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REVIEW OF FISHERIES DATA COLLECTION SYSTEMS IN SELECTED CRFM MEMBER STATES AND RECOMMENDATIONS FOR INTEGRATING FAD FISHERIES

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Review of Fisheries Data Collection Systems in Selected CRFM Member States and Recommendations for Integrating FAD Fisheries

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LIST OF ABBREVIATIONS AND ACRONYMS

CARICOM	Caribbean Community
CARIFICO	Caribbean Fisheries Co-management project
CARIFIS	Caribbean Fisheries Information System
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CRFM	Caribbean Regional Fisheries Mechanism
EBCD	European Bureau for Conservation and Development
EU	European Union
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization of the United Nations
FSS	Fisheries Statistical System
GCFI	Gulf and Caribbean Fisheries Institute
ICCAT	International Commission for the Conservation of Atlantic Tunas
JICA	Japan International Cooperation Agency
MAGDELESA	<u>M</u> oored fish <u>A</u> Ggregating <u>D</u> Evice in the <u>L</u> ESser <u>A</u> ntilles
MCS	Monitoring Control and Surveillance
PWG	Pelagic Fish Resource Working Group
US	United States
WECAFC	Western Central Atlantic Fishery Commission

1.0 BACKGROUND

1.1 Introduction

Fisheries resources have provided food security and produce lucrative commercial commodities for the people of the Caribbean Community. The fishery sector is the third largest provider of employment after agriculture and tourism. Fisheries resources are a source of valuable nutrition. Therefore sustainable management both at national and regional levels is essential.

Fish Aggregating Devices (FADs) may have been introduced in the Caribbean region sometime between the late 1970s and early 1980s, when a proposal was made to the Caribbean Conservation Association for the introduction of artificial reefs construction techniques to the region, an idea influenced by a 1979 Conference held in Barbados on “linking economic growth to environmental management”. At that time, construction of FADs was not the main element proposed but reference was made to the design, construction and installation of specific reefs for specific species. This might be considered the first attempt to introduce FADs and fishery enhancement technology into the region (McIntosh 1984). Experiments with FAD installation followed during the early 1980s in the US Virgin Islands, specifically for the purpose of comparing the effectiveness of several mid-water structure designs in the attraction of pelagic fish.

In 1983 Eastern Caribbean fisheries officers attending the 36th Annual GCFI Conference identified FAD use and training as one of four regional top priorities. The objectives were defined as “Implementation of artificial reefs and fishery enhancement systems to increase landings of demersal and pelagic species in the Caribbean region and to use this technology as part of management strategy to benefit commercial and recreational activities” (McIntosh 1984). After several attempts at trying to secure funding for the fishery enhancement proposal, the USAID agreed to assist and consequently provided funding through the GCFI for a low level effort for one year in St. Kitts/Nevis and Montserrat, in the amount of US\$30,000. The objectives for this effort were to 1) evaluate the use of FADs for improvement of artisanal fisheries in the Eastern Caribbean, and 2) adapt and develop appropriate mooring, deployment and monitoring techniques to assist local use of FADs in the Eastern Caribbean. Several years later other countries introduced the FAD technology, for example St. Lucia, Grenada and Dominica in the late 1980s to early 1990s with the support of the FAO, JICA, EU and the French.

Over the years the CRFM member countries have engaged in implementing FAD technology in their fisheries. Some of these activities were guided through various projects assisted by international and regional agencies. While it can be concluded that benefits are derived from the use of FAD technology, there are also concerns for efficient monitoring and management systems to be put place in order to provide essential information to inform management decisions for sustainable fisheries management and development.

1.2 Rationale for FAD introduction

The decrease of coastal fisheries resources and the risk of overfishing in the region have become evident in recent years. Fishing gears, used mostly in the pot fishery, can either become lost or

abandoned causing ghost fishing, which is becoming increasingly problematic. Also, the high demand on the resources causes high fishing pressure. For these reasons the CRFM member countries requested technical assistance from the Government of Japan through its international development agency, JICA to address some of these problems.

JICA implemented a technical cooperation project on “Formulation of Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean” from 2009 to 2012. Based on the analysis of the data and information collected during the baseline surveys, a preliminary Master Plan was produced. In 2010/2011, pilot projects were identified and implemented such as Fish Aggregating Device (FAD) projects in Dominica and St. Lucia, and Fishery Statistical projects in St. Vincent and the Grenadines and Guyana.

The Fishery Statistical pilot projects implemented during the Master Plan study provided a review of the existing fishery statistical systems throughout the CRFM Member states. The FAD pilot projects implemented during the development of the Master Plan not only confirmed that diversification of the coastal fishery using FADs had great potential in easing the fishing pressure on coastal resources and can be used as a tool to involve fishers and their organizations in the sustainable use of pelagic fishery resources, but also that properly managed and regulated use of FADs should be a basic requirement for their introduction in the region.

Responding to the Master Plan proposed activities, the CRFM and JICA jointly organized FAD Fishery Management Workshops in 2013 for the purpose of reviewing and sharing research results and best practices in the construction, use and management of FADs (CRFM 2013a, 2013b). The Caribbean Fisheries Co-management Project (CARIFICO) project was also initiated in 2013 as a result of proposed activities of the Master Plan. This project intends to develop and implement suitable fisheries co-management approaches for FAD fisheries in CRFM member states.

FAD technology is increasingly being implemented into the fisheries of a number of CRFM Member States. The Western Central Atlantic Fishery Commission (WECAFC) provides regional fishery management advisory services to all Caribbean states and other overseas / international countries and assisted with the implementation of the MAGDELESA (Moored fish Aggregating Device in the Lesser Antilles) project. This project focused on the sustainable management and development of moored FAD fishing in the Lesser Antilles and in Haiti and sought to develop an integrated and participative approach to the sustainable and responsible development of anchored FAD fishing and the redeployment of the coastal resources towards the pelagic high-sea species that still can reasonably provide catches with the use of FADs. The project took a multidisciplinary approach to the sustainable development of moored FAD fishing for large pelagics.

The International Commission for the Conservation of Atlantic Tunas (ICCAT) is responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent seas. ICCAT monitors the development and exploitation of the pelagic fishery resources of the Caribbean states and other international countries, and provides guidelines for the collection of fisheries data, and policies for the preparation of FAD management plans. Further, ICCAT recommends measures for the conservation and sustainable management of the resources based on the results

of analyses on catch and effort, and biological data submitted by its participating countries.

Notably benefits are derived from the use of FAD technology. Such benefits are cited as: diversification of fishery; increased landings, cost and effort savings; eases pressure on reef and insular shelf fish population; increased contribution of fisheries in terms of national economy; contributes to national food security, and encourage greater collaboration among fishermen (Magloire 2011).

However one of the major concerns is that data on the impact of FADs on the marine ecosystem are still poor and there is need to undertake more studies in order to justify and regulate their continued use. Also, poor management of FAD usage may result in increased catch of pelagics and juveniles, contributing to overfishing of this fishery (EBCD 2013). Other concerns regarding the FAD Fishery were listed as: user rights conflict, inadequate management and regulation measures, overcrowding of near shore FADs and poor fishing practices, and perceived high cost of construction and maintenance (Magloire 2011).

The CRFM has seen it necessary to collate the findings and recommendations of the key regional and international organizations, particularly in relation to development of data collection and information management systems, for the purposes of informing, guiding, and enabling FAD fisheries sustainable development and management. This is the basis for discussion in this document.

1.3 Approach

This activity was conducted by reviewing FAD fisheries management literature provided by JICA Master Plan Case Studies, ICCAT, WECAFC, and CRFM/CARIFICO Workshop reports. Focus was given particularly to issues relating to fisheries statistical systems in respect of FAD fisheries across the CRFM Member States, and collating recommendations to address these issues. The findings and recommendations were discussed both at the working session of the Pelagic Fisheries Working Group (PWG) forum and during the Plenary Session of the Tenth Annual CRFM Scientific Meeting (CRFM 2014), with the intention of arriving at a consensus on the way forward.

2.0 SOME RELEVANT CHARACTERISTICS OF CURRENT FISHERIES AND THEIR DATA SYSTEMS

Fish catch data is collected in all countries (JICA 2012). However fisheries statistical systems are weak and must be strengthened in order to provide essential information to manage and develop fisheries resources sustainably in the Caribbean region. The following are the issues relating to fisheries statistical and information systems across CRFM Member States:

- Data collections are not conducted for clear purposes and in a harmonized manner to manage the target fish species by multiple countries.
- Inadequate accumulation of significant information needed to understand the status of the fishery.

- Lack of appropriate catch and effort and biological data collection of target fish species is a major concern.
- Policies and procedures for statistics are not usually documented or seldom reviewed in order to inform decision making. Because statistical data collection procedure is outdated it is one of the main reasons why the collected data is not useful for informed decision making.
- Trolling is the common method used to target the pelagic fishery but it is associated with high operational cost. This situation not only impacts on the fisher's overall economic condition, but further strongly influences the effectiveness of fisheries resource management measures.
- Computer equipment dedicated for statistics is lacking in most member countries. There are also ineffective and inefficient data management procedures and inadequate filing and data back-up systems in place.
- Only a few member states use the Caribbean Fisheries Information System (CARIFIS) database. However, in these instances, CARIFIS is only partially integrated in the data management program since technical support to handle data management in the database is limited. Also follow-up training to efficiently maintain the use of the system and to facilitate capacity building, particularly to compensate for staff turnover, has not been provided.
- A lack of clearly defined management objectives as well as data limitations continue to impact on the quality of assessment results and the management recommendations provided by the CRFM and other regional and international organizations (CRFM 2013).
- ICCAT's assessments for all tunas, billfishes and tuna-like species indicated that these species are overfished (with the exception of the West Atlantic Skipjack Tuna, North Atlantic Swordfish, Blue Shark and Short-fin Mako shark). However the quality and quantity of data to support this assessment is inadequate.
- The capture of juvenile fish is a matter of concern. In particular, the lack of reporting on catch and effort especially regarding increased catches of non-industrial fisheries is of grave concern.

In response ICCAT has implemented a number of management measures including effort and catch controls as well as time and area closures, size-limits and trade restrictions.

In order to improve the quality of information necessary to inform management decisions, it is recommended that data collection programs be enhanced and procedures for analysis and research on the ecological and socio-economic impacts of FAD fisheries, strengthened. Also, technological, behavioral and other measures to reduce the capture of juvenile fish must be improved (CRFM 2013b).

Collection of data should be conducted for clear purposes and in a harmonized manner for management. If only for basic information, the format for the collection of catch and effort and biological data should be standardized across CRFM Member States. Systematic procedures for verifying the validity of data collected should be developed and enforced.

The provision of data must be defined as part of fishers' responsibility associated with licensing and the right to fish. It is recommended that the provision of data from fishers as well as

necessary resource management measures should be clearly defined in government regulations or by-laws of Cooperatives.

Tools for data collection, in particular data collection forms, should be designed simple and yet efficient so as to encourage full integration of the data collection system into the routine activities of fisheries departments.

The development of data collection systems must be informed by management questions which would then inform the minimum data requirements and preferred method of collection.

Appendices 4 - 12 show the data collection tools that have been proposed and/or are currently in use in Member States.

3.0 SYSTEM DESIGN

There are a number of aspects to designing the system for data collection and management that need to be considered. These are discussed below.

3.1 Management questions

An efficient fisheries statistical system should be designed and/or adjusted so as to address management question(s). The management question informs the minimum data requirements and the method of data collection. While countries could agree to answer management question(s) at a regional level, each country would need to determine its own management questions to be answered.

For example, given the potential for FAD fishing to focus fishing effort on juvenile/vulnerable stages in the life history of species, management would need to implement the precautionary approach. A critical monitoring system to put in place would inform the following questions:

Question: What method of fishing catches smaller fishes on the FADs? To answer this, the monitoring system would involve minimum data to be collected such as: Length and/or weight of species; gear type; effort measure; depth of fishing; FAD location.

Question: Frequency of Juvenile catches at the FADs? Minimum data to be collected would include: Length and or weight of species; maturity; gear type; FAD location.

Also for consideration, are the recommendations from the Large Pelagic Fish Resource Working Group meeting in 2012 (CRFM 2012), which 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, the following primary research recommendations were put forward:

- 1) For each trip / record a data field be included which indicates whether the trip was conducted at / near a FAD.
- 2) Each data collection program conducts surveys or analysis which will indicate the

- proportion of total catch which is being reported.
- 3) Length frequency data collected to assist in the definition of any migration patterns that may exist.

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 (see Appendix 1); and in the context of the Guidelines for Preparation of FAD Management Plans (Appendix 2).

3.2 Minimum Data Requirements

The following are recommended as the minimum data required for the development of a fisheries data and information management system for FAD fisheries:

- Basic information should include: date of departure for fishing and data of arrival or return from fishing; time of departure and arrival; FAD location (position/name of FAD); state whether the intention is to catch bait: coastal pelagic fish are used as live bait in trolling and long-line fishing in large quantities for tuna, marlin and king fish. However, this sale causes a short supply of the affordable fish for local consumers in local markets.
- Catch and effort data: species; weight; unit price; gear type; unit of effort; field to capture whether or not trip was successful; bait type; fuel amount and cost; depth of fishing (to inform catch composition and size of fish); field to indicate whether the trip was conducted at or near a FAD (for data collection other than FAD); field(s) to capture relevant details on fishing gear loss.
- The data should also be consistent with existing data capture protocols. In this regard, we are reminded of the proposed effort data sets (Appendix 3) suggested by Murray *et al.* 1996, which were seen as allowing for some measure of standardization of effort data. Any newer protocols should also be considered.
- Biological data: (Frequencies of) individual lengths; (Frequencies of) individual weight; maturity: At present many countries have discontinued the collection of biological data for a number of years, having not been able to sustain the activities funded and monitored by the CRFAMP. Currently, they are still challenged by the absence of skilled personnel and very limited financial resources to support these activities. It is therefore recommended that countries begin to at least attempt to collect length data only, considering the importance of implementing the precautionary approach, monitoring the fishery for migratory patterns and sustainability and to inform management decisions.
- Seeing that the fish is processed at sea in different ways among countries, the PWG agreed that a separate study could be conducted to derive factors for converting various forms of processed length and weight to total length or fork length, and total weight.
 - There is still need to agree on the details of biological data collection e.g. sample sizes, frequency of collection but the mechanisms for capturing biological data will have to be determined at the country level and clearly noted so that it can be built into any error analysis.
- In the case of applying a sampling system for catch and effort data, countries should decide on a minimum sampling number. Each data collection manager should conduct surveys or analysis which will indicate the proportion of total catch which is being

- reported.
- Data collection system should also make provision to include data from sport fishing vessels.

3.3 Tools

The characteristics of each member country's fisheries statistical system (FSS) are diverse. There exists a wide range of systems being operated by CRFM Member States to store and manage fisheries data. The systems range from dedicated database management programmes (such as Oracle) to Excel spreadsheets (where the Excel spreadsheets are considered the Fisheries Division / Departments database). The database systems being operated by Member States were TIP, LRS, Access, .NET/SQL Server database, CARIFIS and Oracle (Masters 2012). Even if it would be better for each country to develop its own Fisheries Statistical Systems, the limitations of human and financial resources present many challenges. In designing the FSS, it is therefore necessary to consider those characteristics which are similar in each country for the purpose of standardizing tools, minimum data requirements, effort measure and preferred method for data collection.

3.3.1 Data Collection Form

The objectives of data collection must be clearly understood by all the stakeholders. To encourage participation, it is very important to make the data collecting form as simple as possible, and at the same time efficient, in order to achieve objectives. Long-term sustainability of the database system has to be a priority. To encourage fishers to share data, clear and visible benefits of providing data should be shown to them. It is, therefore, critical to demonstrate the use of data for management planning and decision-making and to provide feedback to fishers regularly.

In designing the FSS one must also be mindful of regional and international data needs and requirements (e.g. regional MCS; ICCAT). Because most CRFM member countries are already collecting catch and effort data at FADs, the Pelagic Fisheries Working Group reviewed some existing data collection forms for the purpose of verifying that countries have met the minimum requirements for recording catch data at the FADs.

Current Situation

Data Collection forms are intended to be utilized by data collectors for recording catch and effort data via fisher interview, at various landing sites, per vessel trip. The systematic process for conducting interviews is determined by each country according to their capacity and needs.

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

1. Dominica (Appendices 7 and 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. While the country has designed a collection form for biological data there are 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 (Appendices 11 and 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.

Overview

While countries are actively undertaking activities to collect FAD catch and effort data, and associated data collection forms have met the minimum requirements for collecting such data, this review has highlighted areas where these tools can be strengthened. Considering the implementation of the precautionary approach it is imperative that countries begin to undertake activities to support the collection of biological data of main pelagic species. Bearing in mind that countries are constrained by various challenges, it is recommended that they attempt to at least collect length data which would not only allow for monitoring the capture of juveniles, but can also be used to support research on defining the existence of any migratory patterns.

3.3.2 Logbook

The Logbook is intended to be used by the fisher to record a census of FAD catch and effort data. Fishers’ participation in statistical data collection is essential for participatory resource management to be effective. Fishers’ direct participation in recording catch and effort data was recently introduced by the CARIFICO project on the basis of the co-management approach.

Even while Member States have experienced a culture of difficult and most times unwilling fishers with the tendency to give unreliable information (supposedly for the benefit of protecting their turf), and in some instances fishers are unable to complete the logbook accurately; countries must always bear in mind that for co-management to be effective, fishers’ participation is at the core of resource management in data collection. It must be noted however that St. Vincent and the Grenadines have successfully engaged a few fishers to systematically record their FAD catch and effort data, while St. Lucia has agreed to initiate such participation.

As discussed and agreed by the PWG, the importance to create efficient awareness programs among fishers before the logbook system is implemented is of critical importance. While a small percentage of fishers will complete logbooks, it was noted that it should not be expected that the majority of fishers would. It was suggested that countries select a small group of fishers (in the initial stages) to work with the logbooks and gradually work toward including other fishers.

In an effort to encourage fishers to participate in data collection activities, it is important to make the data collection form as simple as possible in order to achieve the target objectives. It is recommended therefore, that the logbook be designed to capture only the very minimum data requirements, in accordance with ICCAT standards, and as agreed by the PWG. These minimum data requirements include: FAD location, fuel information, bait type, gear, biological data, catch and effort, and socio-economic data (CRFM 2014).

The process for verifying logbook data should also influence the design of this activity.

Fields for inclusion:

- General: Date; FAD Location (Identify FAD); Fisher/Vessel name
- Catch: Species; Weight; No. of Fish
- Effort: Time; No. of hooks

In Dominica for example, once approved by the Fisheries Division, fishers' logbooks are used for obtaining bank loans. In this case the benefits are visible and fishers can clearly see the relationship in providing data. Data collection by fishers themselves is an essential part of their small-scale business management. Currently, only a very limited number of fishers who have a high degree of awareness are keeping records of their fishing activities.

3.3.3 Computerized data management system

The benefits of a common computerized database system across countries can be clearly appreciated. A computerized system for addressing data storage, data validation and analysis will be very useful for research activities. However, countries have noted the fact that in the past this approach had failed to reach its potential particularly due to the lack of consistent technical support. Any new intervention at this level must ensure that member states do not incur additional expenses towards accomplishing a fully functioning database. Therefore, the countries have decided instead to continue operating and enhancing their existing computerized systems and concentrate their focus on standardizing basic data requirements for the collection of catch and effort and biological data across all countries. It is in this regard that it was agreed to standardize the data submission format for the CRFM Annual Scientific Meeting.

3.3.4 Preferred Method for collecting data

Data may be collected by census or sampling which can occur at any location to be determined by the country. 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 Fisheries Divisions have the cooperation of vessel captains (voluntarily or mandatorily).

4.0 MANAGEMENT

4.1 Co-Management Approach

The CARIFICO approach to sustainable fisheries resource management is through a co-management arrangement. In this set-up, the fishers' participation in the FSS, particularly regarding data collection, is essential for participatory resource management to be effective. The participatory approach is at the core of resource management; particularly as it relates to data collection, formulation of management plans, reduction of fishing pressure through diversification of fishing activities, and development of alternative income sources.

Fishers must firstly have an understanding of the resource situation and appreciate the relationship of an efficient data collection system to informing management decision towards sustainable fisheries development.

The objectives of data collection must be clearly understood by all stakeholders. In this regard, it is recommended that a stakeholder awareness programme be developed targeting fishers and decision makers, with the objective to stimulate and educate on data requirements for management, highlighting the benefits of the participatory approach. In this respect, data collectors should also be trained to better interact with fishers.

Sustainability has to be a priority. To strengthen communication and the relationship between fishers and fisheries authorities and to encourage fishers to share data, clear and visible benefits of providing data should be shown to them by way of providing regular feedback to fishers on the results of analyses of the data they provided.

4.2 Legislation for FAD Fisheries

At present only a few countries have revised their fisheries legislation to include FAD Fisheries. As such, the licensing 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 fishing¹.

The rules and regulations should cover all aspects of fishery operations and management. Further, legislation could be enforced / effected through specified conditions of license, and

¹ In Antigua and Barbuda, the new fisheries regulations have been enacted in 2013 and this makes provisions for the deployment of FAD's with permission from the Chief Fisheries Officer

licensing should make it mandatory for licensed fishers to provide data. It is recommended that the provision of data from fishers as well as necessary resource management measures should be clearly defined in government regulations or by-laws of Cooperatives.

It is important for fishers to clearly understand the benefits of this system, which ensures the fishing rights of each licensed fisher. In support of this, there should be a strong drive towards sensitization activities, such as a series of consultations with fishers, working together, and providing feedback.

The following are suggested areas to be covered by FAD fishery regulations (JICA 2012):

- 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 and effort, biological data)
- 8) Clarification of FAD users' responsibilities in resource management measures

FAD Management Plans are still in the development stage in CRFM Member States. Further, supporting legislation / regulation is lacking making it very challenging to enforce any management measures. Guidelines for Preparation of FAD Management Plans as recommended by ICCAT (Appendix 3) should include areas such as Objective of the FAD Management Plan; Description; Institutional arrangements; FAD construction specifications and requirement; Applicable areas; Applicable period for the FAD Management Plan; Means for monitoring and reviewing implementation of the FAD Management Plan; Means for reporting to the Executive Secretary.

5.0 RECOMMENDATIONS

5.1 Recommendations from Workshop Discussions

A number of recommendations have been made over the course of the discussions that would need to be incorporated into the data collection and management regimes of the Member States. These are:

1. Factors for converting gutted weight to whole weight are to be derived.
2. Data on depth of fishing; line strength; hook size should be captured since all influence size of fish caught.
3. There is need to link the gear used with the species and quantity of fish caught.
4. Type of bait (natural or artificial); species and quantity if natural are important to record (if not included in form then justification for exclusion must be provided).

5.2 General Recommendations

1. In order to improve the quality of information necessary to inform management decisions, it is recommended that data collection programs be enhanced and procedures for analysis and research on the ecological and socio-economic impacts of FAD fisheries be strengthened. Also, technological, behavioral and other measures to reduce the capture of juvenile fish must be improved.
2. The provision of data must be defined as part of fisher's responsibility associated with licensing and the right to fish. It is recommended that the provision of data by fishers as well as necessary resource management measures should be clearly defined in government regulations or by-laws of Cooperatives.
3. Tools for data collection, particularly data collection forms, should be simple in design; yet efficient in the volume and quality of data collected so as to ensure full integration of the data collection system into the routine activities of fisheries departments.
4. A stakeholder awareness programme should be developed targeting fishers and decision makers, with the objective to stimulate and educate on data requirements for management, highlighting the benefits of the participatory approach. In this respect, data collectors should also be trained to better interact with fishers.
5. National fisheries legislation should be updated to comprehensively address management issues in FAD fisheries.

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Appendix 1: ICCAT 2011 recommendation on a multi-annual conservation and management program for Bigeye and Yellowfin tunas: Annex 1 - Requirements for Catch Recording

Minimum specification for paper or electronic logbooks:

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

Minimum standard information for logbooks:

1. Master 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.

Minimum information in case of landing, transshipments:

1. Dates and port of landing / transshipments
2. Products: number of fish and quantity in kg
3. Signature of the Master or Vessel Agent

Appendix 2: ICCAT 2011 recommendation on a multi-annual conservation and management program for Bigeye and Yellowfin tunas: Annex 2 - Guidelines for Preparation of FAD Management Plans

The FAD Management Plan for a CPC purse seine fleet must include at least:

- (a) Number of FAD to be deployed per purse seine and per FAD type
- (b) FAD design characteristics (a description)
- (c) FAD markings and identifiers

and could include:

1. Objective of the FAD Management Plan
2. Description
 - (a) Vessel-types and support and tender vessels,
 - (b) FAD types: AFAD = anchored; DFAD = drifting
 - (c) Reporting procedures for AFAD and DFAD deployment,
 - (d) Catch reporting from FAD sets (consistent with the Commission's Standards for the Provision of Operational Catch and Effort Data),
 - (e) Minimum distance between AFADs,
 - (f) Incidental by-catch reduction and utilization policy,
 - (g) Consideration of interaction with other gear types,
 - (h) Statement or policy on "FAD ownership"
3. Institutional arrangements
 - (a) Institutional responsibilities for the FAD Management plan,
 - (b) Application processes for FAD deployment approval,
 - (c) Obligations of vessel owners and masters in respect of FAD deployment and use,
 - (d) FAD replacement policy,
 - (e) Reporting obligations,
 - (f) Observer acceptance obligations,
 - (g) Conflict resolution policy in respect of FADs.
4. FAD construction specifications and requirements
 - (a) Lighting requirements,
 - (b) Radar reflectors,
 - (c) Visible distance,
 - (d) Radio buoys (requirement for serial numbers),
 - (e) Satellite transceivers (requirement for serial numbers).
5. Applicable areas
 - (a) Details of any closed areas or periods e.g. territorial waters, shipping lanes, proximity to artisanal fisheries, etc.
6. Applicable period for the FAD Management Plan

7. Means for monitoring and reviewing implementation of the FAD Management Plan
8. Means for reporting to the Executive Secretary

Appendix 3: Effort defined on a Gear basis (relevant to FADs) for Caribbean Islands / states

Effort defined on a Gear basis (relevant to FADs) for Caribbean Islands/states (after Murray, <i>et al.</i> , 1996) edited for the 2014 Pelagic Working Group						
Gear	Number of sets	Units (#) of gear	Effort unit	Gear descriptor	Hours fished	Effort
Troll	# of times lines were towed	# of hooks	hour	single/multi	per set	hook-hour
Hook & line or set line (includes: longline, hand line, drop line or jig line)	# of times unit of gear were fished (i.e. number of "sets")	# of hooks (# line x # hooks/line)	hour	# of lines	per set	hook- hour
Hook and Line (non moving vessel)	# of times unit of gear were fished	# of hooks (# line x # hooks/line)	hour	# of lines	per set	hook- hour

Appendix 4: Proposed Draft Logsheets (Fishers)

Date: _____ Time Depart: _____ a.m./ p.m. Time Return: _____ a.m./ p.m.
 Vessel Name & I.D: _____ Captain: _____ Verified by: _____ Date: _____

FAD I.D # (Location) _____ Fish for Bait: <input type="checkbox"/> Y <input type="checkbox"/> N Bait Type: _____ Gear: _____ No. of Hooks: _____ Total wt caught: _____ lb/kg Depth fished: _____ Total number of fish: _____ Fuel Amount _____ (gals) Fuel cost (\$) _____				FAD I.D # (Location) _____ Fish for Bait: <input type="checkbox"/> Y <input type="checkbox"/> N Bait Type: _____ Gear: _____ No. of Hooks: _____ Total wt caught: _____ lb/kg Depth fished: _____ Total number of fish: _____ Fuel Amount _____ (gals) Fuel cost (\$) _____			
Individual Species Data				Individual Species Data			
Species	Number	Weight (lb/kg)	Gear	Species	Number	Weight (lb/kg)	Gear
Target Species names list				Target Species names list			
Species 1				Species 1			
Species 2				Species 2			
Species 3				Species 3			
Etc				Etc			
Etc				Etc			

Logsheets should be completed at sea, by, or verified by the Captain and delivered to data collector at landing site for verification and data validation. In the ideal situation logsheets are numbered pages in the LogBook which should be designed to facilitate carbon copying and illustrations identifying species and gear, etc.

Bearing in mind the low literacy level, the culture of reluctance on the part of the fisher to provide data, it is recommended logsheets are designed to require mainly basic information, in order to encourage the participation of Fishers.

The logsheets are informed by the requirements of ICCAT to the extent practicable.

Appendix 5: Proposed Catch and Effort Data Collection Form (Draft) (Commercial)

[illegible]

Note: this form is for commercial fisheries (as we will need to consider recreational fisheries separately in future). It is proposed that form could allow capture of both FAD and non-FAD fisheries data.

Appendix 6: Proposed FAD Fishery Biological Data Collection Form (Draft)

[illegible]

Appendix 7: Dominica Catch and Effort Data Collection Form

Government of the
COMMONWEALTH OF DOMINICA

DAILY FISH CATCH and EFFORT FORM

FISHERIES DIVISION
Tel. (767) 266-5291
fisheriesdivision@dominica.gov.dm

Landing Site:

Data Collector:

Date:

day

month

year

Site Activity:

Boats Sampled

Boats Not Sampled

Boats Fishing

Boats Not Fishing

Data Collector Signature

Checked by

Pages For Date:

Page

of

1										2										3										4										5									
Boat ID:				Total Catch:		Departed		Fuel:		Bait:		Fish:			Status:			Wt:		Fish:				Status:		Wt:		Fish:				Status:		Wt:		Fish:				Status:		Wt:							
J7-				lbs.		time		\$		\$		Qty:			Price:			Gear:		Qty:				Price:		Gear:		Qty:				Price:		Gear:		Qty:				Price:		Gear:							
Type	Canoe	Keel	Engine?	Yes	No	day	month	time	am	pm	Oil:	Food:	FAD?	Area:	Qty:	Soaked:	FAD?	Area:	Qty:	Soaked:	FAD?	Area:	Qty:	Soaked:	FAD?	Area:	Qty:	Soaked:	FAD?	Area:	Qty:	Soaked:	FAD?	Area:	Qty:	Soaked:													
Captain:	Crew:			Returned		day	month	time	am	pm	Ice:		Yes	No			Yes	No			Yes	No			Yes	No			Yes	No			Yes	No															

FCE Data Collection Form Rev. 20140516

Biological Data Form

KEY TO CODES: 1) SEX: M = male; F = female; U = uncertain. 2) MATURITY: I = immature; D = developing; M = mature but inactive; R = ripe and running; S = spent.
3) Weight measurement type: VE=visual est; FE= fisher est; SV= scale value 4) GEAR: TR = trolling; HL = handline; DL = dropline

Appendix 9: Grenada FAD Data Collection Form

Grenville FAD Fishers Daily Log Interview Form

[illegible]

Species code: KM – King Mackerel WAH – Wahoo DOL – Dolphin Fish YFT – Yellow Fin Tuna BFT – Black Fin Tuna BAR – Barracuda CAV – Cavalli
 BUM – Blue Marlin SAI – Sailfish RBR – Rainbow Runner SJT – Skip Jack Tuna

FIELD DATA SHEET

Include reason for no/low catch or for early return: state of currents: weather condition. Fill in form when there is effort but no catch. *VE-Visual estimate, FE-Fishermen estimate, WT-Weight measurement, GP-Gutted Weight

No. Wahoo Caught _____
IFT more than 60lbs

24

Appendix 11: St. Vincent and the Grenadines Data Collection Data Form

Date: _____	Departure from Landing Site: _____ a.m./p.m.	Arrival at Landing Site: _____ a.m./p.m.
Boat I.D.: _____	Captain: _____	

FAD I.D. # _____			FAD I.D. # _____		
Main Gear Used: TR/HL/DL/RR			Main Gear Used: TR/HL/DL/RR		
Total wt caught: _____ lb/kg			Total wt caught: _____ lb/kg		
Total number of fish: _____ Fuel consumption (\$) _____			Total number of fish: _____ Fuel consumption (\$) _____		
Individual Species Data			Individual Species Data		
Species	Number	Weight (lb/kg)	Species	Number	Weight (lb/kg)
Skipjack Tuna			Skipjack Tuna		
Yellowfin Tuna			Yellowfin Tuna		
Bullet Tuna			Bullet Tuna		
Frigate Tuna			Frigate Tuna		
Blackfin Tuna			Blackfin Tuna		
Big Eye Tuna			Big Eye Tuna		
Albacore Tuna			Albacore Tuna		
Little Tunny			Little Tunny		
Atlantic Bonito			Atlantic Bonito		
Swordfish			Swordfish		
King Mackerel			King Mackerel		
Cero Mackerel			Cero Mackerel		
Blue Marlin			Blue Marlin		
Wahoo			Wahoo		
Dolphin fish			Dolphin fish		
Atlantic sailfish (Ocean Gar)			Atlantic sailfish (Ocean Gar)		
Shark:			Shark:		
Other:			Other:		

Key to codes

Gear: TR = trolling; HL = hand line; DL = drop line; RR = rod & reel

Appendix 12: St. Vincent and the Grenadines Biological Data Collection Form

St. Vincent and the Grenadines FAD Fishery Biological Data Form																				
Landing site: _____				Date: _____				Boat ID: _____				Time spent at sea: _____				Data Collector: _____				
FAD ID: _____ Main gear used: TROL / BUN / SUN / HLIN Species: _____ Total weight caught at FAD (Demersal): _____ lb/kg Sample weight for length frequencies _____ lb/kg Wt type: round/gutted Wt measurement type: visual est/fisher est/scale value Length Type: / total						FAD ID: _____ Main gear used: TROL / BUN / SUN / HLIN Species: _____ Total weight caught at FAD (Demersal): _____ lb/kg Sample weight for length frequencies _____ lb/kg Wt type: round/gutted Wt measurement type: visual est/fisher est/scale value Length Type: fork / total						FAD ID: _____ Main gear used: TROL / BLIN / SLIN / HLIN Species: _____ Total weight caught at FAD: _____ lb/kg Sample weight for length frequencies _____ lb/kg Wt type: round/gutted Wt measurement type: visual est/fisher est/scale value Length Type: fork / total								
Length freq.		Individual fish sex & maturity					Length freq.		Individual fish sex & maturity					Length freq.		Individual fish sex & maturity				
Length (cm)	No. fish	Length (cm)	Total body wt (lb/kg)	Gonad wt (oz/g)	Sex	Maturity	Length (cm)	No. fish	Length (cm)	Total body wt (lb/kg)	Gonad wt (oz/g)	Sex	Maturity	Length (cm)	No. fish	Length (cm)	Total body wt (lb/kg)	Gonad wt (oz/g)	Sex	Maturity
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S
					M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S						M / F / U	I/D/M/R/S

CRFM

The CRFM is an inter-governmental organisation whose mission is to “Promote and facilitate the responsible utilisation of the region’s fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region”. The CRFM consists of three bodies – the Ministerial Council, the Caribbean Fisheries Forum and the CRFM Secretariat.

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