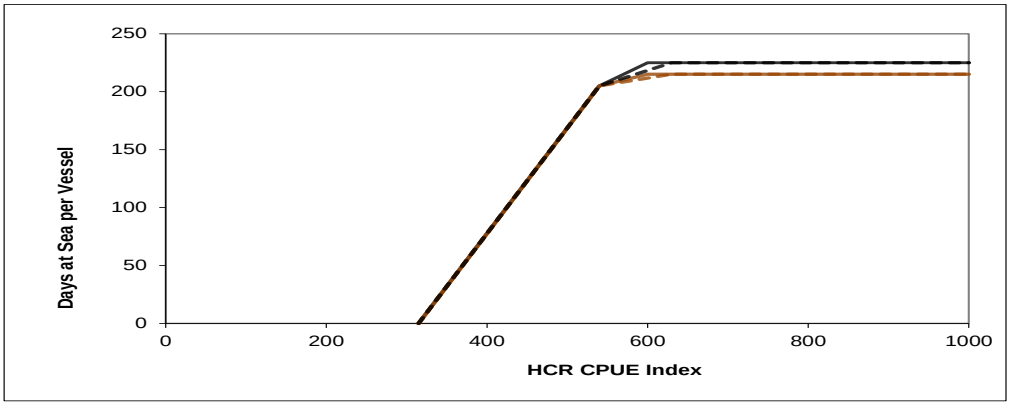
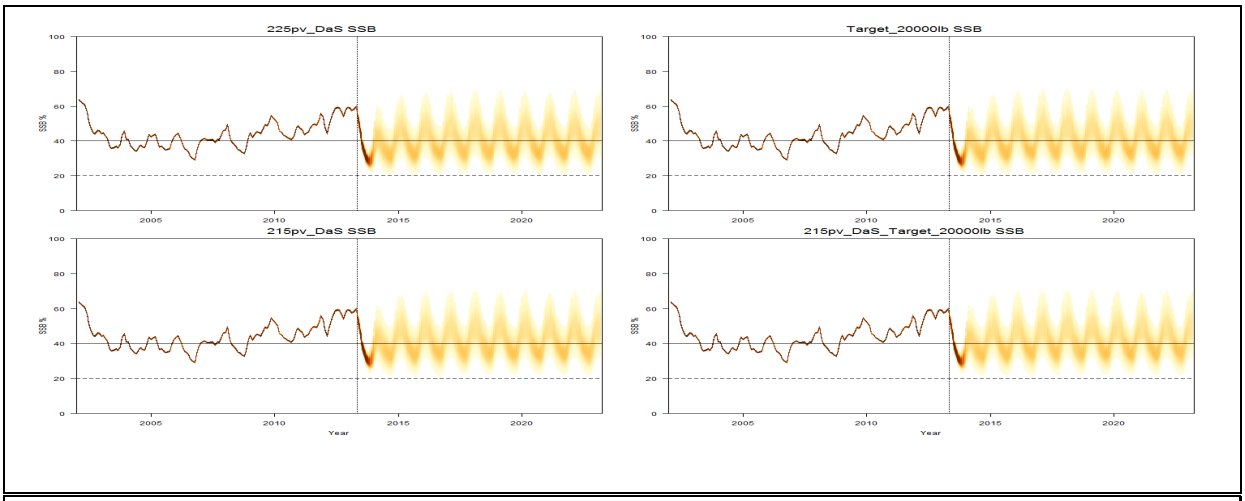
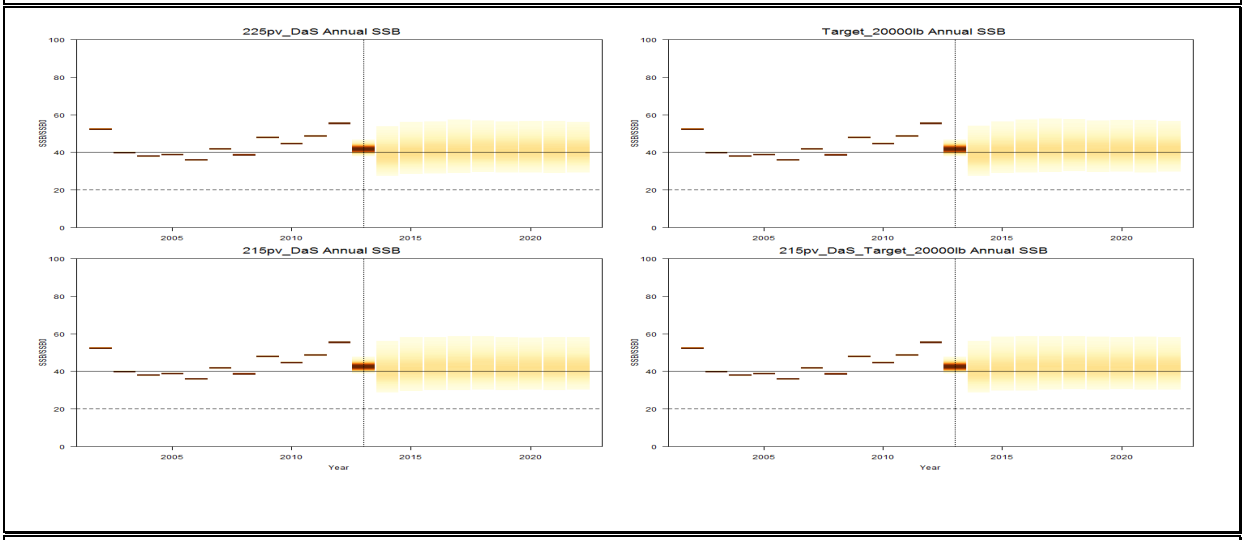
7500_Catch Annual CPUE
10000_Catch Annual CPUE
12500_Catch Annual CPUE
CPUE (kg/hr)
Year


Days at Sea per Vessel
HCR CPUE Index
0
50
100
150
200
250
0
200
400
600
800
1000


225pv_DaS SSB
Target_20000lb SSB
215pv_DaS SSB
215pv_DaS_Target_20000lb SSB
SSB %
Year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Target_20000lb Annual SSB
215pv_DaS Annual SSB
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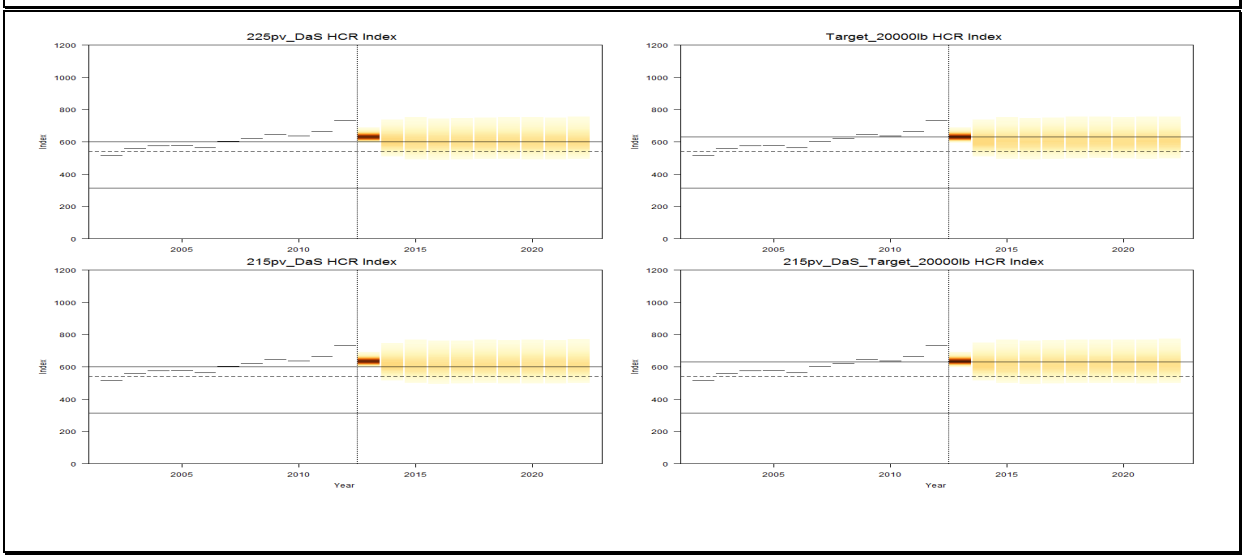
SSB/SSB0
Year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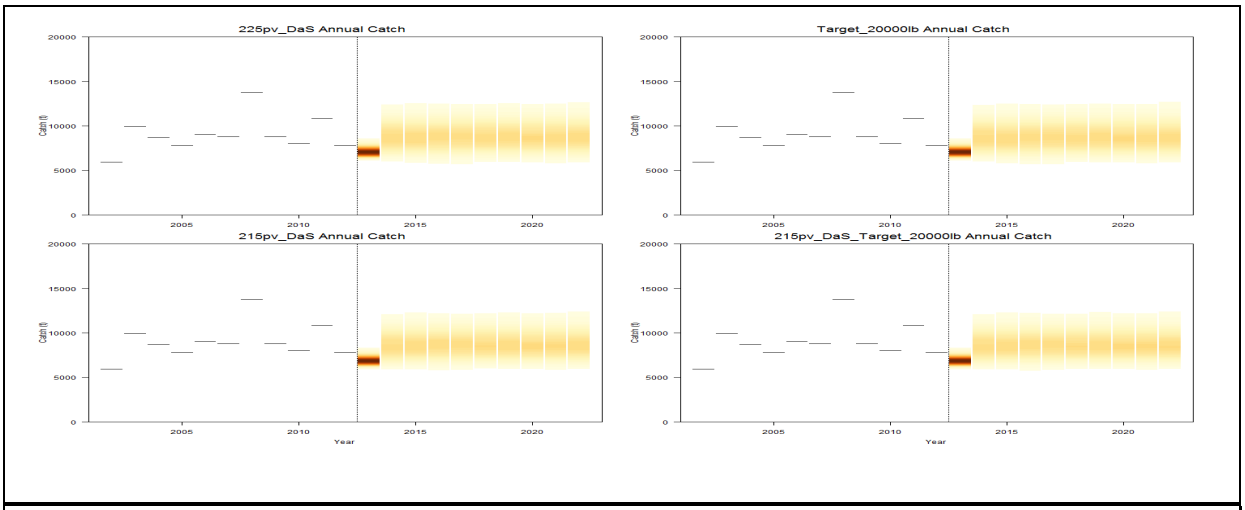
Index
Year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Target_20000lb Annual Catch
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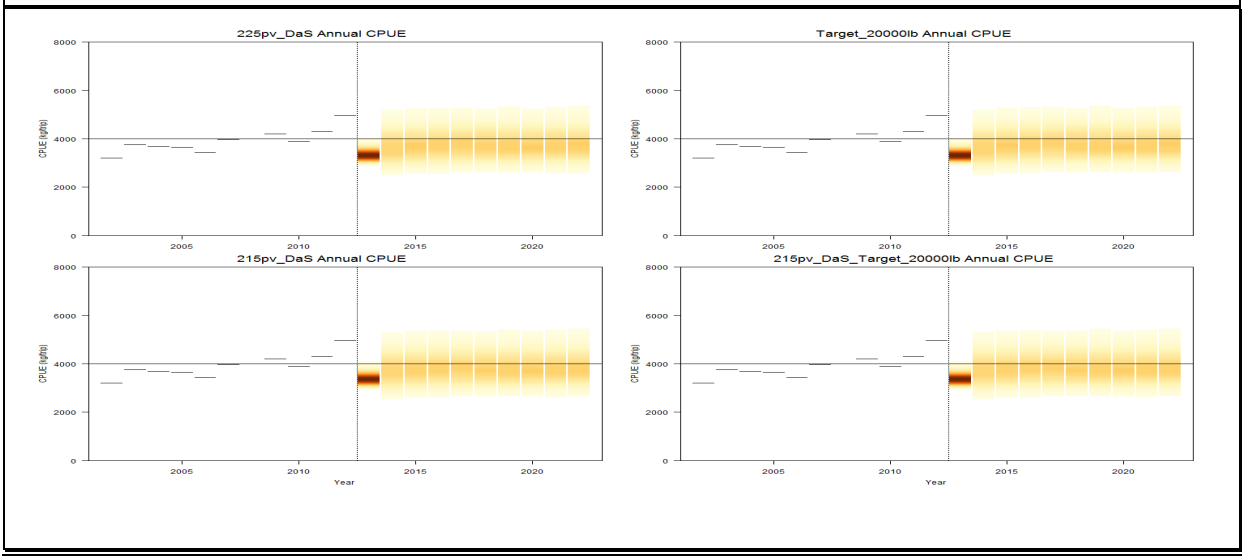
Catch (t)
Year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CPUE (kg/hhp)
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Annex 5

Continental Shelf Fisheries Working Group
Biennial Work Plan for the Period July 2014 to June 2016

Working Group Members: Guyana, Suriname & Trinidad

Working Group Chair: Seion Richardson (Guyana)
Working Group Vice Chair: To be decided

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
National Technical Focal Points					
Guyana	Conduct Seabob Assessment (Industrial)	Training on seabob BDC	Brian Dey, Senior Fisheries Officer/ External Consultant	July and August 2014	**4,000**
		Further develop sampling strategy	Seabob Working Group & Fisheries Dept.	September 2014	**4,000**
		Collection of C&E and BD	Seion Richardson & Other fisheries staff	October 2014 to May 2016	Fisheries Department
		Computerize data	Fisheries Field Assistant/Data Entry Clerk	October 2014 to May 2016	Fisheries Department
		Clean data for analysis	Seion Richardson/ Consultant	January to March 2015 to 2016 respectively	Fisheries Department
		Compile & submit national country report to Secretariat	Seion Richardson/ Consultant	March 2015 and 2016 respectively	Fisheries Department
		Submit data to DMTWG for review and evaluation before scientific meeting	Seion Richardson/ Consultant	March to April 2015 to 2016 respectively	Fisheries Department /Consultant
		Analyze data	Consultant	May to June 2015 and 2016 respectively	Consultant
		Write report	Consultant	May to July 2015 and 2016 respectively	Consultant
		Submit final report for publication	Consultant	May to July 2015 and 2016 respectively	Consultant
		Report to Secretariat on National Progress of WP implementation	S. Richardson	Quarterly from September 2014 to June	Country Representative

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
				2016	
Guyana	Conduct Ground Fish Assessment (Industrial & Artisanal Data)	Develop sampling strategy	TBD	July and August 2014	**10,000**
		Collection of C&E and BD	TBD	October 2014 to May 2016	Fisheries Department
		Computerize data	TBD	October 2014 to May 2016	Fisheries Department
		Clean data for analysis	TBD	January to March 2015 to 2016 respectively	Fisheries Department
		Compile & submit national country report to Secretariat	TBD	March to April 2015 to 2016 respectively	Fisheries Department
		Submit data to DMTWG for review and evaluation before scientific meeting	TBD	March to April 2015 to 2016 respectively	Fisheries Department /Consultant
		Analyze data	TBD	May to June 2015 and 2016 respectively	Consultant
		Write report	TBD	May to July 2015 and 2016 respectively	Consultant
		Submit final report for publication	TBD	May to July 2015 and 2016 respectively	Consultant
		Report to Secretariat on National Progress of WP implementation	TBD	Quarterly from September 2014 to June 2016	Country Representative
Suriname	Conduct Seabob Assessment (Industrial)	Training on seabob BDC	Mario, Ranjit	January to March 2015	
		Further develop sampling strategy	Seabob Working Group & Fisheries Dept.	July 2015	
		Collection of C&E and BD	Companies & Fisheries Department	July 2014 to May 2016	
		Data Collection and analysis	Ranjit/ Consultant	July 2014 to May 2016	
		Compile & submit national country report to Secretariat	Ranjit/ Mario	March 2016	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
		Submit data to DMTWG for review and evaluation before scientific meeting	Fisheries Department/ Consultant	April 2016	
		Analyze data	Consultant	June to July 2016	
		Write report	Consultant	June to July 2016	
		Submit final report for publication	Consultant	May to July 2015 and 2016 respectively	
		Report to Secretariat on National Progress of WP implementation	Mario	Quarterly from September 2014 to June 2016	
		BRD + TED testing	FD/WWF/NOAA		
		Workshop on BRD+ TED	FD/WWF/NOAA		
		Monitoring + Evaluation of Artisanal Fleet (every six month)	Mario		
		Observers on vessels (for MSC)	Ranjit		
Suriname	Conduct Ground Fish Assessment (Industrial & Artisanal Data)	Develop sampling strategy	TBD	July to August 2014	
		Collection of BD (C&E in place)	TBD by CRFM/Consultant/ FD	June 2014 to July 2016	
		Computerize data	Mario	June 2014 to July 2016	
		Clean data for analysis	Mario		
		Compile & submit national country report to Secretariat	Fisheries Department/ Consultant	March to April 2016	
		Submit data to DMTWG for review and evaluation before scientific meeting	Mario	March to April 2016	
		Analyze data	FD/Consultant	May to June 2015 and 2016 respectively	
		Write report	FD/Consultant	May to July 2015 and 2016 respectively	
		Submit final report for publication	FD/Consultant	May to July 2015 and 2016	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
				respectively	
		Report to Secretariat on National Progress of WP implementation	Fisheries Department	Quarterly from September 2014 to June 2016	
Trinidad	Generation of national catch and effort statistics from the artisanal multigear fleets and trawl fleets of Trinidad	On-going statistical (fish landings and effort) data collection at 26 Fish landing sites around Trinidad. At the end of each month the raw data, Fish Landing Sheet and Boat Activity Sheet are submitted.	Shandira Ankiah (Fisheries Officer); Wendy Thomas (Fisheries Assistant) and other Fisheries Staff	July 2014 to June 2016	**436,425**
		Fish catch and effort data to be computerized in Oracle database	Shandira Ankiah (Fisheries Officer) and other Fisheries Staff	July 2015	**189,000**
		Estimation of total landings and effort from the artisanal multigear fleets and trawl fleets of Trinidad	Lara Ferreira (Senior Fisheries Officer Ag.)	July 2014 to June 2016	
		Submission of Trip Reports from non-artisanal trawlers	Shandira Ankiah (Fisheries Officer)	July 2014 to June 2016	
		Computerization of non-artisanal trawl trip data	Shandira Ankiah (Fisheries Officer)	July 2014 to June 2016	
		Estimation of total landings and effort from the non-artisanal trawl fleets	TBD	May 2015 to June 2016	
	Update of shrimp assessment	Determine proportion of shrimp landings from industrial trawl fleet by coast (Gulf of Paria, north and south coasts of Trinidad) (31 May 2014)	Lara Ferreira (Senior Fisheries Officer Ag.)		
		Estimate shrimp landings by trawl fleet for 2011	Lara Ferreira (Senior Fisheries Officer Ag.)	July 2014	
		Estimate shrimp landings by trawl fleet for 2012	Lara Ferreira (Senior Fisheries Officer Ag.)	July 2014	
		Estimate shrimp landings by trawl fleet for 2013	Lara Ferreira (Senior Fisheries Officer Ag.)	October 2014 to March 2015	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
		Estimate shrimp landings by trawl fleet for 2014	Lara Ferreira (Senior Fisheries Officer Ag.)	March 2015 to November 2016	
		Estimate shrimp landings by trawl fleet for 2015	Lara Ferreira (Senior Fisheries Officer Ag.)	March to June 2016	
		Shrimp assessment to be updated and documented including recommendations for management	Lara Ferreira (Senior Fisheries Officer Ag.) and Consultant Dr Paul Medley	September to October 2014	
	Development of trawl management plan (Dec 2014)	Provide support to Consultant in the preparation of the draft trawl management plan (July- September 2014)	Lara Ferreira (Senior Fisheries Officer Ag.)	September to December 2014	**3,437.50**
		Consultations with the trawl industry on new management measures (equipment and vehicle related expenses, refreshments, rental of venue) - some funds required as cash (including reports of consultations) (Aug-Dec 2014)	Lara Ferreira (Senior Fisheries Officer Ag.) and Fisheries Officer, Mrs. Nerissa Lucky	October to December 2014	**3,906.25**
		Consider feedback from stakeholders and modify draft plan accordingly	Lara Ferreira (Senior Fisheries Officer Ag.)	October 2014 to January 2015	
		Hire marine surveyor to determine cost of buy out of trawl vessels	Lara Ferreira (Senior Fisheries Officer Ag.)	August to December 2014	**23,437.50**
		Establish multi-sectoral committee to determine appropriate relief package for trawl operators impacted by new management measures	Lara Ferreira (Senior Fisheries Officer Ag.) and Fisheries Officer, Mrs. Nerissa Lucky	July to November 2014	**3,125**
Trinidad	FAO/GEF Project GCP/RLA/203/ GFF "Sustainable Management of Bycatch in Latin America and Caribbean Trawl Fisheries" (REBYC-II)	Purchase of shrimp samples (to determine length frequencies, species compositions and morphometric relationships) to assess impact of closed season, and contingency field related expenses (equipment and vehicle emergencies) – cash	Shandira Ankiah (Fisheries Officer); Wendy Thomas (Fisheries Assistant) and other Fisheries Staff	July to September 2014 & 2015, November 2014 & 2015 to May 2015 & 2016	**22, 857**

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
		Gear trial surveys for artisanal, semi-industrial and industrial trawl fleets (covers the cost of construction of trawl nets, fuel for gear trials, purchase of bycatch samples and ice) -some funds required as cash	Shandira Ankiah (Fisheries Officer); Wendy Thomas (Fisheries Assistant) and other Fisheries Staff	July 2015 to May 2016	**24,000**
		Preparation of awareness materials (covers stationery and materials for posters and information packages, artwork and printing costs, printing of technical and terminal reports)	Shandira Ankiah Fisheries Officer and other Fisheries Staff	July to September 2014 & 2015, November 2014 & 2015 to May 2015 & 2016	**9,525**
		Consultations with the industry (equipment and vehicle related expenses, refreshments, rental of venue, stipends) - some funds required as cash	Shandira Ankiah Fisheries Officer and National Consultant for the REBYC-II Project Mr. David Ramjohn	January, August and November 2015, January, April and May 2016	**11,430**
		Computerize data	Fisheries Field Assistant/Data Entry Clerk	July to September 2014 & 2015, November 2014 & 2015 to May 2015 & 2016	**27,924**
		Prepare data for analysis	TBD	July 2014 to June 2016	
		Submit national country report to Secretariat	TBD	May 2015 and April 2016	
		Submit data to Chair for review and evaluation by DMTWG	TBD	March 2015 and 2016	
		Analyze data	TBD	June 2015	
		Write report	TBD	June to August 2015	
		Submit final report for publication	TBD	June to August 2015	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
				November 2014, March and September 2015, February 2016	
Guyana Suriname Trinidad	Update on WECAFC-IDB, CLME and REBYC II project	Discussions on progress/status of project	CSWG chair & members	July 2014 to June 2016	
Guyana Suriname Trinidad	Electronic Meetings	Regular GoToMeetings to discuss challenges and progress made in relation to activities scheduled on work plan	CSWG chair & members	Quarterly from June 2014 until July 2016	
Guyana Suriname Trinidad	Review of CSWG project documents	General discussions on relevance and potential impacts on countries within the CSWG	CSWG chair & members	July 2014 to June 2016	
Guyana Suriname Trinidad	Establish Linkages with related groups and organizations	Encourage and foster relationships with key entities with a vested interest in the development and progress of the WG.	CSWG chair & members	July 2014 to June 2016	
Chair of Working Group					
Chair of Working Group	Supervise coordinated development and implementation of the Work Plan at the regional level and necessary reporting	Convene electronic meetings of the Working Group	Seion Richardson	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015	
		Report to Secretariat on Regional Progress in WP Implementation	Seion Richardson	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015	
		Submit data to Secretariat for review and evaluation by DMTWG	Seion Richardson	April 2015 & 2016	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
		Submit report of Working Group for publication in Annual Scientific Meeting Report as well as accompanying data and information and power point presentations	Seion Richardson	July 2014, 2015 & 2016	
		Present Working Group report to Forum (if required)	Seion Richardson	April 2015 &2016	
CRFM Secretariat					
CRFM Secretariat	Facilitate implementation of Working Group activities and reporting so as to inform decisions regarding management, statistics and research	Assist with convening electronic meetings of the Working Group	PMRRA - staff time	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015	
		Coordinate review and evaluation of data submitted for analysis	PMRRA - staff time	February to May 2015 & 2016	
		Convene Annual Scientific Meetings (on site)	PMRRA - staff time	January to June 2015 & 2016	
		Source Consultants to assist with analyses at Annual Scientific Meeting and to conduct identified training	PMRRA - staff time	January to June 2015 & 2016	
		Publish reports of Annual Scientific Meeting	PMRRA - staff time	October to December 2014 & 2015	
		Maintain CRFM Toolbox ; Notebook and Casebook	PMRRA - staff time	July 2014 to June 2016	
		Present Working Group report to Forum for its adoption of Working Group Recommendations (Management, Statistics and Research)	PMRRA - staff time	April 2015 & 2016	
		Assist with preparation and submission of project proposals for external funding (as required)	PMRRA - staff time	July 2014 to June 2016	
		Support development and implementation of harmonized data and information systems	Programme Manager, Statistics and Information (PMSI -currently	July 2014 to June 2016	

Country	Task	Activities	Responsible Person/Entity	Timeframe	Estimated Cost USD
			conducted by PMRRA)		
		Develop and implement regional research programmes as required	PMRRA - staff time	July 2014 to June 2016	

APPENDIX 4: REPORT OF THE PELAGIC FISHERIES WORKING GROUP (PWG)

Introduction

The Pelagic Fisheries Working Group (PWG) comprised of the following participants:

1. Derrick Theophille (Dominica) – *Chair*
2. Louanna Martin (Trinidad and Tobago) - *Rapporteur*
3. Patricia Hubert-Medar (St. Lucia)
4. Cheryl Jardine-Jackson (St. Vincent and the Grenadines) - *Rapporteur*
5. Kharim Saddler (St. Kitts/Nevis) - *Rapporteur*
6. Crafton Isaac (Grenada)

At the commencement of the meeting of the Pelagic Working Group (PWG), the participants were asked to introduce themselves and state their expectations from the meeting. Expectations identified were:

1. To complete analyses of catch and effort and biological data for various fisheries within the region. These include: the scad fishery of Dominica, the dolphinfish fishery of St. Lucia, the large pelagic fishery of St. Vincent and the Grenadines and biological data for the longline fishery in Trinidad and Tobago.
2. To discuss issues pertaining to the blackfin tuna fishery in the region, since this is one of the species listed for analysis by International Commission for the Conservation of Atlantic Tunas (ICCAT) in 2015.
3. To identify pelagic species that is of particular importance to the region for assessment.
4. Have meaningful discussion on issues pertaining to ICCAT which will aid in improved data collection and promote resource assessment activities such as the tagging of tropical tunas in the region.
5. Have meaningful discussion on the phenomenon of incorporating and managing Fish Aggregating Devices (FADs) within the local fisheries.

During this introductory phase the CRFM Secretariat was praised for their efforts over the years in assisting countries to implement proper data collection systems and encouraging the assessment of important fishery stocks across the region. Concerns were raised as to the successful continuation of the CRFM as well as the fisheries departments as expert personnel continue to leave and are replaced by less experienced/trained persons. Succession planning is an issue needing higher importance and further discussion at all levels at departments/organizations across the region.

Review of the Agenda

Participants were given a brief moment to look through the proposed agenda taking into consideration items to be discussed and items pertaining to fisheries data analysis. After reviewing the agenda it was pointed out that the discussion items would be items 1, 2, 3, 9 -14. Items 4-8 related to analysis of available datasets. The agenda is available at Annex 1.

Review of the Terms of Reference

It was pointed out that the Terms of Reference (ToR) included both scientific and management duties. Given that the scientific meeting was organized differently this year, working group members were urged to study the new terms of reference. Special mention was made of:

- Section 3, item 10 of the ToR: The group was urged to become more active in the areas of data collection and reporting to ICCAT and work towards the region speaking to ICCAT as a unified body.
- Section 3, item 11, 12, 13, 14, and 15: Input is required from the Forum; however the PWG will provide guidelines and recommendations on national and regional management issues.

- Section 4, item 4.3: The group enquired whether there was any way to address the issue of nominated National Technical Focal Points (NTFPs) being unsuited for performing the duties required by the role. It was mentioned that the issue could be addressed only at the Ministerial Council level. Additionally, it was noted that more care and attention was necessary for the identification and nomination of NTFPs especially giving due attention to the demands of the role.

Agenda

Agenda Item 1: Inter-sessional Activities

A number of activities were carded for the inter-sessional period leading up to this session of the PWG. However, the PWG was not able to look at many of those activities over the interim period. In the interest of time, a number of inter-sessional items were only briefly discussed and slated for further discussion over the next inter-sessional period. Notes arising from the discussion of inter-sessional activities include the following:

- The group agreed that socio-economic data was necessary for incorporation into future fishery assessments. This will foster a multi-disciplinary approach to fisheries management. This presents the challenge though, of identifying and collecting the data necessary for addressing the socio-economic facets of the fishery.
- There was a recommendation that the relationship between sargassum and the dolphinfish be studied. In some countries the sargassum modified the dolphinfish fishery enough to create a second fishing season during which the catching of juvenile dolphinfish was prevalent. The group agreed that measures should be put in place to address this problem.
- There was concern regarding blackfin tuna reproduction at or around FADs and the harvesting of juveniles of the species.
- The status and value of Small Coastal Pelagics (SCPs) need to be assessed at the national and regional levels. It was noted that SCP landings have declined in some countries over the years in part due to a shift of fishing operations to the offshore pelagics thanks to the introduction of FADs, however, the SCP fishery still continued to play an important role in providing bait fish for the Large Pelagic fishery.

Review of Cleaned Datasets for Analysis

While it was recognized that countries had datasets to be analyzed (mostly catch trends), most of the data still needed to be cleaned prior to any analysis. In some cases the data that were available to perform the planned analyses required more time and effort than the working group session allowed. A recommendation was made that all data cleaning activities should be completed well in advance of the next scientific meeting and that data should be checked by the team nominated under the DMTWG to ensure compatibility with the planned analyses and assessments.

Review and Update of Progress under the ICCAT-JDMIP

The ICCAT-JDMIP (Japan Data Management and Improvement Project) projects were executed in three ICCAT Contracting Parties in the region: Belize, St. Vincent and the Grenadines and Trinidad and Tobago. The project aims at improving the data situation in countries that are party to ICCAT.

Trinidad and Tobago

The one-year project in Trinidad and Tobago facilitated the collection of biological data for tuna and tuna-like species caught by the non-artisanal longline fleet. Equipment was acquired in mid-2013 and data collection began in August 2013. Reporting on the progress of the project, including the data collected, was required at the 2013 SCRS meeting, however, Trinidad and Tobago did not attend. The project ended in December 2013.

The data collection programme continues to be implemented by two officers hired on contract, under the supervision of the Fisheries Officer with responsibility for highly migratory pelagic fisheries, the former project manager.

Additionally, under the project data were collected for the calculation of conversion factors to enable the length and weights of the processed samples to be converted to fork and total lengths and round weights. These data were, and continue to be collected by a crew member of one of the longliners, who was trained as a scientific observer by ICCAT Scientist Dr. Freddy Arocha of Universidad de Oriente, Venezuela.

Review of Proposal for ICCAT Atlantic Tropical Tuna Tagging Programme
The group proposed to pay more attention to this upcoming programme and encouraged the participation/ cooperation of other CRFM member states not party to ICCAT. The tagging programme is expected to be an item in the inter-sessional discussions.

Discussion on Strategy for Collection of Data on Recreational Fisheries
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Discussion on Conduct of Economic Valuation of Commercial Pelagic Fisheries
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Review of Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean
The PWG recognized that the management plan was no longer a draft. The document was endorsed at Ministerial Council meeting in May, however, the activities outlined still needed to be adapted and implemented at the national level. Monitoring and implementing the management plan will need to continue inter-sessionally. The group noted the need to refine and/or develop and implement sampling plans to capture the data necessary for assessing the flyingfish fishery at the national and regional levels.

Review Draft 2012 Sub-Regional Management Plan for Blackfin Tuna
To be discussed inter-sessionally as the draft report was not yet made available to allow for any useful discussions on this matter. The draft report is expected to be circulated for review soon after the Scientific Meeting.

Review of ToRs of CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Review of ToRs WECAFC/OSPESCA/CRFM/CFMC Working Group on Recreational Fisheries
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Review of ToRs of New Joint Regional Working Group on Fisheries Utilizing Fish Aggregating Devices
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Review of CLME Project Document (Second Phase – Implementation of Strategic Action Programme – Pilot Project on the Flyingfish Fishery)
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Review of IDB Strategic Program for Climate Resilience - Marine Component and CIDA Project Proposal on Increasing Resilience of the Fisheries Sector in the Caribbean Region
To be discussed inter-sessionally as not enough time was available for any useful discussions on this matter.

Agenda Item 2: Review of the ICCAT SCRS Report

Dr. Susan Singh-Renton gave a quick review of the general format of the SCRS report and information presented therein. The PWG noted that the CRFM Secretariat, which usually participates in ICCAT as an observer on behalf of CARICOM, had not participated in the annual ICCAT SCRS meetings in recent years due to funding constraints. In fact, the CRFM Secretariat did not participate in any of the 2013 ICCAT meetings. It was also suggested that persons/countries could be assigned to follow different species. Notwithstanding, the PWG noted the importance of participation and engagement in SCRS activities, and, when on-site participation was not possible, of the need to keep the PWG updated of SCRS activities through review of the annual SCRS report which is downloadable from the ICCAT website (www.iccat.int).

As it was not possible to obtain feedback on the 2013 SCRS meeting based on on-site participation, members of the PWG downloaded the ICCAT SCRS report, and spent some time familiarizing themselves generally with the layout and content of the SCRS report, to gain appreciation of how and where to find certain major SCRS outputs of interest in quick time. Particular attention was given to the layout and content of Species Executive Summaries, which typically include, *inter alia*: descriptions of up-to-date information on species biology and ecology, characteristics of fisheries and their operations, management measures and analysis of management performance, summary tables of stock status and catch data, graphical illustrations of catch and effort trends by fleet, gear and area, and graphical illustrations of stock assessment results.

The PWG noted that ICCAT had completed detailed assessments of North and South Atlantic albacore and Atlantic swordfish in 2013. Both albacore stocks were estimated to be overfished, and overfishing appeared to be still ongoing on the south Atlantic stock. The assessment of swordfish indicated that the stock was in stable condition. The results of these assessments informed the development of the relevant corresponding 2013 ICCAT recommendations for albacore and swordfish.

The PWG also familiarized itself generally with the content of other major sections of the 2013 ICCAT SCRS report, including: the usual agenda structure used; reports of ICCAT inter-sessional meetings; reports of meetings of the Sub-committee on Statistics and the Sub-Committee on Ecosystems; the establishment and annual progress reports of special research programs such as the Enhanced Program for Billfish Research; SCRS responses to questions posed by the Commission; and SCRS future plans, including the inter-sessional work plan.

It was also pointed out that the PWG should monitor the work and progress of the recently formed Working Group of Fisheries Managers and Scientists in support of the Western-Bluefin Tuna Stock Assessment through the working group's reports that are included in the annual SCRS report. While the subject species was not commercially significant to CRFM States, there could be best practices worthy of noting in respect of the management of manager-scientist working relations.

Finally, the PWG noted ICCAT's plans to convene inter-sessional meetings on sharks, billfishes and skipjack in 2014. While it was too late to prepare any written papers for the 2014 inter-sessional meetings, it was agreed that specific, written PWG contributions to ICCAT SCRS in 2015 would be identified, discussed, and if possible, developed during the inter-sessional period for formal contribution to the 2015 SCRS process.

Additionally, it was noted that there is ICCAT funding to support the attendance of States that support the advancement of the science at future meetings.

Agenda Item 3: Review of Data for ICCAT SCRS

The PWG reviewed very briefly its understanding of the major, commercial fisheries for larger pelagic fisheries in the CRFM Member States, and also noted that dolphinfish was included in the ICCAT mandate but there did not appear to be a formal code to facilitate statistical reporting. The PWG identified the following 4 species for further attention in respect of data review and improved contribution to the ICCAT SCRS process: yellowfin tuna, blackfin tuna, skipjack tuna, and dolphinfish. Furthermore, it was agreed that review of the data on the relevant fisheries, identification of data gaps, and options for addressing data gaps and weaknesses would be addressed in the inter-sessional period. This would facilitate consideration of possible SCRS contributions for 2015 that could be formally addressed during the 11th scientific meeting. Apart from improved annual statistical reporting to ICCAT, the 2015 SCRS contributions could include 2 papers for SCRS: a paper explaining data corrections and revisions if these occur during the 2014-15 inter-sessional period, and a paper on fishery trends and management performance. In addition, the PWG noted that while work would begin on the 4 major species identified, the data improvement process would be extended to other species later on. Billfish was identified as important for future investigation.

It was noted that presently for the region, only catches are submitted. It was agreed that Member States should work toward submission of important catch rate series for the region -blackfin tuna was identified- and further, that Member States should attempt to obtain guidance with respect to improving regional analyses. The CRFM Secretariat agreed to request assistance from ICCAT contacts with regard to blackfin tuna analysis.

Agenda Item 4 to 8: Analysis of Data for Various Fisheries

Analyses were conducted for all six of the countries represented at this year's PWG session of the Annual Scientific Meeting. These include:

1. Catch and Effort data for the Scad Fishery of Dominica
2. Catch and Effort data for the Dolphinfish Fishery of St. Lucia
3. Biological data for the Longline Fishery of Trinidad and Tobago
4. Large Pelagic Fish Catch and Effort data for St. Vincent and the Grenadines
5. Large Pelagic Fish Catch and Effort data for Grenada
6. Large Pelagic Fish Catch and Effort data for St. Kitts and Nevis

These analyses are documented in separate reports. In the case of Grenada, the analysis was limited to a review discussion on the data collection system.

Agenda Item 9: Assessment of Eastern Caribbean Flyingfish Fishery

Please refer to section 2.1.6 of this report for a record of the discussions pertaining to this agenda item.

Agenda Item 10: Assessment of Blackfin Tuna Fishery

Please refer to section 2.1.7 of this report for a record of the discussions pertaining to this agenda item.

Agenda Item 11: Data Collection for FADs

This item was addressed under the report from Sherill Barnwell, CARIFICO counterpart with responsibility for assessing data systems and data availability with respect to monitoring FAD use and management activities. This report is available at Annex 2.

Agenda Item 12: Identification of Species to be Analyzed in 2015/2016

Discussions on species important to each country were held under the DMTWG sessions. Each country was invited to submit its top ten species of national importance. The DMTWG report documents the initial list of responses.

Further discussions of species to be assessed in 2015/16 will be done inter-sessionally as management objectives are defined and data availability is evaluated.

Agenda Item 13: Detailed Work Plan

A detailed work plan was drafted to cover activities for the two years. This can be found at Annex 3.

Any Other Business

Other items of discussion included the following:

1. It was suggested that the rest day be utilized to promote bonding among participants, e.g. recreational activities, such as cricket/football/basketball/etc. game, which would not incur significant cost could be scheduled.
2. The Secretariat should consider the changing of venues, i.e. countries, for annual scientific meeting. Trinidad and Tobago was suggested as a viable alternative.
3. It was felt that the length of meeting was too short to allow for both meaningful discussions and work on datasets.

Recommendations

General recommendations arising from the PWG are as follows:

1. Countries that have initiated the formulation of a data management plan (they should be species/fishery specific) should be encouraged to share with those that have not yet started the process.
2. All data preparation and cleaning should be done prior to the scientific meeting (inter-sessionally).
3. Countries should take steps to initiate implementation of the Sub-regional FMP for Flyingfish in the Eastern Caribbean especially as regards data and legislative arrangements.
4. The Secretariat should be asked to assist towards conducting studies to assess the impact of sargassum on pelagics, especially dolphinfish and wahoo.
5. Countries are encouraged to define specific management questions for each species and submit them for assessment in advance of the scientific meetings.

Annex 1: Draft Agenda of 2014 Meeting of Pelagic Fisheries Working Group

Chair: Barbados (Christopher Parker)
Vice-Chair: Dominica (Derrick Theophille)

At 2014 Scientific Meeting

1. Review of inter-sessional activities and management decisions since last meeting;
2. Review of ICCAT 2013 Report of the Standing Committee on Research and Statistics (SCRS) – identification of scientific/research responsibilities and proposed actions, including data sets to be submitted for inclusion in ICCAT stock assessments to be conducted in 2015;
3. Review, analysis and update of time series data for CRFM Member States - to be articulated in paper for contribution to meeting of the SCRS in 2015;
4. Analysis of catch and effort data for the scad fishery in Dominica;
5. Analysis of catch and effort data for the dolphinfish fishery in St Lucia;
6. Analysis of biological data for the longline fishery in Trinidad and Tobago;
7. Analysis of large pelagic fish catch and effort data for St Vincent and the Grenadines;
8. Analysis of large pelagic fish catch and effort data for Grenada – discussion on improving data collection strategy for pelagic fisheries;
9. Discussion on assessment/analysis of Eastern Caribbean Flyingfish fishery (possibly in 2015) – key management questions; strategy for improvement of catch and effort data; identification of environmental data required and possible sources;
10. Discussion on assessment/analysis of the blackfin tuna fishery (possibly in 2016) – key management questions; strategy for improvement of catch and effort data; identification of environmental data required and possible sources;
11. Development of data collection (catch & effort; biological) and information system for fisheries which utilize fish aggregating devices;
12. Identification of species/fisheries to be analyzed in 2015 and 2016, consistent with the ecosystem, participatory and precautionary approaches to fisheries management - identification of national fisheries management priorities and objectives; identification of available data sets; review of the associated data sets (if available); identification of types of analyses/assessments to be conducted; identification of specific activities regarding preparation of data for analysis as well as any required preliminary analyses;
13. Develop detailed work plan (2014 to 2016);
14. Any other business.

Inter-sessional

1. Review and "clean" data set(s) to be analyzed.
2. Review and update of progress under ICCAT-JDMIP (Japan Data Management and Improvement Project) to facilitate data collection programme for Task II data in Belize, St Vincent and the Grenadines and Trinidad and Tobago;
3. Review of proposal for ICCAT Atlantic Tropical Tuna Tagging Programme;
4. Discussion on strategy for collection of data on recreational fisheries;
5. Discussion on conduct of economic valuation of commercial pelagic fisheries – data requirements and sources, development of survey questionnaire, agreement on format for data entry, etc.;
6. Review of Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean – identify scientific/research responsibilities and proposed actions;
7. Review Draft 2012 Sub-Regional Management Plan for Blackfin Tuna.
8. Review of ToRs of CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean – identification of scientific/research responsibilities and proposed actions;

9. Review of ToRs WECAFC/OSPESCA/CRFM/CFMC Working Group on Recreational Fisheries, reports and recommendations of the Working Group – identification of scientific/research responsibilities and proposed actions;
10. Review of ToRs of new joint regional working group on fisheries utilizing Fish Aggregating Devices (FAD), established under WECAFC, reports and recommendations of previous similar Working Group – identification of scientific/research responsibilities and proposed actions;
11. Review of CLME Project Document (Second Phase – Implementation of Strategic Action Programme – Pilot Project on the Flyingfish Fishery) – identification of scientific/research priorities and proposed actions;
12. Review of IDB Strategic Program for Climate Resilience - Marine Component and CIDA Project proposal on Increasing Resilience of the Fisheries Sector in the Caribbean Region - identification of scientific/research priorities and proposed actions.

Annex 2: Review of Fisheries Data Information Management Systems in CRFM Member States in relation to FAD fisheries

Powerpoint Presentation at Pelagic Working Group Meeting - 14 June 2014

Prepared by: Sherill Barnwell

Literature Review

A review was conducted to look at the status of the data and information management systems, particularly for FAD data, across the CRFM member states. Material for the Review was drawn from literature developed by JICA, International Commission for the Conservation of Atlantic Tuna (ICCAT), WECAFC and CRFM.

The JICA Master Plan Study provided information on the status of fisheries statistics and information management systems in the CRFM Member States as the Study was guided by the results of baseline surveys analyses conducted in 2011/2012. Further, the survey analysis influenced the development and implementation of FAD pilot projects and Fishery Statistical pilot projects in selected CRFM Member States.

Literature produced by ICCAT recommends minimum requirements for recording catch data to include species composition, landings by species, length composition, and weights. ICCAT also recommends that, as much as possible, biological samples suitable for determining life history should be collected. Generally it was found that while some level of fisheries statistical activity existed, fundamental information needed to understand the status of the fishery resources and inform management decision had not been sufficiently accumulated in most CRFM Member countries.

The Pelagic Working Group met on 14 June 2014, to discuss the results of the review and make recommendations for the way forward. The discussion was guided by a powerpoint presentation outlining the results of the review activity. The results of the review were also discussed at the plenary session of the 10th Annual Scientific Meeting. Overall details and recommendations resulting from these discussions are accounted for in the Consultants report:

Main points presented in Powerpoint presentation:

Issues within the Pelagic Fishery:

High operational cost is associated with trolling, the main gear associated with pelagic fishery.

- Trolling fishery requires a high fuel cost for out-board engines.
- Poor economic conditions strongly influence the effectiveness of fisheries resource management measures.
- Poor design of FADs, materials, setting procedures, and management
    - cause a shortened life of FADs as well as an
    - increase in fishing operational costs.
- Conflicts while using FADs induce fishers to set their FADs farther away from the shore, in turn increasing the operational cost even more.

Insufficient Data Collection for Resource Management of Target species

- Lack of periodic biological data collection of main pelagic species.
- Inability to determine appropriate fishing efforts in regional waters.
- Data collections are not conducted for clear purposes and in harmonized manners to manage the target fish species by multiple countries.
- Small coastal pelagic species are generally caught by seine nets. Landing data of seine-net

fishing are difficult to collect.

- Fishing effort data and periodic biological data are also inadequate for assessing the trend within small coastal pelagic species.

Coastal fisheries resources are gradually declining year after year because of excessive fishing pressure. The FAD fishery has an important role to shift small-scale fishers from coastal to offshore resources without causing any short term economic loss.

FAD fishery management require a precautionary approach, given the potential to focus fishing effort on vulnerable stages in the life history of species that can have negative impacts on the population. Monitoring systems to ensure the timely action for the management would have to be put in place.

Issues in Fisheries Statistics

Insufficient Data Collection to Inform Decision Making

- Statistics policy and procedures are not documented. Statistics policy and procedures are most times outdated or unknown. Consequently the collected data becomes useless to support decision making;
- Inadequate Data Management: In most target member countries, data management shows a high level of deficiency.

Insufficient Use of the Caribbean Fisheries Information System (CARIFIS)

- CARIFIS is based on the needs to realize expected results, but not on the needs of the member countries;
- Technical support to handle data management in the CARIFIS database is limited;
- It is apparent that no member country utilizes the CARIFIS software to its full function. Only four member countries use CARIFIS partially, while one member country is in the process of replacing its spread sheets with CARIFIS. The other member countries could be potential users of CARIFIS considering the level of their computer skills and needs.

Improvement in Fisheries Information

Fisheries resource conditions and current usage must be understood to make sound fisheries policies in order to manage and develop the resources for sustainable use:

- It is important for resource management to understand catch trends of each fishery (ocean pelagic, coastal pelagic, and reef fish) and to obtain a certain indicator for resource management through biological data collection for target species (dolphinfish and yellowfin tuna), in order to obtain size trends.
- Biological data collection of target species needs to be continued at selected landing sites where the data collectors have the cooperation of fishers.
- Minimum sampling numbers should be kept and sustainability of biological data collection needs to be prioritized within the activities of fisheries department/division. It should also be continued at least in the medium term. In addition, biological data collection for main target species of reef, coastal demersal species, and coastal pelagic species should be considered in the future.

Improvement of Fisheries Resource Information

- It was recognized that the participation of fishers in statistical data collection is essential.
- For participatory resource management to be effective, it must begin with an understanding of the resource situation by fishers themselves.
- Providing regular feedback to the information given by fishers strengthens communication between fishers and fisheries authorities.

Legislation for FAD Fisheries

A license system for FAD fishing in member states is limited (and weak), and remains a challenge when shifting from open access to limited entry fishery, and clarifying the user's responsibility for FAD fishing. It is important for fishers to clearly understand the benefits of this system, which ensures the fishing rights of each licensed fisher. Sensitization activities, such as a series of consultations with fishers, are indispensable.

The following are suggested for a FAD fishery regulation:

1) Rules regarding the construction and placement of FAD
2) Clarification of the responsibilities of management organizations
3) Designated FAD
4) Clarification of identification and marking of FAD
5) Clarification of fishing operations near FAD
6) Clarification of FAD user license and fee
7) Clarification of FAD users' responsibility pertaining to provision of the required data (catch & effort, biological data)
8) Clarification of FAD users' responsibilities in resource management measures

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.

The 2012 Statistics and Research Recommendations from LPWG provide some background to the biggest concerns in the interpretation of the existing data:

- 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 were being put forward:
    - For each trip/record a data field be included which indicates whether the trip was conducted at/near a FAD, and each data collection program conduct surveys or analysis which will indicate the proportion of total catch which is being reported.
    - Length frequency data collected to assist in the definition of any migration patterns that may exist.

Data Quality

One main limitation was that the datasets among the countries were not standardized and the fact that a common database was not used.

As much as possible the data collected should be consistent with the Requirements for Catch Recording in Annex 1 of the ICCAT 2011 recommendation on a multi-annual conservation and management program for Bigeye and Yellowfin tunas; in the context of the Guidelines for Preparation of FAD Management Plans (Annex 2 of the same recommendation).

The data should also be consistent with existing data capture protocols. In this regard, we are reminded of the proposed effort data sets (Appendix 1) suggested by Murray *et al.* 1996, which were seen as allowing for some measure of standardization of effort data. Newer protocols arising out of the more recent work of the Data, Methods and Training Working Group and the Annual Scientific Meetings of CRFM should also be considered.

Sources of Data

- Fisher logbook should be designed to collect the following variables
    - Catch: Weight. Species. No. of Fish
    - Effort: Time. No. of hooks.
    - Identify FAD: Name. Location
    - Field Data Collector:
    - Catch and Effort
    - Biological (Sample size, length, weight)
- Market: Census (who collects?. How)
- Eliminate/reduce duplication by identifying record

Suggestions for sampling design

The overall sampling frame might be a cluster sampling approach with each FAD being seen as a cluster and data captured randomly from vessels fishing on any given FAD.

There will be need to determine the number of fish caught on any given FAD in an agreed timeframe. This would determine the number of fish from that FAD to be sampled over similar timeframes for biological data.

Log-book information would provide a census of catch and effort data. It would have to be determined (on a country-specific basis) whether biological data would be captured/reported by all vessels or whether randomly determined vessels would provide such data. This may be a function of willingness of fishers to cooperate in data capture and/or the extent to which FDs have the cooperation of vessel captains (voluntarily or mandatorily).

Requirements for recording catch

As much as possible the data collected should be consistent with the Requirements for Catch Recording in Annex 1 of the ICCAT 2011 recommendation on a multi-annual conservation and management program for Bigeye and Yellowfin tunas; in the context of the Guidelines for Preparation of FAD Management Plans (Annex 2 of the same recommendation).

Minimum specification for paper or electronic logbooks:

- The logbook must be numbered by sheets.
- The logbook must be filled in every day (midnight) or before port arrival
- One copy of the sheets must remain attached to the logbook.
- Logbooks must be kept on board to cover a period of one- trip operation.

ICCAT Recommended Minimum standard information for logbooks (data collection forms): Annex 1.

1. Master (Captain/Owner) name and address
2. Dates and ports of departure, Dates and ports of arrival
3. Vessel name, registry number, ICCAT number and IMO number (if available).
4. Fishing gear:
    a. Type FAO code
    b. Dimension (length, mesh size, number of hooks ...)
5. Operations at sea with one line (minimum) per day of trip, providing:
    a. Activity (fishing, steaming…)
    b. Position: Exact daily positions (in degree and minutes), recorded for each fishing operation or at noon when no fishing has been conducted during this day.
    c. Record of catches
6. Species identification:

    a. By FAO code
    b. Round (RWT) weight in t per set
    c. Fishing mode (FAD, free school, etc.)
7. Master signature
8. ICCAT Regional Observer signature, if applicable
9. Means of weight measure: estimation, weighing on board and counting.
10. The logbook is kept in equivalent live weight of fish and mentions the conversion factors used in the evaluation.

Discussion and recommendations:
The following are the gist of the discussion and recommendations of the PWG in relation to the powerpoint presentation:

Biological data collection:
Countries have not been collecting biological data for several years due to lack of skilled manpower and financial resources. Dominica indicated that they attempted to collect biological data under the MAGDELESA project, but was not successful. With the exception of Trinidad, most participants stated that currently there were not engaged in biological data collection activities.

Database for FAD data storage
The purpose of the database is to store FAD data so that data can be readily accessible for analysis. The group concluded that the CARIFICO project should deliver a full package for development and technical support so that additional expenses are not incurred to countries in their effort to accomplish the goals of collection and storage of FAD data. Participants shared information on the status of their electronic system: it was found that most countries either utilized MS Excel or MS Access to store their data and report on production.

Gear Table
In response to the table presented on gears and associated descriptions it was noted that FAD attracts a new fishing gear (dropline) that was not presented on the list. Dominica also indicated that they were testing hook size as a measure of effort. Grenada participant noted two catch levels in their trolling line fishery: one for bait and the other for commercial catches. The importance of recording catch for bait was highlighted.

In response to the question , "what is the negative impact of placing FADs closer to shore?" it was said that FADs are placed at different locations, however no specific study had been undertaken to test the effect of placing FADs at different locations. There are specific requirements to be considered when placing FADs. Such requirements include: shipping lanes, bottom substrates, depth, etc.

Specification for Log books minimum data required
It was agreed that most of the variables recommended by ICCAT for consideration in designing logbooks were not for our smaller boats. We should adopt a simpler design where practicable. Logbooks are in use in Grenada, and at the early stage of testing in St. Vincent and St. Kitts. Even so there is need of revision of logbooks.

The following should be considered in designing logbooks: FAD location, fuel information, bait type, gear, biological data, catch and effort, and socio-economic data.

Review of forms

Catch and effort data collection forms and biological data collection forms from Dominica, St. Lucia, St. Vincent and the Grenadines and Grenada were presented in an effort to get a suitable base form to build upon for the collection of FAD data. Some suggestions were made to improve the current forms.

Only four countries' data collection forms were selected for review:

1. Dominica (Appendix 7 & 8): Met the minimum requirements for recording catch and effort data. However, while the form captured cost for fuel it did not seek to capture the specific amount of fuel used on any particular trip. Even though the country had designed a collection form for biological data there were currently no activities for supporting the collection of biological data due to various challenges.
2. Grenada (Appendix 9): There are two separate forms for catch and effort data collection, one of which is specifically used for collecting FAD data. The other, the Trip Interview Form, was not made available for review. While the FAD data form has met the minimum requirements for recording FAD data, it is recommended that a field be provided to capture "Other Species" which are not targeted/hard coded on the form, and also that allocation be made to capture catch and effort data. Currently there are no active systems for the collection of biological data due to various challenges.
3. St. Lucia (Appendix 10): Met the minimum requirements for recording catch and effort data. However it is recommended that considerations be made to include fields to identify FAD location and answer more socio-economic type questions. Also provision should be made to allow the linking of species to gear used, and factors for converting gutted weight to whole weight.
4. St. Vincent/Grenadines (Appendix 11 & 12): Met the minimum requirements for recording catch and effort data. However, while the form captured cost for fuel it did not seek to capture the specific amount of fuel used on any particular trip. Provision should also be made to capture the depth at which fishing is taking place as well as socio-economic type data such as pricing and value of catch; as well as costs associated with going to sea, other than fuel costs. Currently there are no activities to support the collection of biological data, even while an up-to-date collection form is in place. Like other countries, the Division is limited by various challenges to undertake this activity.

Way Forward

In order to identify minimum data requirements and the collection methods, it is important to know the management questions to be answered. Some possible questions and the possible data to be collected include:

POSSIBLE MANAGEMENT QUESTIONS	DATA TO BE COLLECTED
• The spawning season of Blackfin tunas?	Maturity and Biological data
• What method of fishing catches smaller fishes by the FADs?	Measurement and weight (biological)
• What is the standardized length of Blackfin tunas at maturity?	If the standardized length is known* there will only be need to collect length frequency data
• Frequency of juvenile catches at the FAD's?	

**Ms. Mohammed is to find out if any such research was undertaken and the result.*

Discussions:

- Dominica was currently experimenting on a new system that scans the data collection forms and saves the information into a database.

- It was noted that countries needed to know what their level of catches were in order to take a precautionary approach. In the absence of knowing the catch level, effort would be the level used for precaution.
- The question was asked, "Given that SVG has an open registry, do the larger vessels utilize the FADs? There was no answer to this question as the representative was not present.
- It was important for fishers to be involved early in the process of developing and implementing any new initiative, if we want them to buy into it. Feedback was also very important.
- Data collectors need to be trained to help them better interact with fishers.
- SLU requested that the CARIFICO Project fund a data collector whose sole responsibility will be to collect FAD data. The Working Group agreed with this recommendation.
- There is urgent need for regulation, legislation and licensing to manage FAD fishing. Licensing should make it mandatory for licensed fishers to provide data.
- The importance to create awareness programs among fishers before the forms are implemented was reiterated.
- While a small percentage of fishers will complete log books, it was strongly felt that it may not be a good idea to get fishers to complete log books judging from experience with fishers' attitude toward data collection. It was then agreed that countries should select a small group of fishers (in the initial stages) to complete log books and as time goes by get others onboard.

Inter-sessional activities:

- Countries to review all the forms presented and select one as the base to build upon when developing the FAD data collection form.
- Identify management questions in relation to FAD fishing and data management.

Annex 3: Pelagic Fisheries Working Group Biennial Work Plan for the period July 2014 to June 2016

Working Group Members: *Derrick Theophille, Louanna Martin, Kharim Saddler, Crafton Isaac, Cheryl Jardine-Jackson and Patricia Hubert-Medar*

Working Group Chair: *Derrick Theophille (Dominica)*

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
National Technical Focal Points				
Grenada	Small Coastal Pelagics Assessment	Develop sampling strategy	Crafton Isaac	2014: Jul-Aug
		Acquire resources for data collection		2014: Sep-Oct
		Computerize data		2014: Oct-Dec; 2015: Jan
		Prepare data for analysis		2014: Dec; 2015: Jan-Feb, Dec 2016: Jan-Feb
		Submit data to Chair for review and evaluation by DMTWG		2015: Mar 2016: Mar
		Submit national country report to secretariat		2015: May 2016: May
		Analyse data		2015: Jun 2016: Jun
		Write report		2015: Jun-Jul 2016: Jun-Jul
		Submit final reports for publication		2015: Jun-Jul; 2016: Jun-Jul
		Report to Chair on progress of work plan implementation		2014: Jul, Sep, Nov; 2015: Jan, Mar, Jul, Sep, Dec 2016: Jan, Mar
St. Kitts and Nevis	Large Pelagics (FAD) Assessment	Develop sampling strategy	Kharim Saddler	2014: Jul-Aug
		Acquire resources for data collection		2014: Sept-Oct
		Computerize data		2014: Oct-Dec; 2015: Jan
		Prepare data for analysis		2014: Dec; 2015: Jan-Feb, Dec 2016: Jan-Feb
		Submit data to Chair for review and evaluation by DMTWG		2015: Mar 2016: Mar
		Submit national		2015: May

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
		country report to secretariat		2016: May
		Analyse data		2015: Jun 2016: Jun
		Write report		2015: Jun-Jul 2016: Jun-Jul
		Submit final reports for publication		2015: Jun-Jul; 2016: Jun-Jul
		Report to Chair on progress of work plan implementation		2014: Jul, Sep, Nov; 2015: Jan, Mar, Jul, Sep, Dec 2016: Jan, Mar
Trinidad and Tobago	Conduct CPUE and size analyses of landings of non-artisanal longline fleet	Literature review	Louanna Martin	2015: Jan-Feb
		Prepare data for analysis		2014: Sep-Oct
		Submit data to Chair for review and evaluation by DMTWG		2015: May
		Analyse data		2015: Jun
		Write report		2015: Jun-Jul
		Receive feedback on report		2015: Jul-Aug
		Submit final report for publication		2015: Aug
		Report to Chair on progress of work plan implementation		2015: Feb, Apr, Jul, Aug
	Conduct resource assessment for Scomberomorus brasiliensis (Serra Spanish mackerel/carite)	Develop sampling strategy - includes: investigation of relevant fleets, augmentation of collection of catch and effort data if required, and design of biological data collection	Louanna Martin	2015: Feb-Mar
		Recruit biological data collection personnel		2014: Jul-Dec; 2015: Jan-May
		Train biological data collection personnel		2015: Jul
		Collect biological data		2015: Aug-Dec; 2016: Jan-Jun
		Computerize biological data		2015: Sep-Dec 2016: Jan-Jun
		Prepare data (catch and effort and biological) for analysis		2016: Mar-Jun
		Submit data for		2016: May

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
		review and evaluation by DMTWG		
		Analyse data		2016: Jun
		Write report		2016: Jun-Jul??
		Receive feedback on report		2016: Jul-Aug??
		Submit final report for publication		2016: Aug
		Report to Chair on National Progress of work plan implementation		2015: Feb, Apr, Jun, Aug, Oct, Dec; 2016: Feb, Apr
Dominica	Small Coastal Pelagics Fishery Assessment	Literature review of the fishery	Derrick Theophille	2014: Oct
		Develop sampling strategy		2014: Oct-Nov
		Choose sampling sites; acquire/assign resources for data collection (data book, data collectors);		2014: Nov
		Collect relevant data		2014: Nov-Dec; 2015: Jan-Dec; 2016: Jan-Jun
		Computerize data		2014: Nov-Dec; 2015: Jan-Dec; 2016: Jan-Jun
		Prepare data for analysis		2015: Jan-Mar, 2016: Jan-Mar
		Submit data for review and evaluation by DMTWG		2015: Mar 2016: Mar
		Submit national country report to secretariat		2015: May 2016: May
		Analyse data (at scientific meeting)		2015: Jun 2016: Jun
		Write report		2015: Jun-Jul 2016: Jun-Jul
		Submit final reports for publication		2015: Jul-Aug; 2016: Jul-Aug
		Report on progress of work plan implementation		2014: Jul, Sep, Nov; 2015: Jan, Mar, Jul, Sep, Dec 2016: Jan, Mar
		Receive feedback on first year's activities		2015: Jun-Jul
		Revise and implement strategies for better fishery assessment for second year		2015: Aug-Oct
St. Lucia	Dolphinfish Fishery	Develop/revise	Patricia Hubert-Medar	2014: Jul-Aug

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
	Assessment	sampling strategy		
		Acquire resources for data collection		2014: Sept-Oct
		Computerize data		2014: Oct-Dec; 2015: Jan
		Prepare data for analysis		2014: Dec; 2015: Jan-Feb, Dec 2016: Jan-Feb
		Submit data to Chair for review and evaluation by DMTWG		2015: Mar 2016: Mar
		Submit national country report to secretariat		2015: May 2016: May
		Analyse data		2015: Jun 2016: Jun
		Write report		2015: Jun-Jul 2016: Jun-Jul
		Submit final reports for publication		2015: Jun-Jul; 2016: Jun-Jul
		Report to Chair on progress of work plan implementation		2014: Jul, Sep, Nov; 2015: Jan, Mar, Jul, Sep, Dec 2016: Jan, Mar
St. Vincent and the Grenadines	Dolphinfish Fishery Assessment	Develop/revise sampling strategy	Cheryl Jardine-Jackson	2014: Jul-Aug
		Acquire resources for data collection		2014: Sept-Oct
		Computerize data		2014: Oct-Dec; 2015: Jan
		Prepare data for analysis		2014: Dec; 2015: Jan-Feb, Dec 2016: Jan-Feb
		Submit data to Chair for review and evaluation by DMTWG		2015: Mar 2016: Mar
		Submit national country report to secretariat		2015: May 2016: May
		Analyse data		2015: Jun 2016: Jun
		Write report		2015: Jun-Jul 2016: Jun-Jul
		Submit final reports for publication		2015: Jun-Jul; 2016: Jun-Jul
		Report to Chair on progress of work plan implementation		2014: Jul, Sep, Nov; 2015: Jan, Mar,

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
				Jul, Sep, Dec 2016: Jan, Mar
Chair of Working Group				
Chair of Working Group	Supervise coordinated development and implementation of the work plan at the regional level and necessary reporting	Convene e-meetings of WG	Derrick Theophille	2014: Jul, Sep, Nov; 2015: Jan, Mar, Jul, Sep, Dec 2016: Jan, Mar
		Report to Secretariat on regional progress in work plan implementation		2014: Jul, Sep, Dec; 2015: Mar, Jul, Sep, Dec
		Submit data to Secretariat and DMTWG for review and evaluation		2015: Apr; 2016: Apr
		Submit report, data and presentation of WG for publication in Annual Scientific Meeting Report		2014: Oct; 2015: Jul 2016: Jul
		Present WG report to Forum (if required)		2015: Apr; 2016: Apr
CRFM Secretariat				
CRFM Secretariat	Facilitate implementation of Working Group activities and reporting so as to inform decisions regarding management, statistics and research	Assist with convening electronic meetings of the Working Group	PMRRA - staff time	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015
		Coordinate review and evaluation of data submitted for analysis	PMRRA - staff time	February to May 2015 & 2016
		Convene Annual Scientific Meetings (on site)	PMRRA - staff time	January to June 2015 & 2016
		Source Consultants to assist with analyses at Annual Scientific Meeting and to conduct identified training	PMRRA - staff time	January to June 2015 & 2016
		Publish reports of Annual Scientific Meeting	PMRRA - staff time	October to December 2014 & 2015
		Maintain CRFM Toolbox ; Notebook and Casebook	PMRRA - staff time	July 2014 to June 2016
		Present Working Group report to Forum for its adoption of Working Group	PMRRA - staff time	April 2015 & 2016

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
		Recommendations (Management, Statistics and Research)		
		Assist with preparation and submission of project proposals for external funding (as required)	PMRRA - staff time	July 2014 to June 2016
		Support development and implementation of harmonized data and information systems	Programme Manager, Statistics and Information (PMSI - currently conducted by PMRRA)	July 2014 to June 2016
		Develop and implement regional research programmes as required	PMRRA - staff time	July 2014 to June 2016

Annex 4: Report on Analysis of Scad Fishery Data for Dominica

Prepared by: Derrick Theophille

1. Overview of the Scad Fishery

The Dominican scad fishery comprises of small, open, wooden boats targeting three species of scads largely off the west coast of the island. The scad fishery forms part of the coastal pelagic fishery.
The three species caught (identified in the Fish Catch and Effort sampling programme) are:

1. Bigeye Scad *(Selar crumenophtalmus),*
2. Mackerel Scad *(Decapterus macarellus), and*
3. Round Scad *(Decapterus punctatus).*

Coastal pelagic fisheries have been in decline for over a decade. The reasons for decline have been attributed to a number of factors, including:

1. A shift in fishing activities from near shore to offshore fishing operations, targeting large migratory pelagics;
2. Destruction of coastal zone ecosystem due to pollution, coastal development, poor (unsustainable) fishing practices.

While the scad fishery was never as large as more popular coastal pelagic species such as Jacks, they were still important within the community socio-economic mechanism. Scads can be used as baitfish as well as a cheap source of food. Like other species, scads were traded for goods and services in the community, as is common.

Small open vessels exploit the scad fishery, mostly on the west coast communities of Dominica.

2. The Dataset

2.1 Description of the dataset

The data for this analysis was sourced from the Fish Catch and Effort database of the Fisheries Division. This dataset comprises records from multiple databases and database types (T.I.P., MS Access). These records were stitched together to create a time series from 1995 to 2013.
The data fields of the dataset were:

1. Date
2. Management Zone
3. Landing site
4. Boat ID
5. Boat type
6. Gear type/class
7. Gear name
8. Fishery
9. Species
10. Catch (lbs)

The data was summarized to show the individual species landed by each boat over the period. The dataset comprised of 5812 observations of scad landings over the period 1995 to 2013.

2.2 Cleaning

Upon initial inspection of the records of the dataset, it was observed that some level of cleaning operations needed to be undertaken before any analyses could be performed.
Errors observed included:

1. Misspelling of values within variables. For example, the boat type "Keel" was sometimes spelt "kele" or "KEEL", which can mean three different things within R and other data analysis programmes.
2. Certain gear was attached to the capture of certain species, when in reality, that occurrence would be highly improbable. For example, tuna caught by fish pot would be an issue.
3. Boat ID labels (for example "J7-001-FDC") were inconsistent over the years as codes and the boat identification system evolved. This portion of the dataset was especially difficult to clean due to the sheer number of records needing remedy and reformatting to a standard format for analysis. It should be noted that as at the time of this report all cleaning operations for Boat ID labels was not yet complete.

3. Analyses

3.1 Objective

The purpose of this analysis is to provide a glimpse into the reasons for the decline of the scad fishery. While it is understood that catch and effort data alone cannot fully describe the state of the fishery nor the reasons for its decline, the exercise was seen as a means of beginning exploratory efforts into the workings of the fishery in hopes of a more comprehensive study in the future.

3.2 Using R

The R statistical programme[1] was used for performing much of the analyses outlined in this report. The training imparted by consultant John Hoenig on the subject of R helped with some of these analyses and results presented.

During analysis, an R script was written with notes on the various operations performed and functions used. This script (annotated for clarity) is provided as an attachment to this report.

3.3 Initial Observations and Summary

After loading the data into R, a few checks were made to make sure that the dataset was ready for analysis. This included looking at the first and last six records in the set. This was easily done with simple commands in R. The most striking observation at this point, since the dataset began with the earlier records and ended with the 2013 records, was that the boat ID format and codes were different[2]. This would pose a challenge to some types of analyses, therefore some effort was made to clean up these records. However, as previously mentioned, the sheer number of records needing cleaning was beyond the time constraints of the scientific meeting.

A summary of the dataset showed the following:

1. Records by zone: Dominica was zoned into four sections for management purposes. It was observed that out of the 5818 (x%) records, 4042 were from communities (landing sites) in the North West zone. Another 1462 records were from South Western communities. Another 300 records were from the South and only 14 from the East.
2. Records by boat type: Based on the boat type which landed the fish, it was observed that an overwhelming 3991 out of the 5818 records were from canoe landings. 599 were from FRP (pirogue) type vessels and 588 from keel types.
3. Records by gear: 5734 (x%) records were attributed to net type gear at landing. Line type gear represented 58 records and pots only 14 records. Beach seine and gill net were the most popular gear identified for scad catches, with 4449 and 1274 records respectively.

[1] More can be learned about R from its website (http://www.r-project.org/) and from the RStudio website (http://www.rstudio.com/). A handy tutorial for R can be found at http://swirlstats.com/.

[2] An example is that boat ID "J7-044-NEWT" from 1995 should be corrected to "J7-044-NTN" to reflect the standardized codes.

4. Species: Of the three species of scads observed, 4632 records were attributed to Mackerel Scad, 827 to Round Scad and 359 to Bigeye Scad.
5. Weight: The mean weight observed was 115.3 lbs. The maximum weight was 3000 lbs. Only 18 records over the entire time period were of landings above 1500 lbs, however. There were 4 records for which zero weight was given for scad landings, which is odd and needs to be checked. Two records were of landings below one pound (both with 0.5 lbs). These also need to be checked.
6. Date of Records: A number of "NA" months were present in the dataset. Six months in 1995, one in 1997 and seven in 1999 had no data, resulting in an "NA". For this reason it was later decided to work with the data from 2000 to 2013 instead.

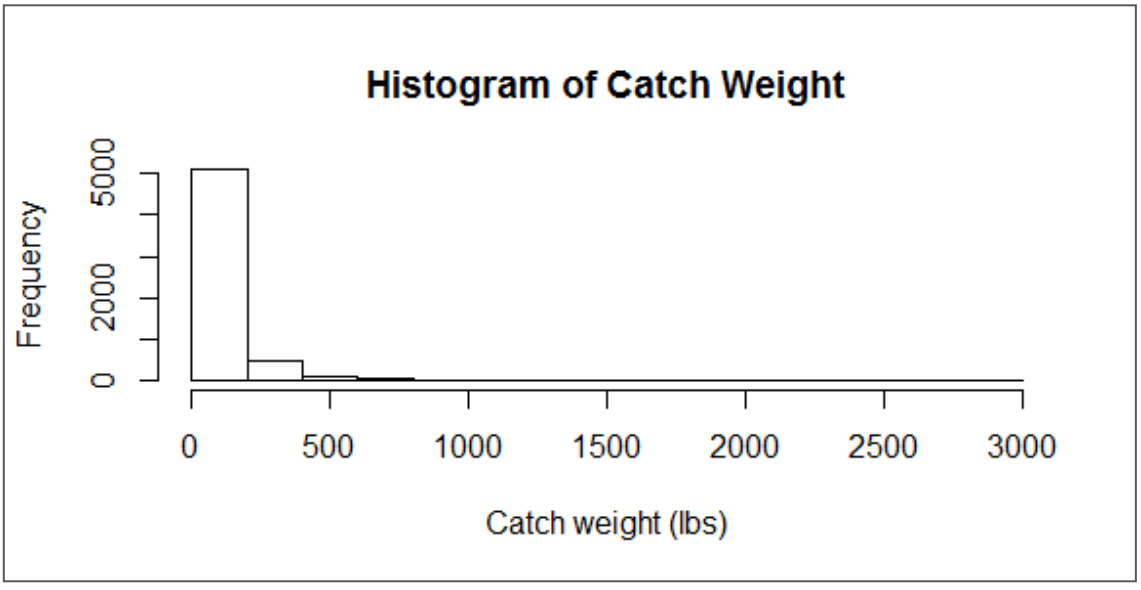
3.4 Results

The following are results from the analyses performed on the dataset.

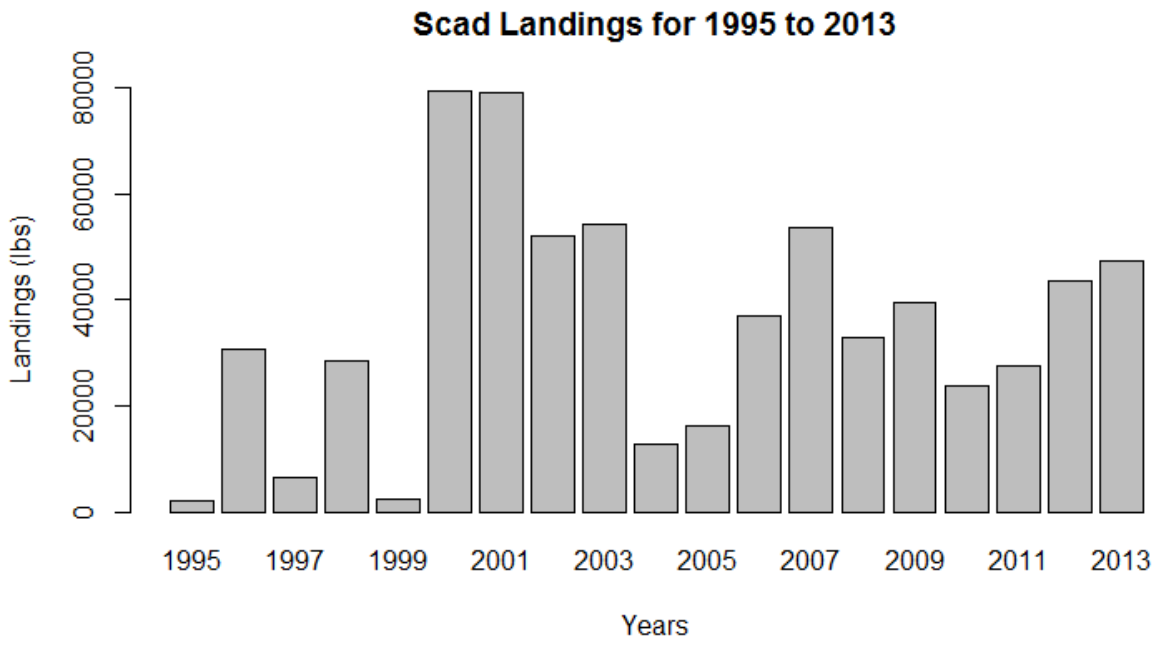
The table below shows the summarized data for the entire period of the dataset (1995-2013). Months are along the top, represented by the numbers 1 thru 12 and years along the left side. The values are in pounds (lbs) and represent sampled landings for the entire island.

	1	2	3	4	5	6	7	8	9	10	11	12
1995	NA	NA	NA	NA	1658	46	24	NA	110	NA	50	26
1996	1966	1327.0	2210.0	2742	2510	2876	9187	4836	1123	683	748	705
1997	372	492.0	1086.0	464	930	255	NA	230	200	1997	525	NA
1998	2062	770.0	6832.0	1802	4288	3209	3499	1388	2071	903	1337	220
1999	NA	NA	NA	NA	481	937	644	391	41	NA	NA	NA
2000	201	1183.0	26769.0	9556	17875	8613	5714	4476	1141	1050	977	2000
2001	201	1183.0	26769.0	9556	17875	8314	5714	4476	1141	1050	977	2010
2002	1639	880.0	1464.0	13586	3000	13574	6303	3148	2091	1681	1480	3375
2003	1736	1153.0	171.0	3015	2611	11716	23513	4786	2275	1664	881	754
2004	598	616.0	1103.0	2063	3641	1072	267	597	125	50	2404	185
2005	200	554.0	726.0	270	146	5990	1288	1948	272	2476	1428	928
2006	2478	905.0	186.5	957	3974	4297	8646	4741	878	2652	4263	3249
2007	1522	1541.0	18308.0	4793	12868	2954	3090	4302	820	962	468	2129
2008	288	1887.0	376.0	2625	3708	9063	8356	2673	1625	1771	362	152
2009	60	60.0	3199.0	7071	5691	7787	6546	4009	175	1282	2777	965
2010	54	166.0	290.0	4282	5305	5507	5081	528	560	679	1195	188
2011	151	3216.0	418.0	831	1034	5629	5425	1610	843	5037	1273	2199
2012	1228	1813.0	9467.0	5310	3393	7153	4706	1682	1732	708	2958	3578
2013	1745	3177.5	2075.0	5727	4181	4806	12628	6718	1569	1996	874	1985

The histogram below gives an indication of the frequency of landed (catch) weight observed per trip and species. Nearly all landings are below 500 lbs. This data spans 1995 to 2013.



The histogram below shows the total scad fishery landings observed from 1995 to 2013. The years 1995, 1997 and 1999 are notably low, due in part to missing data for some months.



The table below shows the mean values for 2000 to 2013 by month. Values are in pounds.

	1	2	3	4	5	6	7	8	9	10	11	12
2000	33.5	59.1	171.6	93.7	241.6	109.0	82.8	109.2	47.5	61.8	69.8	2000.0
2001	33.5	59.1	171.6	93.7	241.6	105.2	82.8	109.2	47.5	61.8	69.8	1005.0
2002	58.5	46.3	77.1	205.8	88.2	174.0	77.8	75.0	65.3	76.4	67.3	337.5
2003	115.7	60.7	17.1	167.5	104.4	117.2	213.8	84.0	81.2	55.5	73.4	107.7
2004	37.4	102.7	64.9	49.1	70.0	44.7	44.5	59.7	62.5	50.0	120.2	37.0
2005	200.0	55.4	66.0	135.0	48.7	193.2	64.4	108.2	45.3	79.9	59.5	48.8
2006	103.2	60.3	31.1	87.0	90.3	85.9	123.5	128.1	79.8	126.3	87.0	77.4
2007	84.6	85.6	523.1	102.0	146.2	65.6	63.1	110.3	205.0	96.2	66.9	106.5
2008	36.0	157.2	47.0	101.0	112.4	133.3	134.8	70.3	62.5	73.8	40.2	30.4
2009	20.0	60.0	106.6	136.0	113.8	144.2	119.0	167.0	58.3	183.1	213.6	193.0
2010	27.0	166.0	58.0	133.8	129.4	110.1	84.7	58.7	70.0	113.2	239.0	94.0
2011	50.3	804.0	104.5	59.4	79.5	144.3	139.1	178.9	120.4	193.7	141.4	169.2
2012	81.9	106.6	205.8	183.1	135.7	162.6	117.7	105.1	86.6	70.8	268.9	162.6
2013	83.1	167.2	207.5	184.7	154.9	129.9	207.0	160.0	87.2	79.8	67.2	124.1

4. Challenges

A number of challenges were faced in conducting the analyses. These included:

1. Only catch and effort data were available for analysis.

2. The dataset had blank data for a few months for the years 1995, 1997 and 1999. This limited analysis of data for those years. Essentially, data was missing for many months pre-year 2000.
3. Spelling mistakes of names, variables, boat IDs, etc., needed correction before analysis.
4. Inconsistent use of codes and labels across years (particularly the pre-2000 years).
5. Gear and species caught didn't match.
6. Thousands of records needed correction/cleaning.

5. Recommendations

Recommendations include:

1. Dataset cleaning is a task that needs more attention and should be completed in advance of future scientific meetings. Cleaning data prior to analysis will allow for more time to work on useful analyses.
2. The dataset had blank data for a few months for the years 1995, 1997 and 1999. The original data books for these years should to be checked to make sure that this missing data was not due to data entry not being performed.
3. A data sampling plan needs to be developed.
4. Continued training for data collectors.
5. More robust data quality control programme needed.
6. Management objectives need to be refined/improved and in some cases developed.
7. The data that are available clearly show a decline in landings from 2000/2001. However, there have been peaks in 2007 and 2013. Further investigation is necessary to make sense of these phenomena and accurately document the changes in the fishery.
8. Additional data that may describe the state of the fishery (environmental, demographics, socio-economics, etc.) need to be acquired (if available) and utilized for a more comprehensive analysis of the fishery.

Annex 5: Review Discussion on Data for the Pelagic Fishery in Grenada

Prepared by: Crafton Isaac

The PWG noted, with concern, Grenada's continuing problem with the preparation of data for submission to and assessment by the Scientific Meeting. This situation denies that country the opportunity to take full advantage of assessment methodologies that are being utilized during the assessment exercises and hence the generation of needed management advice. Several factors contribute to this but the main ones are:

- The non-selection of a specific species at the national level for which an assessment is desirable based on specific management questions
- Due to the above, no species is targeted for concerted data collection and in-putting to allow for a time series of at least catch and effort. Without any species being prioritized there is no corresponding directed allocation of required (albeit limited) sources.

It is commendable that Grenada has resumed the in-putting of catch and effort into the database from 2013. In addition Grenada had also commenced the collection and recording of FAD data even prior to the CARIFICO project beginning with the MAGDELESA FAD.

The PWG appreciates the complexity of the Grenadian fishing subsector in that in addition to the problems inherent with the management of a multi-gear-multispecies fishery, it has the added dimension of a comparatively well-developed long line fishery targeting large tunas for export. Also, its troll fishery captures substantial quantities of pelagic species such as Blackfin tuna, Dolphinfish and wahoo. The fact that both fisheries harvest large tunas at different stages of maturity simultaneously further complicates matters.

Grenada, as do some other member states, faces a number of challenges with respect to data collection, recording and storage. However, due to resource limitations some of these challenges are of a very serious nature and include:

- The PWG notes that the long line fishery, given its importance, suffers from a lack of adequate coverage for data purposes. It is difficult to estimate total catch when only fish bought by the processors are recorded and there is no capture of fishing effort. Long liners are not at present required to carry logbooks.
- In the case of the troll fishery the format used for collection of trip data is not completed across landing sites in a standardized way. There is very little resolution of effort in terms of number of hooks, number of lines, hours or days fished.
- There is a need to statistically validate the raising factors applied to certain pelagic species.

A number of data gaps have been identified in addition to those above and include the uncertain extent of coverage of the SCP fishery and the recording of weight (rounded, gutted or dressed).

The PWG recommends that in order to generate a time series of appropriate data which can be used for assessment it might be helpful for Grenada to consider the following:

- Develop a realistic (i.e. informed by resource limitations and taking into account minimum data requirements) a Data Collection and Management Plan which actively involves the use of the industry (fishers, processors, wholesalers, recreational boats) in the exercise of collecting and reporting of critical data.
- Consideration should be given to the use of legislative instruments such as licensing and concessions to enhance data collection and reporting

- Institute a programme of in-house training for data personnel as well as source external assistance in this regard for short term training. At the same time an awareness programme on the importance of data needs to be carried out within the industry
- The need for data collectors may be partly addressed by up-grading, through training, existing data clerks.

The PWG notes Grenada's intention to focus on Small Coastal Pelagics for the 2015-16 assessment period. This fishery is of critical importance to food security, poverty alleviation and, in recent years, supporting the valuable long line fishery as a provider of bait. The PWG stands ready to offer whatever assistance it can in this regard during the inter-sessional period.

Annex 6: Report on Analysis of Pelagic Fishery Data for St. Kitts and Nevis

Prepared by: Kharim Saddler

Description of national fishing industry
There are five major fisheries that are managed by the Department. These are Queen Conch (*Strombus gigas),* Caribbean Spiny Lobster (*Panulirus argus*), small coastal pelagic, large or ocean pelagic and reef/bank and slope fisheries.

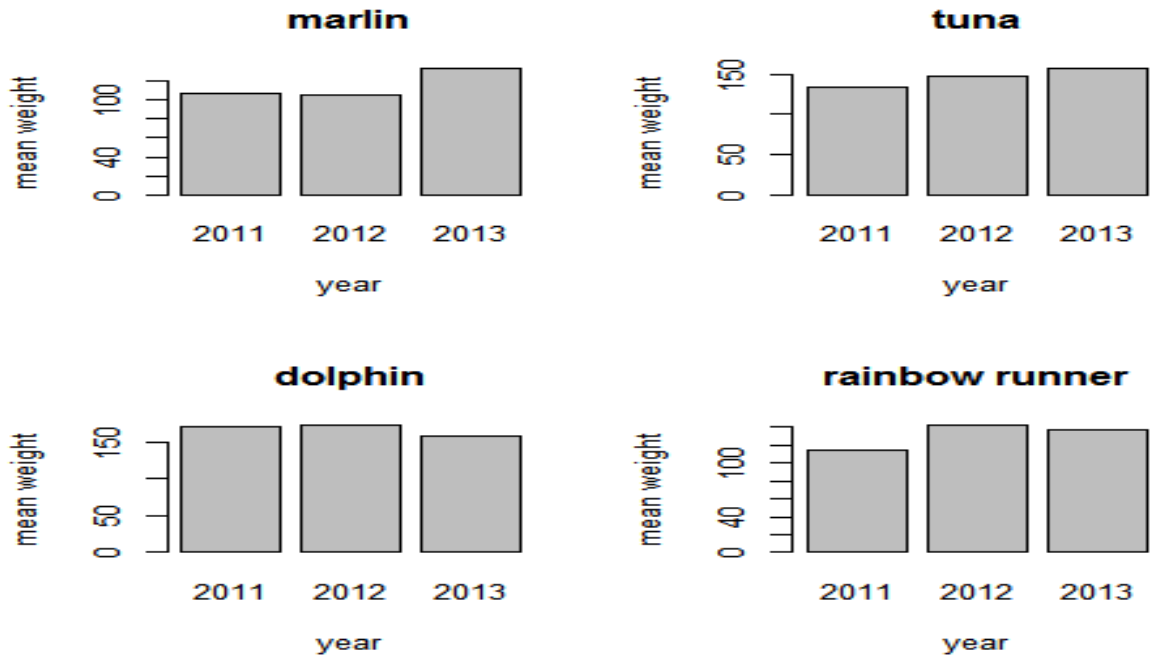
Statistics, Research and Resource Assessment
The Department of Marine Resources has the same method of data collection and analysis which is based on the CARICOM region data system CARIFIS. In St. Kitts and Nevis data collection is done on a systematic census schedule. Information from all vessels landing at the selected site is captured and stored in an excel file due to the difficulties experienced using CARIFIS. Monthly reports on estimates of landings are produced.

Pelagic Fisheries Management and Conservation Activities
LARGE (OCEAN) PELAGIC FISHERY
Objective
Promote the positive aspects of the traditional nature of this fishery and encourage new entrants.

Catches of Pelagics are seasonal and often target the dolphinfish (*Coryphaena hippurus)* and tunas (Scombridae). Larger pelagics are harvested by commercial and sport fishermen mainly by trolling. The commercial fishery is conducted by about 25 fishers using fifteen vessels, outfitted with trolling hooks and lines. Most vessels have a crew of 2- 3 persons including the captain. Trolling lines are normally 80 – 100lbs test with a single hook. Artificial lures are sometimes used especially for the tuna and mackerel. Fishers prefer to use ballyhoo or flyingfish to catch dolphinfish. Some fishers have been using personal as well as government owned Fish Aggregation Devices (FADs) in conjunction with long lines to catch yellowfin tunas.

Analysis objective
- To ascertain the changes in the average landings of pelagic.

Average weight of Marlin, Tuna, Dolphin and Rainbow Runner



Problems

- Unfamiliarity with 'R' program.
- Data had too many missing variables.
- Data lack depth to provide biological analysis.

Recommendations

- Data collectors should seek to capture data for every field.
- Data should be sorted and cleaned after being entered to avoid excessive cleaning at scientific meeting.
- Data collectors should be trained to capture biological data.
- Sampling strategy should be assessed and updated.

Annex 7: Report on Analysis of Dolphinfish Data for St. Lucia

Prepared by Patricia Hubert-Medar

DOLPHINFISH FISHERY IN SAINT LUCIA

Management questions

The management questions for the dolphinfish fishery in St. Lucia are:

- What are the monthly and annual trends in the catches of dolphinfish and how have these varied historically?
- How many fishing vessels have been involved in catching dolphinfish and what is the average catches of dolphinfish for these vessels and how important is the dolphinfish to their livelihoods?
- Are vessels engaged in the fishery on a monthly basis and the profit shared?
- How has the ex-vessel price of dolphinfish varied historically on a monthly and yearly basis?
- How has the implementation of FADS impacted the catches of dolphinfish?
- What is the average price per pound (trends)?

In an effort to build upon the two days of training in the use of the R software, St. Lucia uploaded the Dolphinfish data that was stored in an Excel spreedsheet into "R studio" and used "R" to analyse that data for the period 1995 to 2013. The results of the analysis is graphically presented and the process to arrive at these results explained. The data analyzed represents the recorded landings as per the sampling plan where data is collected for every other returning fishing vessel, over a fifteen day period, which is randomly selected on a monthly basis. Nine out of twenty-one landing sites are sampled. A raising factor is used to calculate total landings for each month and site for all sampled sites. For each non-sampled site a percentage of the estimate for a similar sampled site is used based on the number of vessels at these sites. The raising factor for sampled sites is calculated as follows: (number of fishing days for the month*total boats out per month/total number of sampling days per month)/total number of boats sampled per month.

The results of the analysis attempted to (although in some cases partially) address all the management questions, with the hope of completely answering all the questions inter-sessionally.

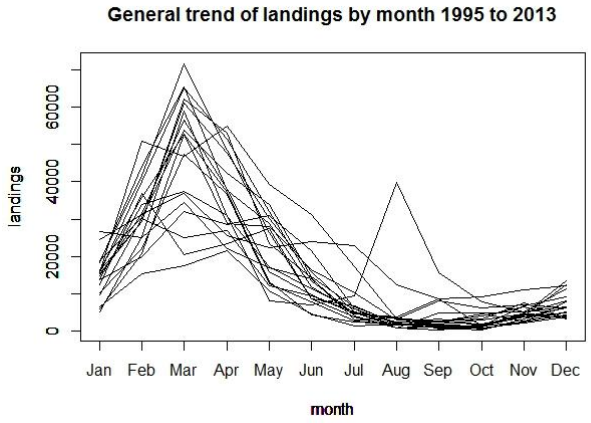
Data quality

Data quality checks are conducted at various levels within the data process. Data quality monitoring and mentoring checks are conducted on a monthly basis. The purpose of these checks is: to ensure that data collectors are onsite collecting data; to ensure that the sampling plan is being followed; to address challenges and answer pertinent questions. The monthly field data sheets are reviewed with the data collectors for errors and omissions in preparation for entry. After data is entered into the Trip Interview Program (TIP) an integrity check is carried out to ensure that the hard copy data matches the soft copy. Prior to the scientific meeting, the dolphinfish data was extracted from the TIP database for each year and saved in an Excel spread sheet. That data was verified for inconsistencies and corrections made where necessary.

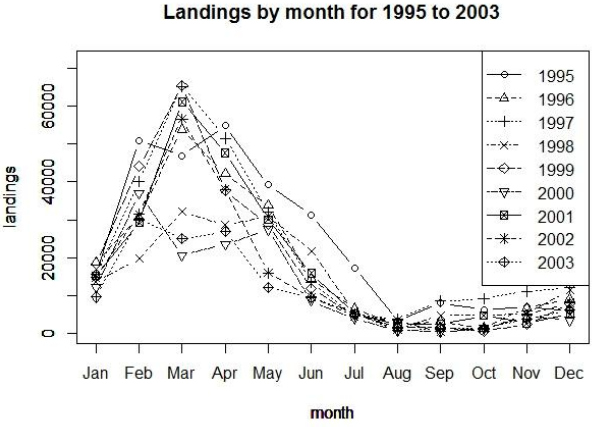
Results

The first three graphs labelled A,B and C respectively, show general trends in dolphinfish landings over a period of nineteen years. The peak period for dolphinfish landings coincide well with the information collected through the fisheries census, which showed that the high season for migratory offshore pelagic fishes extends from December to May and low season during June to November corresponding to the volume catches and availability of offshore migratory pelagic species. Further, the census showed that on average, fishers go out fishing more frequently per week during the high fishing season (December –

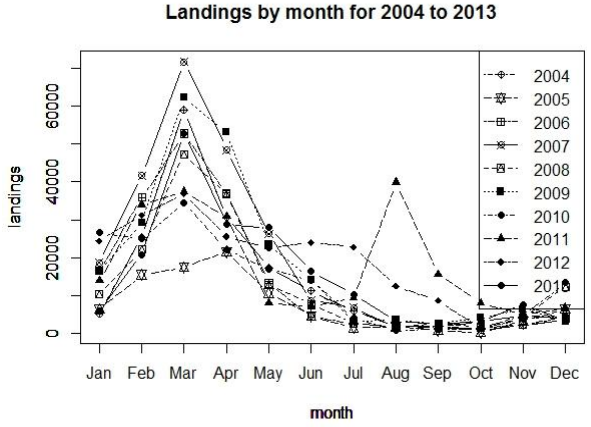
May) than the low fishing season (June – November). Unusually high landings of small dolphinfish were recorded in 2011. This may be attributed to the unusually high quantities of sargarssum seaweed that were experienced within the region during 2011 and juvenile dolphinfish tend to take shelter under these floating seaweed mats. Graph B shows landing trends for the period 1995 to 2003 and graph C shows landing trends for the period 2004 to 2013.



Graph A

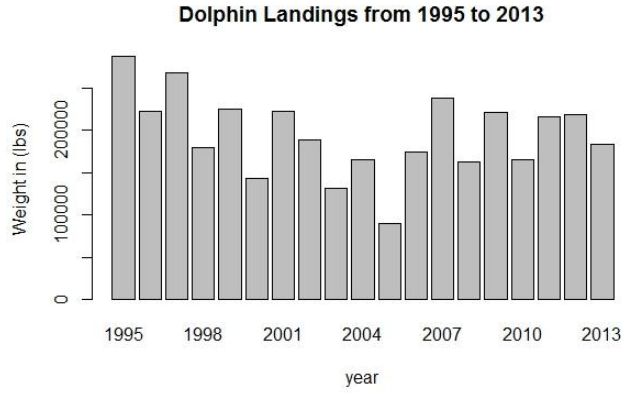


Graph B



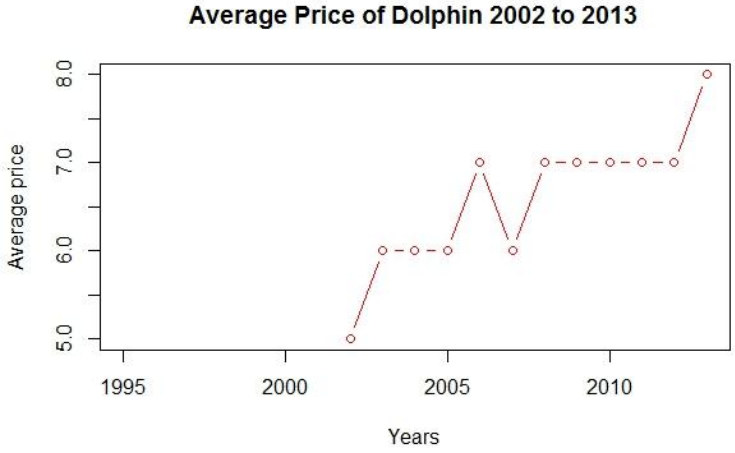
Graph C

The weight of all the landing was sumed up for each year. Plot1., shows an overall decline in dolphinfish catches from 1995 to 2005. There was fluctuation in the catches from 2006 to 2013.



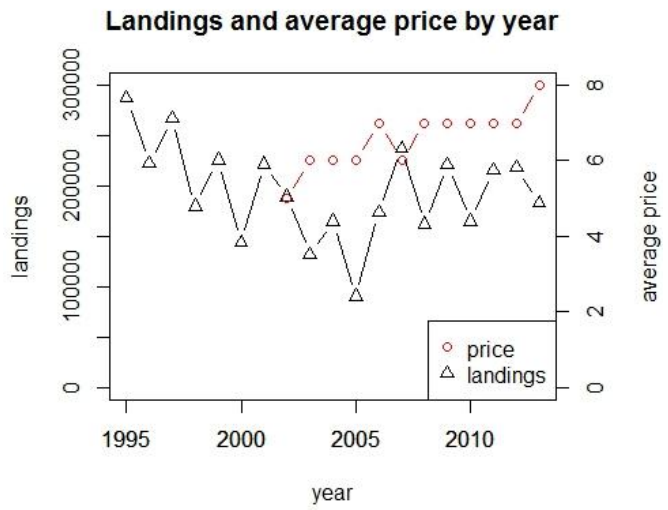
Plot 1: Sum of weight of landings for 1995 to 2013

An average ex-vessel price per pound of fish was calculated for all years. The result shows an increase in the ex-vessel price per pound of fish from 2002 to 2013. From an average of EC$5.00 per pound in 2002 to EC$8.00 in 2013. The recording of data for ex-vessl price per pound of fish commenced in 2001, however the data for 2001 was not used because of no confidence in that data.

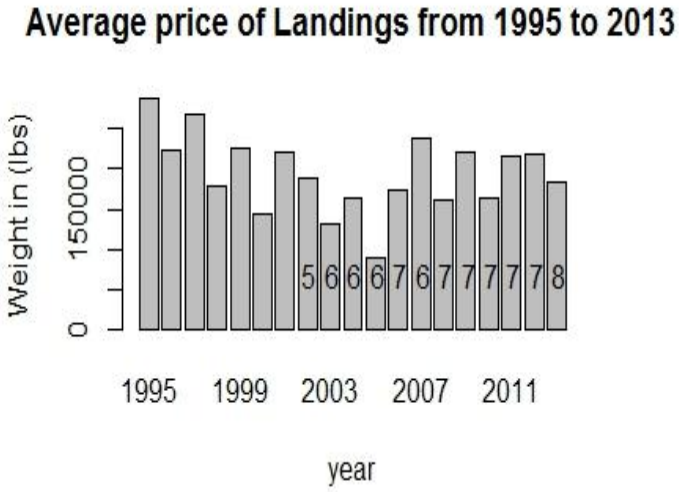


Plot 2: Average ex-vessel price per pound of dolphinfish from 2002 to 2013.

The average price per pound of fish was plotted against the sum of weight of landings. There was no evidence of the law of supply and demand in the trend of prices *vis-a-vie* sumed landings. The result only shows a steady increase overall in the average price per pound of fish for the period.

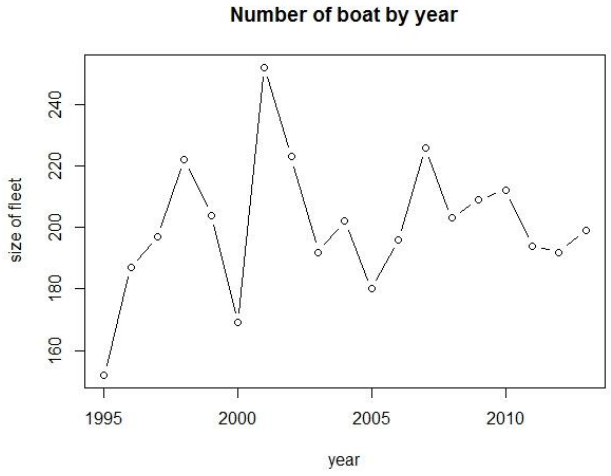


Plot 3: Average price per pound and landings.



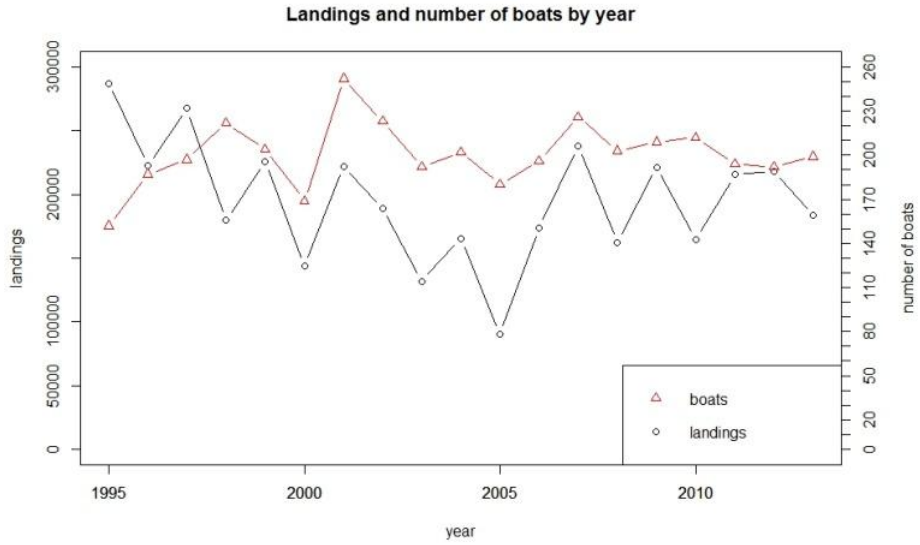
Plot 4: Average price per pound of fish

All the boats that caught dolphinfish for the period 1995 to 2013 was sum up by year. There was an increase in the number of boats that caught dolphinfish from 1995 to 1998, and a decrease from 1999 to 2000 when compared to 1998. In 2001 there was a significant increase in the number of boats that caught dolphinfish and a steady decline in the years following.



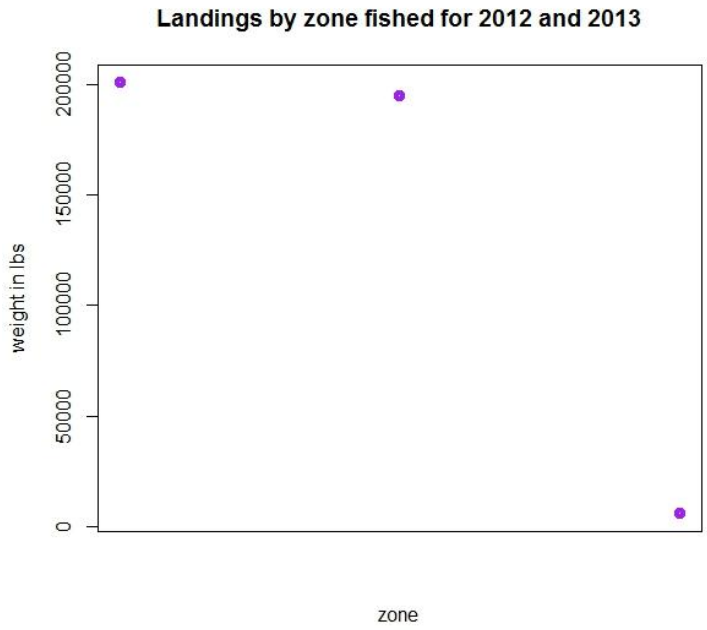
Plot 5: Number of boats that caught dolphinfish

The number of boats that caught dolphinfish was plotted against the sum of weight of landings. Generally when the number of boats that caught dolphinfish increased, the weight of landings increased the statement is also true when there was a decrease.



Plot 6: Sum of landings by number of boat catches.

In 2012 the recording of catches from FADs commenced. The catches for the two years of FAD data collectedwas summed. The catches by FADs was compared to the other zones where dolphinfish was caught.



Plot 7: Catches by zone fished.

Challenges

- The major challenge in analyzing the data was the length of time it took to determine what code to use in "R" to get the desired result, to fully answer the management questions.
- Being involved in two different working groups and having to produce reports and presentations, give very little time to focus on analysis.

Recommendation

- Should "R" be the desired software for performing analysis then longer training is necessary to get participants more comfortable with using the software prior to the scientific meeting.
- The Data, Methods and Training Working Group should meet separate and apart from the fishery working groups.
- Review the price per pound of dolphinfish landings for 2001 and make the necessary corrections to the dataset.
- Analyze all the boats that are involved in the dolphinfish fishery for each period, and compare the number of boats that caught dolphinfish with the total number of boats that are involved in the fishery.

Annex 8: Report on Analysis of Large Pelagic Fishery Data for St. Vincent and the Grenadines

Prepared by: Cheryl Jardine-Jackson

Introduction

Pirogues and multipurpose fishing vessels are used mainly for harvesting large pelagics. Pirogues are open boats with a pointed bow and flat transom, ranging from 7 – 10 m (19 – 30 ft) in length and powered by one or two outboard engines of 40 – 85 hp. There are over 400 pirogues registered in SVG. The multipurpose vessels ranged from 34.7 ft – 48.5ft in length. These are powered by inboard diesel engines ranging from 90 – 190 hp. These vessels are designed to operate up to 150 nautical miles from the islands with a 3 to 5 day stay at sea. There are about 13 registered multipurpose vessels but only about five are operational.

St. Vincent and the Grenadines is also responsible for a high seas fishing fleet. These vessels are foreign owned vessels registered with SVG and conduct their fishing activities on the high seas. In 2012 there were 28 vessels fishing in the Atlantic. Tuna and tuna-like species were caught with yellowfin tuna being the main species targeted. The areas of 10-15S & 30-35W and 10-15N & 50- 55W were the two main areas for fishing activity in the Atlantic by these vessels in 2012.

In 2012, twenty-eight (28) vessels fishing in the Atlantic were 20 meters and over. Of these vessels seventeen (17) were under 24 meters, one (1) was less than 30 meters, seven (7) were between 41-50 meters and three (3) were over 50 meters.

National Fisheries Policy and Management Objective

The overall policy for the fisheries sector is the sustainable use of all fisheries resources to maximize benefits to all Vincentians in the present and future. Emphasis will continue to be placed on the protection of the marine environment, in an effort to maintain and enhance its carrying capacity. Fisheries development goals and strategies will ensure the betterment of the socio-economic conditions of all stakeholders/beneficiaries within the Vincentian population.

Management objective for the large pelagic fishery focus mainly on:

- cooperating with member of ICCAT particularly Caribbean states to assess, protect and conserve the large pelagic resources, and
- to promote development of the pelagic and sport fisheries.

Description of available data

St. Vincent and the Grenadines has available catch and effort data from 1992 to present. This dataset identifies the area fished, landing site, crew size, fuel used in $, quantity of bait used $, hrs fished, gear, species, weight and value.

Challenge/Constraints

A proper analysis of the large pelagic fishery in St. Vincent and the Grenadines could not have been undertaken at the 10th annual scientific meeting because of several challenges/constraints:

- Late compilation of the dataset
- Several fields need to be edited (for instance the data fields fuel used and quantity of bait should be quoted in dollars ($), however for some months they are quoted as gallons and pounds respectively
- The date fields need to be edited, as the dates should be written mm/dd/yy, however about 60% of the dates in the dataset are written dd/mm/yy which complicates the output of the dates.

- Inconsistency with the gear used for instance the gear for large pelagics should be "troll" or "handline' however several of the gear used are quoted as "gillnets".
- Lack of human resources to actually edit and clean the dataset.

Analysis

One promotion to the development of the pelagic fishery in SVG is the deployment of FADs in the waters of SVG. At present one pelagic fisher in Barrouallie volunteered to collect data from approximately five (5) fishers who fish around the FADs which were deployed in late 2011. Approximately 11,696 lbs of tuna and tuna-like species were caught around these FADs during the period July 2012 to April 2014 (Figure 1 and Figure 2).

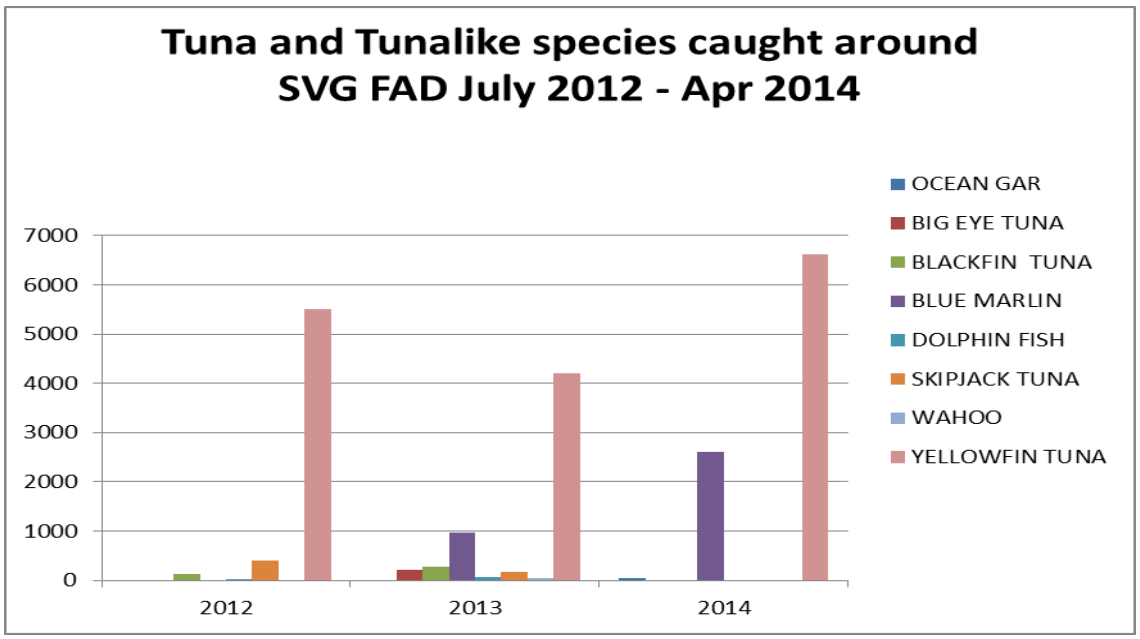


Figure 1: Tuna and Tuna-like species caught around SVG FAD July 2012 - Apr 2014

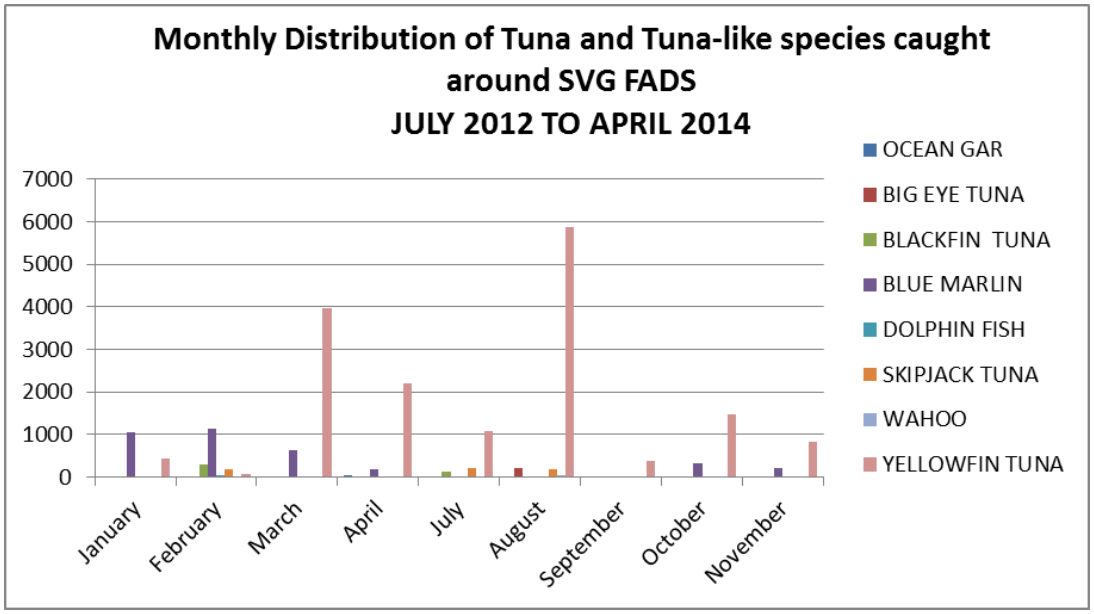


Figure 2: Monthly distribution of Tuna and Tuna-like species caught around SVG FADs July 2012-April 2014

The large pelagics fishery of St. Vincent and the Grenadines contribute approximately 20% of the total estimate of fish landed and marketed in SVG, realizing an annual value of 2.8 million dollars (Figure 3 - Fish landings 2003 – 2012).

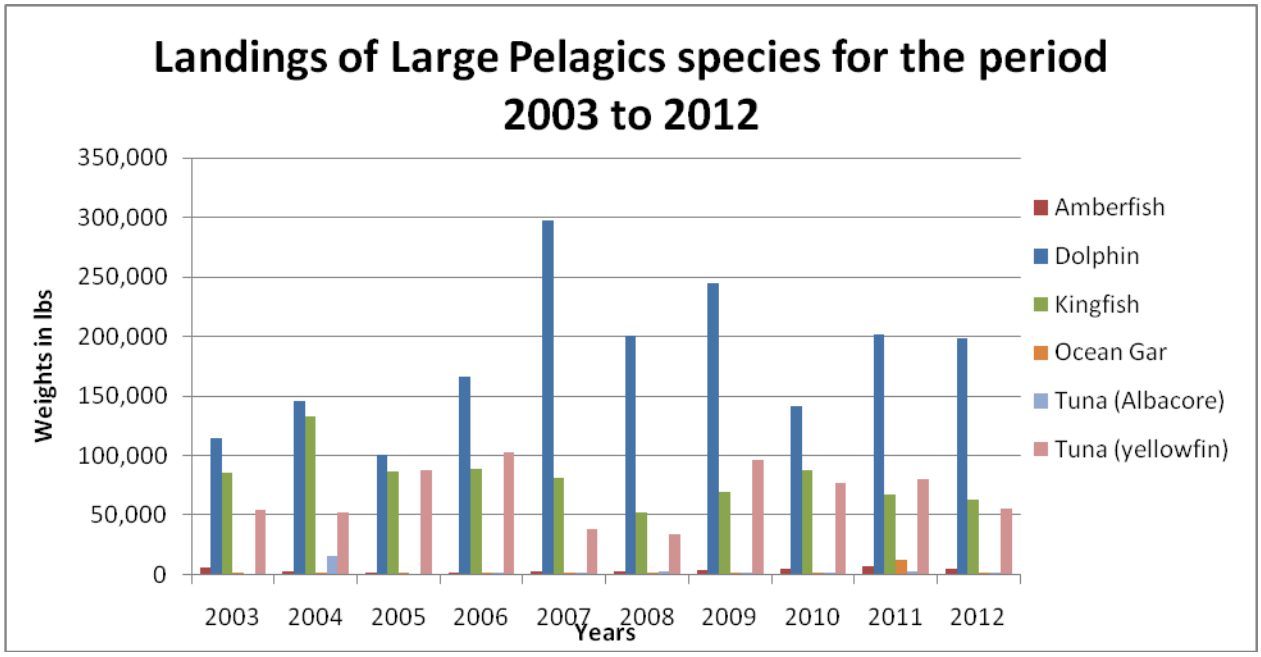


Figure 3: Landings of large pelagic species for the period 2003 to 2012

High-sea statistics

Table 1 and Figure 4 below provide information on the landings of large pelagic species for 2011 and 2012 by the SVG high seas fishing fleet.

Table 1: Tuna and tuna-like species caught by SVG high seas fleet

	2011	**2012**	**Increase/decrease (%)**
Yellowfin	927.223	551.3	-40.5
Bigeye	36.97	24.7	-33.2
Albacore	423.116	396.6	-6.3
Spearfish	4.741	4.05	-14.6
Swordfish	13.507	9.9	-26.7
Sailfish	4.414	4.5	1.9
Kingfish	5.878	5.1	-13.2
Skipjacks	0	0.08	
Miscellaneous	299.453	162.2	-45.8
TOTAL	**1715.302**	**1001.33**	**-41.6**

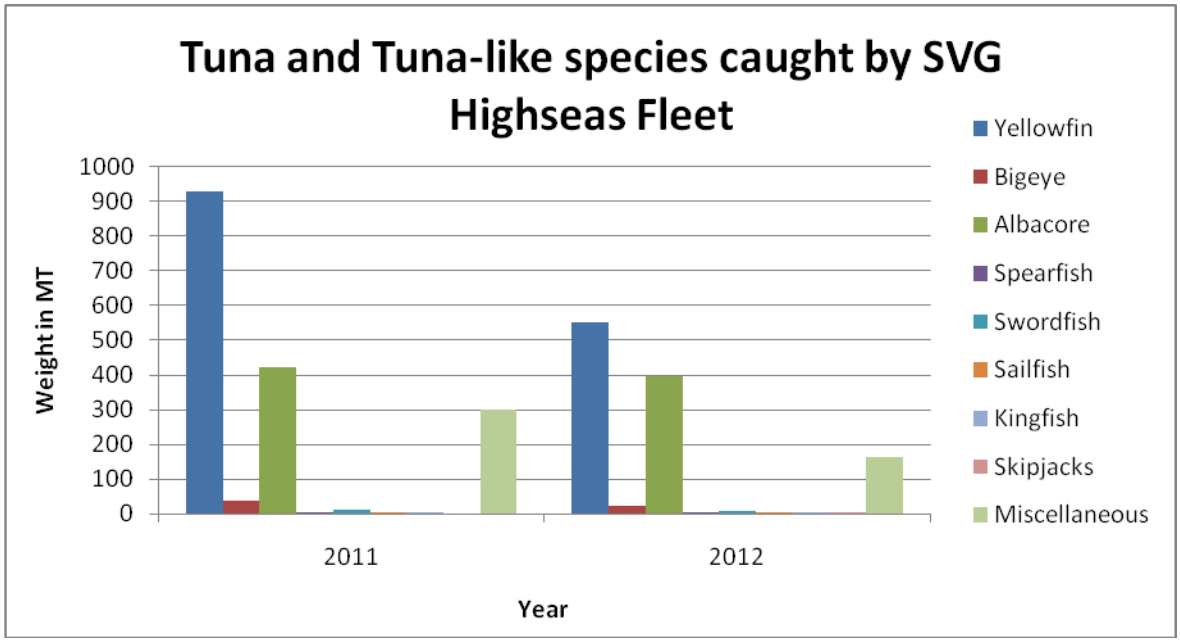


Figure 4: Tuna and tuna-like species caught by SVG high seas fleet 2011-2012.

Recommendations

- SVG need to have more training sessions with staff (though limited) in the compilation and cleaning of the dataset
- Data personnel need more training in stock assessment and the use of statistical packages (eg "R") to clean and analyze data.
- Need to set a time frame to clean dataset so that the bulk of the work would be completed before the annual scientific meeting.
- For the development of the FAD fishery, the lengths of the fish caught around the FAD should be collected.

Annex 9: Report on Preliminary Analysis of Biological Data from the Non-artisanal Longline Fleet of Trinidad and Tobago using R

Prepared by: Louanna Martin

1. Description of the fleet

Fleet	Non-artisanal longline of Trinidad & Tobago
Vessel	Longliner; 14 - 31m; 160 - 400Hp inboard diesel engine; electronic fish finding aids, navigation equipment, communication equipment, fish/ice hold (4 - 9t)
Gear	Pelagic longline
No. vessels	~32. The fleet size has increased steadily since 2004 when 10 vessels were reported. In 2006 the number of vessels reported was 17. In 2007, out of a total of 20 vessels, 19 vessels fished. In 2008 the number of vessels reported was 21. There were 31 operational vessels in 2013.
Fleet fishing operations	Mechanised; year round; T&T EEZ, Caribbean Sea, Eastern Caribbean, North Atlantic; avg trip length = 19 days; avg no. of fishing days = 13
	All vessels land at sites in one general area, Chaguaramas
Species targeted	*Thunnus albacares*, *T. obesus*, *Xiphias gladius*. Bycatch of tunas, billfishes and sharks.
Appropriate units of effort	No. of hooks, no. of sets
Statistical sampling	Trip reporting system gives catch and effort data coverage of ~ 90 %. This system is considered the forerunner of a log book system. Biological sampling aims to cover 100% of fishing trips; and at least 30% of yellowfin tuna landed; 100% of other tuna and billfish landed; and 30% of shark landed.

2. Management questions

The objective with respect to Trinidad and Tobago's participation in the meeting of the PWG at the 10th Annual CRFM Scientific Meeting was to advance its attempt to submit biological data and information for key tuna and tuna-like species by ICCAT, in particular tunas.

3. Available data

The data submitted for analysis were lengths and weights of processed yellowfin tuna (2 471 records), bigeye tuna (391 records) and albacore (386 records) which were sampled from the non-artisanal longline fleet. The data were initially collected under the 1-year ICCAT/JDMIP project which was implemented in Trinidad and Tobago from December 2012 to December 2013 and continue to be collected under the Fisheries Division's coastal and migratory pelagics assessment and management programme.

4. Analyses

The data as submitted were insufficient for significant analysis since they related to processed specimens. Computation and application of conversion factors are required for any substantial assessment of the performance of the fleet. As such, preliminary analyses were performed on the data using R; the use of R being part of a general strategy to advance analyses on the fisheries and fisheries resources.

i. The data were cleaned in Excel
ii. Yellowfin tuna, bigeye tuna and albacore records containing caudal keel lengths and dressed weights were extracted in R for analysis:

Table 1. showing the summary statistics for the total data set

	Species	ckl_cm	dwt_kg
a.	Species	ckl_cm	dwt_kg
b.	ALB: 386	Min. : 42.0	Min. : 2.00
c.	BET: 391	1st Qu.: 74.0	1st Qu.:30.00
d.	YFT:2471	Median : 86.0	Median :42.00
e.		Mean : 82.6	Mean :40.34
f.		3rd Qu. : 92.0	3rd Qu :51.00
g.		Max. :107.0	Max. :84.00
		NA's :11	

Table 2. showing the length frequencies by species

Caudal keel length range (cm)

	(40,50]	(50,60]	(60,70]	(70,80]	(80,90]	(90,100]	(100,110]
yellowfin	3	39	79	305	983	964	91
bigeye	2	52	119	152	64	1	0
albacore	1	222	160	0	0	0	0

Table 3. showing the weight frequencies by species

Dressed weight range mid-length (kg)

	6	16	26	36	46	56	66	76	86
yellowfin	23	82	181	584	824	586	180	10	1
bigeye	1	73	110	130	61	10	6	0	0
albacore	3	338	45	0	0	0	0	0	0

Table 4. showing the summary statistics for yellowfin tuna

Species	ckl_cm	dwt_kg
ALB: 0	Min. : 42.00	Min. : 5.00
BET: 0	1st Qu.: 83.00	1st Qu.:38.00
YFT:2471	Median : 89.00	Median :46.00
	Mean : 87.84	Mean :45.19
	3rd Qu.: 94.00	3rd Qu.:54.00
	Max. :107.00	Max. :84.00
	NA's :7	

iii. Histograms of the caudal keel lengths and dressed weights were derived for yellowfin tuna:

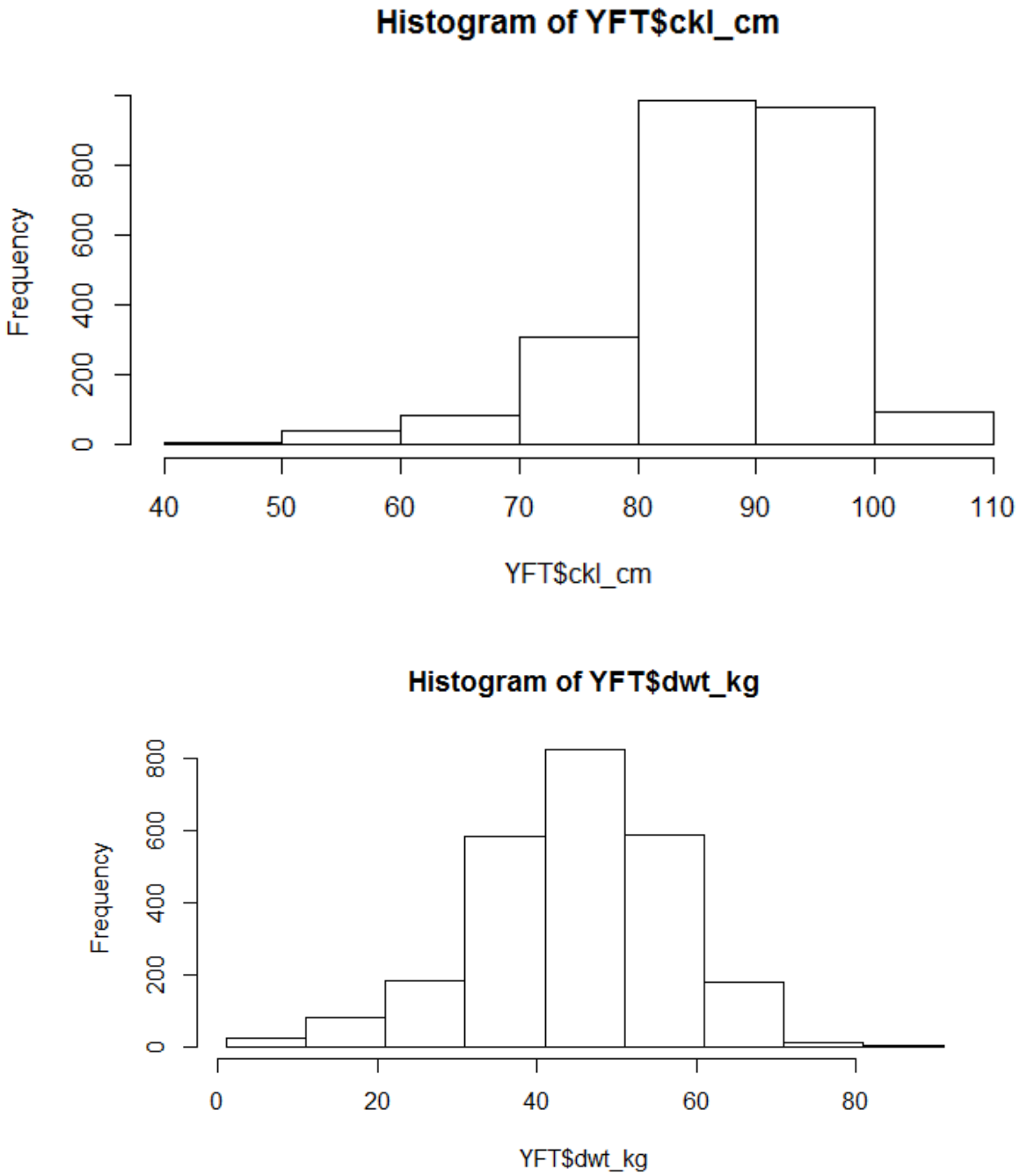


Figure 1: Caudal keel lengths and dressed weights for yellowfin tuna

iv. A plot of caudal keel length vs dressed weight was derived for yellowfin tuna:

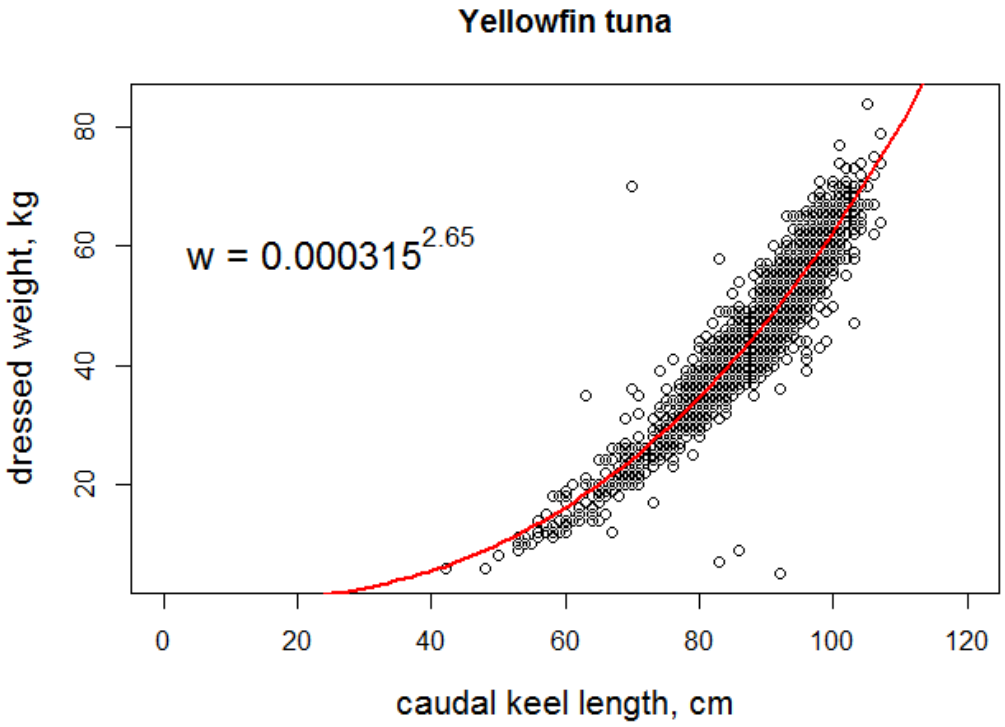


Figure 2: Caudal keel length vs dressed weight for yellowfin tuna

5. Discussion

The results of these preliminary analyses suggest that potentially meaningful information can be derived from the data being collected.

6. Challenges

- Allocation of time to conduct scientific work / prioritization of scientific work at the country level
- Capability to perform scientific analyses affected by limited amount of practice
- Validation of trip data from this fleet is not yet instituted; the Fisheries Division continues to work towards the implementation of a vessel monitoring system (VMS) and a scientific observer programme

7. Recommendations

- Biological data and data for the calculation of conversion factors should continue to be collected.
- Training in the programming language R should continue to be promoted by the CRFM Secretariat for use by Member States.
- Scientists that have received training in R should transfer knowledge of the program to other scientists in their home countries to the extent possible.
- Trinidad and Tobago should aim to improve its contribution to ICCAT assessments – through consistent submission of biological data and catch rate analyses on the target species of the non-artisanal longline fleet.

APPENDIX 5: REPORT OF THE REEF AND SLOPE FISHERIES WORKING GROUP (RSWG)

Group members: Lester Gittens, Bahamas- Chairman; Alwyn Ponteen, Montserrat- Deputy Chairman; Hazel Oxenford- University of The West Indies, Barbados; John Hoenig- Consultant; Nancie Cummings- Consultant; Kris Isaacs- St Vincent and the Grenadines; Luc Clerveaux- Turks and Caicos; Ramon Cacarmo- Belize; Remone Johnson-Anguilla; Ricardo Morris- Jamaica

A. OVERVIEW

Introduction

The completion of the Tenth Annual CRFM Scientific Meeting was a milestone for management of fisheries in the Caribbean. Much change has occurred in the last 10 years. Included in this change is the merger of the former Conch and Lobster Working Group with the Reef and Slope Fish Working Group forming a working group that retains the title Reef and Slope Fisheries Working Group. Though not quite as varied as the issues addressed by the CRFM Annual Scientific Meeting over the last decade, a large variety of species are to be addressed by the revamped working group including some of the most valued in the Caribbean such as the Caribbean spiny lobster, CITES listed species such as the queen conch, species that can play a critical role in mitigating reef degradation such as parrotfish and species that have wreaked havoc across the Caribbean such as the red lionfish. It is perhaps fitting that a single working group should address species occupying the shoreline to the slopes as the species found therein are all interdependent on each other and their physical environment for survival. This becomes especially evident when one uses ecosystem based management to manage these resources.

The RSWG's agenda (Annex 1) included the review of project outcome and project proposal documents as well as review of proposed or already endorsed regional management documents. A biennial work plan was developed to guide the activities of the RSWG for the period 2014 to 2016. The biennial work plan is given at Annex 4 to this report. A number of country specific species assessments were also conducted in addition to a preliminary assessment of queen conch conversion factors. The outcomes of the various activities are outlined in the subsequent sections.

1.1 Review of Inter-sessional Activities

Two electronic meetings were convened inter-sessionally. The first meeting was convened on 20 May 2014 to review the 2013 Pedro Bank Queen Conch fishery assessment and total allowable catch (TAC) recommendation. The Working Group provided suggestions for improvement of the assessment and report. The amended version of the report is attached at Annex 2 to this report. At the second meeting, convened on 02 June 2014, details of the draft Agreement/Declaration/MoU on the Conservation, Management and Sustainable Use of the Caribbean Spiny Lobster (*Panulirus argus*) in CRFM Member States was presented to the Working Group by the Executive Director of the CRFM Secretariat. The Working Group undertook a preliminary review of the draft Agreement/Declaration/MoU at this inter-sessional meeting and a more detailed review at the Annual Scientific meeting (see 1.2 below).

1.2 Review of Agreement/Declaration/MoU on the Conservation, Management and Sustainable Use of the Caribbean Spiny Lobster (*Panulirus argus*) in CRFM Member States

The main purpose of this review was to ensure that the regional agreement takes into account current scientific information. However, recommendations pertaining to other aspects of the document were also invited. The justifications for recommendations were to also be provided. Recommendations and changes in wording made by the RSWG are seen in blue. Changes in wording were completed in only some instances, while in others wider consideration beyond the RSWG is needed for exact wording.

Details of the suggested changes are provided in Annex 3 to this report. These proposed changes are summarized as follows:

Preamble: Should give recognition to the important role of spiny lobsters in the ecosystem;
Article 3 – Objective: management of fishers should be incorporated;
Article 4 – General Principles: Among the guiding principles consideration should be given to the ecosystem impacts of fishing effort as well as implementation of pre-agreed harvest control rules based on appropriate reference points.

Article 5 – Research, Data Collection and Sharing of Data and Information – the CRFM/OSPESCA/WECAFC Working Group on Spiny Lobster and educational institutions should be listed specifically as agencies with which data should be collected and shared. As well, effort and relevant socio-economic indicators should be listed explicitly among the data and information to be provided by vessel owners, masters, fishers, processors and traders to the competent authority. Habitat and by-catch issues should also be included in the focus of scientific research.

Article 6 – Conservation and Management Measures: Regarding the proposed closed season a region-wide review is recommended to determine the occurrence of peak spawning and to determine the best months for the closure. To account for regional differences in peak spawning it may be more appropriate to implement closed seasons for clusters of countries and in this respect lobster fisheries in non-CRFM countries must also be considered. While it is recognized that effort control is important and that each country should determine an appropriate effort limit, the specific 2,500 traps per industrial fishing vessel is inappropriate due to the variation in the scale of fisheries (number of vessels and size of fishing ground) among countries. In addition, there is need to determine the impact of casitas on lobster fisheries and the associated ecosystem so as to inform the management measures for use of such devices. The provisions regarding effort control should also be made specific to traps which target lobsters rather than all traps. To make allowance for those counties which may implement a larger size limit than the minimum 80mm recommended and which may already have developed a harvest strategy the provision for the size of the escape gap should be amended accordingly. Regarding the proposed requirement for removal of traps from the sea after commencement of the closed season, this measure should be effected within five days of the start of the season and all catch should be released. As well, the time period for submission of a signed declaration on the inventory of spiny lobsters to the Competent Authority should be by the third working day of the closed season. Further, the period prior to the season when authorized persons may place their fish pots in the sea should be 14 days as traps will not capture lobsters immediately. For the purpose of packaging and marketing there should be emphasis on each lobster tail with a minimum weight of 5 oz per unit of commercial packaging and a range of 4.5 to 5.5 ounces for each thawed lobster tail. Adoption of an appropriate maximum size limit is also recommended so as to enhance spawning in the region and consideration should be given to establishing lobster-specific MPAs which can be informed by connectivity studies. Although there was agreement that fishers should not be allowed to have lobster meat on board the boat, there was some disagreement as regards the requirement to land lobsters whole since this would be impractical for fisheries in some countries. Although there remains concern about the excessive or enhanced fishing effort due to greater efficiency with the use of SCUBA, an outright ban on the use of this device was not supported, instead use of the device should be regulated and concerns of fisher occupational health and safety could be addressed by allowing only trained fishers to use SCUBA. However, if management of use of the device cannot be effectively implemented then consideration should be given to banning its use.

1.3 Regional Lionfish Strategy and Action Plan

The action plan was reviewed to enable the RSWG to become more familiar with its content and to facilitate the RSWG incorporating the plan into its activities. Countries of the region have already begun to implement aspects of the plan. Activities initiated thus far include:-

1. Research conducted in collaboration with various institutional agencies;

2. Development of lionfish action plans for some member states
3. Public awareness, education and culling control programs of lionfish population;
4. Training of fishers in the handling and processing of lionfish;
5. Monitoring of lionfish habitat and population;
6. Promotion of lionfish as a new fishery and encouraging the consumption of the final product as a source of food;
7. Collection of catch, effort and biological data;
8. Licensing of fishers in some member states targeting lionfish in MPA's.

A number of recommendations for the region are also suggested by the RSWG including:

- Review, develop and implement harmonized legislations and regulations to deal with all IAS in CRFM member states;
- Improve and centralize lionfish data collection and information systems;
- Training of Fisheries staff in the collection of lionfish biological data;
- Develop a National Action plan for the monitoring and control of lionfish;
- Intensify the campaign to promote lionfish as a commercial fishery for local and regional consumption;
- Seek internal and external funding to assist research, monitoring and control of IAS;
- Development of a draft harmonized survey questionnaire by CRFM Secretariat, to evaluate status of implementation of action plans and agreement on data entry format;
- Provide incentives for fishers to target lionfish;
- Regular update to RSWG Chair by member states on the progress been made to adopt and implement the Regional Lionfish Strategy and Action Plan.
- Agree upon and make available lionfish data set from member state for analysis at the next CRFM Scientific meeting;

A, perhaps, controversial issue was also discussed. This is the management of the lionfish fishery as a "sustainable" fishery. Most have accepted that lionfish are here to stay in the Western Central Atlantic. There is also broad agreement that a major way to control lionfish is to encourage a market for them. However, if a market is encouraged its sustainability would be a concern. Should the lionfish be managed in such a way that catches can be sustained? There is a possibility that this can be done while minimizing ecosystem effects by suppressing lionfish abundance below levels that have harmful effects without complete eradication. More regional discussion is needed on this topic. There may also be yet to be discovered or quantified ecological impacts of lionfish that negate any possible benefit to their "sustainable" management.

1.4 Reviews of CIDA Project proposal on Increasing Resilience of the Fisheries Sector in the Caribbean Region and IDB Strategic Program for Climate Resilience – Marine Component

The plenary meeting acknowledged that there was currently no budget for implementing the 2014-2019 Coral Reef Action Plan. However, the RSWG undertook a review of these documents in order to begin to consider how the group might play its role in addressing climate change in relation to fisheries.

One of the major discussion points was the need to move beyond species specific management measures in accordance with an ecosystem based approach and also to help to mitigate climate change. The example used was parrotfish. All reef based fisheries can benefit from greater parrotfish biomass because parrotfish help to maintain coral dominated reefs even where reefs are stressed as is expected with climate change.

1.5 Other Documents Considered by the RSWG

A number of documents were briefly presented to the RSWG and or discussed by the RSWG. Time only allowed for brief discussion of each. Some will be discussed during the intersessional period. The documents presented and/or discussed included:

1 Petition for listing Queen Conch under the US Endangered Species Act and CRFM Response;
2 CLME Project Document (Second Phase – Implementation of Strategic Action Programme – Pilot Project on Reef/Lobster Fisheries) – identification of scientific/research priorities and proposed actions;
3 Review of Terms of Reference for CRFMC/OSPESCA/WECAFC/CRFM Working Groups on Queen Conch and Lobster and reports and recommendations of the respective Working Groups;
4 *A review of the methodologies used for monitoring and evaluation of the spiny lobster stocks in the WECAFC countries and the development of a common methodology*; this was supported by a brief summary by Nancie Cummings.

B. FISHERY REPORTS

2.1 The Bahamas Queen Conch (*Strombus gigas*) Fishery with implications for Belize and other fisheries of the region

Prepared by: Lester Gittens and John Hoenig

2.1.1 Management Objectives

There are no officially endorsed fisheries management objectives for The Bahamas. However, the fishery is managed with the intention of ensuring sustainability. This is done within the bounds of current policy which states that the commercial fishing industry, as far as is practical, is reserved for exploitation by Bahamian Nationals. Only commercial fishing vessels that are 100% Bahamian owned are considered Bahamian and allowed to fish within the exclusive economic zone.

2.1.2 Status of Stocks

The overall status of the fishery is not known. However, of the individual areas studied since 2009, some areas that have historically been heavily targeted have been shown to have low conch densities, while two non-targeted areas have higher densities. An assessment of stock status was not attempted during the current meeting. The focus was on developing meat weight conversion factors in compliance with CITES Decision 16.CC.

2.1.3 Management Advice

Conversion factors for more accurate reporting and comparison of trade data need to be implemented after further development over the next year. This includes evaluation of the use of conversion factors for use in The Bahamas and regional conversion factors. Important aspects of this include determining what acceptable levels of error in estimation are, and documenting the various forms in which conch is traded.

2.1.4 Statistics and Research Recommendations

Data Quality

Data utilized to determine queen conch conversion factors included individual measurements of queen conch meat weight cleaned to various stages utilized in trade by The Bahamas. These included total weight (including shell), meat weight after removal from the shell, meat weight for each level of cleaning for 50+ conch per fishing ground at four fishing grounds. Lip thickness was also measured. These data were collected as a part of a project aimed at conversion factor development. These data were adequate for preliminary estimates of conversion factors and assessments of the usability of the conversion factors.

Other conch data, including catch per unit effort, landings weight and export weight are collected routinely but are only mentioned here as they are not a part of the current analyses.

The possibility of using regional or sub-regional conversion factors needs to be further explored. This will require the collection of the appropriate data from additional fishing grounds.

2.1.5. Assessment Summary

Queen conch conversion factors were estimated for the conversion of exported meat weight to whole weight for four fishing grounds in The Bahamas and three fishing grounds in Belize (See Table 1).

Table 1: Estimated Queen Conch Conversion Factors for Selected Fishing Grounds in the Bahamas and Belize

Location	Conversion Factor
Bahamas North	16.7
Bahamas Central 1	12.5
Bahamas Central 2	13.2
Bahamas South	16.7
Belize 1	12.5
Belize 2	14.9
Belize 3	14.5

A Model I 1-way ANOVA was conducted to determine whether there was a significant difference in conversion factors between Bahamian fishing grounds. The results showed that a significant difference indeed existed. This suggests that each fishing ground should have its own conversion factor to maximize accuracy.

A sensitivity analysis was conducted to determine the maximum effect of using a conversion factor from one fishing ground in another fishing ground. The results showed that the resulting difference in estimated whole weight would be 1,133,976 kg for The Bahamas and 660,077 kg for Belize when a typical annual export amount from The Bahamas was used as a test value.

A review of the analyses by the plenary session suggested using mean values in the sensitivity analysis instead of maximum values.

2.1.6. Special Comments

While a significant difference in conversion factors was detected between fishing grounds in The Bahamas, further sensitivity analyses may still show that it is still acceptable to use conversion factors from one fishing ground for other fishing grounds. This largely depends on the magnitude of the error in the estimated whole weight compared to the amount of exports. For example, 1,133,976 kg (from above) is a large, and unacceptable error, if the total exported amount is 2,000,000 kg and much more acceptable if the exported amount is 100,000,000 kg.

2.1.7 Scientific Assessments

Description of the Bahamian Conch Fishery

Multiple queen conch fishing grounds exist in The Bahamas. These are located on the Great Bahama Bank and Little Bahama Bank. Collection is largely by hand by free diving. Compressed air in the form of hookah is also utilized. Vessels less than 20 ft in length are typically used in the conch fishery. In some instances these small vessels work in conjunction with a larger "mothership" vessel. Day vessels tend to land conch in the shell while vessels that make longer trips tend to land frozen conch meat only.

Based on landings weight and value, this fishery fluctuates between the second most important and third most important fishery in The Bahamas. Most landings occur during the four summer months when the lobster fishery is closed (April-July). Within these areas fishing for conch is primarily done by free diving with hand collection or with the aid of an air compressor outside of the summer.

A fisheries census conducted in 1995 showed that there were approximately 9,300 fulltime fishers and over 4,000 small boats and vessels. Of these fishers, the vast majority target spiny lobster but the proportion that target conch is unknown.

Overall Assessment Objectives

The overall objective was to explore the development of queen conch conversion factors for The Bahamas and Belize while ascertaining the feasibility of developing regional conversion factors for queen conch.

Data Used

Two hundred and sixty queen conch were sampled for various morphometric measurements in The Bahamas with approximately 50 conch sampled per fishing ground from 5 fishing grounds. One hundred and ninety five conch samples were collected in Belize from 4 areas. For the current analysis, only whole wet weight (including the shell and wet tissue) and exported weight were utilized. However, the data was also available for additional levels of cleaning for both countries for use in future analyses. Limiting the current analysis to whole weight and exported weight resulted in a total of 7 fishing grounds (4 Bahamas; 3 Belize) being included.

2.1.8 Scientific Assessments

Assessment 1

Objective

The specific objectives of the current analysis were to estimate conversion factors by area, determine whether the conversion factors differ significantly and evaluate the possibility of using regional conversion factors.

Method

Conversion factors for the conversion of exported weight to whole weight were estimated for each fishing ground by firstly dividing the whole weight of each conch by its fully cleaned weight (export weight). The mean of these individual conversion factors was then calculated per fishing ground.

The Bahamas' data was then analysed using a Model I ANOVA as data were collected from pre-selected fishing grounds. Belize's dataset was excluded from the ANOVA as it did not meet homogeneity of variance and normality assumptions necessary for ANOVA to be reliably utilized. This was even after multiple transformations were attempted.

A sensitivity analysis was conducted to ascertain the effect of using a fishing ground specific conversion factor in other fishing grounds. This involved applying the various area specific conversion factors calculated during the present study to a typical export amount for The Bahamas.

Results

Conch is exported from The Bahamas in a fully cleaned state, i.e. only white muscle tissue remains (Figure 1). The level of “cleaning” for exported conch varies from country to country with portions of the mantle or skin remaining intact in some instances.

Figure 1: Fully "Cleaned" Conch in The Bahamas

Conversion factors for conch cleaned to export level varied between 16.7-12.5 for four fishing grounds in The Bahamas (Table 2). The differences were significant ($p < 0.000$) (Table 3). Post Hoc analyses were not completed as specifying which fishing grounds differed from other fishing grounds was not important. In Belize conversion factors varied between 12.5 and 14.9 for conch from three areas (Table 2). Data for other levels of cleaning were available for both countries but not analyzed due to time constraints.

Table 2: Estimated Queen Conch Conversion Factors for Selected Fishing Grounds in The Bahamas and Belize

Location	Conversion Factor
Bahamas North	16.7
Bahamas Central 1	12.5
Bahamas Central 2	13.2
Bahamas South	16.7
Belize 1	12.5
Belize 2	14.9
Belize 3	14.5

Table 3: Results of 1-Way ANOVA For Bahamas Queen Conch Conversion Factors

Tests of Between-Subjects Effects

Dependent Variable: RecFWR

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	482.066[a]	3	160.689	12.222	.000
Intercept	55312.725	1	55312.725	4206.978	.000
Location	482.066	3	160.689	12.222	.000
Error	2669.014	203	13.148		
Total	58554.525	207			
Corrected Total	3151.080	206			

During a sensitivity analysis, the conversion factors in Table 2 were used to convert a typical annual export amount from The Bahamas to whole weight. This showed that a maximum difference in estimated weight of 1,133,979 kg resulted within The Bahamas depending on the conversion factor used, i.e. the difference in estimated weight resulting from the use of conversion factor 16.7 verses 12.5 was 1,133,979. Hence, if a conversion factor from one fishing ground is applied to conch from a different fishing ground, the maximum error in estimation would be approximately 1,133,979 kg for a typical export amount in The Bahamas. Based on the same methodology, but using an export amount from The Bahamas, the maximum error would have been 660,077 kg in Belize and 1,133,979 kg if Belize and The Bahamas were considered together. While this was the sensitivity analysis carried out, the advice after a review during the plenary session suggested using a mean conversion factor during a sensitivity analysis. This approach will be adopted in future.

Discussion

The results suggest that conversion factors for the estimation of whole weight from exported weight differ significantly by fishing ground within The Bahamas. Despite this, these differences may be acceptable when the resulting estimates of whole weight are compared to the magnitude of exports as a percentage. An acceptable level of difference between true whole weight and estimated whole weight (from conversion factors) needs to be determined. Further to this point, it is understood that conversion factors are intended to estimate whole weight. This implies a degree of acceptable error.

Two levels of consideration are in effect for The Bahamas when ascertaining suitability of conversion factors. Firstly, would a single conversion factor be appropriate for the entire Bahamas? Secondly, would a regional conversion factor be appropriate? The answers to these partly rely on what will be considered an acceptable level of error as described above. Utilizing a regional conversion factor has an added level of difficulty. This is because conch is not necessarily cleaned in the same way in each country, for example, conch exported from The Bahamas has only pure white muscle remaining whereas some other countries may export conch with pieces of the mantle remaining. This can result in major differences in conversion factors between countries. Nevertheless, the level of acceptable error still needs to be considered and this consideration also needs to take into account the acceptability of alternatives such as the 7.5 conversion factor currently utilized for queen conch by the FAO or the alternative of simply reporting the weight of conch traded, regardless of cleaning level. The fact that the previously mentioned CITES Decision has been made indicates that conversion factors must be used. Further evaluation of conversion factors for The Bahamas, Belize and the rest of the Caribbean is needed.

2.2 Anguilla Reef and Slope Fisheries

Prepared by: Remone Johnson and Nancie Cummings

A. Introduction

The Anguilla representative provided an updated collection of landings data categorized by landing site, fishing method, and landed species. This data was also analyzed at the Ninth CRFM scientific meeting but have since been reformatted to achieve more detailed analysis of Anguilla's landings. The landings information was analyzed by the RSWG for the Tenth CRFM scientific meeting. The RSWG summarized data on total number of trips by year and fishing site, number of trips by fishing method (gear) and year, number of trips by species group and fishing method, number of trips by gear and fishing site. The working group previous year's recommendation to include calculated mean landing weight per trip for the species groups was addressed to the extent possible.

B. Technical Analysis Summary

Summary of Anguilla Fishery Data 2009 – 2013

Data were available for 2009 through 2013. The majority of the landings were observed at three main landing sites, Island Harbour, Cove Bay, and Sandy Ground (Table 1, Figure 1). These sites serve as the base for most of the commercial fishing. There were very few observed trips for Blowing Point, Sile Bay, and Crocus Bay, these sites serve as the primary base for subsistence fishing. There is limited sampling at the Sile Bay landing site due to its remote location.

For the observed trip data, the primary fishing methods were traps (60%), handlines (11%), purse seines (10%), and scuba (10%) (Tables 2, 3 and Figure 2).

In terms of observed landings, mixed reef fish was the main target species and occurred in over fifty percent of the total trips, followed by Caribbean spiny lobster (17%), Round Scad (12%), Snapper (11.2%), Queen Conchs (10.4%), Large Pelagic (5.7%), Spotted spiny lobster (2%), and Grouper (0.3%). Even though only 12% of the total observed trips targeted Scad, some 37,000 pounds of Round Scad were landed from 2009-2013 with a mean landed weight of just over 500 pounds per trip (Table 4).

Table 4 presents the distribution of landed weight for all observed species groups in the Anguilla fisheries 2009-2013. On a relative scale of catch per unit, measured as mean nominal landed weight per trip, the dominant species for all gears combined were round Scad (512 lbs. per trip), grouper unclassified (102 lbs. per trip), large pelagic (72 lbs. per trip) and snapper unclassified (51 lbs. per trip). The mean landings per trip for Round Scad have increased from just over 400 pounds to about 700 pounds in 2013.

The main fishing methods used by the Anguilla fishing industry are traps (mixed reef fish, lobster, snapper, and grouper), Handlines (Mixed reef fish, snapper, Large Pelagics,), SCUBA (Queen Conch) and seines (Round Scad) (Table 5). Speargun (mixed reef fish) and snorkeling or skin-diving (Queen conch) are also used but to a lesser extent. This distribution of observed landings supports the further sampling of these primary fleets (traps, handlines, purse seines, droplines) for more detailed information on the catch of these species groups. It is further noted that the dropline gear is referred to as a vertical longline by the Anguilla fishers.

2.2.1 Management Objectives: Anguilla

Anguilla's fisheries were primarily artisanal; managers would like to focus more on increasing fishing effort in the deeper waters off the coast targeting the pelagic resources (CRFM, 2013).

2.2.2 Status of Stock
The status of the Anguilla reef and slope species is currently unknown.

2.2.3 Management Advice
Although the status of the reef and slope fish stocks was currently unknown, managers wished to ensure that future fish catches did not decline and wished to improve fish stock status as far as possible, so that fishers can maintain a livelihood from the industry (CRFM, 2013).

2.2.4 Statistics and Research Recommendations
Several tasks were identified during the RSWG working session which, if completed during the 2014/2015 inter-sessional period, should improve the data quality significantly and the management advice generated from analyses of these data.

The RWSG recommends that going forward Anguilla prioritize collection of species specific data to facilitate greater analysis of the fishing industry.

<u>Data set management and information collected</u>
Standard quality control and quality assurance procedures should be implemented to insure that all data entry errors are eliminated.
Database managers and fishery officers should be familiarized and trained in the use of standard database programs (e.g., ACCESS, SAS, etc.) and familiar in the use of frequently used computer summarization software (e.g., MS Excel, R, SAS,SPSS).
Detailed information on species identity should be recorded for groups that are currently being aggregated (e.g., snapper, mixed reef fish, large Pelagics)
The present data collection forms have been modified to capture discards, spatial area of catch, quantity and type of gear used, but this data need to be computerized into an easy to analyze dataset or combined with the present catch and effort dataset.
The present data collection system should be developed further to account for catches from IUU fishing.
Efforts should be taken to begin the collection of biological data (e.g., lengths, maturity samples, age samples) for primary species observed in the landings (e.g., round Scad for purse seines and other dominant species that occur in the landings)

As recommended at the ninth CRFM scientific meeting, Anguilla should also develop protocols to improve the timeliness of landings data availability from fishers who may not be accessible during normal working hours.

3. References

CRFM. 2013. Report of Ninth Annual CRFM Scientific Meeting – Kingstown, St. Vincent and the Grenadines, 10-14 June 2013. *CRFM Fishery Report - 2013*. Volume 1. 85p.

Table 1: Number of observed fishing trips by year and landing site.

	Fishing Site							
Year	Blowing point	Cove Bay	Crocus Bay	Island Harbour	Sandy Ground	Sile Bay	Total Number Observed Trips	Percent of Total Observed Trips
2009	8	45	0	46	30	0	129	19.1
2010	2	33	0	78	67	1	181	26.8
2011	3	58	1	100	38	0	200	29.6
2012	3	43	7	41	17	0	111	16.4
2013	0	23	1	24	7	0	55	8.1
Total	16	202	9	289	159	1	676	

Table 2: Number of Observed fishing trips by gear and year.

Gear	2009	2010	2011	2012	2013	Total Number Observed Trips	Percent of Total Observed Trips
Drop lines	2	1	11	0	1	15	2.22
Handlines	21	15	25	7	6	74	10.95
Purse Seine	2	2	26	37	5	72	10.65
Scuba	12	17	17	15	8	69	10.21
Scuba & Speargun	0	0	1	0	0	1	0.15
Snorkel & Hand	0	0	0	1	0	1	0.15
Speargun	0	3	3	0	5	11	1.63
Traps	79	134	112	51	30	406	60.06
Traps & Handlines	7	3	0	0	0	10	1.48
Traps/Trolling	0	1	0	0	0	1	0.15
Trolling	6	5	5	0	0	16	2.37

Table 3: Number of observed fishing trips by fishing method and landing site 2009-2012.

Gear	Blowing Point	Cove Bay	Crocus Bay	Island Harbour	Sandy Ground	Sile Bay	Total Number Observed Trips	Percent of Total Observed Trips
Drop lines	0	0	0	14	1	0	15	2.2
Handlines	0	1	0	0	0	0	1	0.1
Handlines	4	10	2	44	15	0	75	11.1
Net	0	0	0	2	0	0	2	0.3
Purse Seine	0	0	4	58	8	0	70	10.3
Scuba	5	15	0	1	31	0	52	7.7
Scuba & Speargun	0	0	0	0	1	0	1	0.1

Snorkel & Hand	0	0	0	1	0	0	1	0.1
Speargun	0	0	0	7	4	0	11	1.6
Tanks	0	0	0	0	17	0	17	2.5
Traps	0	5	0	0	0	0	5	0.7
Traps	8	167	3	144	78	1	401	59.1
Traps & Handlines	0	4	0	2	4	0	10	1.5
Traps/Trolling	1	0	0	0	0	0	1	0.1
Trolling	0	0	0	16	0	0	16	2.4

Table 4: Number trips, proportion of all trips, landed weight and mean weight per sampled trip all years combined.

Species Group	**Total Number Observed Trips**	**Percent of Total Observed Trips**	**Landed Weight (Lbs.)**	**Mean Weight Per Trip (Lbs.)**
Mixed reef fish	323	54	13,000.81	40.25
Caribbean spiny lobster	104	17.4	3,764.27	36.19
Round Scad	72	12	36,857.96	511.92
Snapper	67	11.2	3,453.42	51.54
Queen conch	62	10.4	3,165.54	51.06
Large Pelagic	34	5.7	2,436.18	71.65
Spotted spiny lobster	12	2	258.54	21.55
Unspecified Species	2	0.3	NA	NA
Grouper	2	0.3	204.11	102.06

Table 5. Mean landed weight per trip by year and species group for all trips combined

	Species/Group							
Year	Caribbean spiny lobster	Grouper	Large Pelagic	Mixed reef fish	Queen conch	Round Scad	Snapper	Spotted spiny lobster
2009	35.11	NA	87.06	31.22	32.88	442.24	33.25	10.58
2010	36.40	113.40	69.33	36.30	43.14	454.71	38.13	36.29
2011	33.62	90.72	19.05	40.89	65.98	489.17	75.25	17.58
2012	32.59	NA	112.26	51.37	63.57	511.64	42.33	NA
2013	50.65	NA	74.84	55.24	55.28	705.77	57.83	11.34

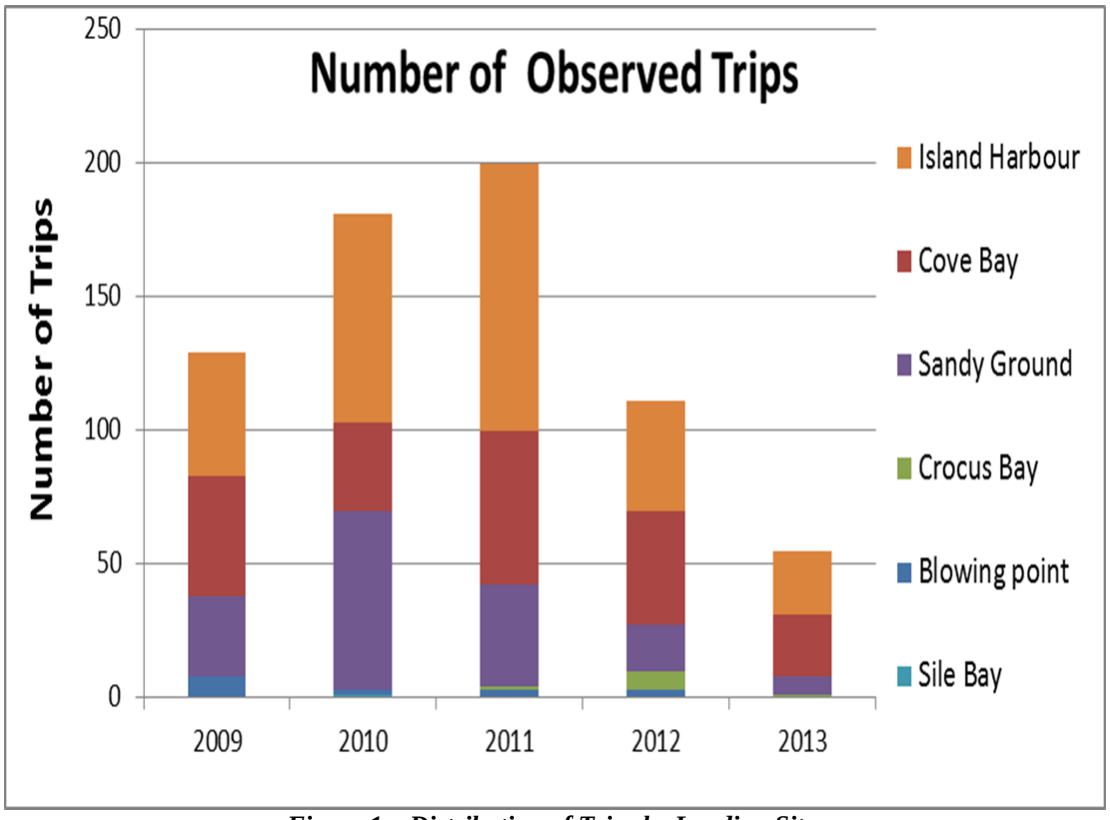


Figure 1. Distribution of Trips by Landing Site.

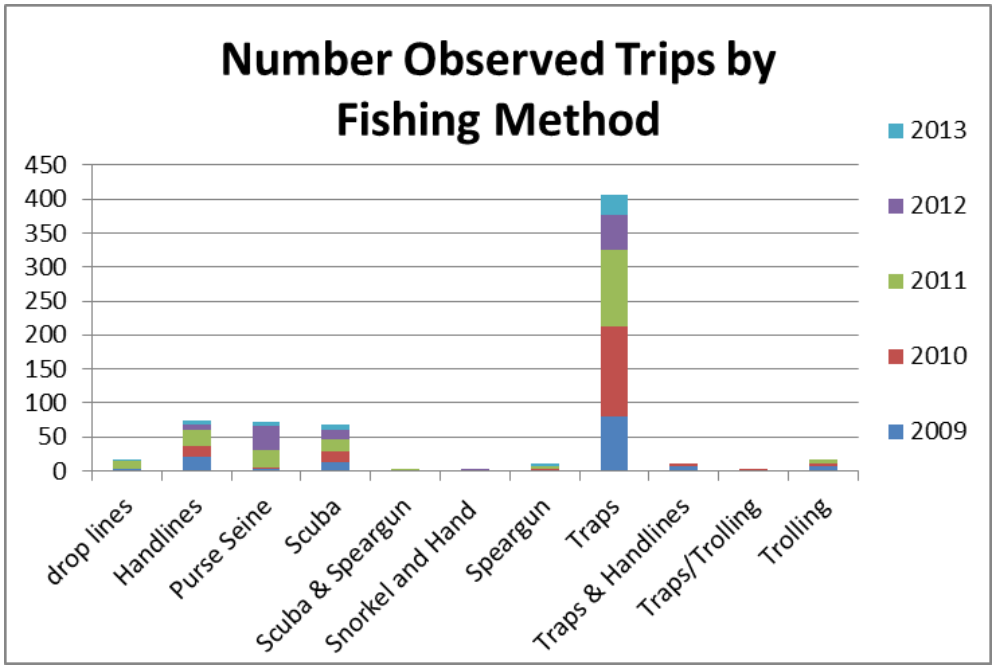


Figure 2. Number Observed Trips by Fishing Method.

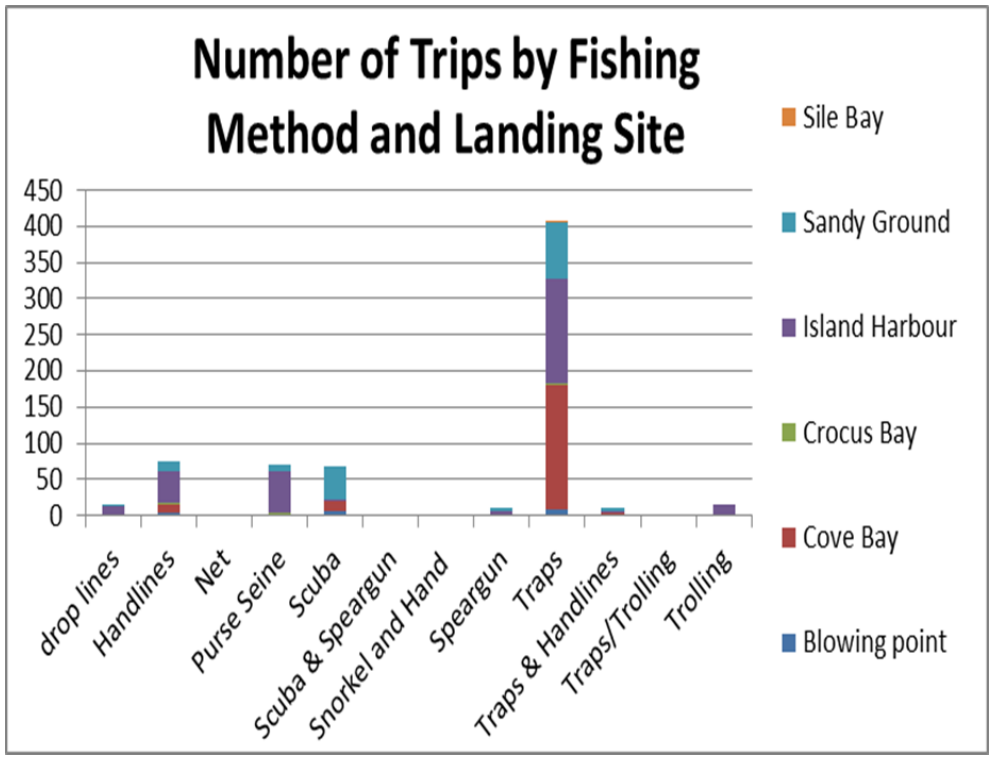


Figure 3. Distribution of Trips by Fishing Method and Landing Site

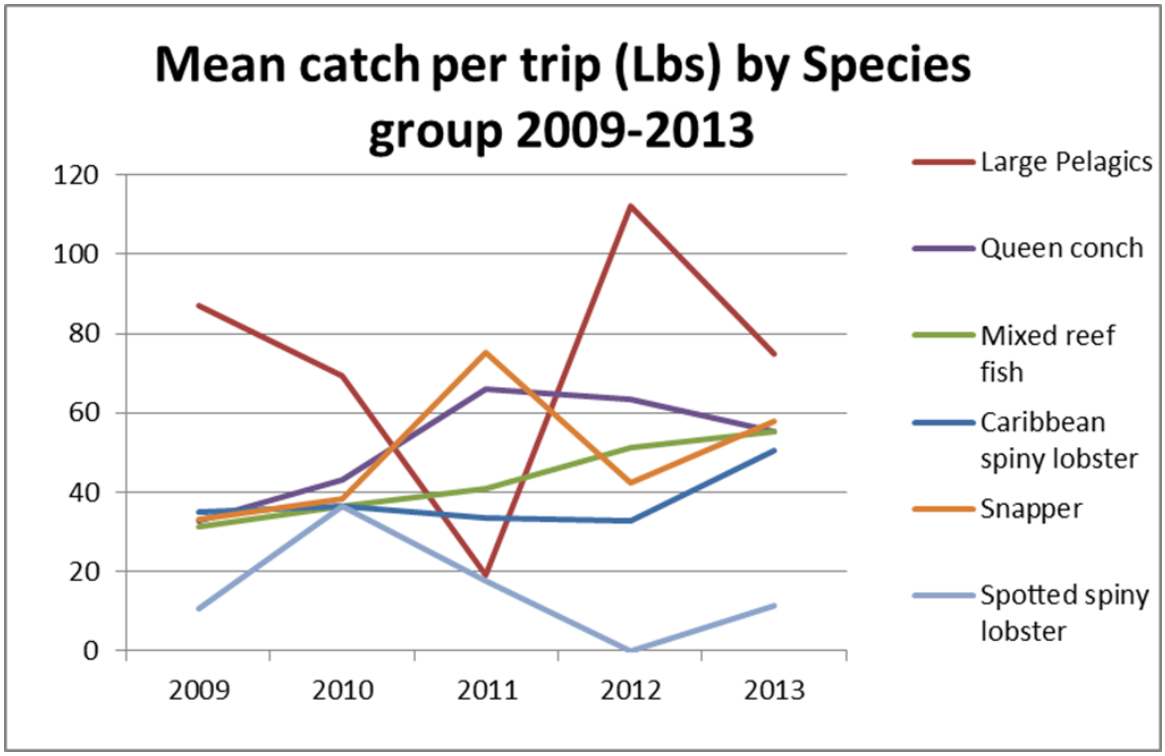


Figure 4. Mean catch per trip (Lbs.) by species group 2009-2013.

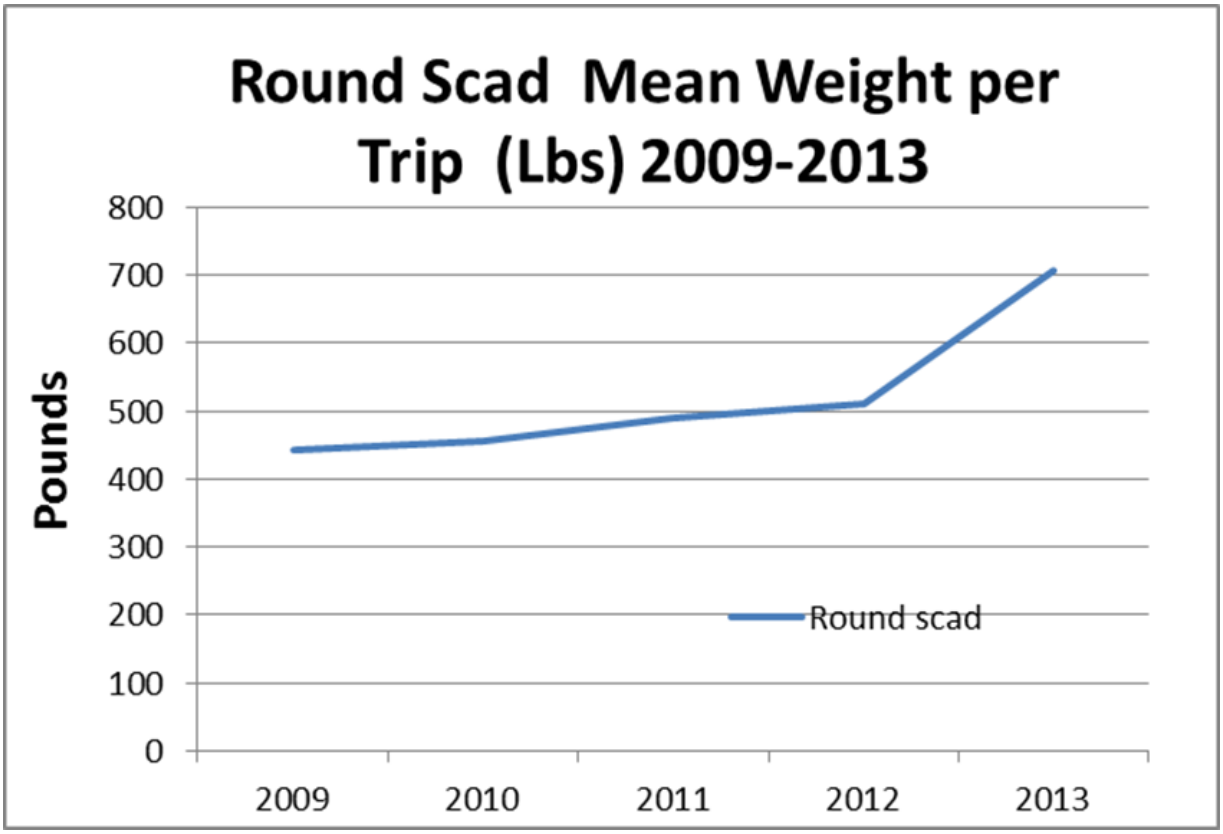


Figure 5: Round Scad Mean Weight per Trip (Lbs) 2009-2013

2.3 Population Dynamics of the Mutton Snapper (*Lutjanus analis*) Stock from the Gladden Spit Spawning Aggregation Site (Belize)

Prepared by: Ramon Carcamo and John Hoenig

2.3.1 Management Objectives

There is no formal management plan for the finfish fishery (mutton snapper) of Belize. However, the objectives of the Fisheries Department are to manage sustainably the fishery for its conservation, protection and responsible use. At the initiative of the Fisheries Department, the Gladden Spit Spawning Aggregation Site is monitored and catch landings and biological data of the Mutton snapper are obtained annually.

2.3.2 Status of Stocks

According to Graham *et al.* (2008) the mutton snapper landings at Gladden Spit declined from 2000 to 2002; they recommended that a precautionary management approach should be implemented at the site. Also Granados *et al*. (2013) argue that the total landings of the mutton snapper from Gladden Spit have decreased since the 1980s due to decrease in fishing effort caused by the rise of the tourism industry. This study provides additional information that may be used to inform managers about the current status of mutton snapper at Gladden Spit. The present study indicates that there is high variability in the mean lengths obtained over the study period. Also the present study estimated the growth parameters (Linf, K and Tzero), which were used to estimate the instantaneous total mortality (Z) to be at 0.52 yr^{-1}, hence the stock suffered a constant mortality of 41.1 % per year and 58.8 % of the stock survived for the next spawning season. Therefore, it is recommended that a catch quota and size limit should immediately be implemented to control the fishing effort applied on the stock.

2.3.3 Management Advice

Although Gladden Spit is one of the 11 spawning aggregation sites that were declared as marine protected areas, fishing has continued at the site. Also recognizing that fishing culture and tradition should be maintained, fishing at the site should be managed with effective management measures so as to maintain the integrity of the spawning site. It is recommended that measures to reduce fishing effort and options to maintain (or improve) the reproductive and recruitment process of the stock be considered. It is also recommended to continue the monitoring of the fishing activities at the site and to develop an awareness campaign to educate the general public of the importance of the spawning site.

2.3.4 Statistics and Research Recommendations

Data Quality

The Belize Fisheries Department has annually sought resources and personnel to be used to gather the data from the landing site (Button Wood Caye). The Department has also collaborated with other NGOs to join efforts to gather data from each fisher that fish at the site.

After careful examination of the dataset, it was noticed that the use of Excel spreadsheets is not adequate to continue to manage the mutton snapper data set. Therefore, the data will need to be hosted in an Access database so as to maintain good quality of data. Through the use of a data base to manage sample observations, future evaluations and assessment on how to improve sampling would result in more efficient (or optimal) set of fishery statistics for use in management advice.

Research

It would be important to conduct further analysis of the data set to quantify fishing effort and calculate (L_c) so as to recommend size of hook to be used in order to conserve some of the mega spawners.

2.3.5 Stock Assessment Summary

The length and weight dataset was used to determine the Length-Weight relationship of the mutton snapper, which resulted as W = 0.0438L^2.8012. The length frequency data set was evaluated using the LFDA software to determine von Bertalanffy growth parameters for the mutton snapper stock. The LFDA software applies two different methods (SLCA & ELEFAN) to determine or derive an estimate of the growth parameters, however the results of SLCA was selected. The SLCA method resulted with a K= 0.148, Linf = 91.13 and Tzero = -0.631. Then the growth parameters were used to construct a length based catch curve to determine the instantaneous total mortality (Z), which was estimated to be 0.52 yr^{-1}. The natural mortality was estimated with the use of the equation M = 4.118*K^.73 * Linf^(-.33) developed by Then *et al*. (2014) and fishing mortality was then calculated as Z = M + F. The values for M and F were estimated as M = 0.23 and F = 0.30.

2.3.6 Special Comments

The data set contained other kinds of data such as sex, gonad stage and Catch Per Unit Effort (CPUE) data that was not reviewed or analyzed due to time limitation. However, it is intended to conduct further analysis so as to understand the dynamics of the mutton snapper stock.

2.3.7 Policy Summary

The Belize Fisheries Department is committed to the conservation, protection and sustainable use of the aquatic resources of Belize. The Fisheries Department has been involved in conducting basic research, education awareness, marine environmental monitoring, policy development, marine reserves management and enforcement of the Fisheries Regulations.

In 2002, the Government of Belize closed 11 spawning aggregation sites and prohibited fishing at the sites, with the exception of Gladden Spit Spawning Aggregation. It has been the policy of the Department to allow traditional fishers to fish at Gladden Spit to capture Mutton snappers during the full moons of April, May and June of the year. However, the fishers are required to provide the catch and biological data to the Department.

2.3.8 Scientific Assessments

Background of the Mutton Snapper Fishery

Mutton snappers (*Lutjanus analis*) have been found abundant along the reef of Belize especially at spawning aggregation sites. For many decades, Mutton snappers have been fished from the Gladden Spit Spawning Aggregation without any management regime. However, in 2002 the Fisheries Department declared 11 spawning aggregation sites as protected areas. Therefore, fishing at the spawning aggregation sites was banned with the exception of four sites. Gladden Spit Spawning Aggregation Site has been one of the sites where fishing has been allowed.

The mutton snapper is usually caught utilizing hand lines. It has been reported that the Mutton snapper exhibits high site-fidelity, spawning at exactly the same location and on the same days of the lunar calendar year after year (Domeier *et al*., 1996). As with groupers, snappers begin to arrive at the spawning site approximately one week prior to the peak spawning activity and linger at the site after spawning for another week (Domeier *et al*., 1996). The spawning aggregations at Gladden Spit have been observed to occur usually a few days before and during the full moon in April, May, June and September of each year. It has been reported that the full moon of May is when the highest abundance of Mutton snapper is observed (Leslies, pers. comm.).

Since 1999 the Belize Fisheries Department has been monitoring the fishing activities at Gladden Spit Site and biological and catch data have been gathered from the fishers that fish at the site. The data are normally gathered around the full moon of April, May and June of each year. The data are obtained from

commercial fishers that temporarily land their catch at Button Wood Caye, which is an island near the site.

Overall Assessment Objectives

The Belize Fisheries Department has been monitoring the fishing activities at Gladden Spit Site with the general objective to ensure the sustainability of the stock and contribute to the welfare of fishers from Placencia Village, Monkey River Village and Mango Creek Village.

Table 1: Description of the mutton snapper (1999-2014)

Name	Description
Mutton snapper biological and catch landings.	CPUE and morphometric data collected from 1999- 2014 from Gladden Spit Spawning Aggregation Site.

Assessment

Objective

General management objectives used to guide the 2014 analysis include:

1. To determine the growth parameters (Linf, K and Tzero) of the mutton snapper stock.
2. To determine the age structure of the population.
3. To determine the Length –Weight relationship of the mutton snapper.
4. To estimate the Total mortality (Z) and the natural mortality rate (M) of the mutton snapper stock.

Method/Models/Data

Mutton snapper specimens were obtained from intensive field samplings, conducted from April 1999 to June 2014 at Button Wood Caye. The activities were concentrated between April and June of each year. The samples were obtained from commercial fishing vessels that would temporarily land the fishes at **Button Wood Island** for partial possessing. The samples were collected opportunistically having no regard to sex, size and quantity. The samples were measured for fork length (FL, cm), weighed to the nearest 0.01 Kg, sexed by removing the gonads and examining and also *determining* the development stage for each fish from the color, size and shape.

Body-size relationships between length measures and weight were characterized by nonlinear least squares regression. The parameters **a** and **b** of the length-weight relationship of the species were estimated with the use of R statistical software and specific R scripts. The relationship was established with the use of the equation described below.

$W = a L^b$

In order to verify if the calculated **b** was significantly different from 3, the Student's t-test was employed. Normality of the **b** distribution was also tested through symmetry and kurtosis analyses.

The LFDA software developed by Fisheries Management Science Program (FMSP, 2001) was used to estimate growth parameters for the mutton snapper stock. The LFDA contained two methods that were used, which were Shepherd's Length Composition Analysis and Electronic Length Frequency Analysis (ELEFAN).

The first method used was the Shepherd's Length Composition Analysis (SLCA) method, which compares the observed length-frequency distribution with a length frequency distribution that would be

expected for given values of the Von Bertalanffy growth parameters. A goodness of fit score was then calculated using a certain test function. Large positive score values indicated that the expected length-frequency distribution matches with the observed data.

The second method used was the ELEFAN method, which restructures the length frequency data with emphasis on the peaks and troughs in the data and calculates a score function as a function of the proportion of available peaks and troughs that can be explained by a Von Bertalanffy growth curve with specific parameters.

The K, Tzero and Linf values obtained from the SLCA and ELEFAN methods were used to populate Von Bertalanffy equation to estimate the age structure of stock. Then the standard length- based catch curve method was used to estimate the instantaneous rate of total mortality (Z) (Pauly, 1984).
$\log_e N = a + bt.$

Results

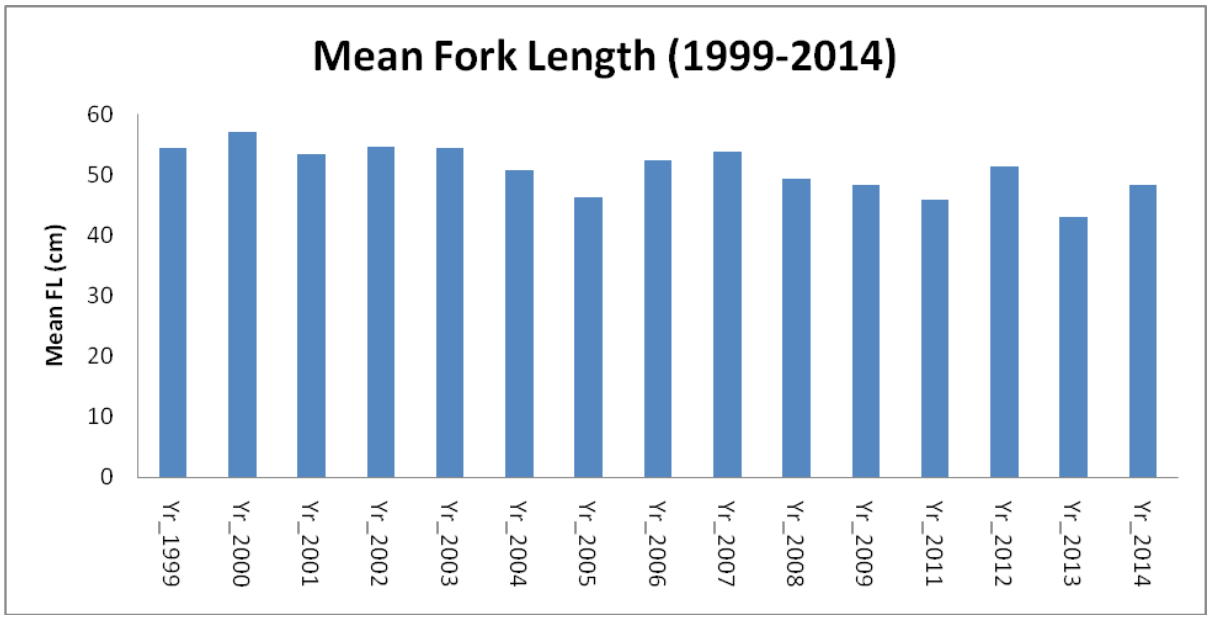


Figure 1: Mean fork length per year (1999-2014)

It was observed that the mean fork length of the fish samples taken between 1999 – 2014 varied significantly from 43.06 cm to 57.13 cm ($F_{(14,17449)} = 197.8$, $P < 0.05$) (Figure 1).

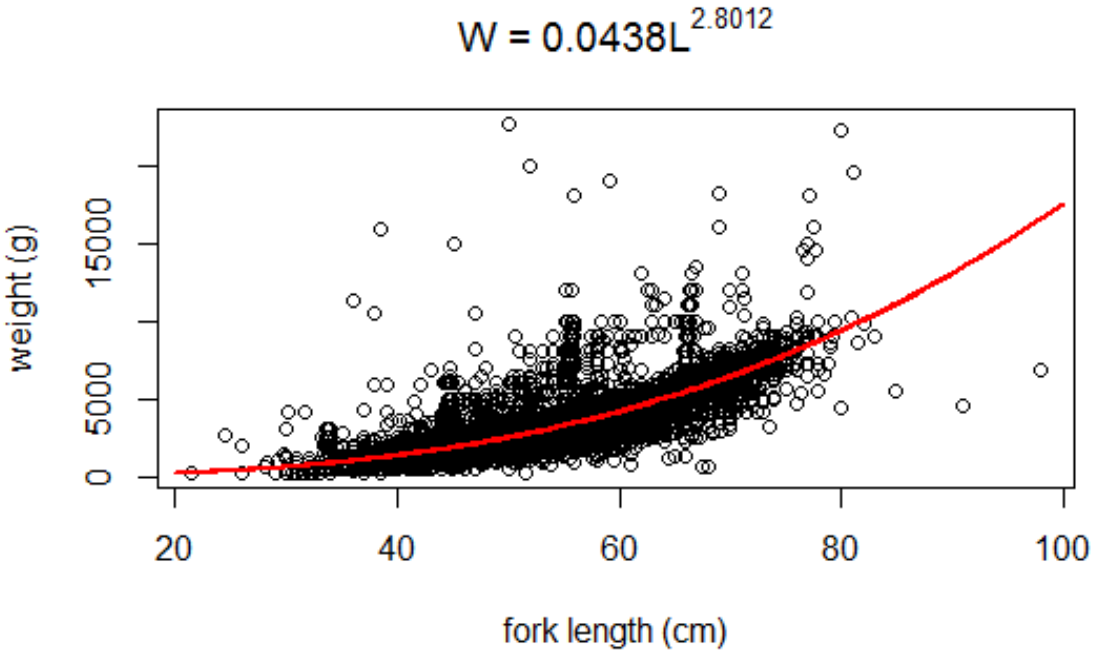


Figure 2: Length-Weight Relationship of the Mutton snapper sampled.

The length-weight relationship was established and the **a** and **b** values of the relationship were determined to be 0.0438 and 2.8012 respectively (Figure 2).

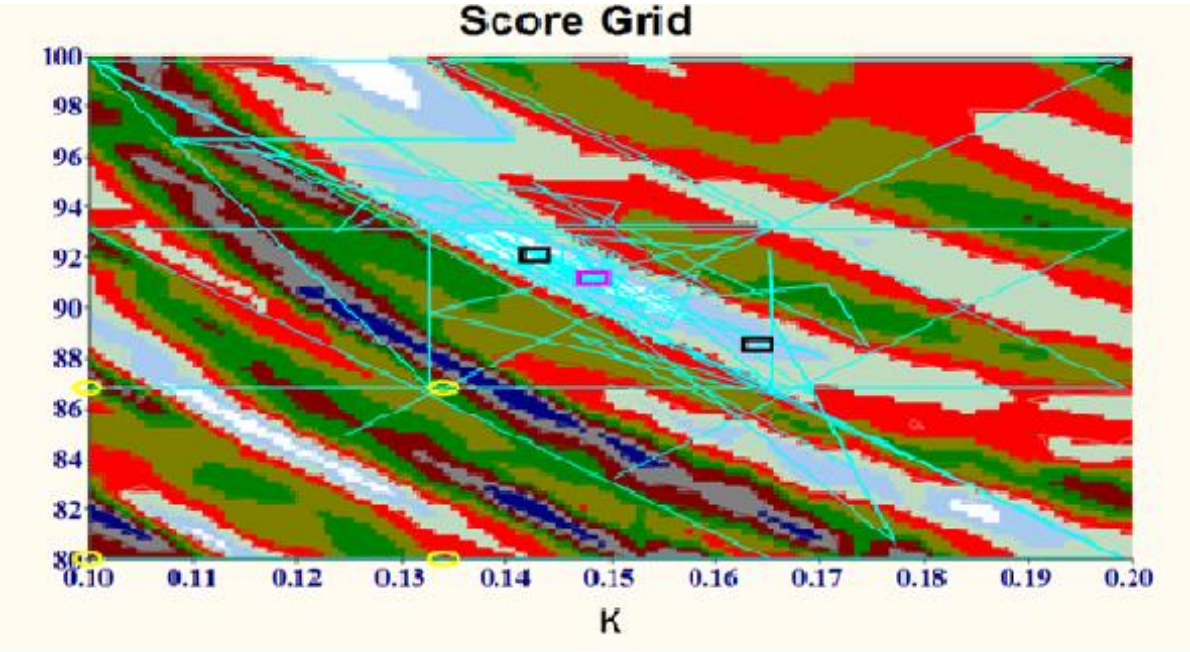


Figure 3: Maximization of the Shepherd's Length Composition Analysis.

The SLCA initially resulted with K = 0.11, Linf = 85.71, Tzero = -0.331 and Score = 39.091. Then the first maximization analysis resulted with K =0.148, Linf = 91.13 and Tzero = -0.631. The second maximization resulted with K = 0.148, Linf = 91.13 and Tzero = -0.631(Figure 3).

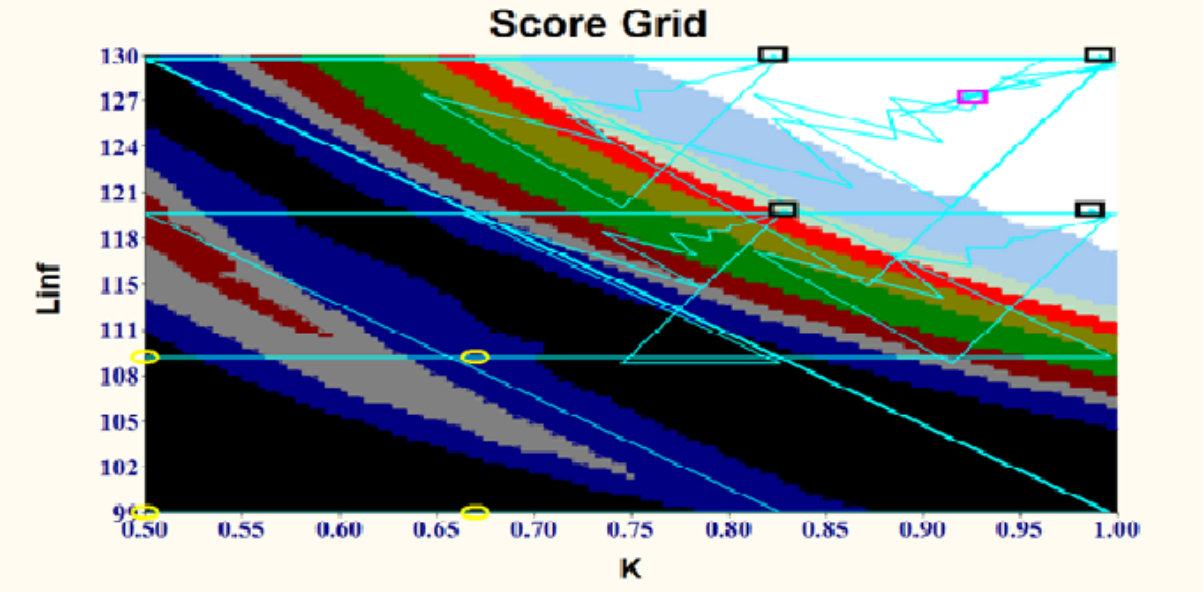


Figure 4: Maximization of the ELEFAN method.

The ELEFAN analysis initially resulted with K = 1, Linf = 123.57, Tzero = -0.52 and Score = 0.693. Then the first maximization analysis resulted with K =0.95,, Linf = 126.74 and Tzero = -0.53. The second maximization resulted with K = 0.926, Linf = 127.115 and Tzero = -0.54 (Figure 4).

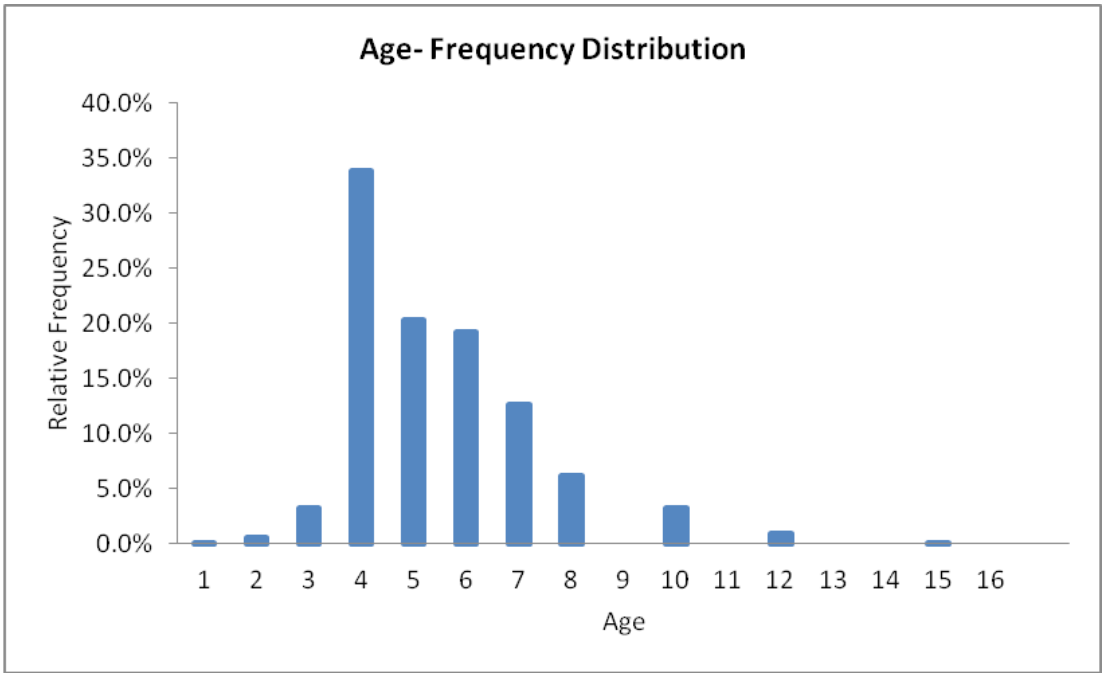


Figure 5: The age frequency distribution of the mutton snapper (1999-2014)

The estimated age frequency distribution indicated that 33.9% of the samples were age 4 , 20.3% were age5 19.2 % were age 6 , 12.6% were age 7 and 6.1% were age 8 (Figure 5).

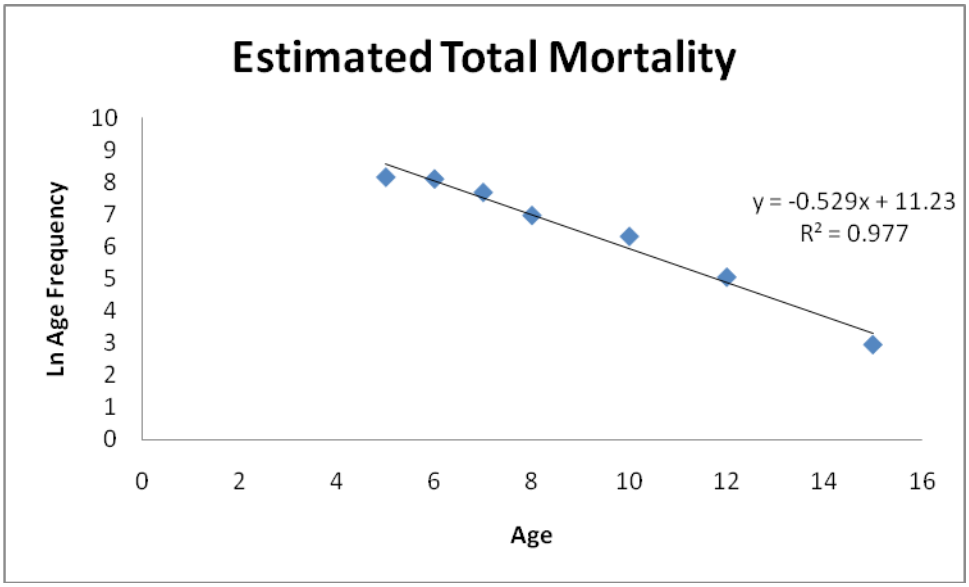


Figure 6: Instantaneous Total Mortality (Z) for the Mutton snapper stock.

The Length-based catch curve analysis resulted with Z = 0.5298. Natural mortality was calculated as M = 0.23 yr^{-1} using the equation of Then *et al.* (2014) ($M = 4.118\ K^{0.73}\ Linf^{-0.33}$.)

Using the Z = F + M equation, the fishing mortality was estimated to be 0.30 yr^{-1}.
Equations: survival (%) = 100 exp (-Z) & mortality (%) = 100(1-exp (-Z) to determine percentage of survival (41.1 %) and mortality (58.8 %).

Discussion

The mutton snapper has been an important commercial finfish species in Belize; one of the management interventions undertaken by the Belize Fisheries Department was to declare 11 spawning aggregation areas as marine protected areas with the objective to protect the reproductive activities of many finfish species. The promontory at the Gladden Spit Marine Reserve is an area where the mutton snapper species aggregate on an annual basis during the full moon of April, May and June.

According to Graham *et al*. (2008) the median length showed a slight decline during the study period. However, the present study showed that the mean length of mutton snapper stock varied from 43.06 cm to 57.13, however no significant declining trend was observed. Munro *et. al* (1973) have indicated that the species matures at 50 cm TL being at 5 years. In order to determine the relationship between gonad stage and fork length, it is recommended to conduct an analysis of the gonad stages obtained from the samples.

The length-weight relationship (W = 0.0438L^2.8012) suggests that the mutton snappers have become lighter for its length as it grows. This could be due to gonadal maturation or changes in feeding intensity. However, gonadosomatic analysis is recommended in order to further understand the reproductive dynamics of the stock.

According to Burton (2001) the growth parameters for the Mutton snapper studied in Florida was Linf = 86.9 and K = 0.16, while Pozo (1978) reported that in Cuba the growth parameters were Linf = 80.8 and K = 0.12. The results from this study found K= 0.148, Linf = 91.13 and Tzero = -0.631 for the study period 1999-2014.

The length based catch curve analysis resulted with Z = 0.52, M = 0.23 and F = 0.30 and it was estimated, hence, the stock experienced a total annual mortality of 41.1 % per year and 58.8 % of the stock survived for the next spawning season.

It is recommended that monitoring should continue and other management measures should be implemented (size limit, bag limit and etc). Also other kinds of analyses should be conducted to further understand the dynamics of the mutton snapper at the Gladden Spit spawning site.

2.3.9 References

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2.4 Turks and Caicos Islands Report of Queen Conch Data Analysis

Prepared by: Luc Clerveaux, John Hoenig and Nancie Cummings

The queen conch fishery is the second most valuable fishery in the Turks and Caicos Islands, and has been sustainably harvested in TCI's coastal waters for decades. Catch and effort data for the queen conch fishery have been collected by the fishery department since 1974. Fishery independent surveys in the form of visual surveys are carried out periodically. Stock assessments using production models as the primary stock evaluation model have been conducted annually.

The catch and effort data were analyzed using the ASPIC software for production modeling (Prager 1994), and the following results were obtained.

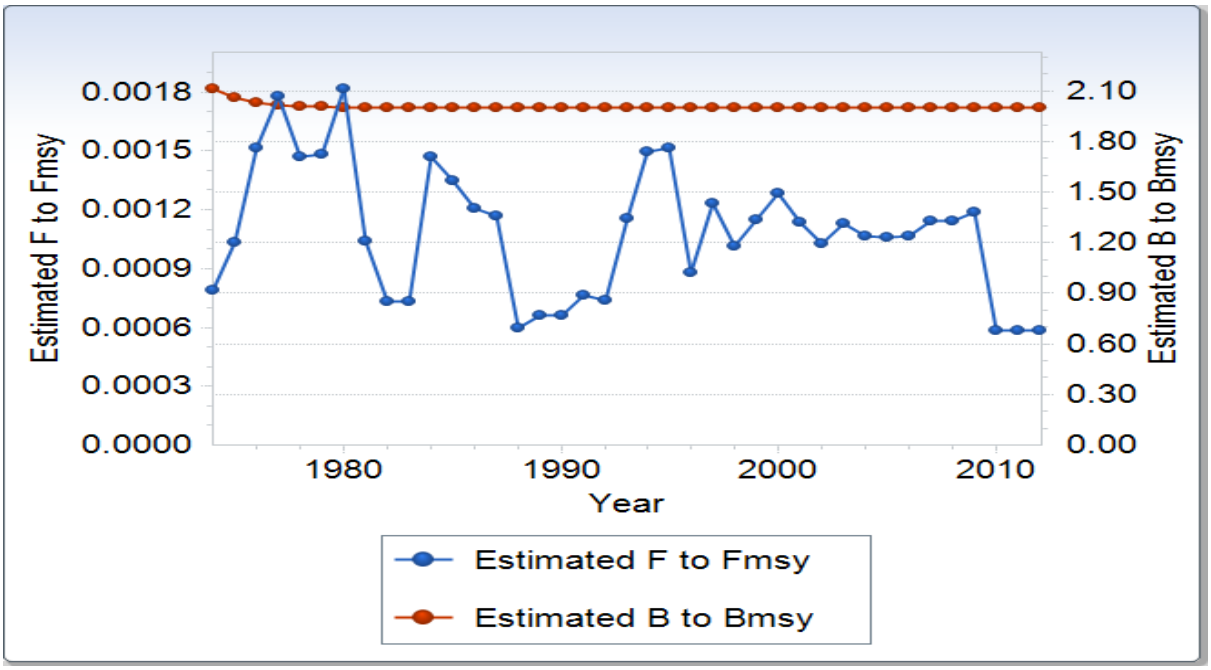

Figure 1. Production model for the Turks and Caicos conch population, 1974-2012, fitted with the ASPIC software. The estimated trajectory of the ratio of fishing mortality to fishing mortality at maximum sustainable yield (F/MSY) is shown in blue and the trajectory of biomass relative to BMSY is shown in red.

The resulting estimates of MSY are much lower than those obtained in previous analyses for this stock. Figure 2 clearly indicates the model is not fitting well, as a strong residual pattern exists.

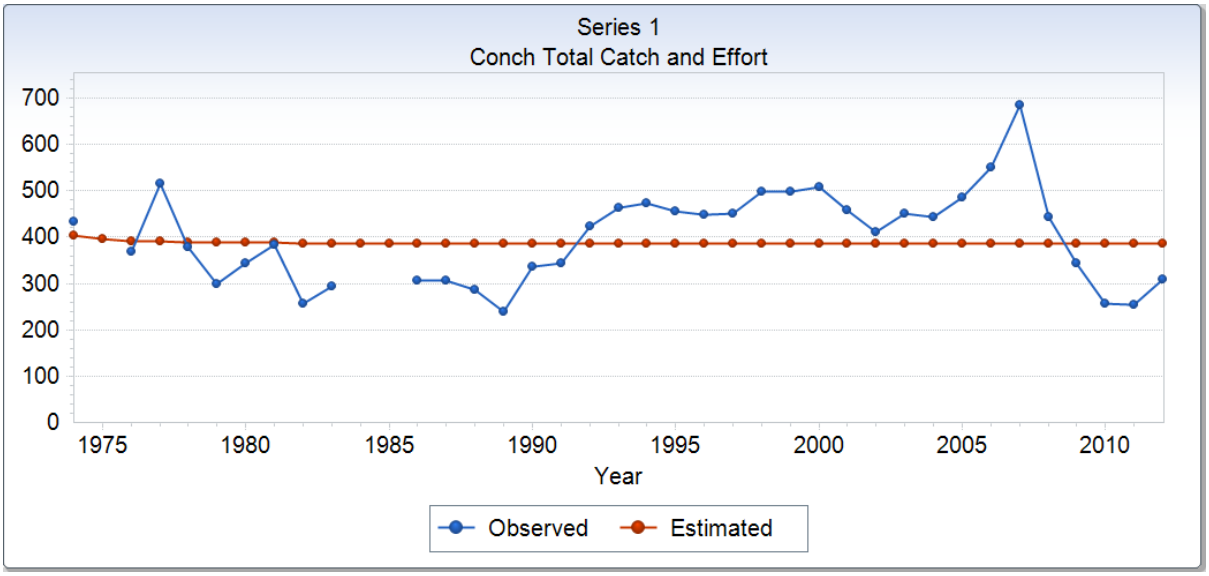

Figure 2: ASPIC estimated catch per unit of effort (CPUE) and observed CPUE for Turks and Caicos conch population 1974-2012. The predictions are extremely flat and there is a clear pattern to the residuals with observed catch per unit effort being above predicted values for most of the 1990s and the first decade of the new millenium.

The fishery independent visual survey data were analyzed using R statistics, to evaluate patterns in conch abundance (measured as counts) with habitat type and to further explore life history differences by habitat type. The six habitat types (algae, rubble, sponge, rock, sand, grass) on which conch are found in the fishing zones were compared based on predefined age categories, (small, medium and large juveniles, sub, young and old adults) revealing that the small juveniles were more abundant on the rubble habitats, while old adults seemed to prefer algae habitats. Sub-adults were most abundant in grass habitats, while young adults displayed a preference for algae and rubble habitats.

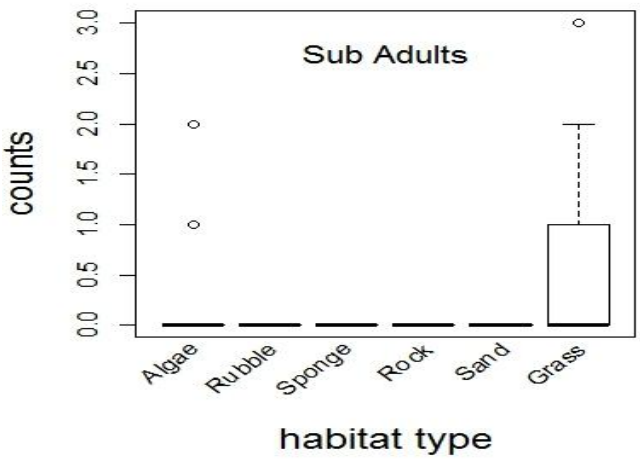

Figure 1 _Graph depicting density of sub-adults throughout the surveyed areas.

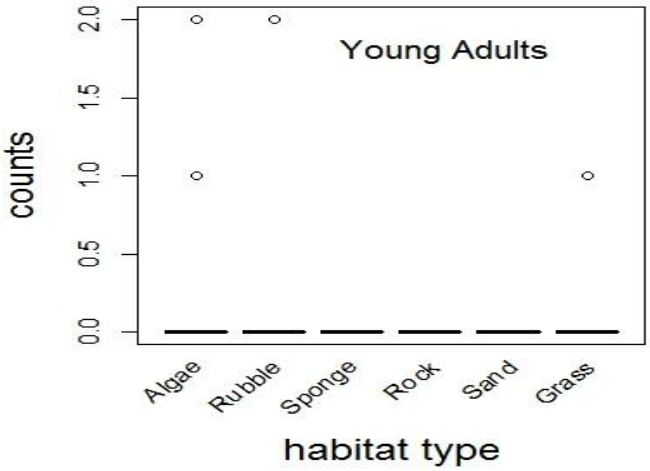

Figure 2_Graph depicting density of Young adult conch throughout the surveyed areas of the fishing grounds.

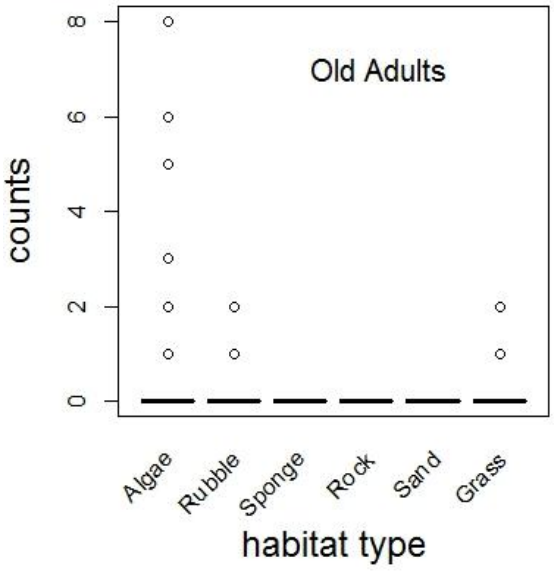

Figure 3_ Graph depicting density of Old Adult conch throughout the surveyed areas.

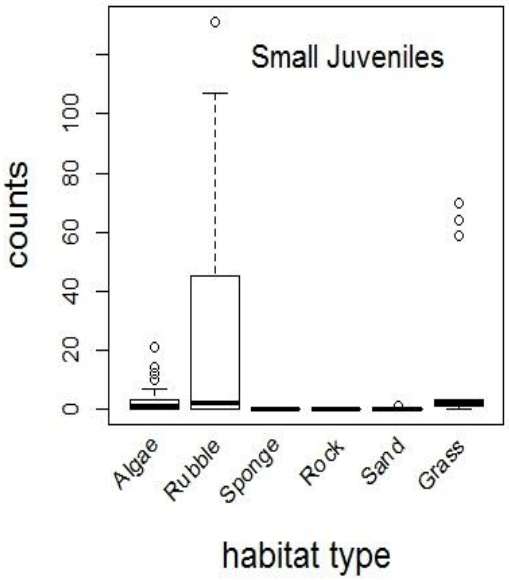

Figure 4_ Graph showing density of Young Juvenile conch throughout the surveyed areas

Further work and recommendations

- It is recommended that the remaining visual survey data be collected in order to provide an independent estimate of conch biomass with which to ground truth the ASPIC biomass estimate. In addition this would aid in obtaining a better understanding of the population structure and distribution.

- Continue to work with ASPIC production model to identify the source of the model fitting problems.

- Carry out research to help update conversion factors of queen conch processing levels in the Turks and Caicos Islands.

- Share result of findings with working group.

- Prepare written documents of all work to document findings.

References

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ANNEX 1

CSM-10-02
(Version: 06 June 2014)

(B) DRAFT AGENDA OF 2014 MEETING OF REEF AND SLOPE FISHERIES WORKING GROUP

(Kingstown, Saint Vincent and the Grenadines – 12 to 14 and 16 June 2014)

Chair: The Bahamas (Lester Gittens)
Vice-Chair: Montserrat (Alwyn Ponteen)

At 2014 Scientific Meeting

1. Review of inter-sessional activities and management decisions since last meeting;
2. Development of national and regional morphometric conversion factors for the Queen Conch (includes identification of different levels of processing nationally, detailed description of each level of processing with photographs, national sampling strategies for estimating conversion factors, data analysis, status of development of conversion factors at the national level with details of such factors);
3. Analysis of biological data to estimate Queen Conch morphometric conversion factors for different levels of processing to whole weight for The Bahamas;
4. Analysis of Queen Conch survey and/or catch and effort data for Turks and Caicos Islands;
5. Analysis of catch and effort data for Anguilla;
6. Analysis of catch and effort data for Montserrat;
7. Analysis of lobster catch and effort and biological data for Belize;
8. Analysis of mutton snapper biological data for Belize;
9. Analysis of catch and effort data for St Kitts and Nevis;
10. Review of document – Draft [Agreement/Declaration/MoU] on the Conservation, Management and Sustainable Use of the Caribbean Spiny Lobster (*Panulirus argus*) in CRFM Member States – suggestions for improvement of management and other measures proposed based on recent scientific information and country-specific experiences - identification of scientific/research responsibilities and proposed actions – (initiated through e-meeting of 02 June 2014)
11. Identification of species/fisheries to be analysed in 2015 and 2016, consistent with the ecosystem, participatory and precautionary approaches to fisheries management - identification of national fisheries management priorities and objectives; identification of available data sets; review of the associated data sets (if available); identification of types of analyses/assessments to be conducted; identification of specific activities regarding preparation of data for analysis as well as any required preliminary analyses;
12. Develop detailed work plan (2014 to 2016);
13. Any other business.

ANNEX 2

Queen Conch (*Strombus gigas*) on Pedro Bank, Jamaica

Prepared by: Ricardo Morris

1. Management Objectives

The management objective is to ensure optimum sustainable yields and efficient utilization of Jamaica's Queen Conch resources for the benefit of Jamaica through sound research and management incorporating the ecosystems approach, precautionary principles and the participatory approach. This management strategy is guided by the Draft Conch Fishery Management Plan of 1994 as well as aspects of the Draft National Fisheries Policy. Various government bodies in the management regime are mandated and empowered by legislation primary of which is the Fishing Industry Act of 1975 and associated conch-related subsidiaries.

2. Status of Stock

The results of the most recent (2011) Conch abundance survey revealed a mean of 184.25 conch/ha for the exploitable stock (adults >20 cm siphonal length) and an estimate of biomass amounting to 12,213.98 MT. This density is well above the minimum 100 conch/ha recommended by the Queen Conch Experts Workshop 22-24 May 2012 held in Miami, USA and which was later validated at the CFMC/OSPESCA/WECAFC/CRFM Queen Conch Working Group Meeting 23-25 October 2012, Panama City, Panama. The reported biomass is at a level similar to those observed during the 1997 survey (Table 1) and is also well above the 5,000MT limit reference point (LRP) which would coincide with the level at which it would be recommended that the fishery be closed based on the harvest model developed by Smikle (2009).

Table 1. Estimates of density for each depth strata and total Queen Conch biomass on the Pedro Bank for each survey year (1994-2011). 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	
2011	0_10	243.31	12,213.98
	10_20	144.81	
	20_30	165.44	

3. Management Advice

The current management approach appears robust and should continue.

4. Statistics and Research Recommendations

Data Quality

Jamaica relies on the gathering and analyses of both fishery-dependent and fishery-independent data for answering management questions and providing advice. Fishery independent data such as those gathered during the 3-5 abundance surveys provide the best dataset from which management questions regarding stock status can be had. Fishery-dependent data such as vessel log information on catch and effort are inherently less reliable however is of high enough quality to allow for meaningful annual assessments to be conducted.

Research

The following is a non-exhaustive list of research questions aimed at meeting the objective of the fishery.

- What are the parameters that determine the rate and range of post larvae settlement on the Pedro Bank?
- What are the characteristics and factors that determine low conch density areas versus high conch density areas (migration patterns) on the Pedro Bank?
- What is the effect/possible effects of climate change on the stock?
- Are conch on the Pedro Bank becoming smaller or larger? If so what are the main factors? Is this due to population variances or something else? Is it localized or across the stock?
- How often should conversion factors for processed conch to nominal weight be revised and updated?
- What are the social and political implications of managing for the bioeconomic optimum yield?

5. Stock Assessment Summary

The assessment is aimed at analyzing the 2013 industrial conch fishing season catch and effort data with a view to inferring the status of the stock, determining the impact of fishing and recommending a total allowable catch for the 2014 conch fishing season on the Pedro Bank. Analyses included computations of catch rates and the implications on the stock based on the latest (2011) conch survey results.

The assessment examined the overall performance of each active fishing vessel to determine catch rates and infer the possible positive or negative effect that fishing has had on the stock. Previous data including those from previous assessments and abundance surveys were also incorporated into the analysis. It was determined that fishing did not adversely affect the population biomass and therefore a TAC of no greater than 500.00 MT would be recommended for the 2014 fishing season. This is in keeping with the cautious management approach and under the condition that fishers continue to adhere to the conditions of their licenses.

6. Special Comments

None.

7. Policy Summary

The general policy as it relates to marine capture fisheries and by extension the conch fishery may be summarized as follows:

- To sustainably manage the marine capture fisheries resources of Jamaica

- To manage toward the optimal sustainable yield of each resource, which include optimizing output (catch and revenue), strengthening property rights where applicable, reversal of overfishing in overexploited fisheries and increasing 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 protect and 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
- To achieve sustainable development and utilization of fisheries resources in inland waters, and
- Apply principles of the ecosystems, participatory and precautionary approaches to fisheries management

8. Scientific Assessments

Introduction

Background

The queen conch (*Strombus gigas*) is a large edible marine gastropod of the family *Strombidae*, and is found throughout the Caribbean but with greatest populations reported for the west, central and northern Caribbean (Ehrhardt and Valle-Esquivel 2008). The fishery for queen conch has a long tradition in the Caribbean region, with the species being valued, especially for its meat, for several centuries dating back to pre-Columbian times (Brownell and Stevely 1981). By the end of the mid-nineties, harvest levels were estimated to be around 6,000t of conch meat per year. This number does not take into account conch meat that is harvested for local subsistence consumption and the unknown amount of conch that is taken by illegal fishing (Chakallal and Cochrane 1996). The wholesale value of these landings is estimated to be around US$60 million per year, but may be multiplied several fold taking into account jobs created in the processing and marketing of *Strombus gigas* products, particularly in the ornamental, tourist and restaurant industry (Chakalall and Cochrane, 1996; Appeldoorn 1994).

Jamaica has been recognised as a major conch producer regionally (Chakallal and Cochrane 1996) and continues to do so with exports averaging around 500MT since 2005 (NEPA CITES export data, 2005 – 2007 and Fisheries Division 2013). The commercial fishery for queen conch is based on the Pedro Bank (Figure 1) and has been reported on by several authors (Aiken *et al*. 1999; Smikle 1997). The fishery is managed utilising annual total allowable catch limits and individual non-transferable quota systems (Aiken *et al*. 2006; Kong 1997). Total allowable catches (TACs) are established based on abundance surveys of the conch population on the Pedro Bank (fishery independent) as well as analyses of catch and effort during each fishing season where a survey does not take place.

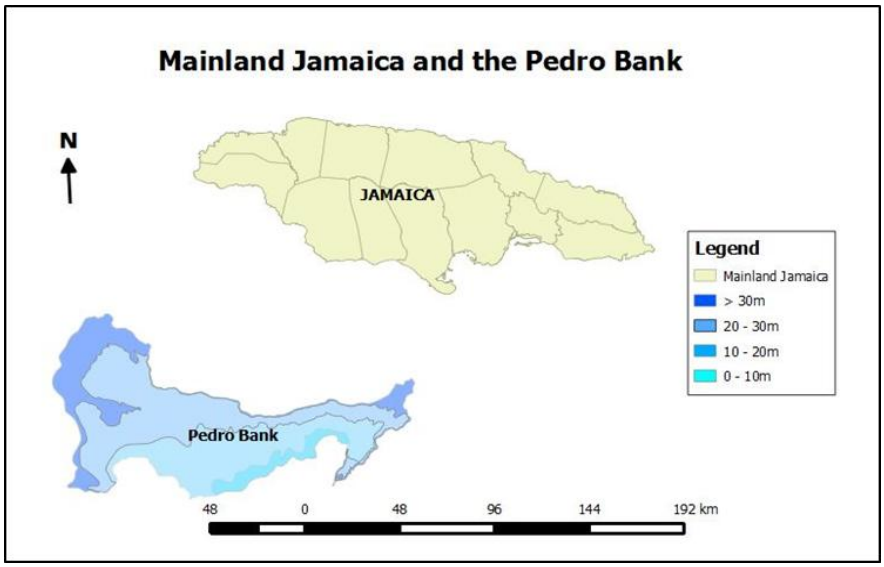

Figure 1. Mainland Jamaica and the Pedro Bank to the south of the island. The Pedro Bank is the country's largest and most important fishing ground as well as the area where commercial fishing for conch takes place.

Since 1994, when the quota system was introduced, all conch assessments have been based on biomass (stock abundance) surveys of the conch population on the Pedro Bank (Appeldoorn 1995; Tewfik and Appeldoorn 1998; Smikle and Appeldoorn 2002). This present assessment considers data from the most recent survey (2011) as well as catch and effort data collected during the 2013 fishing season. This approach follows the method utilised for previous fishing seasons (Smikle 2009; Murray 2011; Murray *et al.* 2012) to determine and recommend catch quota for the following fishing season as well as to determine the status of the stock in the absence of an abundance survey in a particular year.

Description of the Fishery

At the start of the 2013 industrial conch fishing season eight (8) companies successfully applied for individual (non-transferable) quotas of the 500 MT TAC which was declared by the Honourable Minister of Agriculture and Fisheries. As is the case since the system was introduced in 1994, each successful applicant would have demonstrated, among other things, their ability to fish and utilize or cause to be fished or utilized a certain quantity of conch meat. This usually includes having a duly certified and licensed industrial motor fishing vessel or an agreement with someone who has one. Motor fishing vessels measure 25-30m in length overall and are usually licensed as freezer or carrier vessels for conch. Five (5) motor fishing vessels were licensed and authorized to either fish or carry conch during the 2013 season. Industrial motor fishing vessels may conduct 3 to 8 trips of up to 8 days per season depending on the scale of their operation and quota allocated. These large vessels are often associated with a number of smaller dories or canoes from which 5-8 divers using compressed air methods dive for conch at a radius of approximate 5km from the mother vessel. For the 2013 season roughly 65 individual fishers where issued licenses, these persons functioned as captains, divers, boat crew, etc. in the operations of the companies who were given quotas.

Conch are landed at landing sites usually in or around the Kingston area and are inspected for product quality and safety. At this time the captains are interviewed and fishery log sheet information is collected and inspected by a designated fishery inspector. Landed conch are then transported to a licensed processing facility where the conch is processed (usually 50% cleaned processing level) and the majority packaged for primary markets in the European Union (EU) and a smaller portion is sold locally. A more detailed description of the fishery may be found in Aiken *et al* (2006).

Overall Assessment Objectives

To determine an appropriate level of total allowable catch (TAC) for the Queen Conch fishery on the Pedro Bank Jamaica for the 2014 fishing season using catch and effort data as well as other relevant information.

Data Used

Data for the analysis of the 2013 conch fishing season were obtained from vessel log sheets that are made available to the Fisheries Division upon arrival of the vessel for landing of the catch. A summary of the log sheet data use is shown in Table 1 below.

Table 1. Total landings in metric tonnes (MT) per fishing trip for each mother vessel active for the 2013 fishing season. Trip data are based on reported fishing days recorded on log sheet sheets submitted to the Fisheries Division.

Trip Number		Fishing Vessel				
		Windjammer	Bryce	Captain Sean	Lady Kim	Geronimo
Trip # 1	Start Date	19/05/2013	04/05/2013	16/05/2013	12/06/2013	20/08/2013
	# of Days	7	9	9	10	1
	# of Divers	8	16	18	6	10
	Catch	11.79	34.07	35.93	13.68	2.30
Trip # 2	Start Date	29/05/2013	16/05/2013	20/05/2013	04/07/2013	
	# of Days	3	9	2	4	
	# of Divers	8	18	30	5	
	Catch	8.62	35.96	21.44	3.65	
Trip # 3	Start Date	17/06/2013	11/06/2013	27/05/2013		
	# of Days	7	5	2		
	# of Divers	8	14	27		
	Catch	12.70	26.14	21.89		
Trip # 4	Start Date	29/06/2013	24/07/2013	23/06/2013		
	# of Days	7	4	2		
	# of Divers	8	12	30		
	Catch	12.25	8.97	19.59		
Trip # 5	Start Date	14/07/2013		01/07/2013		
	# of Days	7		2		
	# of Divers	8		26		
	Catch	12.70		13.70		
Trip # 6	Start Date	07/08/2013		15/06/2013		
	# of Days	6		4		
	# of Divers	8		28		
	Catch	11.75		48.12		
Trip # 7	Start Date	16/08/2013		23/08/2013		
	# of Days	6		2		
	# of Divers	8		26		
	Catch	13.56		27.58		
Trip # 8	Start Date	24/08/2013		29/08/2013		
	# of Days	7		2		
	# of Divers	8		20		
	Catch	13.57		14.97		
Total fishing days		**50**	**27**	**25**	**14**	**1**
Average number of fishing days		**6**	**7**	**3**	**7**	**1**
Total Catch		**96.94**	**105.14**	**203.22**	**17.33**	**2.30**

Assessment 1: **2013 Pedro Bank Queen Conch Fishery Assessment and TAC Recommendation**

Objective

To determine an appropriate level of total allowable catch (TAC) for the Queen Conch fishery on the Pedro Bank Jamaica for the 2014 fishing season using catch and effort data as well as other relevant information.

Method/Models/Data

1. Data from conch vessel log sheets were compiled into a spreadsheet (MS EXCEL) and made available by the Fisheries Division. The vessel log data included: Trip Date; Number of Divers; Dive time; latitude and longitude of vessel during fishing; total catch during trip
2. Computation of CPUE was done for each reported fishing trip for each vessel where possible. Total catch and average CPUE were reported for each vessel over the fishing season where possible.
3. Results from the most recent conch survey (2011) were also reviewed as a reference to assist in inferring the state of the conch population.

Results

Table 1 (section 2.3.8.3) provided a summary of reported landings per fishing trip for each mother vessel active during the 2013 season. Note here that total catches attributable to one vessel does not represent quota allocated to any one company as vessels may or may not fish for more than one quota holder. Total catch for the season for each vessel ranged from 2.3MT in the case of M/V Geronimo which made only one (1) trip to 203.22 MT for M/V Captain Sean which made eight (8) trips. Average fishing days per trip ranged from a low of one day for Geronimo to around 7 days for vessels such as M/V Windjammer, M/V Lady Kim and M/V Bryce.

Total reported landings amounted to 837,720.00 lbs or 379.98 MT (see table 2) which like previous years is less than the total allocated quota (500.00 MT). This is as a result of incomplete or under reporting of catches on vessel log sheets submitted to the Fisheries Division. Though this weakness does not affect much the monitoring of the TAC as the Fisheries Division is also able to check each vessel at landing sites as well as pre- and post-processing documentation it does affect our ability to grasp all the facts about what occurs in our fishery. A breakdown of reported landings per vessel is shown in Table 2 below.

Table 2. Catch per unit effort (CPUE) and total reported landing for all mother vessels active during 2013 fishing season. CPUE are based on information recorded and reported on log sheets as well as Fisheries Division landing inspection information.

Conch Fishing Vessels	Average CPUE (Catch/Diver*Hour)			Total Catch	
	lbs/hr	kgs/hr	conch/hr †	lbs	MT
MV Wind Jammer	288.54	130.88	796	213,724.00	96.94
MV Bryce	384.32	151.79	1,061	132,735.00	60.21
Captain Sean	358.85	162.77	990	448,016.00	203.22
Geronimo	224.46	101.81	619	5,080.00	2.30
Lady Kim	349.76	158.65	965	38,165.00	17.31
Grand Average	**321.19**	**141.18**	**886.47**	167,544.00	76.00
Total Catch				**837,720.00**	**379.98**
(† Using conversion factor of 2.76 conch/lb of unprocessed conch meat)					

Table 2 above shows the catch per unit of effort (CPUE) and total landings for all the conch vessels based on reported landings and associated effort. CPUE was calculated as the weight of conch caught per diver hour (i.e. the unit representing the number of divers times the average dive time for each dive). In addition to weight in pounds and kilograms, CPUE is also reported in numbers of conch per diver hour using the conversion factor 2.76 conch/lb of "dirty" conch [Stephen Smikle 2013 pers. Comm.] (i.e. no tissue loss, animal simply removed from shell).

The average CPUE for all vessels was 141 kg/diver*hour which is unusually high given the trend in recent years where, for instance, in the last analysis of CPUE in 2012 an average of 37.03 kg/diver*hour was reported. It is quite likely that the current CPUE results do not effectively reflect what occurs in the fishery and therefore skew the results. It would also have to be noted here that some 25% of the TAC was not accounted for by log sheets and may or may not have had a significant effect on this CPUE figure. Anecdotal reports have long suggested that reported fishing trips are no more than voyages to collect conch stock piled prior to the vessels arrival. This is another weakness in the management system which must be addressed perhaps through having observers on board mother vessels. One positive inference from this however is that, assuming conch are not being stock piled weeks prior to the arrival of the mother vessel, densities of conch are still high enough to allow for fishing of allocated quotas in a relatively very short fishing period (~3 months). This premise may be supported by the results of the 2011 Pedro Bank Queen Conch Abundance survey which reported high densities of juveniles (>20cm SL) at sites throughout the bank particularly central, southern, northern and eastern areas. The stock may have also benefitted from there being no major weather system to affect the Pedro Bank for the last 4 years.

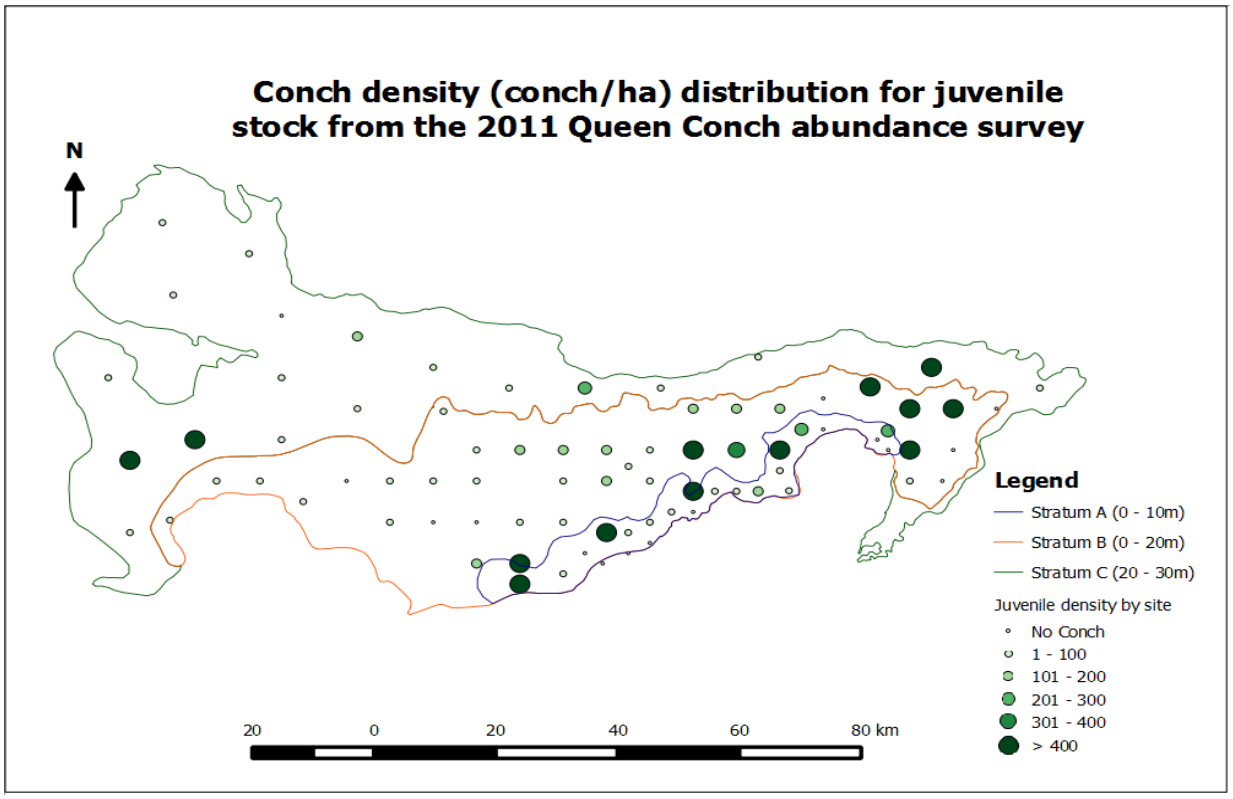

Figure 2: Juvenile conch density (conch/ha) distribution for sample sites surveyed across the Pedro Bank during the 2011 Conch Abundance Survey (Fisheries Division 2013)

CPUEs were calculated for fishing trips for each vessel to (i) look at their performance over the fishing season and (ii) obtain an overall average for all vessels which will provide a useful indicator of the impact that fishing has had on the overall stock. Figure 3 is a graphical output of trends in average catch per unit of effort (CPUE) for the five (5) active mother vessels during the 2013 season. Each point on the graph represents the average CPUE per fishing day for each mother vessel. The trend line included is based on simple regression analysis on the CPUE per fishing day, with the corresponding equations and R^2 values shown on the graph.

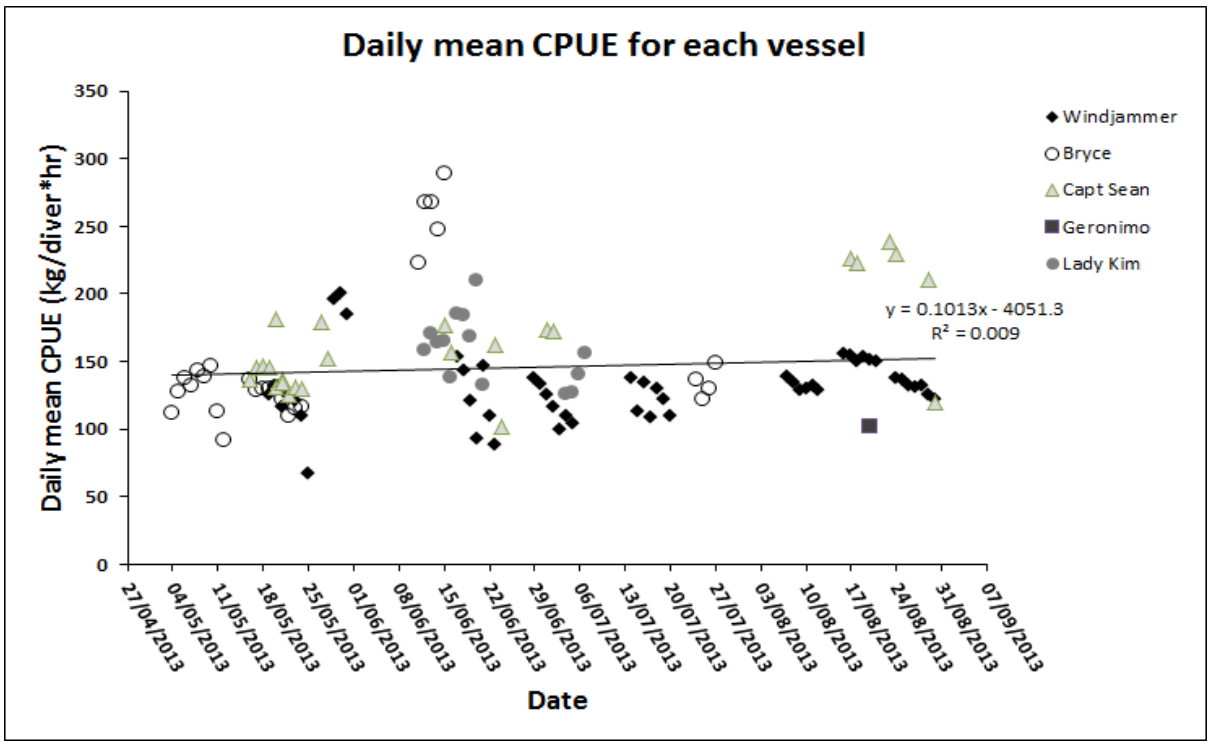

Figure 3. CPUE trend for four of five conch fishing vessels for the 2013 conch fishing season. Each point on the graphs represents the average CPUE per fishing day for each fishing vessel on a reported fishing day. The trend line included is based on simple regression analysis.

Analyses of CPUEs for all vessels showed a steady to slightly increasing trend for the 2013 season notwithstanding the low R^2 value (provides a statistical estimate of the likelihood of the trend line fitting the data) it is encouraging that there is not a decreasing trend.

Table 3 below shows the changes in CPUE and biomass since 1994.

Table 3. Estimated values for Average CPUE and Biomass for the queen conch fishery on the Pedro Bank 1994 – 2013.

Year	Average CPUE	Biomass	References for Biomass estimate
1994	40	13,325.48	Appledoorn (1995)
1995	32		
1996	22		
1997	16	12,203.27	Tewfik and Appeldoorn (1998)
1998	18		
2002	26	15,305.85	Smikle and Appeldoorn (2003)
2007		7,421.78	Smikle (2009)
2008	35		
2009	52 (38*)		
2010	44.4		
2011		12,213.98	Fisheries Division (2013) [unpublished report]
2012	37.03		
2013	141.18		

*SF&T dolphins

Values for CPUE up until 2002 are as reported in Smikle and Appeldoorn (2002), while 2008 to 2012 values are based on computations from the vessel logs prepared by the conch fishers in Smikle (2009); Murray (2011), and Murray *et al.* (2012).

Discussion

Generally catch rates for the 2013 season ranged from stable to increasing over time which given key assumptions regarding CPUE is indicative of there being no adverse effect on the overall stock on the Pedro Bank. Also the high juvenile abundance and densities reported in the 2011 conch survey indicate that this year's harvest would have benefited greatly from recruitment from this cohort. Also there has been no major weather system affecting the bank for the last four years. This may partially explain the relatively short time in which fishers were able to fish their quota as densities are likely to still be around the level they were during the 2011 survey. However questions still remain regarding the approximately 25% of catch which was not reported on log sheets and reports of possible stockpiling.

The possibility also exists that the unusually high CPUE levels observed may not reflect actual significant increases in catch rates, but rather a distortion due to the log sheets being incorrectly or incompletely filled out by the captain of the mother vessel. Errors in the filling out of log sheets are likely to have occurred where:

1. the vessel operator reports only summary landings by canoe for a given day instead of detailed catch and effort for each canoe/dorie and,
2. the vessel operator reports summary landings per day for the mother vessel despite the fact that the conch may have been purchased/collected from smaller operators who caught the product some time.

In either case, the required CPUE (catch per diver per hour) may not have been reported. Further intervention in having the vessel operators and captains trained in proper logging of catches is required to have these errors reduced.

Management

The implications of the assessment to management may be measured by the findings given and the ensuing recommendations:

1. Total Allowable Catch for the 2014 fishing season should be set at no more than **500.00 MT.** This is in keeping with our cautious management approach given the various uncertainties which still exists including IUU fishing and possible under-reporting.

2. It is also recommended that an abundance survey be conducted at the end of the 2014 fishing season to assess the conch population on the Pedro Bank and to verify current CPUE trends.

3. Where a conch abundance survey is not due in the next year, an interim fishery-independent assessment should be conducted at selected sites on the bank to verify catch rates reported. This will improve and add to the information set used to manage the fishery and help to address the over-reliance on the 3-5 year abundance survey.

4. Training of quota holders and relevant stakeholders in the proper filling out of log sheets should be conducted prior to the opening of the 2014 season. This should streamline recording and reduce inconsistencies and errors. As previously pointed out by Smikle (2010) recordings should be made the same day or as soon as possible to ensure good data quality.

5. Starting at the 2014 fishing season observers should be randomly placed on board mother vessels to guide and monitor the collection of fishery data as well as the TAC on a whole.

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ANNEX 3

DRAFT
ROSEAU DECLARATION ON CONSERVATION, MANAGEMENT AND SUSTAINABLE USE OF THE CARIBBEAN SPINY LOBSTER (*PANULIRUS ARGUS*)
May 2014

PREAMBLE

WE THE CRFM MEMBER STATES,

RECOGNIZING the important contribution of the Spiny Lobster fisheries to food and nutrition security, employment, international trade, and the economic and social well-being of the people of the region;

RECOGNIZING that spiny lobsters play a role in proper ecosystem function and in the services that ecosystems provide;

Comment 1: Organisms do not exist in isolation. They are part of an ecosystem. The functioning of these ecosystems depends on their biotic and abiotic components. While the exact role of lobsters in the ecosystems that they are a part of is not fully understood, fishing levels need to take into account broader ecosystem impacts.

CONCERNED that the long-term sustainable use and contribution of the Spiny Lobster fisheries to the Region's social and economic development and food security is being threatened by illegal, unreported and unregulated fishing, and inadequate conservation and management of the resource and its habitats;

RECALLING the Decisions of the 4th and 5th Meetings of the Ministerial Council of the CRFM regarding the conservation and management of the Spiny Lobster;

RECALLING ALSO the relevant provisions of the 2012 Belize Declaration on Caribbean Regional Fisheries Mechanism (CRFM) and the Central America Fisheries and Aquaculture Organization (OSPESCA) Cooperation for Sustainable Development of Fisheries and Aquaculture Resources, and the Joint Action Plan (CRFM – OSPESCA);

RECALLING FURTHER the Draft Agreement Establishing the Caribbean Community Common Fisheries Policy;

AWARE that existing regional organizations, including OSPESCA, UNEP RCU and FAO/WECAFC have programmes relevant to the conservation and management of Spiny Lobster and their habitats in the Caribbean region;

RECOGNIZING the importance of involving all relevant parties including inter-governmental, non-governmental and private sector organizations and resource users, in co-operative conservation and management of the Spiny Lobster and its habitats;

RECOGNIZING ALSO the rights and duties of States established in international law, as reflected in the United Nations Convention on the Law of the Sea of 10 December 1982, relating to the conservation, management and sustainable use of living marine resources;

INSPIRED by the principles contained in the 1992 Rio Declaration on Environment and Development, the 2002 Johannesburg Declaration on Sustainable Development, and the 2013 Rio+20 Outcome Document - The Future We Want;

INSPIRED ALSO by OSPESCA's Regulation OSP-02-09 for the Regional Management of the Caribbean Spiny Lobster (*Panulirus argus*) Fishery in Central America;

CONSIDERING the principles and recommendations set forth in the 1995 Code of Conduct for Responsible Fishing adopted by the Conference of the Food and Agriculture Organization;

RECALLING the United Nations General Assembly Resolutions on the Caribbean Sea and supporting sustainable fisheries and oceans management;

ACKNOWLEDGING the objectives of the Revised Treaty of Chaguaramas and more specifically Articles 58 and 60 which enjoin Member States to co-operate in all areas necessary to foster regional development and integration regarding Natural Resource Management and Fisheries Management and Development respectively;

ACKNOWLEDGING ALSO that the main objective of the Caribbean Regional Fisheries Mechanism (CRFM) is to promote efficient management and sustainable development of marine and other aquatic resources and promoting and establishing cooperative management arrangements of shared and highly migratory resources in conformity with the economic objectives of the Member States;

RECOGNISING the trans-boundary nature of the Spiny Lobster and the interconnectedness of the marine ecosystems in which they live and, therefore, the need for range States to cooperate and coordinate actions to achieve long-term sustainable use and effective conservation and management;
ACKNOWLEDGING our shared responsibility for long-term sustainable use through conservation and effective management of the Spiny Lobster populations and their habitats;

DESIRING to enhance the contribution of the Spiny Lobster fisheries to regional food and nutrition security and to support the progressive realization of the right to adequate food; and

Bear in mind that this fishery is characterized by international trade and provides foreign exchange to purchase food at a country level vs direct consumption

DETERMINED to establish, through this Declaration, appropriate measures for the conservation, protection, management and long-term sustainable use of the Spiny Lobster and their habitats for the benefit of present and future generations;

HAVE AGREED AS FOLLOWS:
[**Original Outline:**
Preamble Could include Acknowledgement of:

- The social and economic importance of the Caribbean Spiny Lobster to the countries and peoples of the region;
- Their mutual interest in the long term sustainable use, conservation and management of the Caribbean Spiny Lobster
- That spiny lobster is a transboundary species whose habitat covers a broad area in the Caribbean
- Their shared responsibility for the conservation and effective management of the spiny lobster populations inhabiting their waters in order to maintain the populations at levels which will permit long-term sustainable catch for food and other purposes

- The conservation and management of spiny lobster in the Caribbean Region cannot be fully effective unless it is comprehensive and has the participation of all States that fish spiny lobster in that region
- That concerted, coordinated action must be taken immediately to address the threats posed to the existing populations
- That they should agree to work closely together to improve the stock status of the Caribbean Spiny Lobster and the habitats on which they depend]
-

PART I GENERAL PROVISIONS

ARTICLE 1 USE OF TERMS

[to be completed

'Berried female' means a female Spiny Lobster bearing eggs attached to the abdominal appendages.

'Carapace Length' means the straight line measurement from the forward edge between the rostral horns, excluding any soft tissue, and proceeding along the middle to the posterior edge of the carapace.

'Close Season' means a period in the year when it is prohibited to fish for, capture, kill, possess, sell or trade the spiny lobster.

'Competent Authority' means the Government Fisheries Department or Fisheries Division or any other body designated by the State as the competent body responsible for management, conservation and sustainable use of the Spiny Lobster.

'Escape Gap' means an opening in the side of a trap designed to facilitate the exit of juvenile and undersize Spiny Lobster from that trap.

'Escape Panel' means a panel, or other mechanism, designed to allow for the exit of Spiny Lobster from a trap after a period of time if the trap has been lost or abandoned at sea.

'Member States' mean the States Parties to the 2002 Agreement Establishing the Caribbean Regional Fisheries Mechanism.

'Ministerial Council' means the body established by Article 6(a) of the Agreement Establishing the Caribbean Regional Fisheries Mechanism.

'Industrial vessel' means:

'OSPESCA' means the Fisheries and Aquaculture Organization of the Central American Integration System (SICA).

'Possession' means to have in one's custody or control, either personally, or by another who is under one's control.

'Spiny Lobster' means the Caribbean spiny lobster, *Panulirus argus.*

'Trap' means a lobster trap, pot, or other stationary device that may be set on the seafloor and used for the taking or holding of Spiny Lobster.

…….. ..]

ARTICLE 2 SCOPE

1. Unless otherwise provided, this declaration applies to the sustainable use, conservation and management of the Spiny Lobster (*Panulirus argus*) stocks and their habitats within areas under national jurisdiction or sovereignty of Member States.

2. Nothing in this declaration shall preclude Member States from implementing stronger national conservation and management measures than those specified herein for the Spiny Lobster and its habitats.

ARTICLE 3 OBJECTIVE

1. The objective of this declaration is to ensure the long-term sustainable use of the spiny lobster (*Panulirus argus*) through effective implementation of conservation and management measures for the stocks, ~~and~~ their habitats [based on the best scientific evidence available] **and fishers.**

Comment 2: While it is recognized that effective implementation of conservation and management measures is critical, it is also important to recognize that management of fishers is one of the key avenues for achieving these. Bearing this in mind at this stage in the document also assists managers in remembering that the socio-economic state of fishers is also important.

[Original Outline: The objectives of this Agreement could be:
1. To establish an international regime for conservation, management, and optimum sustainable utilization of spiny lobster resources in the Agreement Area;
2. To restore and maintain the lobster resources in the Caribbean Region at levels which will permit long-term sustainable yields; and
3. To cooperate in the gathering and examining of scientific data and information including, biological, ecological, environmental, social and economic concerning spiny lobster resources in the Caribbean Region.]

ARTICLE 4 GENERAL PRINCIPLES

1. Member States, in order to achieve the objectives of this declaration and in giving effect to their duty to cooperate in accordance with relevant regional and international law, shall apply the following guiding principles:

(a) The precautionary approach and the ecosystem approach to fisheries;

(b) Ensure long-term sustainability of the spiny lobster and promote the objective of their optimum utilization;

(c) Ensure that conservation and management measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing sustainable yields, as qualified by relevant environmental, socio-economic and ecological factors;

(d) Protect biodiversity in the marine environment;

(e) Ensure that the levels of fishing effort do not exceed those commensurate with the sustainable use of the lobster stocks **and that ecosystem impacts are considered**;

(f)

Comment 3: This is consistent with Comment 1 above.

(g) Take into account the interests of small-scale and subsistence fishers and promote their participation in the decision-making processes that affect their livelihoods;

(h) Take into account traditional ecological knowledge and local knowledge of fisheries and fishing communities regarding conservation and management of the resource and protection of critical habitats;

(i) Collect and share, in a timely manner, complete and accurate data and information concerning fishing activities; and

(j) Ensure compliance with conservation and management measures through effective monitoring, control and surveillance, and public education and awareness programmes.

(k) Utilize pre-agreed harvest control rules (HCR) that are based on appropriate reference points.

Comment 4: HCRs pre-agreed by stakeholders are a way of quickly and effectively limiting harvests if and when the need arises. If a stock is found to be overfished, approaching overfishing or approaching a landings quota, then corrective measures need to be taken to curtail harvests. Agreeing on an effective way to curtail harvests is best done prior to arriving at an overfished state so that corrective measures can be more quickly implemented. This also facilitates transparency and allows the measures to be less severe than a late response. There would also be greater acceptance by stakeholders. Reference points that trigger the corrective measures also need to be pre-agreed and scientifically shown to result in the rehabilitative effect desired and practical.

[Original Outline: The principles should be based on those articulated in the FAO Code, including

- Precautionary
- Ecosystems approach
- Participation
- Sustainable use
- Integrated approach
- Use of the best available data and information for decision-making]

PART 2 CONSERVATION AND MANAGEMENT

ARTICLE 5 RESEARCH, DATA COLLECTION AND SHARING OF DATA AND INFORMATION

1. Member States shall, as far as possible and as appropriate, ensure that fishing vessels, fishers and other natural or legal persons within their jurisdiction, who are directly or indirectly involved in the capture, processing, marketing or trade of Spiny Lobster provide such data and information as may be necessary in order to fulfill their obligations under this Declaration. To this end, Member States shall:

(a) Collect and share scientific, technical, and statistical data with respect to fisheries for the spiny lobster **with the CRFM/OSPESCA/WECAFC Working Group in addition to educational institutions**.

Comment 5: While there are concerns about the misuse and misunderstanding of data, there is potentially much to be gained from the sharing of data. In particular, the sharing of data between countries of the region facilitates regional analyses and approaches to management of transboundary species. Expanding the sharing of data to educational institutions also allows access to expertise that might otherwise only remain in academia and also assists educational institutions in providing graduates that are more in tune with fisheries management issues. A data sharing agreement may be needed to standardize, as far as practical, the data to be shared as well as clearly define permissions and uses of the data.

(b) Ensure that data are collected in sufficient detail and accuracy to facilitate effective assessment, preparation of conservation and management advice, and monitoring of management performance; and

(c) Adopt provisions requiring vessel owners and masters, fishers, processors and traders to submit to the competent authority, data regarding the catch, **effort,** sale, processing, marketing, **relevant socio-economic indicators** and trade of Spiny Lobster.

Comment 6: The additions are considered key information needed by fisheries managers.

2. Member States shall cooperate through the organs of the CRFM to agree on the specification of data and the format in which they are to be provided for analysis by the appropriate CRFM Working Group or other competent body;

3. Member States shall promote and conduct scientific research related to the sustainable use, conservation and management of the spiny lobster (**including aspects of ecosystems that *P. argus* is a part of such as habitat and by-catch)** ~~its habitat~~, and actively promote the publication and dissemination of the results of that research.

Comment 7: This is consistent with Comment 1. Special mention of by-catch is made because by-catch species can become overfished although they are not targeted. By-catch is a major concern with regards to conservation. There are also examples of fisheries that are closed when by-catch levels are too high.

4. Member States shall seek to cooperate with neighbouring States in the wider Caribbean region in the conduct of scientific research related to the Spiny Lobster. Cooperation with the Central American States shall take place in accordance with the Memorandum of Understanding between CRFM and OSPESCA, the Belize Declaration on CRFM and OSPESCA Cooperation, and the CRFM-OSPESCA Joint Action Plan.

[**Original Outline**: To that end, in a spirit of mutual understanding and co-operation, the parties should consider including in the agreement the following articles:

1. Commitment to **national data collection and sharing of the data**: i.e. catch, effort and socio-economic data on an annual basis for stock assessment.

[*Comment: The collection of statistical, biological and socio-economic data needs to be strengthened across the region, as it is the foundation of a successful management system*.]

2. Commit to **standardizing data collection units**, indicators, and processes.

[*Comment: It is important that CRFM work with member countries to ensure data collection is standardized (i.e. units, indicators etc.), so that comparisons can be made across countries and over time*.]

3. Commitment to conduct or participate in transboundary **research programs** to obtain biological, ecological, environmental, oceanographic data and information, etc, to ensure that decisions are taken on the basis of good scientific information:

(a) Ongoing collection and analysis of statistical information relating to the current conditions and trends of the lobster fishery resources,

(b) Studying and appraising information concerning measures and methods to ensure maintenance of the populations of lobster at levels which will permit the maximum sustainable catch and which will ensure the effective exploitation of these fishes in a manner consistent with this catch.

4. Commit to cooperate in the **exchange of scientific information**/research/ data collection regarding any lobster fishing.

[C*omment: The exchange of scientific information allows the status of the Spiny Lobster in the Caribbean to be understood region-wide and comparisons can be made across countries].]*

ARTICLE 6 CONSERVATION AND MANAGEMENT MEASURES

1. The Ministerial Council shall make policy decisions to ensure long-term conservation, management and sustainable use of the Spiny Lobster stocks, and protect and safeguard their habitats.

2. The Ministerial Council shall make the policy decisions mentioned at paragraph (1) above on the basis of scientific advice provided by the Forum or other competent technical or scientific body.

3. Each Member State shall, in accordance with its particular conditions and capabilities and as appropriate based on the local fisheries:

(a) Develop or adapt existing national strategies, plans, programmes or regulations to, as far as possible and as appropriate, give effect to the decisions of the Ministerial Council regarding conservation, management and sustainable use of the Spiny Lobster stocks and protection of their habitats; and

(b) Integrate, as far as possible and as appropriate, the conservation, management and sustainable use of the Spiny Lobster stocks and protection of their habitats into relevant sectoral or cross-sectoral plans, programmes and policies.

4. Without prejudice to the generality of paragraphs 1 and 2, each Member State shall, as far as possible and as appropriate, taking into account the overall importance of the fishery, local conditions and state of the stocks:

(a) Prohibit fishing for the Spiny Lobster without a valid licence issued by the Competent Authority;

(b) [Within two/three/four (2/3/4) years from the date of adoption of this Declaration], implement a Close**d** Season for the Spiny Lobster for a period of not less than 4 months, between 15th February and 31st August each year;

Comment 8: The main reasons for the selection of a region-wide synchronous closed season are the protection of the peak of spawning and the limiting of opportunities for foreign poaching. Foreign poaching would be limited through a reduction in marketability of foreign sourced poached tails. The SLWG recommends a region wide review of the occurrence of peak spawning to determine the best months for closure. There was also an unresolved debate over whether the recommendation should state what the best 4 month period is or simply state that the 4 months should fall between Feb15th-Aug 31st. Resolving this will be partly depend on the review and also the likelihood that countries with closed seasons in place will change their closed season. Synchronous closed seasons for clusters of countries may also be best as there may be regional differences in the peak of spawning as well as a need to be in sync with nearest neighbours. Consideration of the timing of closed seasons also goes beyond CRFM countries.

Impose an upper limit of [~~two thousand five hundred (2,500)]~~ Traps per industrial vessel targeting Spiny Lobster;

Comment 9: A maximum number of traps per industrial vessel applied to the entire region is inappropriate due to differences between fisheries including size of fishing grounds and number of vessels. However, as effort control is important, each country should determine an appropriate level of fishing effort for all gear types and/or utilize a catch limit.

(c) Each member state should conduct studies to determine whether the introduction of casitas would be appropriate before the introduction of this fishing gear. Where this gear has already been introduced, the relevant studies should still be conducted.

Comment 10: Somewhat related to the issue of effort control, as stated in Comment 9, is the use of casitas. The impact of casitas is not yet fully understood in terms of the effect of their combination of fishing effort and enhanced fisher efficiency on lobster fisheries. In addition, their ecological impact in adult and juvenile habitats is still being unraveled and may not be the same depending on the individual fishing grounds. Also of concern is the effect on the environment when casitas are lost.

(c) In the case of artisanal fisheries, each Member State shall determine the maximum number of Traps per vessel or per fisher, if any, taking into account the nature of the fishery and the socio-economic condition of the fishers;

(d) Ensure that any Trap used for **targeting,** harvesting or holding the Spiny Lobster at sea is made of biodegradable material;

Comment 11: Some group members felt that it was important to clarify that traps that are used to target spiny lobsters should be subject to this provision and not necessarily all traps.

(e) Ensure that any Trap used for harvesting or holding the Spiny Lobster at sea is equipped with an Escape Panel;

(f) Ensure that any Trap used for catching Spiny Lobster:

(i) have at least one Escape Gap for the purpose of facilitating the exit of juvenile Spiny Lobster from that Trap;

(ii) the Escape Gap shall be located on the opposite side of the line used to lift the Trap; and

(iii) the Escape Gap shall have an opening of 2 1/8 inches (5.4 centimeters) between the bottom and the first rib from the bottom of the Trap **or larger depending on each country's minimum size limit and country specific harvest strategy.**

Comment 12: An escape gap size of 2 1/8in would be adequate if countries choose to utilize the minimum size limit of 80mm recommended below. However, if a larger minimum size limit is selected, a larger escape gap would be more appropriate. Nevertheless, this also depends on each country's harvest strategy, as the larger the escape gap the larger the proportion of legal sized lobsters that will escape while the lower the amount of undersized lobsters that will be retained. A range of escape sizes will work but it all depends on the risk the individual country may wish to take. If a given country is confident that undersized lobsters retained in traps will be released by fishers then an escape gap that retains a larger portion of undersized lobsters may be fine so that fewer legal sized escape. However, if compliance with minimum size limits by fishers is a problem, then a better strategy may be to decrease the chances that traps retain undersized lobsters by utilizing a larger escape gap. Enforcing an escape gap size may be easier than enforcing a minimum size limit in these ~~insatnces.~~instances

(iv) Ensure that upon the commencement of the Close**d** Season, persons and legal entities authorized to fish for Spiny Lobster remove from the sea any Trap owned by them or in their Possession. All traps and fishing gear used to capture Spiny Lobster should be removed from the sea within [three (3) / five (5)] day after the commencement of the Close**d** Season **as far as practical; Traps must be removed by the beginning of the closed season as far as practical. Thereafter traps must be removed within 5 days and any catch released.**

Comment 13: The SLWG felt that it was important that traps be removed from the sea as quickly as possible at the end of the fishing season. This is to avoid fishers seeking to extend the fishing season illegally and also to avoid fishers not removing traps with urgency. This need for immediate removal is counterbalanced by the reality that scenarios arise that may prevent the prompt removal of traps. After much debate, with some members of the group strongly feeling that all

fishing should end immediately at the end of the season, the compromise seen above was settled on. Traps can be retrieved up to 3 or 5 days (amount of time not yet agreed) after the season closes, however, any lobsters within the traps must be released.

(g) Adopt provisions that:

(i.i) require fishers, vessel owners, processors, traders, wholesalers, retailers or any other person in Possession of Spiny Lobster to submit to the Competent Authority by the **[third~~/fifth~~ (3~~/5~~) working day]** of the Closed Season, a signed declaration of the inventory of Spiny Lobsters or parts thereof in their Possession;

(i.ii) require the Competent Authority to verify and certify the declaration of inventory as soon as possible within a period of not more than five days after receipt of the declaration;

(i.iii) empower and require the Competent Authority to carry out inspections as deemed necessary to ensure compliance with this provision, notwithstanding any other provision of control that each State Party may implement; and

(i.iv) during the Closed Season, prohibit any legal or natural person from having in their Possession, sell or deal in Spiny Lobster except those declared and verified by the Competent Authority.

(h) Determine and establish the time period prior to the opening of the fishing season when persons authorized to fish for Spiny Lobster may place or return their Traps to the sea in order to prepare for the commencement of fishing when the season reopens. **The maximum time allowed shall not exceed [fourteen (14) ~~/ ten (10) days~~] prior to the commencement of the fishing season;**

Comment 14: The SLWG felt that 14 days is acceptable since traps will not begin to catch lobsters immediately

(i) Adopt a minimum size for catching Spiny Lobster, of no less than [eighty millimeters (80 mm) Carapace Length; (or alternatively one hundred forty millimeters (140 mm) of tail length, measured from the first abdominal segment to the terminal portion of the telson)];

(j) Adopt, for packaging and marketing, a~~n~~ minimum ~~average~~ weight of five ounces per unit of commercial packaging, with a range of 4.5 to 5.5 ounces for each ~~of~~ thawed lobster tail;

Comment 15: The use of the word "average" would allow undersized tails to be packaged as long as the average weight per package was high enough. The revision places focus on each lobster tail.

(k) Adopt an appropriate maximum size limit.

Comment 16: This will assist in enhancing spawning in the region. This is important since P. Argus larvae have a trans-boundary occurrence and many countries depend on an upstream supply while also supplying larvae to other countries. Protection of spawning stock is needed by all range states if multiple fishing grounds are to survive.

In addition, larger lobsters fertilize more eggs per egg clutch. On top of this, larger lobsters reproduce more times per year than newly mature lobsters. There is also limited market value for really large lobsters and there is a likelihood of easy acceptance by the fishing industry. An appropriate maximum size limit needs to be determined.

Another way of protecting large individuals is to create an adequate number of lobster specific marine protected areas. Establishment of MPAs for this purpose needs to be further considered in terms of size and location. Further regional connectivity studies would assist with identifying the best lobster larvae source sites for MPAs. In addition, larval settlement sites can be identified and also benefit from enhanced site protection.

(l) Prohibit the catch, possession, storage, sale, offer for sale or trade of a Spiny Lobster:

(i) with spermatophore or tar spot;
(ii) that is carrying eggs (Berried Lobster);
(iii) that is molting;
(iv) that has been scrubbed or has in any manner other than natural hatching had the eggs removed from the tail; and

Require that a Spiny Lobster with spematophore or carrying eggs or moulting must be returned to the sea immediately.

(m) Require fishing vessels and persons fishing for Spiny Lobster to land the Spiny Lobster whole, and prohibit the Possession on board a vessel or landing of Spiny Lobster parts such as shelled tails, or head meat;

Comment 17: The intent is to disallow avenues for undersized lobsters to enter the market. There was agreement that fishers should not be allowed to have lobster meat on board their vessels, however there wasn't full agreement that whole lobsters must be landed. The landing of only whole lobsters was not practical for fisheries such as The Bahamas where mainly tails are landed. Nevertheless, every effort should be made to utilize the entire animal to minimize waste. In addition, discarding lobster parts at sea may contribute to the spread of the PaV1 lobster virus if other lobsters consume the tissues of infected lobsters.

(n) Prohibit the use of scuba diving and hookah for Spiny Lobster fishing within [three/four/five (3/4/5)] years from the date of adoption of the present Declaration.

Comment 18: The RSWG was not in agreement that SCUBA should be disallowed completely. Though there are strong concerns about enhanced or excessive fishing effort due to greater fishing efficiency, the use of SCUBA can be appropriately controlled like other fishing methods. Each country can decide whether to allow SCUBA when considering allowable fishing effort. There was a greater concern over the potential for injuries and death due to the bends. As such, it is recommended that only trained fishers be allowed to use this fishing method. Where this cannot be managed effectively, banning of CSUBA should certainly be considered.

[Original Outline: 7. Harmonized minimum size and weight requirements. Consideration should be given to agreeing harmonized minimum size and weight requirements across the region.

[Comment: (i) *Minimum size and weight requirements for CARICOM Member States are listed in the Conservation and Management Measures Section of the Baseline Review on the Status and Management of the Caribbean Spiny Lobster Fisheries in the CARICOM Region. Some examples of size requirements in CARICOM countries are as follows:*

- *Minimum size limits (carapace length >3 inches; tail weight >4 oz) Belize*
- *Minimum size limits (carapace length <82.55 mm; tail length <139.7 mm) Bahamas*

- *Minimum size limits (carapace length ≥ 95 mm; tail weight ≥ 7 oz) Antigua and Barbuda*

(ii) OSPESCA Agreement for minimum size requirements:
For catching and storing purposes, a minimum size of one hundred forty millimeters (140 mm) of length is set, measured from the first abdominal segment to the terminal portion of the telson.
For packaging and marketing purposes an average weight of five ounces per unit of commercial packaging is set, with a range of 4.5 to 5.5 ounces of thawed lobster tail.]

8. Harmonized closed-season: consideration should be given to identifying a minimum harmonized closed season.

Current list of closed-seasons in the Caribbean:

Country	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anguilla	No closed season											
Antigua & Barbuda	No closed season											
Bahamas												
Barbados												
Belize												
Dominica	No closed season											
Grenada												
Guyana	No lobster fishery											
Haiti												
Jamaica												
Montserrat	No closed season											
St. Kitts & Nevis	No closed season											
Saint Lucia												
St. Vincent & the Grenadines												
Suriname	No lobster fishery											
Trinidad & Tobago	No lobster fishery											
Turks & Caicos												

Trinidad has lobster fishery

[*Comment: The OSPESCA agreement indicates the following in regards to a closed season: The States agree to implement a temporary suspension of the entire fishery for Caribbean spiny lobster (Panulirus argus) over a period of 4 months, from March 1st to June 30th each year, with the exception of Belize that will keep it between February 15th and June 14th of each year.*
A region wide lack of harmonization of management measures may undermine their enforcement, particularly with respect to minimum size regulations and closed seasons; for example, spiny lobster taken illegally in one country during a closed season could be landed legally in a neighbouring country. For this reason, a harmonized close season is recommended for the CARICOM Region]

9. Escape Gaps
Consideration should be given to including provisions on escape gaps or panels in lobster Traps.
[*Comment: From OSPESCA Agreement: Traps to be used shall have at least one escaping gap, in the opposite side of the line used to lift the Trap, with an escaping opening of 2 1/8 inches (5.4 centimeters) between the bottom and the first rib from the bottom above, to the effect of ensuring the exit of juvenile lobsters.*]

10. Prohibitions
Countries should consider whether to include prohibitions against taking lobsters in reproductive phase (spermatophore, moulting), or lobster tail meat without the shell.
[*Comments: Restricting fishing of lobsters in their reproductive phase ensures that they are able to maximize their reproductive capacity, and larger more fecund individuals are preserved. Prohibiting the sale of lobster tail meat without the shell helps to reduce the sale of undersized lobster.*]

11. Diving or other gear restrictions
Countries should consider whether to regulate or restrict gear or fishing methods include Scuba and hookah or other methods of fishing, or prohibit the use of certain gear types.
[*Comment: Restriction of gear types helps limit the extent to which and the location where lobster may be caught.*]

ARTICLE 7 MONITORING, CONTROL AND SURVEILLANCE

1. Member States shall cooperate through the CRFM and other competent regional and sub-regional bodies in taking appropriate enforcement action, consistent with regional and international law and their respective domestic laws, to deter Illegal, Unreported and Unregulated fishing activities for the Spiny Lobster.

2. The Ministerial Council shall adopt regional guidelines for use by States, as appropriate, in order to:

(a) Establish sanctions for non-compliance by vessels, fishers and other natural or legal persons connected to the Spiny Lobster fisheries and trade, to be applied in accordance with national law, that are adequate in severity to effectively secure compliance, deter further violations and deprive offenders of the benefits arising from their wrongful or illegal activities; and

(b) Evaluate their systems of sanctions to ensure that the penalties are effective in securing compliance and deterring violations.

5. Cooperate in taking appropriate action (**enforcement**), consistent with international law and their respective domestic laws, to deter IUU fishing activities for lobster, along with the creation of a strong disincentive/enforcement program.
[Comment: High market demand and high prices for lobster, including undersize lobster, are prompting rampant violation of minimum size and other regulations, is one of the most serious issues undermining the sustainable management of lobster stocks in the Caribbean.]

6. Review and strengthen the governance and management systems for lobster fisheries at each level (i.e. local, national, sub-regional).
[*Comment: (i) The governance/**policy-making process** needs to be more integrated, collaborative and participatory, incorporating stakeholder opinions, and regional concerns into the establishment of management measures*.
(ii) The current structure across the region is reducing the effectiveness of, and compliance with, fishing regulations.]

ARTICLE 8. PUBLIC EDUCATION AND AWARENESS

1. Member States shall:

    (a) Promote and encourage understanding of the importance of, and the measures required for, the conservation, management and sustainable use of the Spiny Lobster, and protection of its habitats and ecosystem;

    (b) Cooperate, as appropriate, through the CRFM and other regional and international organizations in developing educational and public awareness programmes for the conservation, management and sustainable use of the Spiny Lobster; and

    (c) Promote the use of information and communication technology tools including social media, in order to improve public awareness and understanding of the importance of the Spiny Lobster and the measures required for their conservation, management and long-term sustainable use.

SIGNATURE

[Signature by ministers is not necessary but desirable. Approval of the document by the Council as was done for the Castries Declaration is sufficient**]**

[Original text:
12. Final Clauses

- Depositary
- Participation
- Opening for signature
- Signature
- Entry in force
- Application
- Reservations

- Notification
- Territorial limitation
- Settlement of disputes
- Amendments
- Revision
- Duration

  Comment: *If a binding treaty is desired then the abovementioned final clauses will have to be considered. Alternatively, a soft law instrument such as a Code of Conduct or a Declaration may also be considered at this stage as it could be completed much faster and though not binding, would still be of considerable value in achieving coordinated action on the subject*]

ANNEX 4

Reef and Slope Fisheries Working Group
Biennial Work Plan for the period July 2014 to June 2016

Working Group Members: *Luc Clerveaux, Ramon Carcamo, Ricardo Morris, Remone Johnson, Kris Isaac, Hazel Oxenford, John Hoenig, Nancie Cummings*

Working Group Chair: *Lester Gittens (The Bahamas)*
Working Group Vice-Chair: *Alwyn Ponteen (Montserrat)*

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
National Technical Focal Points				
Turks and Caicos Islands Turks and Caicos Islands	Conduct Queen Conch Assessment	Develop sampling strategy	Luc Clerveaux	July 2014
		Acquire resources	Luc Clerveaux	July 2014
		Implement abundance survey	Luc Clerveaux	Jul – Sep 2014
		Computerize data	Luc Clerveaux	Jul - Sep 2014
		Prepare data for analysis	Luc Clerveaux	Jul – Sep 2014
		Submit national country report to Secretariat	Luc Clerveaux	Oct 2014
		Submit data to Chair for review and evaluation by DMTWG	Luc Clerveaux	Sep 2014
		Run with ASPIC	Luc Clerveaux	Jul – Oct 2014
		Write report	Luc Clerveaux	Aug – Oct 2014
		Submit final report for publication	Luc Clerveaux	Oct – Nov 2014
		Report to Chair on National Progress of WP implementation	Luc Clerveaux	Oct – Nov 2014
	Develop national morphometric conversion factors	Acquire measuring equipment	Luc Clerveaux	Jul 2014
		Develop sampling strategy	Luc Clerveaux	Jul 2014
		Collect morphometric data	Luc Clerveaux	Oct – Nov

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
				2014
		Computerize morphometric data	Luc Clerveaux	Oct – Nov 2014
		Prepare data for analysis	Luc Clerveaux	Oct – Nov 2014
		Submit data for review and evaluation by DMTWG	Luc Clerveaux	Oct – Nov 2014
		Analyze data	Luc Clerveaux	Oct –Nov 2014
		Write report	Luc Clerveaux	Dec 2014
		Submit final report for publication	Luc Clerveaux	Dec 2014
		Report to Chair on National Progress of WP implementation	Luc Clerveaux	Dec 2014
The Bahamas	Conduct Queen Conch Stock Assessment	Draft queen conch stock assessment proposal	Dept of Marine Resources/ National stakeholders	Oct 2014
		Acquire resources	Dept. of Mar. Resources	Nov – Dec 2014
		Conduct stock assessment	DMR/ Consultant	Jan – Mar 2015
		Review stock assessment	RSWG/ Local experts	Apr – Jun 2015
		Propose management action based on stock assessment	RSWG/ Local experts	Apr – Jun 2015
	Develop national morphometric conversion factors	Finish collection of data	Lester Gittens	Jul 2014
		Analyze data	Lester Gittens	Oct 2014
		Submit report for review by RSWG	Lester Gittens	Apr 2015
		Conduct regional assessment	Lester Gittens	Jun 2015
		Submit final report for publication	DMR	Jul 2015

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
		Implement conversion factors	TBD*	TBD
All CRFM countries that trade queen conch	Develop national morphometric conversion factors	Collection of data	TBD	Jul – Nov 2014
		Analyze data	RSWG	Sep 2014
		Submit report for review by RSWG	Lester Gittens	April 2015
		Conduct regional assessment	RSWG	June 2015
		Submit final report for publication	DMR	July 2015
		Implement conversion factors	TBD	TBD
Chair of Working Group				
Working Group Chair	Supervise coordinated development and implementation of the Work Plan at the regional level and necessary reporting	Convene electronic meetings of the Working Group		
		Report to Secretariat on Regional Progress in WP Implementation		
		Submit data to Secretariat for review and evaluation by DMTWG		
		Submit report of Working Group for publication in Annual Scientific Meeting Report as well as accompanying data and information and powerpoint presentations		
		Present Working Group report to Forum (if required)		
CRFM Secretariat				

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
CRFM Secretariat	Facilitate implementation of Working Group activities and reporting so as to inform decisions regarding management, statistics and research	Assist with convening electronic meetings of the Working Group	Programme Manager, Research and Resource Assessment (PMRRA) - staff time	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015
		Coordinate review and evaluation of data submitted for analysis	PMRRA - staff time	February to May 2015 & 2016
		Convene Annual Scientific Meetings (on site)	PMRRA - staff time	January to June 2015 & 2016
		Source Consultants to assist with analyses at Annual Scientific Meeting and to conduct identified training	PMRRA - staff time	January to June 2015 & 2016
		Publish reports of Annual Scientific Meeting	PMRRA - staff time	October to December 2014 & 2015
		Maintain CRFM Toolbox ; Notebook and Casebook	PMRRA - staff time	July 2014 to June 2016
		Present Working Group report to Forum for its adoption of Working Group Recommendations (Management, Statistics and Research)	PMRRA - staff time	April 2015 & 2016
		Assist with preparation and submission of project proposals for external funding (as required)	PMRRA - staff time	July 2014 to June 2016
		Support development and implementation of harmonized data and information systems	Programme Manager, Statistics and Information (PMSI -currently conducted by PMRRA)	July 2014 to June 2016
		Develop and implement regional research programmes as required	PMRRA - staff time	July 2014 to June 2016

TBD – To be determined

APPENDIX 6: REPORT OF THE DATA, METHODS AND TRAINING WORKING GROUP (DMTWG)

1. Opening of the Meeting

Ms. Elizabeth Mohammed, Programme Manager for Research and Resource Assessment, CRFM Secretariat, opened the meeting at 8:45 a.m. and welcomed participants to the 2014 meeting of the DMTWG. Ms. Mohammed provided a logistical update including working hours and scheduled breaks before handing over to Chairperson Ms. Patricia Hubert-Medar, St. Lucia's representative.

After a brief word of prayer, Ms. Hubert-Medar extended greetings to participants and invited everyone to introduce themselves. In attendance were representatives from Grenada, Trinidad and Tobago, Guyana, Anguilla, The Bahamas, Jamaica, St. Vincent and the Grenadines, Dominica, Montserrat, Belize, St. Kitts and Nevis, as well as Professor John Hoenig, Consultant to the Reef and Slope Fisheries Working Group, and who would also conduct training in R Statistical software for all meeting participants. Following general introductions, Professor Hoenig was asked to introduce himself and also gave an overview of the training that would be undertaken.

2. Review and adoption of Meeting Agenda

The draft agenda (Annex 1) was made available electronically via the various D-Groups and was presented to the meeting for review and adoption. The text in item 2 was corrected to reflect "2 days" rather than the "1.5 days" and a new item was added to address review of the new Terms of Reference (ToRs) for the working group. The Chair pointed out that item 1 as well as the other agenda items will be addressed at the end of the R training.

Mr. Mikhail Francis, CARIFICO Administrative Assistant with CRFM and Jamaica Representative Mr. Ricardo Morris were appointed rapporteurs to the meeting.

3. Training Sessions

Professor John Hoenig conducted a two-day training session on the use of R for data manipulation, graphics and statistical analysis. Participants were exposed to a number of tools and applications including, but not limited to aspects of data cleaning, data inputting, graphing, interpreting errors, the use of statistical models, in-class exercises. Topics included summarization including the use of apply functions (the R equivalents of pivot tables in Excel), graphics, linear regression and nonlinear regression including growth curves and length-weight relationships. Some participants continued to use R for the analysis of their country's fisheries data set during the fisheries working group sessions at the scientific meeting.

Participants were each provided with a pen drive containing the course materials, working exercises and solutions. They were also given an assignment to complete within two weeks of the end of Scientific Meeting. Upon completion of the assignment, the participant will be issued a certificate attesting to the successful completion of the training. In addition, participants were provided with electronic copies of the data cleaning manual developed by Prof. Hoenig and Prof. Oxenford (Annex 2) and the R-Book (Crawley, 2013).

4. Meeting

The meeting/discussion session commenced on the afternoon of 12 June 2014 to address the remaining agenda items; including, a review of inter-sessional activities (2013-2014) and management decisions since the last meeting, a review of the Terms of Reference for the working group, and review of Appendix

4: Proposed Intervention Points and Actions for Strategy for Capacity Building to Strengthen Fisheries Data and Information Management in the CRFM from the Report of the Workshop to Develop Draft Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information. The session also facilitated discussion on future needs and the development of a detailed biennial work plan for the period 2014 – 2016.

4.1 Review of the 2012 – 2013 inter-sessional activities

Ms. Mohammed provided the Meeting with an update of the inter-sessional activities undertaken by the CRFM Secretariat and management decisions since the last meeting. She highlighted the challenge with compiling a comprehensive list of current technical staff of CRFM Member States to facilitate their invitation to become members of the various CRFM DGroups, used to share technical and other information, and with whom the Secretariat could communicate on pertinent matters. This situation is particularly challenging where persons have moved on from their national fisheries-related post or new staff join the Fisheries Departments and the Secretariat is not informed to facilitate update of its mailing list. She requested that participants at the meeting advise the Secretariat of persons within their departments who should be included on the CRFM's mailing list.

4.2 Review of Terms of Reference for the DMTWG

The Chairperson went through items of the ToRs and facilitated representatives' comments on the main points listed below:

- Significant challenges with data collection were highlighted. Some of the challenges included no minimum data requirements and no guidance on the format for collection and storage of data that can be fed into the Annual Scientific Meeting.
- The participant from Montserrat, Mr. Alwyn Ponteen, highlighted the fact that data collectors were not trained and there was no standard for data collection among Member States. In his opinion, intervention from an outside agency was necessary since the level of data collection and management had deteriorated since the days of CFRAMP.
- Greater emphasis must be placed on the data collection and management process as the recommendations made by the Forum were not being implemented.
- The Belize representative, Mr. Ramon Carcamo, appealed for a more structured data collection plan with results oriented output. He stated that this was the only way governments would provide support and funding and that tangible results were needed in order to make policy. Plans must also be synchronized to allow Ministers to offer their support.
- Nancie Cummings of U.S, NOAA, NMFS stated that data collection plans needed to be tailored specifically to each island.
- Professor Hoenig pointed out that in terms of data required for analysis we should consider what information can be extracted from the data based on how the fishery operates.
- In the case of St. Vincent and the Grenadines, three (3) critical areas of concern were identified by representative Cheryl Jardine-Jackson; namely a lack of finance, a lack of data collectors and a general lack of interest from the data collectors themselves. Moreover, more biological data was needed.
- Ms. Mohammed interjected with the suggestion that there should be a country-specific approach where the Fisheries Divisions work with other agencies which collect data including cooperatives and processing plants. They should also try to fill in the gaps through efficient use of existing resources given that resources for data collection are not likely to increase in future.
- The Montserrat representative, Mr. Ponteen, reminded the meeting that they had requested of the CRFM to hire someone to provide training for data collectors since there was a problem with the quality of the data being provided.
- Mr. Ponteen further recommended that in-house training should be conducted for data collectors by a professional.

- Mr. Carcamo raised the point that each country has its own challenges and objectives plus there was a need for guidance at a higher (policy) level.
- It was suggested that we must first assess ourselves and our concerns should be addressed at the level of the Caribbean Fisheries Forum.
- Another suggestion came from Mr. Ponteen that could be added to the inter-sessional work plan. Within two (2) months, the CRFM should communicate to all Government Ministers and Permanent Secretaries the importance of data collection. An email can be sent highlighting the concerns of Member States coming out of this year's Scientific Meeting.
- St. Vincent representative, Mr. Kris Isaacs, suggested that there was a disconnect between the policy makers and Fisheries personnel because the focus is mainly on the financial and human resource elements.
- Consultant, Professor John Hoenig advised participants to explain what they need and why. He suggested that countries explain the output which will be achieved if the Ministers can give what is needed. Nancie Cummings added that we should speak the language the Ministers speak.
- Mr. Carcamo reiterated his point made earlier that there was a need to develop data collection programs both nationally and regionally. In addition, a single database was necessary across all CRFM Member States.
- Chairperson Ms. Hubert-Medar informed the meeting that her country is in the process of acquiring the services of a consultant to modify CARIFIS to address their needs.

4.3 Review of Workshop Report to Develop Draft Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information

Ms. Mohammed presented via PowerPoint an overview of the recommendations of the meeting to Develop Draft Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information, specifically regarding Appendix 4 of the respective report. She elaborated on the meeting recommendations and impacts on the format of future scientific meetings and suggested that the recommendations form the basis upon which a detailed work plan for 2014 to 2016 be developed.

4.4 Suggested Training for the 2014 - 2015 period

1. The Montserrat representative requested that data collectors be properly trained in the correct methods of performing their duties to improve efficiency and quality of data.

2. The Dominica representative requested longer R-software training.

3. States to utilize regional and local expertise to develop data collection and information management.

4. The Belize representative suggested that the GoToMeeting software be used to facilitate regular re-current training in the R-software platform whereby Fisheries personnel could have the opportunity to remain current in its use and share best practices. Ms. Mohammed agreed that the technology was being underutilized at the moment.

5. St. Lucia offered to provide training to the data collectors of Montserrat as such an arrangement had taken place in the past.

4.5 Biennial work plan (2014-2016)

It was suggested that the group consider aspects of the Workshop report (mentioned at 4.3) strategic actions with a view to developing the 2014-2016 work plan.

- After some deliberation, the meeting came to the consensus that each country would rank its ten (10) species according to their national importance, identify the basis or criteria for such ranking and

circulate the compiled ranking among CRFM member states for review and analysis to prioritise the list of species for regular regional assessment and monitoring.

- It was agreed that countries without national data sampling plans such as: The Bahamas, Montserrat, Grenada, St. Lucia and Dominica, would develop same and those countries that already had national data sampling plans, including: Belize, Turks and Caicos Islands, Jamaica, St. Vincent and the Grenadines, Trinidad and Tobago and St. Kitts and Nevis, would update their plans. The development of these plans will be undertaken with assistance from the CRFM Secretariat and respective Member States.

The detailed biennial work plan is attached as Appendix 3. The main tasks identified include:

(1) Training of data collectors;
(2) Development of new or update of existing national sampling plans;
(3) Identification and prioritisation of a list of species for regular assessment and monitoring at the regional level;
(4) Review and evaluation (screening) of data submitted for analysis at the Annual Scientific Meetings.

4.6 Recommendations

1. If personnel within any country required skills, the CRFM should facilitate the training of these persons at the regional level using both expertise within the region and outside. This could include data collectors and processors.

2. The meeting recommended that data be screened by members of the DMTWG, supported by the Secretariat. Dominica representative Mr. Derrick Theophille and Bahamas representative Mr. Lester Gittens volunteered to work with Ms. Mohammed in this regard. Ms. Hubert-Medar, in her capacity as Chair of the DMTWG, would lead the activity.

3. The Chairperson Ms. Hubert-Medar recommended that since persons received two days training in the R-software, the CRFM should have encouraged the use of R to undertake analyses at the scientific meeting.

4. The Montserrat representative recommended that the R-software be recognized and made available online as a formal tool for fisheries data analysis in all CRFM Member States and that such a proposal is presented at the next Caribbean Fisheries Forum.

5. The Data, Methods and Training Working Group should meet separate and apart from the resource working group, to allow for more preparation of DMTWG activities, which included the identification, preparation and cleaning of critical data for analyses along with inter-sessional training and overarching activities that spanned all fishery working groups. If the DMTWG concluded all of its activities prior to the next scientific meeting, the output from those activities would fit into the requirements and ultimately the success of the scientific meeting.

6. The training components of the DMTWG should be such that trained persons can impart knowledge gained to other staff members to achieve sustainability. The problems being experienced with knowledge transfer were highlighted.

The meeting was adjourned at 5:14 p.m. on 12 June 2014.

REFERENCES

Crawley, M.J. 2013. The R-book. Second Edition. John Wiley and Sons Ltd. West Sussex, United Kingdom. 975 p. (Downloaded from: http://www.bio.ic.ac.uk/research/mjcraw/therbook/index.htm)

Annex 1

CSM-10-02
(Version: 06 June 2014)

DRAFT AGENDA OF 2014 MEETING OF DATA, METHODS AND TRAINING WORKING GROUP

(Kingstown, Saint Vincent and the Grenadines – 10 to 11 June 2014)

Chair: St Lucia (Patricia Hubert-Medar)
Vice-Chair: Jamaica (Ricardo Morris)

At 2014 Scientific Meeting

1. Review of inter-sessional activities and management decisions since last meeting - proposed new format for CRFM Annual Scientific Meetings;
2. 1.5 day training session on the use of R-software for statistical analysis (Note: each Working Group is required to have a data set for analysis in practical session);
3. Review of Workshop Report to Develop Draft Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information – in particular Appendix 4: Proposed Intervention Points and Actions for Strategy for Capacity Building to Strengthen Fisheries Data and Information Management in the CRFM – discussion on the way forward;
4. Develop detailed work plan (2014 to 2016);
5. Any other business.

Inter-sessional

1. Review of CLME Project Document (Second Phase – Implementation of Strategic Action Programme) – identification of possible data requirements and assessment approaches to be applied;
2. Review of IDB Strategic Program for Climate Resilience - Marine Component and CIDA Project proposal on Increasing Resilience of the Fisheries Sector in the Caribbean Region - identification of possible data requirements and assessment approaches to be applied.

Annex 2

Caribbean Regional Fisheries Mechanism - Data, Methods and Training Working Group

Data Cleaning Procedures Using Excel and R: a real example using reef fish landings from the Turks and Caicos Islands

John M. Hoenig

Virginia Institute of Marine Science

Gloucester Point, Virginia

Hazel Oxenford

CERMES, University of the West Indies,

Cave Hill Campus, Barbados

ALL datasets can be assumed to have errors. It's a fact of life and we must deal with it. This manual shows you some useful techniques for finding errors. We will apply these methods to data on reef fish landings in the Turks and Caicos Islands. The data were entered into an Excel

spreadsheet by various people. The Excel file is called "reef_fish_length_data.xls". We'll first use Excel and then R to look for errors.

Before beginning, let's think about the kinds of errors or inconsistencies that might be detected. Here is a partial list:

1) Typing errors – a wrong key is pressed. For example, a length of "32.7" is entered as "32..7".

2) Spelling mistakes – for example, the month "February" is entered as "Febuary".

3) Inconsistent names, codes and formats – for example, a vessel is sometimes entered as "LadyAnn" and sometimes as "Lady Ann"; a catch is sometimes recorded as "spiny lobster" and sometimes as "lobster, spiny".

4) Inconsistent units – for example, length is sometimes total length and sometimes fork length, or weights that used to be recorded as pounds are now recorded as kilograms or grams in the same column.

5) Missed decimal, e.g., the length 32.7 gets entered as 327.

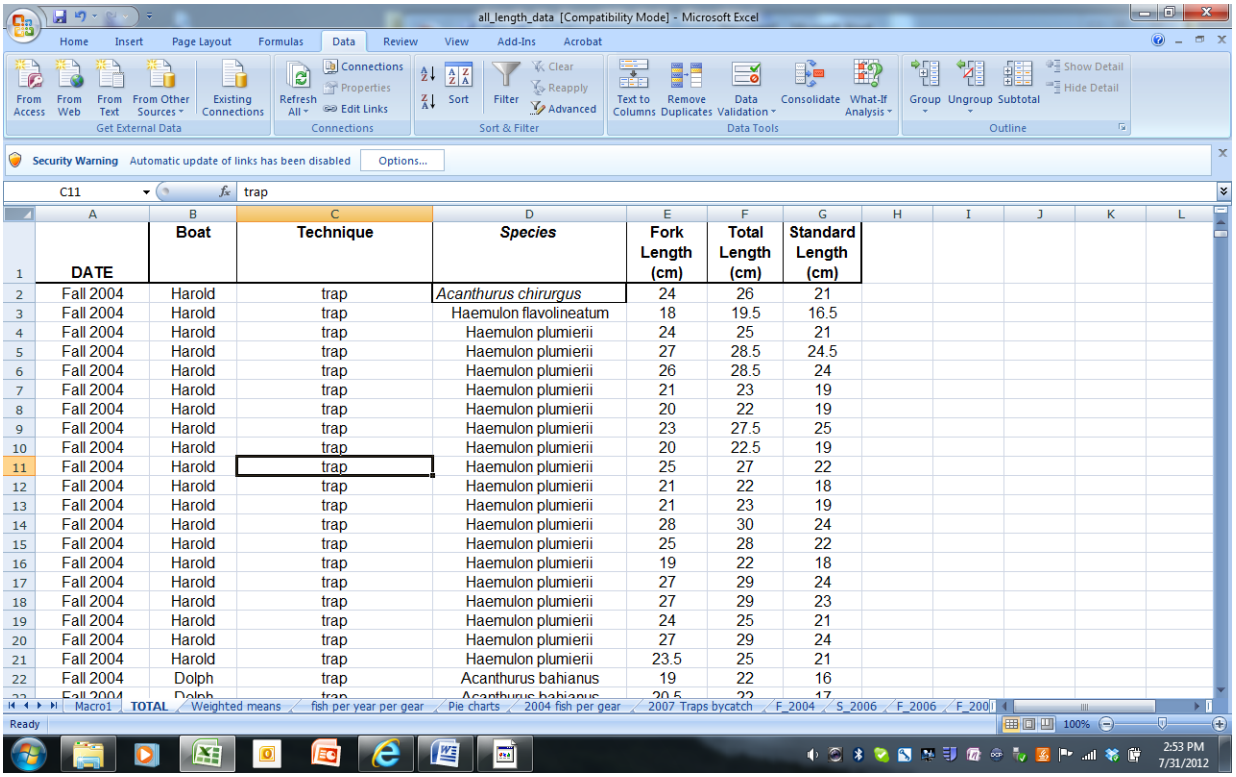
6) Duplicate rows - the same row of data is entered into the database twice.

The above errors are data entry problems. There can also be more fundamental problems: a fish is misidentified or its length is recorded incorrectly. Fortunately, many of these errors can be detected and 'repaired' by data cleaning procedures.

EXCEL

In general, before working on a datafile, make a copy of it and work from the copy. The reason is that if you accidently mess up the data you still have the original. For the purpose of this training exercise, it's a good idea to make a copy because you'll correct errors in Excel and then find errors in R. If you only have the version you corrected in Excel you won't be able to detect errors that no longer exist when you go into R.

The first thing to do is look at the data and familiarize yourself with what's in each column by reading the column labels and the first few rows of data. Skip down to the last row of data to get a feel for the size of the datafile and to check that there isn't anything unusual about the last row.



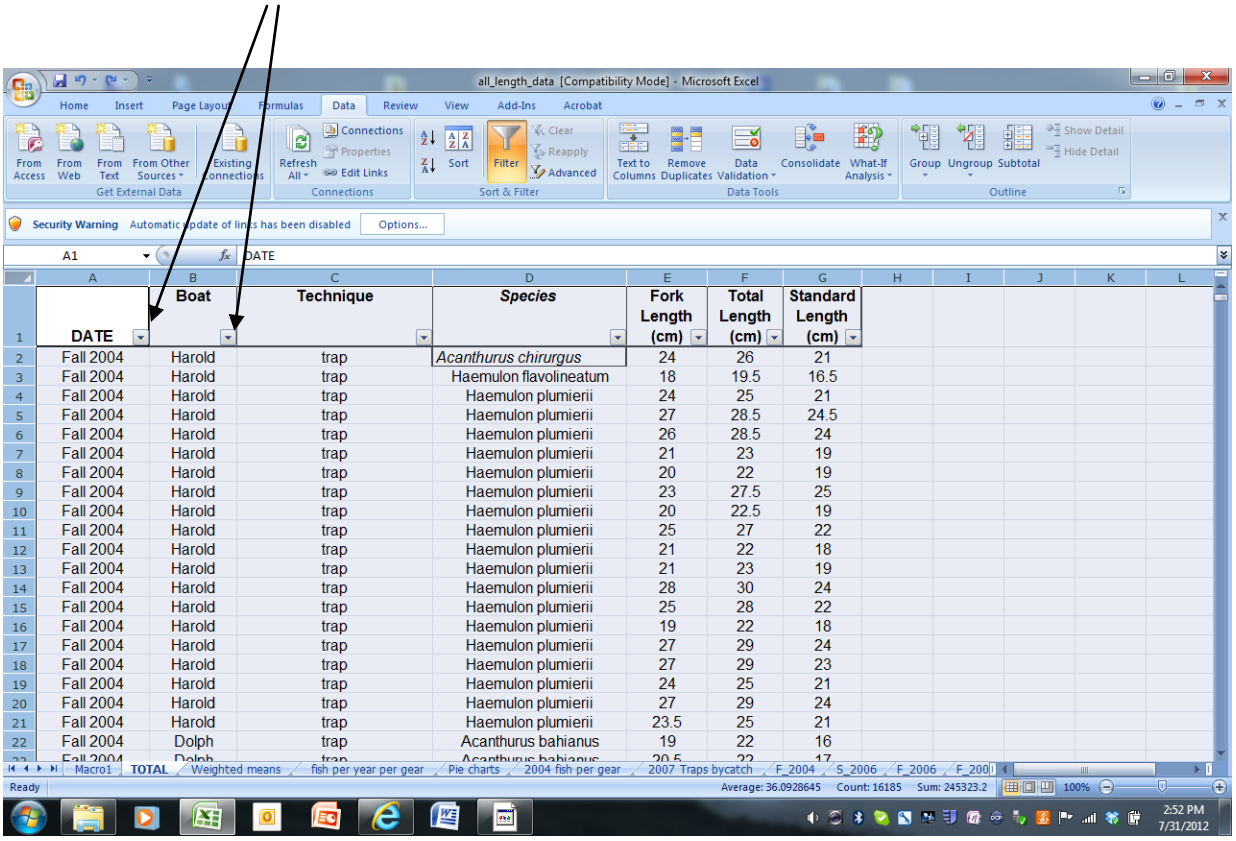
all_length_data [Compatibility Mode] - Microsoft Excel

Security Warning Automatic update of links has been disabled Options...

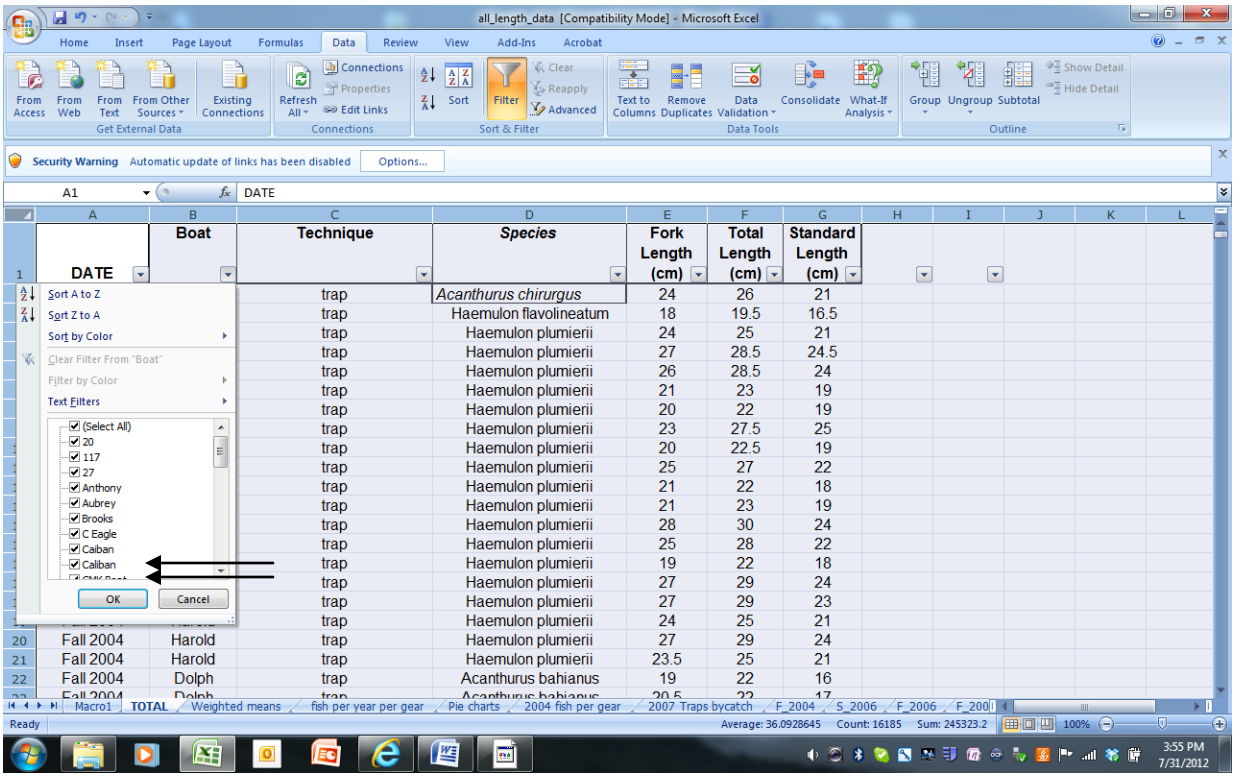
C11 trap

	A	B	C	D	E	F	G
1	DATE	Boat	Technique	*Species*	Fork Length (cm)	Total Length (cm)	Standard Length (cm)
2	Fall 2004	Harold	trap	*Acanthurus chirurgus*	24	26	21
3	Fall 2004	Harold	trap	Haemulon flavolineatum	18	19.5	16.5
4	Fall 2004	Harold	trap	Haemulon plumierii	24	25	21
5	Fall 2004	Harold	trap	Haemulon plumierii	27	28.5	24.5
6	Fall 2004	Harold	trap	Haemulon plumierii	26	28.5	24
7	Fall 2004	Harold	trap	Haemulon plumierii	21	23	19
8	Fall 2004	Harold	trap	Haemulon plumierii	20	22	19
9	Fall 2004	Harold	trap	Haemulon plumierii	23	27.5	25
10	Fall 2004	Harold	trap	Haemulon plumierii	20	22.5	19
11	Fall 2004	Harold	trap	Haemulon plumierii	25	27	22
12	Fall 2004	Harold	trap	Haemulon plumierii	21	22	18
13	Fall 2004	Harold	trap	Haemulon plumierii	21	23	19
14	Fall 2004	Harold	trap	Haemulon plumierii	28	30	24
15	Fall 2004	Harold	trap	Haemulon plumierii	25	28	22
16	Fall 2004	Harold	trap	Haemulon plumierii	19	22	18
17	Fall 2004	Harold	trap	Haemulon plumierii	27	29	24
18	Fall 2004	Harold	trap	Haemulon plumierii	27	29	23
19	Fall 2004	Harold	trap	Haemulon plumierii	24	25	21
20	Fall 2004	Harold	trap	Haemulon plumierii	27	29	24
21	Fall 2004	Harold	trap	Haemulon plumierii	23.5	25	21
22	Fall 2004	Dolph	trap	Acanthurus bahianus	19	22	16

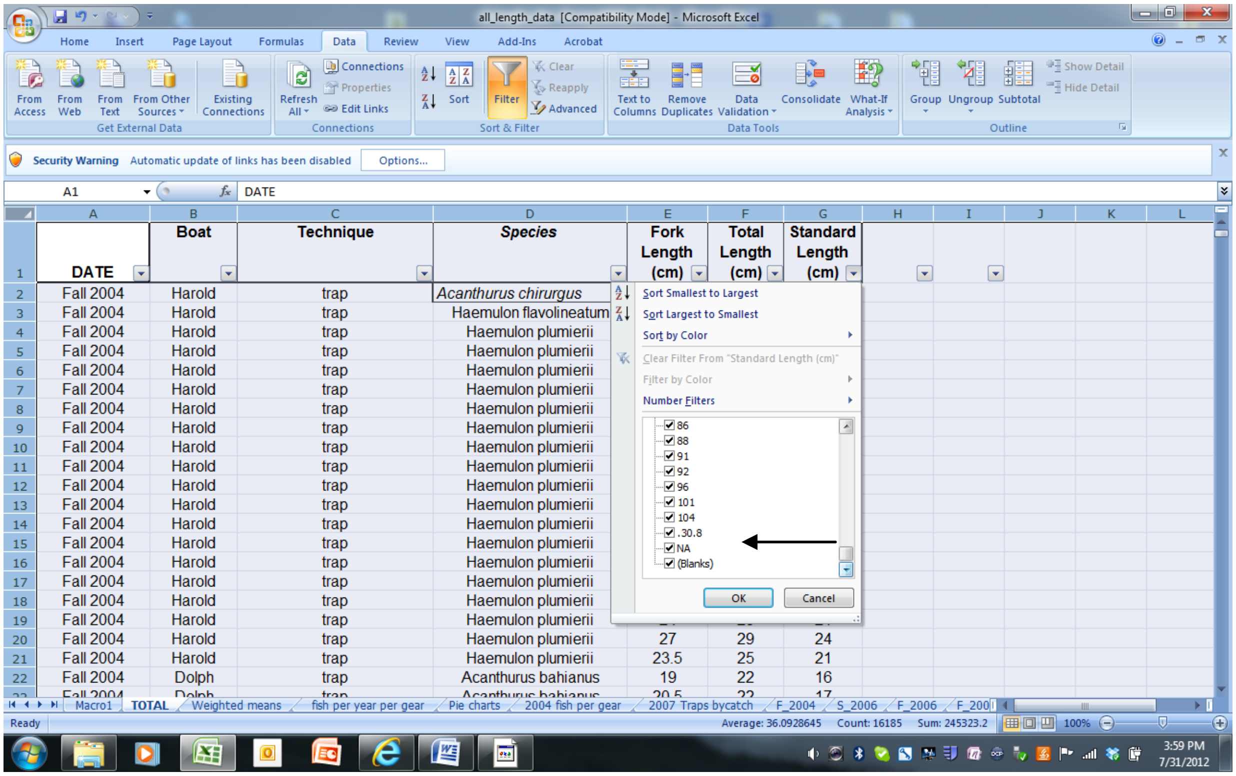
Now our strategy is to look for things that are unusual. We can do this quite effectively using Excel's filters. Click on Data to go to the Data menu and then click on Filter. When the filter is applied, notice the little black triangle that appears in the lower right corner of each column header (see illustration below). The triangle marks a pulldown menu.



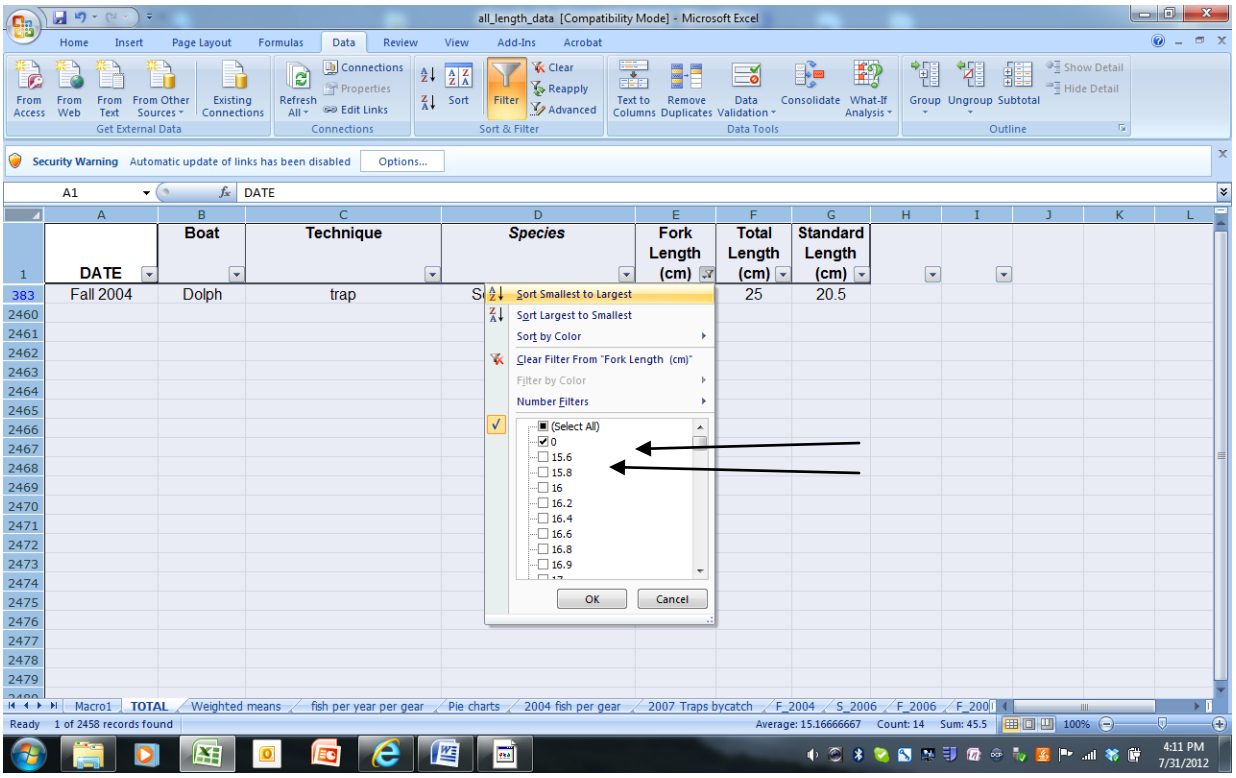
Click on the pulldown menu for Column B (Boat) to get a list of all of the boat names in the database. We see that there is a boat called Caliban and one called Caiban (see illustration below). Presumably, one of these is wrong. Likewise there is one called Harold and another called Harold's which may well be the same boat. Ronald and Ronald Dean may also be the same boat and should at least be checked.



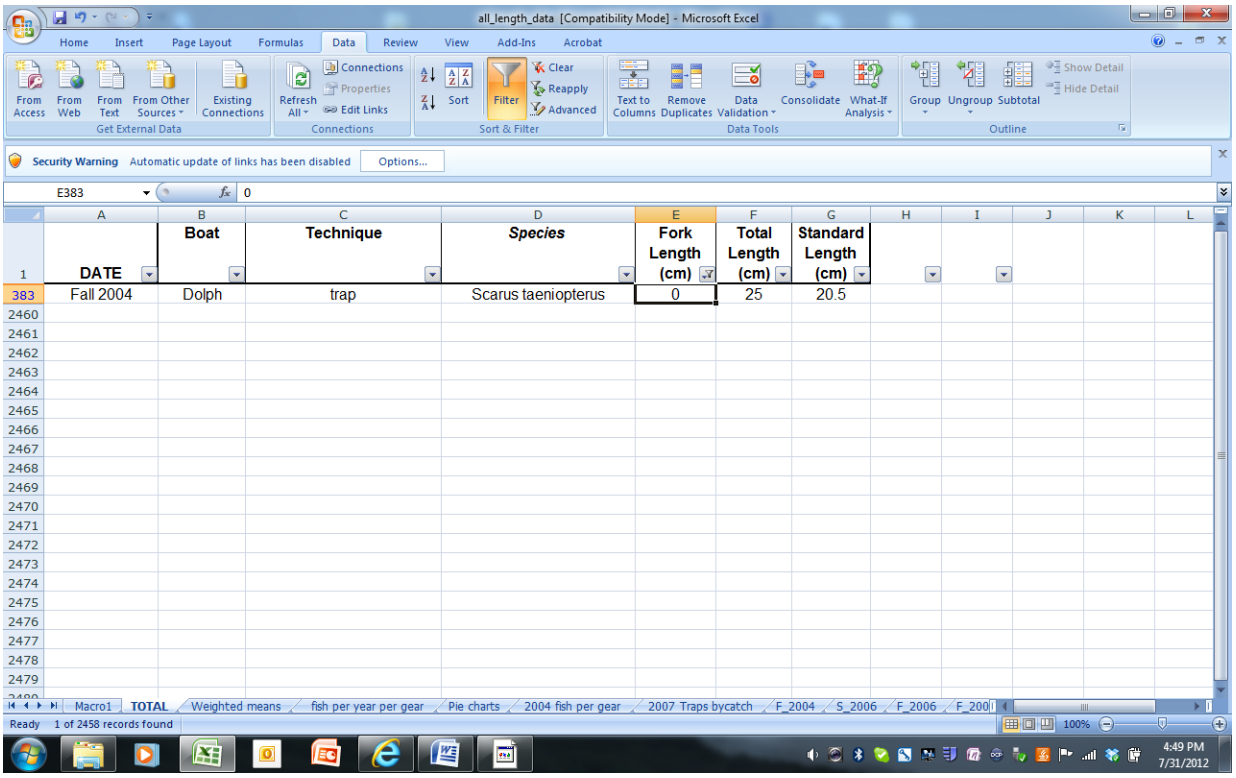
Now, pull down the menu for Standard Length (cm). We see there is a length of .30.8 which is obviously wrong (see illustration). We can go back to the original datasheet to see what the value should be – IF the original datasheets have been preserved. Otherwise, we'll have to decide between "correcting" the value to 30.8 (dropping the leading period) or deleting the value. We would NOT want to correct the value to 30.8 if it turned out that 30.8 is an extreme value (i.e., is either the largest or smallest value for that species) or if 30.8 is inconsistent with other data. That is, standard length should be smaller than fork length which should be smaller than total length. We note, also, there are some blank entries and some entries that are "NA". Entries of "NA" presumably pertain to missing values (i.e., "Not Available"). We'll want to have a single way to mark missing values. In R, the symbol for missing values is NA.



Look at the values of Fork Length: the first length class is 0 and the second is 15.6 cm. Presumably, the 0 should be coded as a missing value. Looking at the end of the list we see there are 120, 1938, -, NA, and blanks. The value of 1938 is obviously wrong, and it appears there are three separate ways to specify missing values.



We can find all of the rows that have Fork Length = 0 by unchecking the 'select all' box at the top of the drop down list and ticking the box in front of 0 and finally we click on OK at the bottom of the box. We then see that there is just one row with Fork Length = 0. It's row 383. We can easily replace the 0 with whatever symbol we want to represent missing values.



We can then go back to looking at all rows by pulling down the menu and clicking on Select All, then clicking on OK at the bottom of the menu. Be careful to return each column to 'select all' when moving to another column. Note that any column that has been left with only a subset of the data selected will be marked with the filter icon beside the small arrow, so that it is easy to spot if a selection has been left on.

We recommend that you check each column in this way.

VERY IMPORTANT! Notice that cells H1 and I1 do not have a column heading but there is a black triangle in the lower right corner of those cells indicating there is a pulldown menu. If you click on the triangle you'll see that at least one row has a blank. (This means there is a space in at least one row, i.e., somebody pointed to a cell and then hit the space bar.) This will cause headaches when you try to read the datafile into R and process the data. We

recommend that you highlight just the cells you want and copy them to a new workbook rather than working with the original Excel file. The reason is that somewhere in the original datafile there could be a blank or other problem that you don't notice and it might take a long time to figure out what is the problem.

Practice exercise: Look at the column labelled Technique and see if you can find the errors and problems.

Other data checks. There are other quality control procedures we could implement in Excel to look for errors. Histograms of variables can be used to look for unusual values that are suspicious. Then, one can plot one variable versus another to again look for unusual values. For example, a plot of weight versus length should approximate an arc from lower left to upper right (low weight and short length up to heavy weight and long length). A fish with fairly low weight with very long length, or a very heavy fish that is very short, would stand out as unusual. Also, as mentioned earlier, standard length must be less than fork length which must be less than total length. We should check to make sure this is always the case.

Data Cleaning in R

The first thing we have to do is get the data into R. To do this, we convert the Excel file into a format that R can read. Very often, we use .csv files which are text files where the fields are separated by a comma (hence, csv stands for comma separated variables).Open the Excel file in Excel, click on "Save As" in the file menu, and then in the dialog box where it says "Save as type:" pull down the file type menu and specify CSV.

Once you have a .csv file you can look at it a couple of different ways. If you just click on the file name in the folder where it resides the file will be opened by EXCEL and will appear as an EXCEL spreadsheet. But, if you open it using a text editor (e.g., Wordpad, Notepad or Word) you'll see the text (it won't be in rows and columns (cells)). The different data items will be separated by commas, as below.

DATE,Boat,Technique,Species,Fork Length (cm),Total Length (cm),Standard Length (cm),,

Fall 2004,Harold,trap,Acanthurus chirurgus,24,26,21,,

Fall 2004,Harold,trap,Haemulon flavolineatum,18,19.5,16.5,,

Fall 2004,Harold,trap,Haemulon plumierii,24,25,21,,

Fall 2004,Harold,trap,Haemulon plumierii,27,28.5,24.5,,

We see a couple of problems. First, there is a double comma ",," at the end of each line. These need to be eliminated. Also, the first row of data has the names of the variables (DATE, Boat, Technique, etc.). Some of the variable names have spaces embedded in them. These will cause problems in R so we should change the names, e.g., Fork Length (cm) can be changed to Fork_Length or maybe FLeng_cm.

Also look at the end of the .csv file and you'll see the following:

Spring 2008,CMK Boat,Trolling ,Sphyraena barracuda,80.5,87.5,74,,

Spring 2008,CMK Boat,Trolling ,Sphyraena barracuda,85,94,70,,

Spring 2008,CMK Boat,Trolling ,Caranx latus,53,67,46,,

Spring 2008,CMK Boat,Trolling ,Coryphaena equiselis,92,110,85,,

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,,,,,,,,

,,,,,,,,

,,,,,,,,

,,,,,,,,

Thus, there is a whole bunch of lines at the end of the file that are nonsense. They need to be eliminated.

Now we can read the data into R using the command:

```
Caicos <- read.csv("reef_fish_length_data.csv",header=T)
```

This command specifies the name of the file to be read and says the first line of the file contains the names of the variables. The dataset is read into R and given the name Caicos. The individual variables are accessed by Caicos$*variable_name* such as Caicos$Boat.

For the rest of this document, the text is executable in R. Just copy what's below and paste it into an R script and then execute the commands.

```
# The next command lists the first 30 rows of data (and all columns).

Caicos[1:30,]

dim(Caicos)  # show how many rows and columns there are

names(Caicos)  # show the names of the variables in Caicos

summary(Caicos) # give a summary of each variable in Caicos.

# The summary command only shows some of the particular values of a categorical variable,
e.g., some of the boat names. We # can see more of the values, say 25 boat names, by specifying

summary(Caicos,maxsum=25)
```

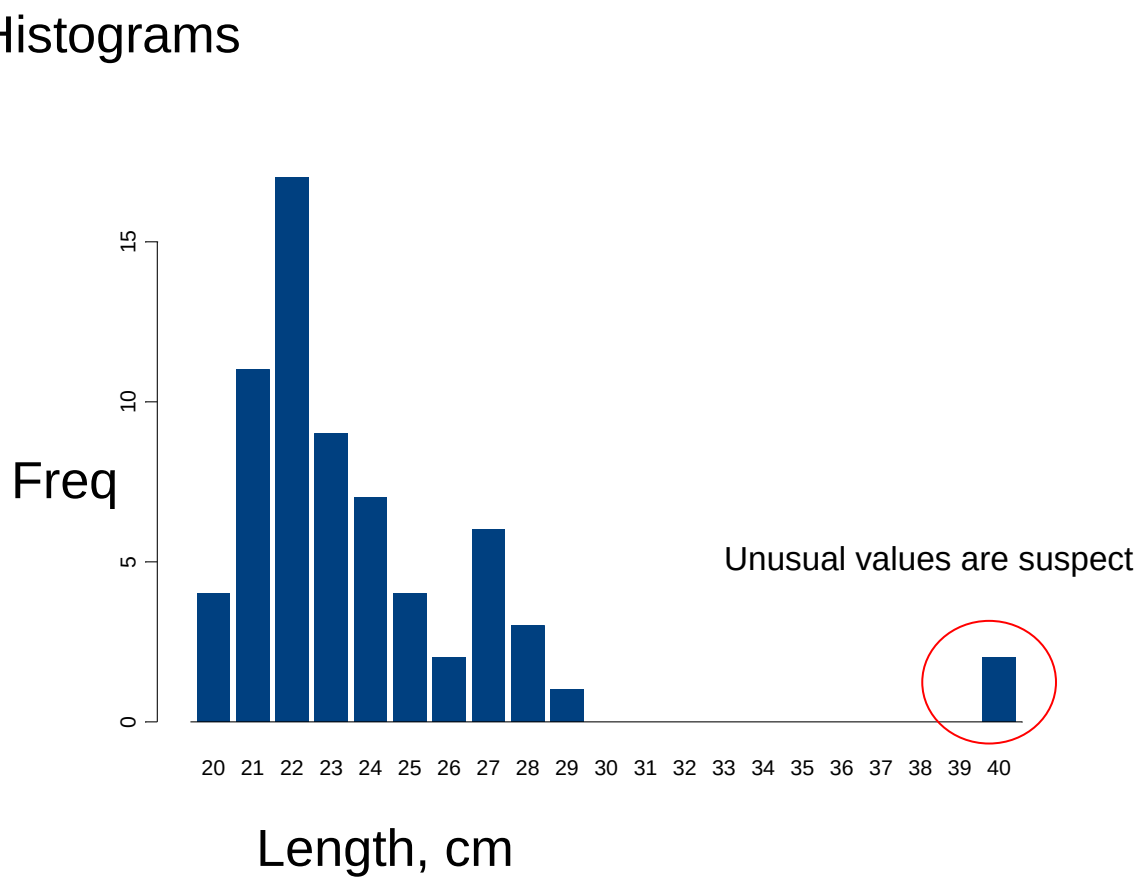
```
# A number of problems are evident now. There are two nonsensical variables: X and X.1. We
# can eliminate them but first we should understand why they arose. It turns out there were
# spaces entered into the last two columns of the Excel spreadsheet and these spaces were treated
# as data. The last two columns need to be eliminated.

# look at the last 6 rows of the datafile.
tail(Caicos)
# obviously, there is something wrong here. Examination of the datafile shows the blank rows –
# IF you open the file with a text editor instead of Excel

# The variable names came out strangely.  We should rename them in the .csv file (but we could
# rename them in R.)

# We see that there is a gear type called “hook and line” and one called “Hook and Line” and one
# called “Line”.
# Similarly, there is “lobster trap” and “Lobster Trap”. We should go into the original datafile
# and make the codes consistent. (This should have been caught in an initial quality control
# check in Excel but, even after careful examination of the data, one is likely to find that errors
# remain. It is exceedingly difficult to find ALL errors and one must be ever vigilant.)

# The summaries for the length variables indicate that standard, fork and total length are factors
# (categories), not numeric variables. (If they were numeric, the summary would give the mean,
# median, quartiles and minimum and maximum variables.) What would cause R to treat the
# variables as factors? The answer is: if any entry in the column is not numeric then the variable
```

```
# becomes a factor. Entries with an Oh instead of a zero would be non-numeric. So would an
# entry of 32..7. We need to go back to the datafile and find the non-numeric entries.

# *********    And try this in R    **********
attributes(Caicos$Total.Length..cm.)
attributes(Caicos$Standard.Length..cm.)

# Look at the two ends of the listings. What do you see ???

which(Caicos$Total.Length..cm. == "n/a")  # identify rows with n/a
which(Caicos$Total.Length..cm. == "")
which(Caicos$Standard.Length.. cm.== ".30.8")

# The summary() output also shows that Haemulon plumierii occurs twice. Why is
# that? Try this:

is.factor(Caicos$Species)
levels(Caicos$Species)
attributes(Caicos$Species)

# we see that there is “Haemulon plumierii”  and “Haemulon plumierii ” (the latter
# having a space at the end). Similary, there is “Lutjanus” and Lutjanus ”.

# A very nice function in R is the duplicated() function. It gives a vector of TRUE and FALSE
# values indicating whether each row is a duplicate of a previous row. (Note: the first occurrence
of a row is not a duplicate of anything earlier so the row gets a FALSE designation; if the row
```

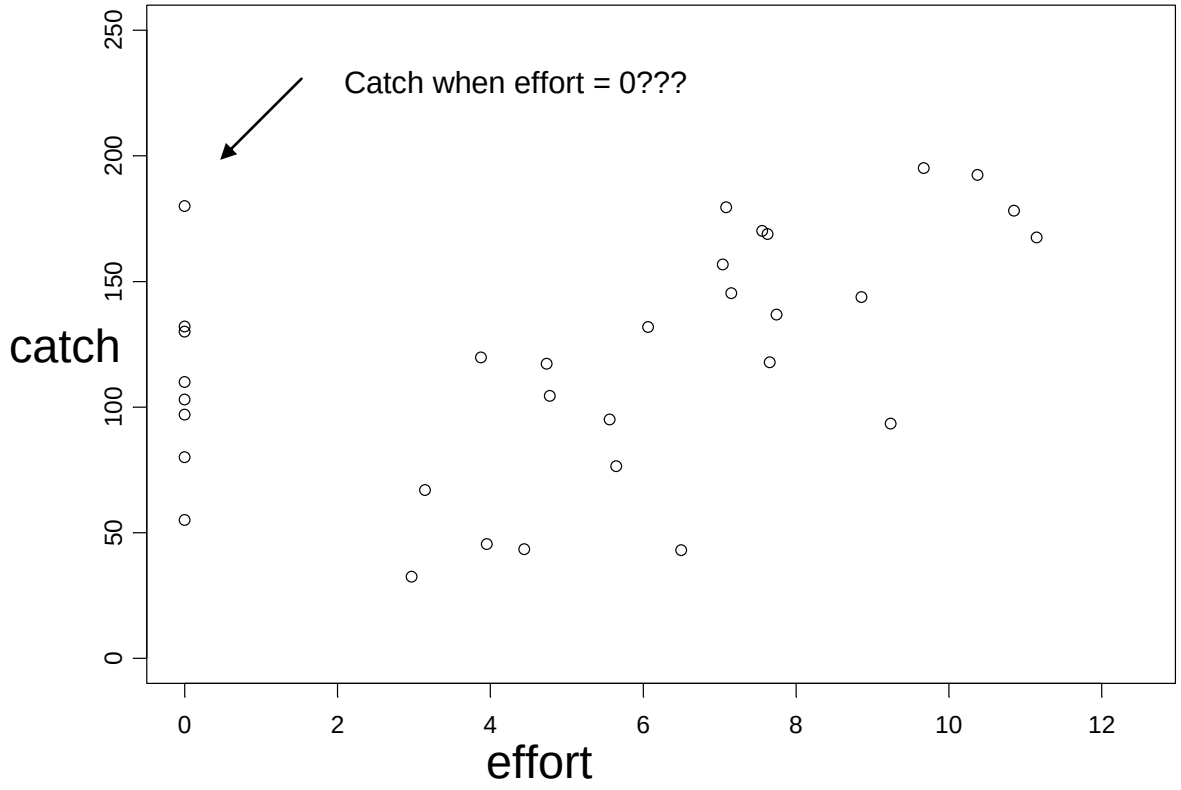
occurs again lower down in the listing it then gets a TRUE designation because it repeats a row that occurred above.)

```
duplicated(Caicos)


# After cleaning the data, we can do quality control checks by making histograms of
# lengths to look for lengths that are suspiciously small or large. We can also do length-weight
# regressions to look for suspicious cases (if we have weight data). We can also check that
# fork length is less than total length by making a scatterplot. Or we can count the number of
# times the fork length is greater than the total length. You can use the following command
# (after you eliminate the non-numeric values and make the lengths into numeric variables)

sum(Caicos$Fork.Length…cm. >= Caicos$Total.Length..cm.)  # count how many times
                                                          # fork length is > total length

##############################################################################
```

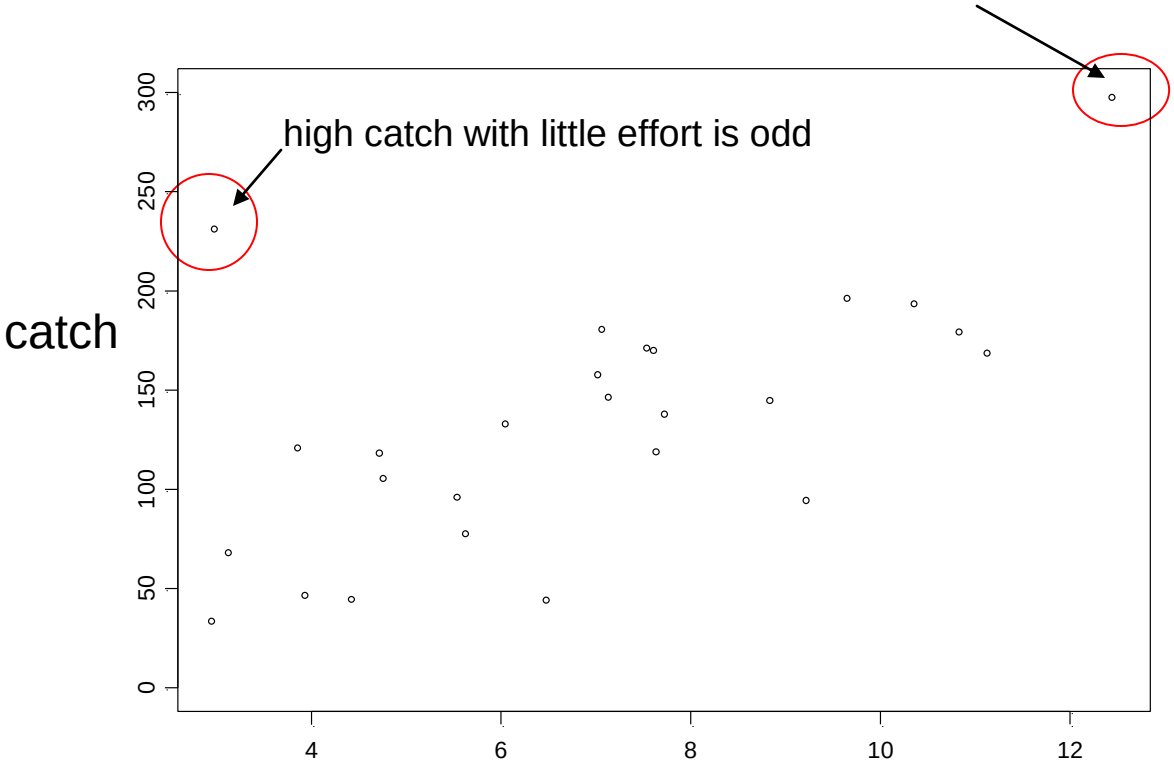
Here are some examples of graphs of data that can be used to spot problems.




Zeros? Or missing?
freq
0
5
10
15
20
25
0
1
2
3
4
5
6
7
effort


Catch when effort = 0???
catch
effort
0
50
100
150
200
250
0
2
4
6
8
10
12

High catch with high effort is plausible (but you might check the value anyway because it's extreme)



Annex 3

Data, Methods and Training Working Group
Biennial Work Plan for the Period July 2014 – June 2016

Working Group Members: *Derrick Theophille, Louanna Martin, Ramon Carcamo, Kharim Saddler, Crafton Isaac, Remone Johnson, Lester Gittens, Seion Richardson, Alwyn Ponteen, Kris Isaacs, Cheryl Jardine-Jackson and Luc Clerveaux*

Working Group Chair: *Patricia Hubert-Medar (St. Lucia)*
Working Group Vice-Chair: *Ricardo Morris (Jamaica)*

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
National Technical Focal Points				
Montserrat Grenada Dominica Suriname	Training of data collectors	Communicate with Head of unit; source funds; identify specific areas for training; liaise with St Lucia to develop training material and finalise dates; finalize training agenda and convene training	A. Ponteen C. Isaac D. Theophille M. Yspol	TBD*
Bahamas Montserrat Grenada St. Lucia Dominica Belize Turks and Caicos Jamaica St. Vincent Trinidad and Tobago St. Kitts Suriname	Compile list of 10 most important species	Submit to Chair of DMTWG Chair	P. Hubert-Medar; L. Martin; K. Saddler; C. Isaac; R. Johnson; L. Gittens; S. Richardson; A. Ponteen; K. Isaac; C. Jardine; L. Clerveaux; M. Yspol	July – September 2014
Bahamas Montserrat Grenada St. Lucia Dominica	Develop National data sampling plan	e-meetings to discuss prioritising list of species to be assessed and monitored on a regional basis & progress of sampling plans. Meeting with DOF staff to develop sampling plan	Group Members and other fisheries staff	Every quarter; Oct 2014; Jan 2015; April 2015; July 2015; Oct 2015; Jan 2016; April 2016
Belize Turks and Caicos Jamaica St. Vincent Trinidad and	Update National data sampling plan	e-meetings to discuss progress of sampling plans	Group Members and other fisheries staff	TBD

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
Tobago St. Kitts Suriname				
Chair of Working Group				
Chair of Working Group	Supervise coordinated development and implementation of the Work Plan at the regional level and necessary reporting	Convene electronic meetings of the Working Group	P. Hubert-Medar	Every quarter; Oct 2014; Jan 2015; April 2015; July 2015; Oct 2015; Jan 2016; April 2016
		Report to Secretariat on Regional Progress in WP Implementation		Every quarter; Oct 2014; Jan 2015; April 2015; July 2015; Oct 2015; Jan 2016; April 2016
		Submit data to Secretariat for review and evaluation by DMTWG		30 March 2015; 30 March 2016
		email DMTWG requesting submission of training materials Forward to CRFM Secretariat		TBD
		Submit full report of Working Group for publication in Annual Scientific Meeting Report (includes data sets and ppts)		31 July 2014
		Compile training materials for data collectors		TBD
		Submit prioritised list of important species to be assessed and monitored regionally Secretariat		TBD
CRFM Secretariat				
CRFM Secretariat	Facilitate implementation of Working Group activities and reporting so as to inform decisions regarding management, statistics and research	Assist with convening electronic meetings of the Working Group	PMRRA - staff time	September & December 2014 & 2016, March & May 2015 & 2016 & July 2015
		Coordinate review and evaluation of data submitted for analysis	PMRRA - staff time	February to May 2015 & 2016
		Convene Annual Scientific Meetings (on site)	PMRRA - staff time	January to June 2015 & 2016

Country/Entity	Task	Activities	Responsible Person/Entity	Timeline
		Source Consultants to assist with analyses at Annual Scientific Meeting and to conduct identified training	PMRRA - staff time	January to June 2015 & 2016
		Publish reports of Annual Scientific Meeting	PMRRA - staff time	October to December 2014 & 2015
		Maintain CRFM Toolbox ; Notebook and Casebook	PMRRA - staff time	July 2014 to June 2016
		Present Working Group report to Forum for its adoption of Working Group Recommendations (Management, Statistics and Research)	PMRRA - staff time	April 2015 & 2016
		Assist with preparation and submission of project proposals for external funding (as required)	PMRRA - staff time	July 2014 to June 2016
		Support development and implementation of harmonized data and information systems	Programme Manager, Statistics and Information (PMSI -currently conducted by PMRRA)	July 2014 to June 2016
		Develop and implement regional research programmes as required	PMRRA - staff time	July 2014 to June 2016

**TBD- To be determined.*

APPENDIX 7: CARIBBEAN FISHERIES DATA OPEN INITIATIVE

Caribbean Fisheries Open Data

This Project is:

- Part of a small **research project** (Jun–Sept 2014)
- Exploring opportunities for use of '**open data**' in fisheries
- In support of a Caribbean **Knowledge Economy**
- Executed by Caribbean Open Institute at UWI and partners

Open data – freely accessible in useable form, for use, reuse and re-distribution by anyone

Benefits – empowerment of civil society, improved transparency and collaboration between Gov – private sector

Team Contacts:

- Patrick McConney
- Maria Pena

patrick.mcconney@gmail.com

Caribbean Fisheries Open Data

This Project will:

- Examine factors which may enable or constrain provision and use of open data
  - stakeholders (capacity, interest)
  - public data (availability, practices and policies)
- Focus on the use of open
  - Bio-physical data
  - Socio-economic data
  - Governance data

Pilot Countries

- Antigua and Barbuda
- Barbados
- Belize
- Dominican Republic
- Jamaica
- Trinidad and Tobago

Participants

- Fisheries Divisions
- Fishing Industries
- Data network(s) personnel

Caribbean Fisheries Open Data

This Project will:

Investigate aspects of

- Data
  - How open
  - What is available
  - Quality
- Use
  - Who is/will use it
  - For what purpose
- Benefits
  - Social
  - Environmental
  - Political/governance
  - Economic

How to become involved

- Discuss concept at CRFM Science meeting
- Share ideas with research team
- Participate in research queries
- Comment on research output
- Implement recommendations

In support of CRFM goals

- Improve data sharing
- Improve management planning
- Bridge science-policy gap
- Supports CCCFP and CLME^{+} SAP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