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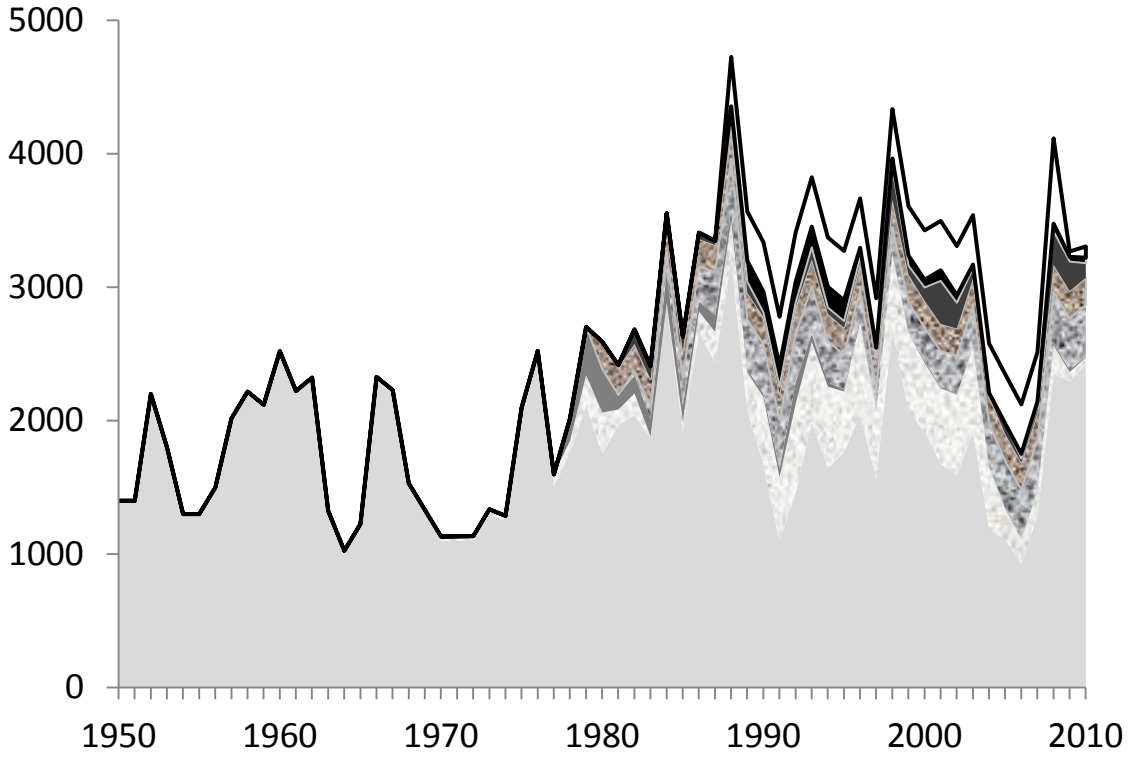
Report of the First Meeting of the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean



18 - 19 June 2012
Kingstown, St. Vincent and the Grenadines

CRFM Secretariat
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Report of the First Meeting of the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean, 18 – 19 June 2012, St. Vincent and the Grenadines

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1. Opening of the Meeting

The Chief Fisheries Officer (CFO) for St. Vincent and the Grenadines, Mr. Raymond Ryan opened the workshop by welcoming guests and visitors to St. Vincent and the Grenadines. He acknowledged that Fisheries Divisions / Departments and fishery management groups were charged with the conservation and management responsibility of marine resources and that despite the many challenges this posed, the sustainable utilization of our resources must be a priority and depended on the use of the best and most current scientific advice available. He acknowledged that Meetings, such as the present, facilitate this important knowledge exchange between countries and provided significant recommendations for both sub-regional and international marine resources management. It was recognized that in terms of flyingfish, some countries had better developed management standards and some were just developing; which further emphasized the importance of the sharing of knowledge and practices through vehicles such as this working group. He pointed out that although substantial work had been done within the region in preparation for flyingfish management, and despite the challenges that existed, the need for a higher focus on communication and cooperation was apparent.

Mr. Raymon VanAnrooy (FAO / WECAFC) expressed that it was his pleasure to visit St. Vincent and the Grenadines for the second time and extended thanks to CRFM for organizing the present meeting, which is the first meeting of the joint CRFM / WECAFC Working Group. He noted that flyingfish was an important fishery resource which was caught both as a food source and as bait for the longline fleets in the Eastern Caribbean region. He reminded the Meeting that WECAFC had been involved in assessing this fishery since 1999. He pointed out that the Caribbean was the only area in the world which was lacking sub-regional management plans for shared marine fisheries resources. He noted that the management plan drafted in 2008 was a good working document; however it was never formally adopted. Four years later, the technical and assessment information and country reports have been updated, and the appropriate information has been collected and an updated draft plan has been produced. The stakeholders are expecting tangible outputs now, more than ever. It was recognized that the first meeting of this working group provided an opportunity for such outputs and the sub-regional management plan could become a best practices manual for other shared resources in the region, which also need to be managed.

Dr. Susan Singh-Renton also extended a welcome to attendants. She acknowledged the first attendance of Martinique in this type of working group. On behalf of CRFM, Dr. Singh-Renton expressed delight at the co-convening of the meeting with WECAFC and noted the tremendous effort through the respective technical working groups of the two organizations including WECAFC from the 1990's and CRFM which entered in 2010 through the CLME project. The good foundation of our present understanding of the biology and ecology of the fourwing flyingfish provided by Professor Hazel Oxenford and colleagues at the University of the West Indies was acknowledged. Dr. Singh-Renton also recalled developments afforded by the CLME project which was focused on improving governance and management of resources at the ecosystem level. It was pointed out that the flyingfish working group provided a good arrangement for active management of the resource. It was noted that flyingfish was a small fish with a big heart, as it provided a source of food, employment and was a well known symbol in the Barbados tourist industry and yielded rich rewards to the countries concerned. It was therefore important that tourists coming to the country saw that there was active management. In view of the wealth of information available to support active management of flyingfish at this time, it was pointed out that the Ministerial Sub-committee on Flyingfish provided an opportunity to get support at the highest political levels. The absence of the two large flyingfish countries, Barbados, and Trinidad and Tobago was noted and it was pointed out that they would be kept abreast and informed of the developments of the meeting. Dr. Singh-Renton noted that she was looking forward to a successful meeting and active participation from the members.

The Director of Maritime Affairs in the French West Indies, Mr. Olivier Mornet informed the Meeting that it was his first time in St. Vincent and he was pleased to have been invited even though he was not a flyingfish expert. He indicated that his expertise was in administration, management and safety and security at sea. He expressed an interest in participating in all the CRFM and WECAFC working groups and pointed out that Mr. Lionel Reynal from IFREMER would be sending Martinique's national report to the CRFM Secretariat shortly. He fully agreed with the CFO, Mr. Ryan, on the need for management of the resources in the Eastern Caribbean Sea and was interested in knowing about best practices as a lot could be learnt and he also expressed his support for the Caribbean Community Common Fisheries Policy (CCCFP). He reminded the Meeting of the work being done by the various European Institutions and realized the need to convince the EU Commission of the importance of sustaining and supporting the CCCFP in the region.

2. Adoption of meeting agenda and meeting arrangements

The amended agenda is attached as ***Appendix 1***. The agreed working hours of the Meeting were 9 a.m. -5 p.m.

The Working Group agreed on the following outputs for the Meeting:

(a) Updated Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean
(b) Agreed Process for National Consultations
(c) Agreed list of key management measures
(d) Draft resolution to be discussed and signed at the next meeting of the CRFM Ministerial Sub-committee flyingfish or the CRFM Ministerial Council
(e) Inter-sessional Work Plan

3. Introduction of Participants

The countries and territories represented included: Dominica, Grenada, Martinique, St. Lucia, and St. Vincent and the Grenadines. There were also representatives from the CRFM and WECAFC Secretariat. The University of the West Indies (UWI) was also represented. A list of the participants is attached as ***Appendix 2***.

4. National Reports

Each country representative provided a brief description of his/her flyingfish fishery. A summary of the Working Group discussions on each country presentation is provided below. Professor Hazel Oxenford provided an informal, oral update on the Barbados flyingfish fishery. National reports were provided by Dominica, Grenada, St. Lucia and St. Vincent and the Grenadines (***Appendix 3***).

4.1 Informal verbal update on the fishery of Barbados, as provided by UWI representative

The Meeting was informed by the UWI flyingfish fisheries expert that Barbados accounted for approximately 60% of the flyingfish catch in the region. The three fleets used were iceboats, dayboats and longliners. It was noted that flyingfish was important for the longline fleet in terms of supporting the cash flow and that flyingfish trips are often used to fund the more expensive longline trips. The meeting was informed that recorded catches ranged between 1000 - 2500 MT/yr. It was noted that recorded landings had decreased by 50% over the last decade, however catch per trip had not, therefore the decrease may

have been partly due to the deteriorating catch recording system. In terms of a management plan, the last published plan covered the period 2004 - 2006, a draft plan was prepared for 2008 - 2011, however it was never made publically available and therefore a new FMP is currently being prepared.

The Meeting was informed that last year (2011) from around April when the floating sargassum weed appeared, to the end of the flyingfish season failed. Furthermore, this year the flyingfish season (November 2011 - June 2012) has been extremely poor and this has had significant socio-economic impacts for the whole sector. It was noted also that during the Sargassum event, in August 2011, small dolphinfish arrived and given the poor end of the last flyingfish fisheries season, landings of the small dolphinfish were tolerated although there was concern among some fisherfolk and the Fisheries Division. Three possibilities were suggested for the poor flyingfish season: (i) the centre of the flyingfish population may have moved in response to oceanographic changes associated with unusual currents and the floating sargassum weed, such that they were not found in the usual fishing range of the fleets; (ii) recruitment to the 2011/2012 adult population failed or (iii) the flyingfish are not being attracted to fishers' FADs in the same abundance as usual because the Sargassum is offering large amounts of alternative spawning substrate. As a result the industry suffered with low catches and job losses in the processing sub-sectors. In a previous season, before the sargassum event, flyingfish fishers have shown concern for the practice of removing egg laden "screelers" (FADs) from the water, and on their own initiative decided to leave the "screelers" which are floating objects used to attract the spawning fish in the water in an attempt to not unnecessarily reduce the population by removing the attached eggs.

The use of flyingfish for bait in the longline fishery was not considered to be an issue now as frozen squid is used almost exclusively by the longline fleet.

4.2 Dominica

The Meeting was informed by the expert from Dominica that the catch of flyingfish was about 10 tonnes annually over the period 2007 - 2011. Fishers do not target the species specifically, but carry gears on board in case they encounter flyingfish schools.

A query on the regulation of gillnet mesh sizes for juvenile and adult flyingfish was made and the Dominica representative indicated that he was unsure of why this distinction existed. The UWI representative informed the Meeting that studies had shown that mature flyingfish could only be captured effectively with one specific mesh size.

Clarification was sought on the number of flyingfish fishers in Dominica. It was indicated that this was difficult to quantify as some fishers do take gear, however they generally do not target flyingfish.

Dr. Singh-Renton asked how often field checks were done to update national reports and noted the importance of stating if this occurred as well as citing the information sources.

4.3 St. Lucia

The St Lucia expert informed the meeting of a sharp reduction in flyingfish catches from 2010 to 2011, with reported catches of respectively 109 tonnes and 22 tonnes. She noted further tremendous fluctuations in landings were typical for St. Lucia; however it was expected that this year would be significantly lower than others in terms of catches.

The possible effect of the Sargassum event on the fishery was mentioned as a possible reason for the observed reduction in catches. Dr. Singh-Renton indicated that she could share a presentation on modeling the movement of Sargassum and identification of possible sources.

It was further noted by the expert from St Lucia that a sub-regional management approach would be urgently needed for flyingfish and that more joint research and data collection should take place on flyingfish biology.

4.4 Grenada

The expert from Grenada informed the meeting of the fisheries sector in his country and referred to a catch of 500 tonnes of flyingfish in 1978. Currently, catches of flyingfish do not reach the landing sites in Grenada and are therefore not recorded. It was also pointed out that landings recording were done mostly at centralized markets, so there were no data collectors. The Grenada representative indicated that the use of log books by fishers was a good idea to capture data and believed that if sufficient incentives were in place, the fishers would cooperate as they had the capacity to complete them.

The need for stricter terms and conditions for fishers to participate in the data collection process was discussed and the example of denying fishers concessions such as subsidized fuel was given as a possible measure.

4.5 Martinique

The expert from Martinique pointed out that the fishery in both Martinique and Guadeloupe had the same characteristics. The total number of fishers in Martinique was estimated to be 900 and in Guadeloupe 1000. In Martinique, the average age of fishers was 55. Fishing activities on the East coast of Martinique, accounting for 35% of the fishing area, had been prohibited due to coastal pollution from the use of a banana pesticide. While the fish production (capture) by Martinique was around 4000 tonnes annually, the island imported some 12,000 tonnes annually. Flyingfish is in the top 10 of fish species caught in terms of volume and value by the Martinique fleet.

It was queried whether the flyingfish fishery was specific to Martinique and not of interest to fishers in Guadeloupe and it was indicated that this was the case. The Meeting was also informed that there were recently new elections for the Fisherman's Associations in Martinique and Guadeloupe. The new presidents were Olivier Marie Reine in Martinique and Jean Claude Yoyotte in Guadeloupe and it was expected that some changes would occur which would facilitate improved sharing of information.

4.6 St. Vincent and the Grenadines

The expert from St Vincent informed the meeting of the general status of the fishery sector in his country. A request was made for the catch data of flyingfish in recent years if it was not previously stated. It was indicated that there was no reported catch of flyingfish last year, 2010, or 2009 since it was not a target fishery and monitoring was not routinely done. The expert mentioned that the flyingfish fishery was not of importance to the fishery sector and the related economy in St Vincent. Moreover, the population did not consume flyingfish.

5. Review and Update of the Sub-regional Fisheries Management Plan for Flyingfish

Dr. Singh-Renton provided an overview of the work conducted since the development of the 2008 Draft Management Plan which facilitated update of the plan. The CLME project will be completed by December of this year and CRFM was responsible for completing the Flyingfish Case Study component of the project. To date, CRFM contributions related to the flyingfish fishery included a bio-economic

assessment of the fishery; a Multi-Criteria Analysis; a Stakeholder Analysis; a review of existing policies and legislation; and establishment of a CRFM Ministerial Sub-Committee on flyingfish.

There was discussion on the two–year moratorium proposed in the draft plan, and it was queried whether a quota was more suitable. It was pointed out that the moratorium was an input control rather than an output control and would be easier to monitor. There was significant discussion to determine the best management measures applicable for the sub-region.

Clarification was sought on the database to be used for storing flyingfish fishery data and it was pointed out that it could be a sub-regional database housed at the CRFM Secretariat. However, it was recognized that an agreement was needed on what would be shared as these data would inform assessments at the sub-regional level. It was pointed out that the sub-regional information on fishing activity was expected to include, in the initial instance, catch and effort data, types and number of vessels. It was also pointed out that increased cooperation with France was necessary in order to secure participation of Martinique.

It was queried whether IUU fishing would be addressed at the sub-regional level. It was recognized that IUU fishing would need to be addressed at the national and sub-regional levels along with the governments as the issues were multi-faceted. The Meeting was reminded that in terms of flyingfish, one of the issues was that national fleets often fish in neighbouring EEZs and this could be addressed with bi-lateral arrangements.

In terms of formalization of the relationship between France and the CRFM/WECAFC Working Group, the Director of Maritime Affairs in the French West Indies indicated that it was important to establish a link between the EU, and the Department of Maritime Affairs in the French West Indies. He indicated that he would have a formal letter prepared by his Department requesting for consideration of this arrangement by the upcoming EU Commission in Brussels.

The Working Group reviewed the updated draft plan, which was updated by Dr. Uwe Tietze (CRFM consultant) in close coordination with the CRFM and WECAFC Secretariats (***Appendix 4***).

The finalized Management Plan will be published under separate cover and so the following provide an itemized list of the changes to the plan that were proposed during the meeting:

1. It was agreed that the introduction should note that there is a specific focus on the fourwing flyingfish as the main target species, but the plan is valid for all flyingfish species.
2. The group agreed to include in the updated plan selected charts and text describing catch and effort trends that appeared in the 2008 Fisheries Management Plan.
3. It was agreed that a section on Monitoring and Evaluation of the plan itself should be included. This section should cover:
    (i) Preparation of reports on the review of the draft plan by stakeholders at the national and sub-regional level through consultative processes that include public hearings, public posting of management plans and comment periods in addition to reviews by FACs
    (ii) Production of a template survey (questionnaire) to monitor national level progress in the implementation against the management measures in the plan
    (iii) Preparation of reports by Working Group members (countries) to the CRFM and WECAFC Secretariats by March 2013,
    (iv) Preparation of reports by the Working Group to the Caribbean Fisheries Forum meetings, CRFM Ministerial Sub-Committee on Flyingfish meetings, CRFM Ministerial Councils and WECAFC sessions.
4. The group developed operational objectives, and attempted to identify suitable indicator variable and references points to the extent possible. The meeting appreciated that the operational objectives, indicators and reference points as written in the document (Table 2) represented an

initial position and would likely need further elaboration during the coming years, as more information becomes available.

5. In the interest of completeness, it was agreed to include a list of the proposed specific management measures in the Executive summary.

In addition to the changes noted previously, the following were text edits to the Draft Management Plan:

1. Guadeloupe should be added wherever Martinique is mentioned, although interest in Guadeloupe for flyingfish is low. The representative at the meeting confirmed that he was representing both Martinique and Guadeloupe.
2. The section referring to the agreement between Dominica and France should be removed, as the agreement has not come into force.
3. Flyingfish should be written as one word throughout the document, and the FAO terminology-fourwing flyingfish should be used, wherever appropriate.
4. Ecosystem based management (EBM) is to be replaced by Ecosystem Approach to Fisheries (EAF).
5. "K065SE" should be deleted under species introduction (page 67).
6. The Working Group agreed to remove the annexes from the draft plan and include them in the report of the Working Group.
7. A summary of specific updates to be completed for the 2008 draft management plan (See FAO Fisheries and Aquaculture Report No.929[1]) is summarized below:
    - Table 2 (pages 62 - 63); Table 3 (page 64) and Table 4 (page 71) should be updated by the countries before 10 August 2012.
    - Figure 5 should be updated up to 2010 (page 72).

There was also some discussion on the fact that a mechanism for punitive measures for countries that do not implement the plan was missing. It was noted that even though these measures were addressed under the CCCFP, it was still awaiting approval and national regulations were often not in place. The importance of recognizing CRFM and WECAFC agreements was noted as well as the limitations of these bodies not being management bodies.

6. National Consultations

The Working Group agreed that the national consultations and review of the Fisheries Management Plan are intended to achieve the following:

(i) Introduce and increase awareness on draft FMP and the measures included;
(ii) Solicit feedback on draft FMP and adjustment / refinement (if required);
(iii) Generate buy-in from fishers and other stakeholders for implementation of the FMP;
(iv) Prepare stakeholders for implementation of the FMP (discussion about national level implementation of management measures, e.g. licenses).

The Working Group agreed that there was a need to identify clearly all the stakeholders at the national level and stakeholders should include among others: flyingfish fishers; flyingfish processors and retailers; Fisheries Divisions / Department; Market Departments; Coast Guard; Fish Inspection / Health Ministries / Departments; Gear suppliers.

The Working Group agreed that proposed national consultation plans should be documented by countries and provided to the Working Group for review by the end September, 2012. It was suggested that the national consultations could be held during October to December 2012, using the usual national resources

[1] Available from: http://www.fao.org/docrep/013/i1602e/i1602e00.pdf

(staff, funding, media access, etc.) available for this process. The working group was reminded that management measures would need to be reviewed and discussed internally in the fisheries departments and divisions in preparation for the national consultations which would lead to further refinement of the document.

It was agreed that CRFM would prepare a brief with key messages and measures to facilitate national level stakeholder meetings by the end of August 2012.

The Working Group was reminded that the Ministerial Sub-committee on Flyingfish would only be able to meet in 2013, after all the national consultations were completed and after the plan was presented to the Caribbean Fisheries Forum. However, it was recommended that a draft be shared during the upcoming CRFM Ministerial Council Meeting in October 2012.

7. Inter-sessional workplan

The inter-sessional workplan for the Working Group with regard to execution of agreed steps resulting in implementation of the Fisheries Management Plan was discussed. It was agreed that the Working Group would review the national consultation reports during January - February 2013, make the necessary adjustments to incorporate inputs from these consultations and finalize the plan inter-sessionally.

The Working Group also acknowledged the specific steps and time-frame for development and implementation of the Fisheries Management Plan, which are provided in Table 6 of the Fisheries Management Plan.

8. Ministerial Advisory Note

In order to obtain the relevant political level commitment to actively manage the fourwing flyingfish fishery based on the available knowledge base to date, a resolution on the Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean for presentation to the CRFM Ministerial Sub-Committee on Flyingfish was prepared by the Working Group and is given in ***Appendix 5***, as well as ***Appendix 1*** to the updated sub-regional management plan.

9. Review and adoption of the report

It was agreed that review and adoption of the report would be done by email.

10. Any Other Business

The absence of the two important flyingfish countries at the present meeting was noted (Trinidad and Tobago and Barbados) and it was stated that all material generated will be shared with these countries. Comments provided by these countries will be taken into consideration as an inter-sessional activity for the Working Group. Depending on the degree of disagreement with the draft plan that was produced during the present meeting, and if the Working Group is unable to address the comments, the Draft Plan would then need to be reviewed by the Forum. This meeting built on a 2008 plan that was previously adopted by these countries, and this should be emphasized.

11. Adjournment

Dr. Singh-Renton thanked the participants for their contributions and patience throughout the intensive and long discussions that took place, and expressed hope for continued progress following the extensive ground covered in the past two Meeting days. The Working Group was reminded to work actively with the conveners. The importance of flyingfish in the Barbadian culture was reiterated. The co-convener WECAFC was thanked for his inputs.

Mr. Mornet thanked the CRFM and WECAFC and expressed pleasure at meeting colleagues from other Fisheries Divisions / Departments from other islands. He indicated that Martinique was expected to be an ally to the CCCFP and pointed out that he now understood the CRFM process better. He also indicated that he looked forward to providing assistance in obtaining cooperation between France and the CRFM Secretariat.

Dr. VanAnrooy noted that the Meeting achieved its objectives and represented a good re-start for a sub-regional fisheries management plan. He thanked the participants on behalf of FAO / WECAFC and noted the need for management plans for other shared fishery resources. He thanked the CRFM for co-convening the meeting and for its excellent hospitality. He also acknowledged the experts' contributions, rapporteurs and caterers.

The Meeting was adjourned at 4:49 pm.

APPENDIX 1: Meeting Agenda

CRFM / WECAFC Flyingfish Working Group Meeting
18 - 19 June 2012, CRFM Secretariat, Kingstown, 0900-1700h

1. Opening of the meeting.

2. Adoption of meeting agenda and meeting arrangements.

3. Introduction of participants.

4. National reports:

   - To review and update the Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean developed by WECAFC in 2008, taking into account: the recent findings and recommendations of the CLME Case Study on flyingfish, and national fishery management progress and developments documented in national reports, in accordance with the guidelines provided.

   - To consider practical options for improving the data and information base on Eastern Caribbean flyingfish, taking into account the need to adopt an ecosystem approach to fisheries.

5. National Consultations.

6. Inter-sessional Work Plan:

   - To prepare a Ministerial advisory note for presentation of the updated fisheries management plan for consideration by the CRFM Ministerial Sub-Committee on flyingfish.

   - To prepare a report of the meeting for review and consideration by the CRFM and by WECAFC.

7. Review and adoption of meeting report.

8. Any other business.

9. Adjournment.

APPENDIX 2: List of Participants

CRFM / WECAFC Flyingfish Working Group Meeting
18 – 19 June 2012, Kingstown, St. Vincent and the Grenadines

Name	Designation	Organization / Address	Contact
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APPENDIX 3: National Reports

I - Commonwealth of Dominica
National Fisheries Industry Report (2012)

Prepared by Derrick Theophille (Fisheries Liaison Officer – Data), Fisheries Division, Dominica. This document is prepared for the 2012 CRFM Scientific Meeting (20th to 30th June, 2012) and the CRFM / WECAFC Working Group Meeting on Flyingfish in the Eastern Caribbean (18 to 19 June 2012).

1. About the Commonwealth of Dominica

The Commonwealth of Dominica, known to the world as the Nature Island of the Caribbean and the indigenous Kalinago as Wai'tu kubuli, is one of the small island nations of the Lesser Antilles within the Caribbean Archipelago. Some details about Dominica are presented below.

Area	750 km²
Coastline	148 km
Maritime Claims	
Contiguous Zone	24 nm (UNCLOS)
EEZ	200 nm (UNCLOS)
Territorial sea	12 nm (UNCLOS)
Shelf	900 km² (majority of shelf area is situated on east of island)
Climate	Tropical; moderated by Northeast trade winds; heavy rainfall. Average daytime temperatures range from 75 to 85 degrees Fahrenheit. There are two seasons, the dry season (January to April) and the rainy season (July to October).
Terrain / Topography	Rugged mountains of volcanic origin, covered with lush rainforests. Mountains extend deep into the sea (particularly on the west coast), hence there are steep drop-offs and very deep waters near shore. There are numerous rivers, streams and waterfalls. The island is 29 miles long and 16 miles wide.
Natural resources	Timber (forests), water, sand and stone.
Environment	Flash floods a constant hazard (heavy rainfall). Rainforests cover more than 60% of the island.
Population	73,126 (July 2012 estimate)
Language	English is the official language. Creole (French Patois) is widely spoken.
Government	Full independence (1978) with republican status within the British Commonwealth. Now formally known as the Commonwealth of Dominica.
International disputes	None

2. Description of the Fishery and Fleet

The local fisheries industry is comprised of about 800 fisher folk (both men and women; there may be many more persons operating who are undocumented or unregistered) operating from fishing communities around the island, fishing from small open vessels, typically in an artisanal fashion. There are about 32 landing sites scattered along the coastline, the majority of which are on the west coast or Caribbean Sea side. The East Coast is far more difficult to operate from due to the harsh Atlantic Ocean, however, a few sheltered bays (both natural and man-made) allow for fishing communities to exist and even thrive, as in the case of Saint Sauveur and Marigot.

A typical fisher folk can be described as an un-married 40 to 50-something year old male with a primary school education level. Fisher folk may be fishers, boat owners, fish vendors, gear or boat builders, outboard engine mechanics or any combination of these roles. This report focuses primarily on the activities of the fishers and the boat owners.

Fisheries here is multi-species focussed. Fishers may have a particular fish they target, but often times plan to catch more than one type of fish on any particular fishing trip. The gear used allows for catching multiple types of fish, except for specific situations.

Characteristics of the Fishing Boats

434 boats were reported during the 2011 Dominica Fisheries Industry Census. Keel-type boats were by far the most common, making up about half of the boats found in the industry. It should be noted the number of keel boats have dropped from 66% in 2008 to 52% in 2011. FRP (fibre-reinforced plastic) or pirogue boats have been gaining significance in the local fleet for several years now. Only 50 FRP vessels were reported in 2008. That number has more than doubled in 2011.

Table 1- Boats by type and number. 2011 Fisheries Industry Census.

	2008		2011	
Type	**Count**	**Percent**	**Count**	**Percent**
Canoe	95	21.4%	91	21.0%
Keel	292	65.8%	224	51.6%
FRP	50	11.3%	119	27.4%
Other	7	1.5%	0	0.0%
Grand Total	**444**	**100.0%**	**434**	**100.0%**

All fishing boats in Dominica operate for a few hours a day (day-trips). Fishers usually leave shore in the morning and return between midday and sunset. Fishing trips tend to be about 6 to 8 hours from time of departure to return. Canoe trips tend to be shorter in most cases as they operate closer to shore. The time of departure varies by coast (east or west) and fishing community, based on the type of fish targeted or social customs. Time of return depends primarily on the amount of fish caught and the usual time of vending at the various communities. Boats tend to operate for 3 to 4 days a week, making fishing largely a part-time activity.

Table 2- This table shows the characteristics of the types of fishing boats found locally.

	Canoe	Keel	FRP / Pirogue
Length range	Typically under 20 ft in length. Usually 10 to 20 ft in length	Usually 15 - 25 ft in length	Usually 20-25 ft in length
Construction / Description	Made of dug-out gommier trunk	Wooden planked open vessel on a skeleton frame with a keel	Fully fibre glassed open vessel
Propulsion methods	Mostly un-powered. Oars are used for propulsion. In cases where outboard engines are used, they are 15 HP or smaller	Powered by outboard engines (mainly 30-85 HP). Some boats carry two outboards. Oars are carried as a backup in some cases	Powered by outboard engines (mainly 30-85 HP). Some boats carry two outboards. Oars are carried as a backup in some cases. Some of the larger FRP vessels can carry dual 150 HP four stroke outboards
Gear used	Mainly uses net-type gear such as beach seines. Fish pots are also used	Hook and line gear is most popular, although the boats are known to carry fish pots as well	Hook and line, fish pots and even nets can be used off these boats. However, hook and line gear is most popular, especially when used for handling operations around FADs
Species fished	Small coastal pelagic such as ballyhoo, jacks and sardines. Reef fish such as parrot fish, groupers and snappers	Migratory pelagics such as tunas, dolphin fish, marlin, flyingfish and wahoo among others. Reef species include snappers and groupers	Migratory pelagics such as tunas, dolphin fish, marlin, flyingfish and wahoo among others. Reef species include snappers and groupers
Fishing distance	Canoes usually operate within one mile from shore	Can travel to over 20 miles off-shore, but usually operate within 10 miles	Can travel to over 20 miles off-shore, but usually operates within 10 miles

Fishing Gear

Fishing gear used locally comes in the form of hook and line types, net types and fish pot / trap types. Of these, almost 70% of all gear used is the hook and line variety. Pots make up about 20% of all gear and nets only make up 9% of all gear.

Hook and Line Gear

Although hook and line type gear can be and is modified to target demersals, over 66% of this type of gear is used for hand lining or trolling for pelagics. About 60% of the local fishers utilize hook and line type gear as part of their operations.

The trolling fishing method was utilized the most in recent years, but with the increasing popularity of FADs fishers have reverted to hand lining near and around FADs for catching large migratory pelagics. This has saved considerably on fuel costs; where in the past fishers would troll over many more miles of water before coming upon a catch, they could now almost guarantee a catch off of the FAD. Fish typically caught from off-shore trips are dolphin fish, yellow fin tuna and blue marlin.

Other line type gear used locally include surface, vertical and bottom long lines. These, however are not the typical long line operations found in more developed countries with large scale fisheries operations, but an artisanal scale operation, consisting of a specially made gear that can be set or set adrift or simply

held by the fisher off the side of the boat. This gear is fitted with multiple hooks. Some of these long lines can be used to target reef species such as snappers. Though they are used all over, line type gear is most popular in the South Western communities.

Net Gear

According to the 2011 FIC results, there are about 617 net-type gear utilized locally, the most common of which is the flyingfish net followed by the gill net, cast net and dip net. These nets are used to surround schooling fish and can be either pulled back into the boat or unto the shore after the fish is trapped. Species normally caught with these gears include small pelagics such as flyingfish, ballyhoo, mackerels, jacks and small tuna. Nets tend to have a mesh size of 1.5 inches, as per the national fishery regulations. Nets are most common on the east of the island.

Fish Pots

This type of gear is a box-shaped structure constructed with wire mesh on a wooden frame. Fish pots can be set on the sea floor for days at a time. An entrance allows fish to enter but not escape the trap. Box (rectangular-shaped) and Z-type pots are the most popular found locally. A wide variety of fish can be caught using trap type gear, from demersals, such as snappers and groupers to lobsters and eels.
On average, fish pots soak for about 6 days at which point they are hauled (usually by hand) and the fish is removed. The pot is sometimes reset or brought to shore.

Pots also use a mesh size of 1.5 inches, conforming to the local regulations. Fish pots are most common in the communities of the North West.

Fish Aggregating Devices (FADs)

FADs are structures set in the open sea for gathering fish. They are very popular here, being utilized by almost half of the fishing population at least once per week. FAD fishing is least common in the communities of the south and most popular in the east.

Traditionally, fishers have been responsible for building and setting their own FADs, as their own personal fishing gear and property within the waters of Dominica. However, the Fisheries Division is partnering with the National Association of Fisherfolk Cooperatives (NAFCOOP) to manage the use of FADs locally. Under this arrangement, NAFCOOP will be the sole body responsible for setting and maintaining FADs in Dominica and no individual fisher can claim to be the owner of any FAD in Dominican waters.

The most common problem encountered with FAD use is local piracy, where one fisher fishes off of the FAD of another fisher without his consent. The second most common issue is the presence of foreign (French) fishing vessels fishing off of local FADs.

Species Targeted

Off-shore pelagics are most commonly targeted, followed by coastal or small pelagics and then lastly demersals. Following the 2011 FIC, however, it was observed that one in two fishers said that they targeted snappers. A similar number said they target dolphin fish and also tuna. One in three target blue marlin and one in five mentioned jacks as the target fish.

The most popular species are:

- Off-shore pelagics
  - Dolphin fish *(Coryphaena hippurus)*
  - Yellowfin tuna *(Thunnus albacares)*
  - Flyingfish *(Exocoetidae)*
  - Blue marlin *(Makaira nigricans)*
  - Skipjack tuna *(Katsuwonus pelamis)*
  - Wahoo *(Acanthocybium solandri)*
- Coastal pelagics
  - Ballyhoo *(Hemiramphus brasiliensis)*
  - Jacks *(Carangidae)*
  - Mackerels *(Scombridae)*
- Demersals / reef
  - Queen Snapper *(Etelis oculatus)*
  - Red snapper *(Lutjanus campechanus)*
  - Groupers *(Epinephelus, Mycteroperca)*
  - Ocean Triggerfish *(Canthidermis sufflamen)*
  - Queen Triggerfish *(Balistes vetula)*

Fish Prices

Fish price varies around the island by community and species of fish. Small fish such as ballyhoo can sell for as low as one dollar a pound, while lobster can go for fifteen dollars a pound locally. Small coastal pelagics tend to stay below six dollars, while large pelagics range from five dollars for marlin to nine dollars for dolphin fish. Demersals can hover at this same range but are often times pricier, sometimes going for more than ten dollars a pound. Flyingfish tends to go for three to five dollars a pound.

3. National Fisheries Management: Policy, Legislation and Regulations

Policy and Management

The national policy for fisheries continues to be promoting sustainable fisheries for all Dominican fishers. The mission statement of the Fisheries Division is:
To optimize the contribution of the fisheries sub-sector to the Dominican economy through its sustainable management and development by creating an enabling environment for sustained employment, enhanced food and nutrition security, reduction of poverty and for enhancing the contribution of fisheries to the economic diversification of food production in Dominica.

Table 3- Overview of the fisheries managed (Fisheries Management Plan)

Fishery Managed	Fishing Methods	Area Fished	Resource Status
Shallow shelf reef fisheries	Fish traps, set nets, spear guns	Coastal coral reefs and insular shelf area	Most shallow reef fish resources are considered to be fully or exploited
Coastal pelagic fisheries	Hand lines, floating gillnets, cast nets, troll lines	Near /coastal areas	Unknown.
Deep slope fisheries	Fish traps, hand lines, vertical long lines	Deep sloping edges of the insular shelf, offshore banks	Although unknown some areas yield landings that suggest a potential for increased fishing
Large (offshore) pelagic fisheries	Troll lines, Long lines (vertical and mid-water)	Oceanic EEZ	Although ICCAT and others suggest caution recent yields from FAD fishing suggest a potential for increase

Recently, the Fisheries Division, under the African Caribbean Pacific (ACP) Fish II program, held consultations at major communities around the island (Roseau, Portsmouth and Marigot) on much needed reform to the current policies governing the local fisheries. The aspirations of the stakeholders were documented as well as the challenges that impede the development of the industry. This European Union project aims to strengthen fisheries management in ACP countries.

Legislation and Regulations

The Fisheries Act No. 11 of 1987 and the Territorial Sea and Contiguous Zone, Exclusive Economic and Fishery Zone Act No. 26 of 1981 provides the Fisheries Division of the Government of the Commonwealth of Dominica with the legal authority to manage the affairs of the marine capture fisheries and aquaculture in Dominica. This legal authority also extends to coordinating the discharge of national obligations to legally binding international fisheries agreements and instruments such as the UN Convention of the Law of the Sea (Part V), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the International Commission on the Conservation of Atlantic Tuna (ICCAT).

There are specific regulations pertaining to:

- Designated berthing areas (landing sites) for fishing vessels
- Establishment and management of the Soufriere/Scott's Head Marine Reserve
- Registration of fishers and fishing vessels (including vessel registration markings and fisher registration cards)
- Conservation measures for sea turtles, conch and lobsters
- Gear mesh sizes (fish pots and nets)
- Safety-at-sea
- Erection and use of FADs for fishing
- Territorial Sea, Contiguous Zone and Exclusive Economic Zones

As the Fisheries Regulations are not yet gazetted and thus unenforceable, the Fisheries Division has encouraged and educated fishers on the best practices for ensuring the sustainability of the fisheries sector and promoted voluntary self-regulation and policing. The Fisheries Rules (1939) still apply legally until the new regulations have been promulgated but as a matter of policy the draft Regulations (2010) have been adopted.

Jurisdiction is also an issue, especially concerning sea turtles, which while at sea are covered by Fisheries Regulations, but while on the shore, are covered by Forestry and Wildlife Regulations.

Concerning flyingfish, there are no specific management policies. However, there are regulations governing mesh sized for nets used for harvesting at juvenile stage (0.75 inch mesh) and at adult stage (1.5 inch mesh).

NAFCOOP

The National Association of Fisherfolk Cooperatives (NAFCOOP) is the umbrella organization for fishing co-operatives in Dominica. It has ten co-operative affiliates with a combined total membership of about 400 persons. NAFCOOP is governed by a committee made up of nine board members, persons belonging to the various affiliate co-operatives. Activities include:

- Advocacy for fisher folk, representing the interests of fishers across the island
- Operating a fuel station for fishers at the Roseau Fisheries Complex
- Management of FADs within the waters of Dominica
- Participating in the Diamondback Squid research program

NAFCOOP is a key player in the management of the local fisheries industry, taking on key projects such as research to fisheries policy formulation.

4. Research

Diamondback Squid

Currently, the Fisheries Division is conducting exploratory research into Diamondback Squid (*Thysanoteuthis rhombus*) in the waters off the West Coast. A new gear, the squid jig, is used to fish at about 500 meters depth for the squid. Diamondback squid is a high value product. A recipe book (with tasting sessions) and brochure were prepared to help generate public interest and promote development of the fishery. Fishing trips are done by the Fisheries Division in conjunction with interested fishers. This is a JICA supported project.

Queen Snapper Fishery Assessment

This is a special research initiative conducted by Japan Cooperation Overseas Volunteer Tetsuya Miyahara. The research involves collecting data from fishing trips of one fisher in the community of Fond Cole. The trip details are recorded, including gear and method utilized. Fish length is recorded as well as gonad details (weight and maturity).

Ghost Fishing

This is another JICA project. The Ghost Fishing Research Program started in 2007 with the deployment of 10 fish pots into the waters off the west coast of the island. Two staff members have monitored the capture and kill rate along with the life span of these traps since then. Some promising results were obtained that could help promote more sustainable trap fishing practices.

A sub-regional program on the use of biodegradable materials in fish pots was conducted, training fisheries officials from around the region last year.

Improved Fish Catch and Effort System

Under the Moored Fish Aggregating Devices in the Lesser Antilles (MAGDELESA) project, the Fisheries Division intends to carry out a pilot project to test proposals for improving the current fish catch and effort data collection system. This project includes the development of a revised data collection form, improved collection methodology and data collection at new sites. Data collectors will also be equipped to capture some biological information on blackfin tuna *(Thunnus atlanticus).*

FADs

There are a number of projects ongoing concerning FADs. These are:

- The JICA Master Plan Project: this looked at developing policy for the improved management of FADs and also capacity building for fisher folk and co-operatives for managing FADs.
- University of Florida FAD Project: this is primarily focused on data collection activities surrounding the use of FADs in the local industry. Data is collected at a few sites, looking at how FADs are used and managed by fisher folk.
- University of Texas A&M FAD Study: This project involves the tracking of fishing activity and effort through the use of GPS technology as well as FAD location and fishing effort around FADs.
- MAGDELESA / IFERMER Project: This is a study to test new FAD technology, constructed with new materials. So far two FADs were deployed off the West Coast of Dominica. This is a

two-year pilot project conducted in Martinique, Guadeloupe, Dominica, St. Kitts and Nevis, St. Vincent and the Grenadines and Haiti. Data will be collected to study the fishing activity and species caught off FADs.

Other Projects

- FAO Disaster Risk Management: This is a project about improved vertical long line fisheries for increasing catches and helping to promote national food security. Fishing equipment is already acquired and will soon be distributed to fishers. Data will be collected to study the usefulness of the improved gear technology.
- Lion Fish: This invasive alien species is now in Dominican waters. As a means of managing the impact of this new species, the Fisheries Division in collaboration with the dive operators and fishers keep a database on sightings and capture of the fish. A recipe book may be produced soon in an effort to encourage the capture and consumption of the fish.
- Fisheries Industry Census (FIC) 2011: As a follow-up to the 2008 FIC, a second census was held in 2011. A report of the results is nearing completion and will afterward be printed for distribution.

The survey involved interviewing over 800 persons who operate in the industry. Target groups were fishers (current and retired), fish vendors, boat owners, gear and boat builders/repairers and equipment suppliers. The survey was run during the latter half of 2011. This project was funded by the Japan International Cooperation Agency (JICA). A critical baseline dataset giving an overview of the current state of the fishing industry was obtained.

5. Fisheries Statistics and Sampling Programs

Fish Catch and Effort

There is only one regular sampling program, this is the fish catch and effort sampling program. Data is collected at 13 landing sites around the island by 9 data collectors (part-time employees attached to the Fisheries Division). Random sampling is performed at all sites except for Marigot (after the completion of the new fisheries facility in 2004) which captures all data for all boats landed. Generally, more than 50% of the day's catch is sampled randomly by the data collector. Collection is done for at least 4 days weekly.

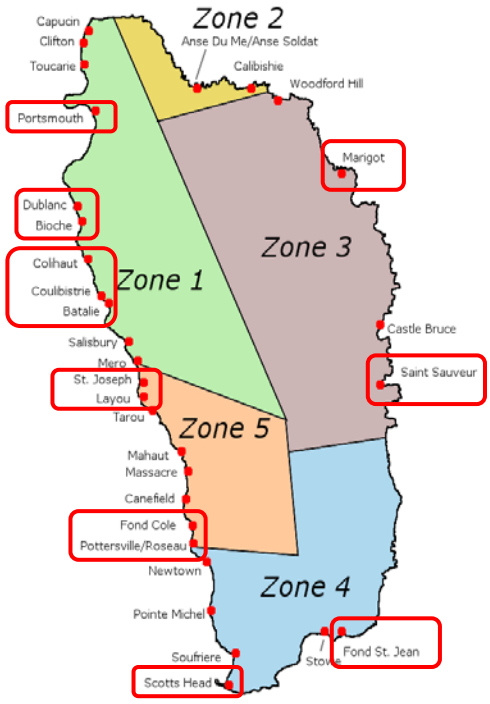

Figure 1- Map of Dominica, divided by Fisheries Liaison Officer (FLO) Zones, showing landing sites, with data collection sites boxed.

A data book is issued to data collectors monthly for the purpose of collecting the data. Datasets of interest are: date of catch, landing site name, number of boats sampled and total of boats fished at that date, boat registration number or other identification (usually owner or captain name), name of species caught, weight of species caught, gear used, fishing location (name of location), time spent at sea and number of crew members.

Data collectors are supervised by Fisheries Officers on field visits. However, there were incidences in reduced data quality over the year, resulting in replacing the offending collector(s). The Fisheries Division endeavors to maintain and improve the quality of information collected by hosting data collectors

meetings, bringing every collector to the main office to discuss matters pertaining to the job, including data collection issues and results of data analyses.

Registration of Fishers and Fishing Vessels

This program is simply a register of persons and vessels which operate within the industry. Registration is not yet mandatory in Dominica for a person to fish; however, the Fisheries Division has tied registration to benefits for fishers (such as duty free on fishery item imports, assistance for recovery after natural disasters). This encourages persons to get registered and make sure that their records are kept up to date.

Fisheries Industry Census

The Fisheries Division has carried out two Fisheries Industry Censuses to date, one in 2008 and the second in 2011. These studies have helped fill knowledge gaps for the industry.

National Fish Production

The chart below shows the national fish production trend for Dominica for the past ten years.

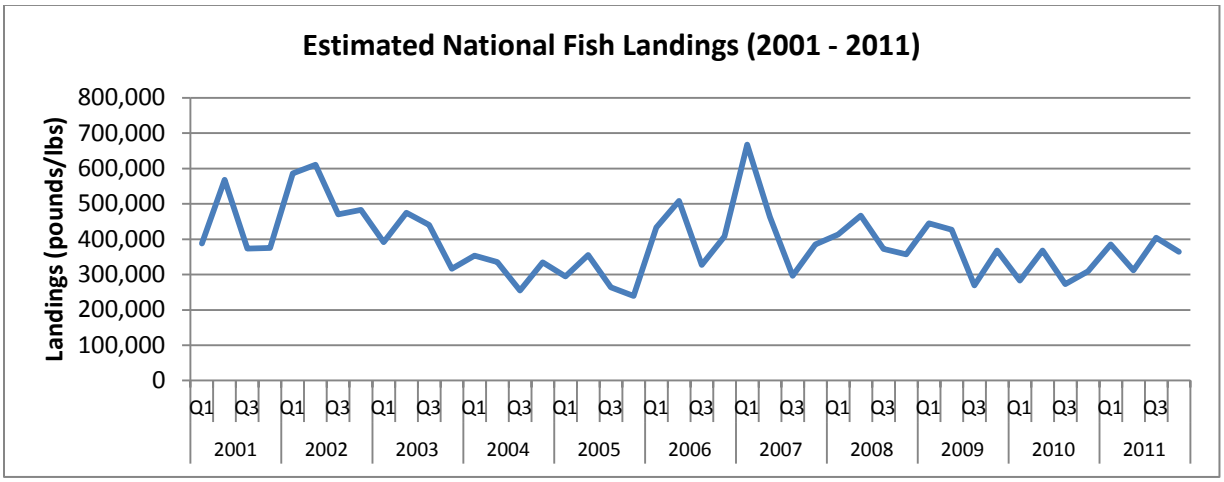

Table 4- Estimated Fish Landings (2001-2011). Values in pounds (lbs).

Month	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
January	65,638	198,288	133,318	95,635	116,172	122,040	204,916	136,314	114,207	84,308	103,915
February	92,807	194,495	111,510	116,929	79,689	134,555	175,536	141,064	121,154	91,876	111,832
March	229,713	193,005	146,809	141,213	98,678	176,779	287,343	135,503	209,255	106,702	169,630
April	161,271	261,047	162,707	120,053	105,536	205,587	175,784	148,341	154,039	134,728	134,589
May	250,088	164,951	179,702	107,114	94,568	155,610	170,284	180,042	149,640	127,847	94,137
June	156,873	184,578	132,213	107,902	155,390	147,375	116,930	138,178	123,245	105,501	82,865
July	132,488	145,695	162,460	75,919	109,047	110,204	92,168	136,463	77,771	97,195	115,483
August	134,789	167,805	144,505	102,601	64,438	135,697	86,599	125,001	90,365	92,115	164,547
September	106,465	156,993	133,289	76,334	90,177	81,028	117,640	111,372	101,104	83,154	124,475
October	116,416	195,864	131,447	71,267	86,022	117,894	112,377	114,830	108,801	110,841	141,136
November	103,020	168,893	78,885	146,147	78,776	121,702	124,264	118,129	165,523	99,285	126,602
December	156,037	118,108	105,551	116,928	74,878	168,079	148,105	124,105	93,540	99,289	96,464
Grand Total (lbs)	**1,705,605**	**2,149,722**	**1,622,395**	**1,278,042**	**1,153,372**	**1,676,549**	**1,811,946**	**1,609,343**	**1,508,643**	**1,232,842**	**1,465,676**

The chart below shows the sampled landings of flyingfish over the last five years.

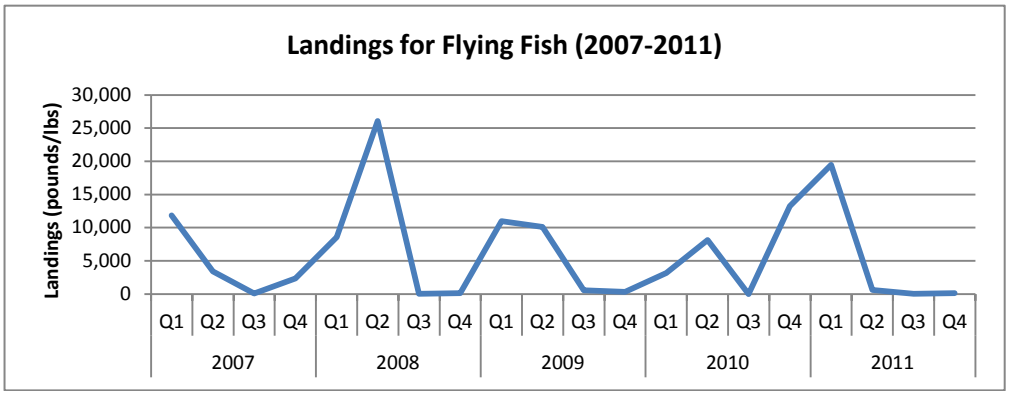

Table 5- Landings for flyingfish (sampled data). Values in pounds (lbs.).

Years	Q1	Q2	Q3	Q4
2007	11,867	3,400	80	2,346
2008	8,575	26,053	35	130
2009	10,998	10,089	562	324
2010	3,183	8,128		13,267
2011	19,482	622	26	120
Grand Total (lbs)	**54,105**	**48,292**	**703**	**16,187**

II – French West Indies (FWI)-Martinique and Guadeloupe Flyingfish report

By

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This report done at the request of CRFM, gathers the information available on the Martinique and Guadeloupe fishing fleets targeting Flyingfish.

A. Fishery and Fleet description

During the year 2008, 2009 and 2010 in Martinique, 1084, 1098 and 1111 boats were registered as commercial fishing boats and in Guadeloupe 878, 903 and 956 respectively. Within the same years, 85 %, 82 % and 80 % (916, 896 & 892) of the vessel fleet were active in Martinique and in Guadeloupe 90 %, 86 % and 79 % (794, 778 & 760) were active. Most of the boats are between 5 to 9 m total length. The 7 to 9 m boats are more frequent in Martinique (fig. 1). During the last decade, the number of 7 to 9m boats increased in Guadeloupe while the number of 5 to 7 m boats decreased (fig. 2). The average length of the boats is similar between the two French Antilles, but the engine average power is higher in Guadeloupe (148 kW *vs* 82). The total power of the fleets had increased steadily from 56,788 to 91,578 kW in Martinique between 1993 and 2010 and at the same time, from 84,240 to 141,264 kW in Guadeloupe. The average age of the boats are 16 years in Martinique and 12 years in Guadeloupe.

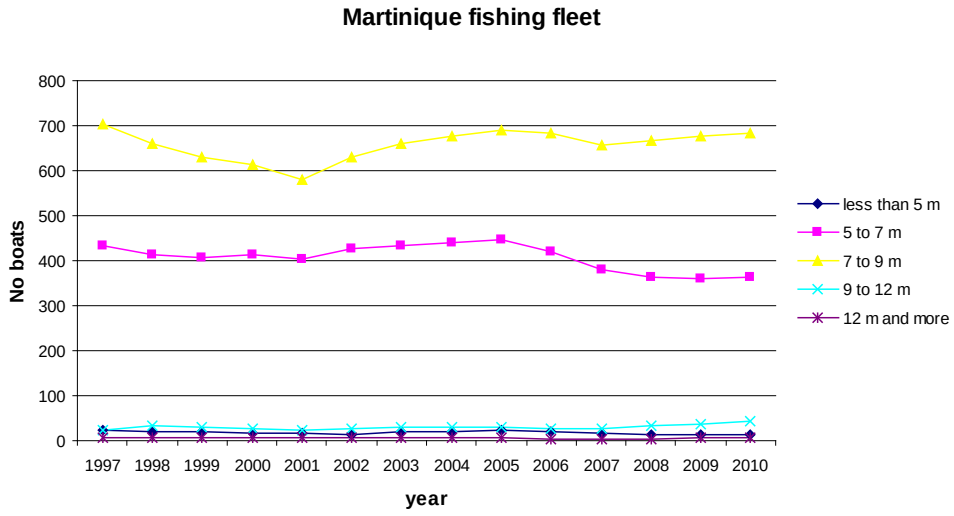

Figure 1. Length frequencies of the fishing fleet of Martinique (1997 to 2010)

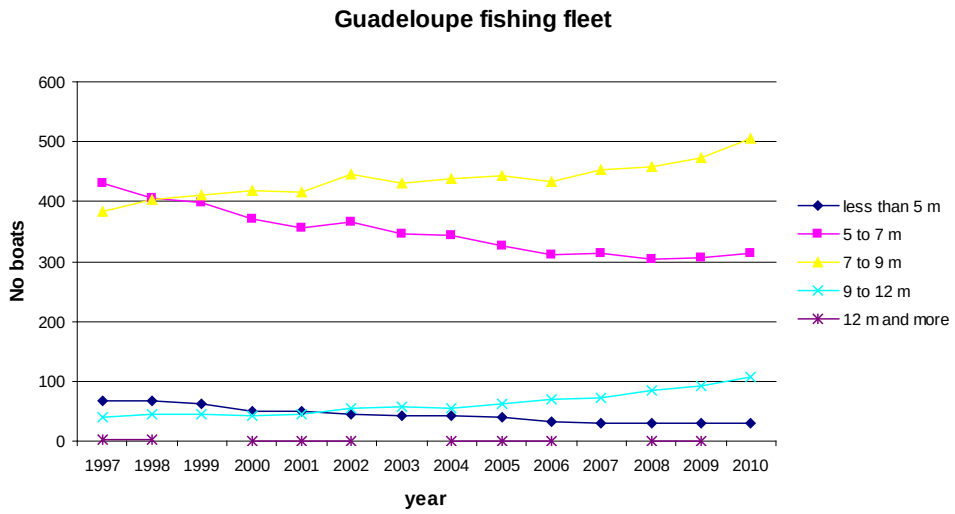

Figure 2. Length frequencies of the fishing fleet of Guadeloupe (1997 to 2010)

Flyingfish are mainly fished using the following:

- High sea drifting nets targeting flyingfish (Martinique only)
- Nets for flyingfish during high sea trolling lines for large pelagic fishes (Martinique only). The nets are used only on identified schools
- Flyingfish drifting nets during FADs fishing trips; in this case flyingfish are targeted as bait for yellow fin tuna fishing
- Surface gillnet, essentially targeting balao (note: the data presented below are not concerning only those targeting balao)

Flyingfish are not targeted by the commercial fishing boats of Guadeloupe. This is practiced mainly by high sea fleets with drifting nets in Martinique. The characteristics of the boats using the gears above are presented table 1.

Table 1. Characteristics of the Flyingfish fishing fleet (Martinique 2010)

						Average per baot				
Metier	**Gear code**	**No boats**	**kW Total**	**U.M.S. Total**	**No crews**	**Length (m)**	**kW**	**U.M.S.**	**Age of boats**	**No crews**
FAD	DCL	315	37028	663	562	7.6	118	2	12	1.8
Surface net	GNC	61	2116	56	111	6.4	35	1	17	1.8
Drifting net for Exocet	GND	84	9814	164	145	7.4	117	2	12	1.7
High sea trolling line for large pelagic	LTL	335	36886	669	608	7.5	110	2	13	1.8

In 2010, only 84 boats are targeting flyingfish with drifting gillnet. Inside the 12 nautical miles from the coast, on the west side of the island, 58 boats are totalling 507 months of activity with this gear, on the south, 20 boats are fishing during 165 months and on the east coast 19 boats are working during a total of 140 months. Between 12 and 24 nautical miles, mainly on the west and north-east sides, 53 boats targeted Flyingfish for a total of 340 months within the year 2010. Because they are working on high sea, the average power of the boats targeting Flyingfish is higher than the total fleet (117 kW). The average duration of a Flyingfish fishing trip with drifting net is a little less than 10 hours. The fishing mean duration of the net is 7 hours. The mesh size used is between 38 and 44 mm and the consumption per trip is estimated at 92 litters.

The number of fishing trips (table 2) is very low for the flyingfish drifting net (less than 1000 per year) but the average landing per trip is the highest for this metier: 66 kg (2009) and 100 kg (2010) (table 3).

Table 2. Number of fishing trips per year and gear (Martinique 2009 and 2010)

		2009			2010 (*)		
Metier	**Gear code**	**No trips**	**I-**	**I+**	**No trips**	**I-**	**I+**
FAD	DCL	6 122	4 497	7 777	6 167	5 777	6 557
Surface net	GNC	1 968	1 377	2 559	1 149	1 076	1 222
Drifting net for Exocet	GND	516	339	692	676	633	719
High sea trolling line for large pelagic	LTL	5 217	3 875	6 558	4 562	4 274	4 850
Total No of fishing trips (all gears)		**40 133**			**32 221**		

Table 3. Average Flyingfish landing per trip and per gear (Martinique 2009 and 2010)

		2009			2010		
Metier	**Gear code**	**Landing (kg)**	**I-**	**I+**	**Landing (kg)**	**I-**	**I+**
FAD	DCL	0.1	0.03	0.19	0.05	0	0.11
Surface net	GNC	0.01	0	0.04	0.29	0	0.83
Drifting net for Exocet	GND	66.29	38.4	98.61	99.54	65.3	142.83
High sea trolling line for large pelagic	LTL	0.85	0.35	1.47	0.83	0.15	1.72

In 2009, the landings of Flyingfish in Martinique per year were estimated at 39.6 tonnes and in 2010 at 84.7 tonnes (table 4).

Table 4. Flyingfish landing per year in Martinique (2009 and 2010)

		2009			2010		
Metier	**Gear code**	**Land. / year (kg)**	**I-**	**I+**	**Land. / year (kg)**	**I-**	**I+**
FAD	DCL	612	135	1 478	308	0	721
Surface net	GNC	20	0	102	333	0	1 014
Drifting net for Exocet	GND	34 206	13 018	68 238	67 289	41 335	102 695
High sea trolling line for large pelagic	LTL	4 434	1 356	9 640	3 786	641	8 342
		39 577	**14 407**	**81 445**	**84 674**	**44 248**	**138 177**

The flyingfish represent 99 to 100 % of the drifting nets landings. This proportion is very low for the other gears (table 5).

Table 5. Proportion of the flyingfish in the landings per gear in Martinique

		2 009			2 010		
Metier	**Gear code**	**Land. / year (%)**	**I- (%)**	**I+ (%)**	**Land. / year (%)**	**I- (%)**	**I+ (%)**
FAD	DCL	0.2%	0.1%	0.3%	0.1%	0.0%	0.2%
Surface net	GNC	0.0%	0.0%	0.2%	1.2%	0.0%	3.0%
Drifting net for Exocet	GND	99%	98%	100%	100%	100%	100%
High sea trolling line for large pelagic	LTL	1.2%	0.6%	1.7%	1.6%	0.4%	2.9%

The drifting nets are landing 87 % of the Flyingfish in Martinique; the other gears are responsible of 11% (high sea trolling line) and 2 % (FADs) of the landings of this fish (table 6).

Table 6. Relative importance of the different gears in the Flyingfish landing in Martinique (2009)

Metier	**Gear code**	**2009**
FAD	DCL	2%
Surface net	GNC	0%
Drifting net for Exocet	GND	87%
High sea trolling line for large pelagic	LTL	11%
		100%

The average price per kg of the Flyingfish is higher for the FAD fishing and is lower for drifting net specialised in Flyingfish fishing (table 7).

Table 7. Average price per kg of the Flyingfish per gear in Martinique (year 2009 + 2010)

Metier	ENGIN	Price (€/kg)	I-	I+
FAD	DCL	6.2	5.72	6.72
Surface net	GNC	5	5	5
Drifting net for Exocet	GND	4.49	4.23	4.75
High sea trolling line for large pelagic	LTL	5.75	5.5	6

The value of the landings reached 184 k€ in 2009 and 418 k€ in 2010 (tbl. 8).

Table 8. Value of the Flyingfish landings per year in Martinique (2009 and 2010)

2009			2010		
Total landing (€)	I-	I+	Total landing (€)	I-	I+
184 424	62 881	401 983	418 201	200 164	735 166

B. Statistics and Sampling

A Fisheries Information System (FIS) conceived by IFREMER has been implemented in Guadeloupe and Martinique since the beginning of 2010 after a pilot project in 2008 in Guadeloupe and in 2009 and 2010 in Martinique. The FIS is a permanent, operational and multidisciplinary national network for the observation of marine resources and their associated uses.

The methods used are the following:

- *Phone investigation*: stratified sampling plan based on a simple stratified random sampling of the vessel each week to reconstitute trip and inactivity on 7 days. Stratification (25 stratums) made out of length, gradient and zone of fishing of the vessel. In Martinique, 75 interviews are made per week and 60 in Guadeloupe
- *Sampling at landing points*: sampling strategy of harbours with at least 10 vessels between Monday and Friday

The pilot studies give first preliminary figures on the extrapolated landings of these islands but these data have to be validated. The scattering of the landing points around Guadeloupe and Martinique (more than 100 in each island) makes the monitoring of the fishing activities difficult. The use of two methods to estimate the number of trips gave results up to 2 times less than those obtained in Martinique by a previous study 20 years ago (Gobert, 1989). Different surveys have been launched in Martinique in order to improve this issue. The results are going to be published in a few months.

The biological samplings of flyingfish are necessary on the field to identify the different species in the catches, to measure the catches, etc. According to fishermen interviewed, there are at minimum 3 species of Flyingfish in Martinique. The fishermen recognise a big Flyingfish called “Koden”. The more common could be the “tèt rond”. When the fishermen target the balao with surface gillnets they catch a flyingfish called “volan la kot”. This fish is used as bait. The big Flyingfish are fished with 42 to 44 mm mesh size between November and July. The smaller one are fished with 38 mm mesh size in June, July and August.

The number of fishing trips targeting flyingfish (drifting net for flyingfish) represents 1 or 2 % of the total fishing trips in Martinique (table 2). So a special sampling plan is necessary to have the opportunity to get a sample bigger enough to be statistically exploitable.

C. Legislation and Management Regulations

There are no special legislation and management regulations for commercial fishing of flyingfish. Limit of total power and gross tonnage is separately imposed for the commercial fleets of Guadeloupe and Martinique.

Literature cited

Gobert B., 1989. Effort de pêche et production des pêcheries artisanales martiniquaises. Document scientifique n° 22, 95 p.

III - Description of National Fishing Industry In Grenada

Grenada's national fishing industry can be characterized as artisanal and semi commercial which comprises of fishermen, boat builders, processors, vendors, gear suppliers etc. The industry comprises of approximately 2,000 fishermen and 700 fishing vessels, three processing fish plants exporting on an average 800,000 Lbs annually with a value of approximately $1.2 million EC dollars.

The main species targeted are pelagic species i.e. yellowfin tuna, dolphin, wahoo, blackfin tuna, skipjack tuna, blue marlin and ocean gar. Small coastal pelagic fishes such as jacks, round scad and bigeye scad are also targeted. Demersals species of interest targeted are grouper, snapper, parrotfish and red hind. Species targeted by scuba divers are conch and lobsters.

Types of fishing gear used within the fishing industry are as follows. The surface longline are used for targeting pelagic species using live bait as well as trolling equipment using artificial bait. Demersal species are harvested by using hand line and bottom longline. Scuba equipment is used to target conch and lobsters as well as free divers.

The fishing industry comprises of different types and sizes of fishing vessels which conducts multi disciplines in fishing for instance a longline fishing trawler may engage in demersal fishing during the off season. In Grenada there are three types of fishing vessels engage in longline fishing, open pirogue size 16 ft. – 18 ft. carry approximately 100 – 200 hooks and powered by 25 hp - 40hp outboard motors. Fiberglass pirogues with cabin 28ft. - 30ft. carry approximately 200 – 300 hooks and powered by two 40hps out board motors. The large longliners 35ft -60ft. carries approximately 350 – 500 hooks and powered by 175 hp - 225hp inboard diesel engines.

Currently there are three processing plants which engage in the exportation of yellowfin tuna to America and Canada. Southern Fishermen Association, Nordoms Sea Foods and Spice Isle Fish House.

Grenada catches approximately five million pounds of fish with a value of 32 million EC dollars. The value of the fishing industry is estimated at $ 250 million EC dollars including the fisheries and physical infrastructure developments.

Statistical Information

Types of vessels	Time spent at sea	Type of fishing gear	Method of retrieving gear	Method of propulsion & Hp	Species targeted
Longliners Trawlers	3 – 5 days	Floating long line	Hydraulic	Inboard engines 175 – 225 Hps	Yellow fin tuna
Fiberglass pirogue with cabins	1 - day	Floating longline	Manual fiberglass reels	Two outboard engine 40 x 40	Yellow fin tuna
Open pirogue	8 - 12 hours	Light floating longline	Manual fiberglass reels	25 – 40 Hps	Yellow fin tuna
Open pirogues	5 - 12 hours	Trolling equipment (artificial bait & double sprang hooks) handline	By hand	2 stroke outboard motors 40-60hp & 4 stroke outboard 60 – 90Hps	Dolphin, wahoo, blackfin tuna, skip jacks, barracuda. Snapper & red

					hinds
Seine boats		Beach seine net	Manual hauling	Oars & 6 -25hp outboard engine	Jacks ,round robin
Open pirogue	5 hours	Scuba equipment		40 – 75 hps outboard	Conch & lobsters

Policy and Legislation

Currently the Fisheries Division is engaged in the process of developing a Fisheries Policy with assistance from the EU in collaboration with Fish Phase II project. Consultations have been conducted by the EU consultants and stakeholders throughout the island of Grenada, Carriacou and Petit Martinique. The first draft has been submitted and a validation workshop is carded for the month of July 2012.

Development Activities

The establishment and development of Grenada's MPA is considered to be a success despite challenges faced. Currently three areas are established and are located in the south of the island, with other areas ear-marked for MPA development. One MPA coordinator has been appointed along with three wardens who are working closely with the St. George's University, which is engaged in the management of the MPAs.

Fisheries Management and Conservation activities

Prior to the introduction and development of the longline fishing technology into Grenada during the year of 1979, data revealed that Grenada had a vibrant flyingfish industry recording over one million pounds of flying fish landed during the year of 1978. However, since the introduction of longlining there has been a decrease in the quantity of flyingfish recorded. The reasons being flyingfish has moved or shifted from a food fishery to a bait fishery and at the same time limited records are been kept. However as it relates to the number of fishing boats catching flyingfish at sea to be used for bait and the number of sets made by each vessel per fishing trip is not recorded. To compound the problem the absence of data collectors contributes to this growing problem. In addition, fishers seldom use flyingfish as bait, as they prefer to use jacks or robin which is kept alive in their bait wells and considered to be more convenient for them as it is not necessary to catch bait at sea to conduct their fishing activities. Moreover the attitude of young fishermen to engage in the catching of flyingfish remains a challenge.

Research

Currently a new species of flyingfish have been sighted by fishers and reported to the Fisheries Department. The flyingfish is brightly colorful with brown stripes and was caught within the sargassum weeds a specimen has been collected and preserved. A copy of same is shown at Figure 1.

……..
Francis T. Calliste
Fisheries Officer

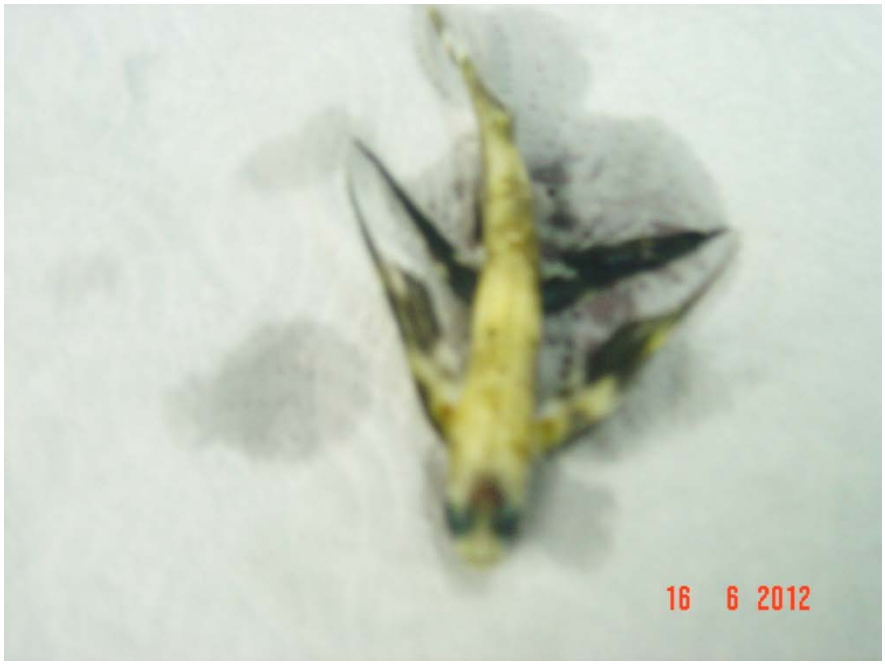

Figure 1: Flyingfish Specimen found in Sargassum.

IV - Description of the St. Lucia's national fishing industry

1. Fishery and Fleet Description

The major fisheries resources of Saint Lucia comprise demersal, coastal pelagic and offshore pelagic fisheries. Within the past 5 years (2007 – 2011), the total estimated fish landed in Saint Lucia has ranged from 1509 to 1857 tons. The offshore pelagic species represent the highest tonnage of fish landed annually in Saint Lucia. In 2011, the fishery contributed over 71% of the annual fish landed in St. Lucia. The offshore pelagic species typically influence the fishing seasons in Saint Lucia. A typical year can be divided into two main seasons: a "high' season that extends from December to May when there is significant landings of offshore pelagic fish and a "low" season that extends from June to November when relatively large quantities of demersal fishes are landed. Whereas, the main "pot-fishing" season extends from June to February, this is when fishers target reef fishes (Gorbert & Domalian, 1995; Andre-Bigot, 1995).

The fisheries of St. Lucia are multispecies in nature; fishers target a variety of species on each fishing trip. The offshore pelagic fishery consists of a number of migratory species including dolphinfish (*Coryphaena hippurus)*; mackerel (*Stromberomorus* spp.*)*; Wahoo (*Acanthocybium solandri)*; Tunas (Thunnus sp.); Skipjack tuna (*Katsuwonus pelamis)*; sharks (various families); billfishes (Istiophoridae, Xiphiidae) and flyingfish (*Hirundichthys affinis)*.

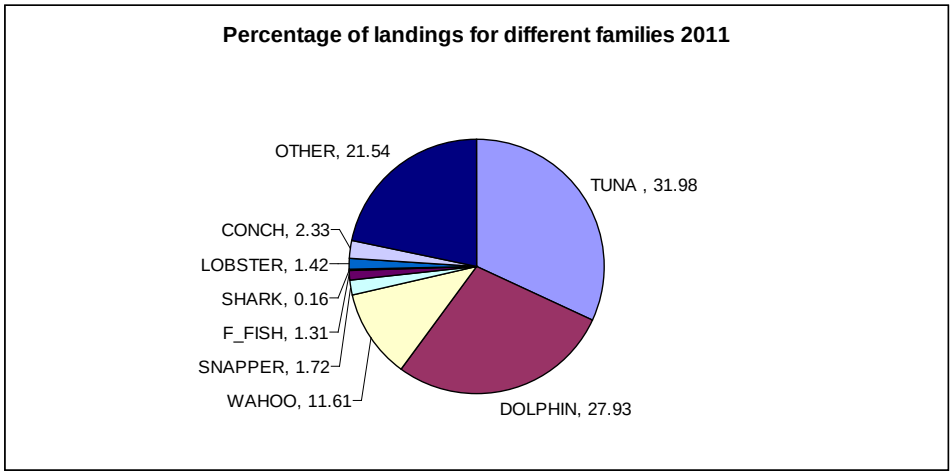

Figure 1: Percentage of landings for different fish families and species in 2011.

In the coastal pelagic fishery, the second most important fishery comprise an array of targeted species including: ballyhoo (Hemiramphidae spp.); barracudas (Sphyraenidae spp.); creole wrasse (*Clepticus parrae)*; herrings (Clupeidae spp.); jacks (Carangidae spp.); mackerels (*Decapterus macarellus)*; needlefishes (Belonidae spp.). Whilst the demersal fishery lands the most highly priced and valuable species for the local, tourism and export sectors including: snappers (Lutjanidae spp.); groupers (Serranidae spp.); Caribbean spiny lobster (*Panulirus argus)*; Caribbean queen conch (*Strombus gigas).* The contribution of this fishery to the total annual landings has steadily declined.

FLYINGFISH

Traditionally flyingfish has been targeted by many St. Lucian fishermen. Early technology comprised the use of a shallow dip net (locally known as a "kali") to scoop up flyingfish found in aggregations or attracted by some form of artificial raft (often banana leaves tied to the vessel). Finely chopped fish

("fresh") was often thrown into the sea as an added attraction. This methodology is still in use today, however, surface handlines (with single hooks) and surface gillnets are also commonly used. The surface gillnet (fillet) is set approximately nine meters from the boat and then pulled alongside as the fish gather within it. Usually the net is used to encircle and trap fish that have been attracted using an artificial raft. A dip net is then used to scoop up the entrapped fish and then the net is hauled into the boat, usually by a crew of three, where any gilled fishes are removed. The net is then reset until sufficient fish is captured or the boat moves to locate another school.

The majority of vessels used are now open fiberglass pirogues. This vessel type has replaced the traditional wooden canoe as the dominant craft within the fisheries sector. When targeting flyingfish, most fishing trips focus on areas 10 to 15 miles offshore primarily off the northwest and southwest coasts of the island. The average trip starts early in the morning with fishermen returning in the late afternoon or evening, some 10 to 12 hours later.

Flyingfish landings are heavily dominated by the fourwing flyingfish, but at least one other species (the larger *Cypselurus cyanopterus*; locally known as "denn") forms a small part of the catch. The fishery tends to be seasonal, occurring mostly between the months of October and July, but seasonality varies from year to year with peak landings occurring anywhere between December and February and then May to June.

Over a five year period (2007 –2011) the flyingfish landings have been variable with the lowest landings seen in 2011 with 22 tones and peaking at 251 tons in 2008.

Table 1: Annual Estimated Landings of Flyingfish in St. Lucia, 2007 – 2011

Note: *US = $2.71 EC*

Year	Landings (tons)	Value $EC
2007	46	260,735
2008	251	1,486,703
2009	220	1,214,890
2010	109	603,840
2011	22	147,061

Department of Fisheries, 2012

In 2011, there were 641 registered fishing vessels. The vessels can be categorized as follows:

Table 2: Categorisation of Saint Lucia Fishing Vessels Fleet

Vessel Category	Canoe	Pirogue	Transom	Shaloop	Whaler	Longliner	Total
Total	68	500	41	19	5	8	641

(Source: Department of Fisheries, 2011)

On average fishing vessels engaged in the fishery in Saint Lucia are 7m long but range between 5-9 meters and are propelled mainly by outboard engines 75 horse power and over. Due to the multi-species nature of the fishery in Saint Lucia, fishing vessels are generally equipped with the following gear: trolling lines; flyingfish nets; longlines (palangres); gillnets; handlines; and fishpots (traps). Gillnets and seine nets are less common. Seines and fillets are primarily owned and operated by west coast fishers, but gillnets are operated around the island with the exception of the Soufriere Marine Management Area, where their use has been banned.

2. Policy and legislation

The primary pieces of legislation governing management of the island's marine resources are the Fisheries Act (No. 10 of 1984) and Fisheries Regulations (No. 9 of 1994) which are based on the Organization of Eastern Caribbean States (OECS) harmonized legislation. The Fisheries Regulations specify conservation measures such as gear restrictions, fishing method restrictions, close seasons and creation of marine reserves. The policy of the Government of Saint Lucia for the fishing sector focuses on development and management of the fishing industry through the promotion of sustainability of the sector through self-sufficiency by increased production from capture fisheries and the aquaculture sector (Department of Fisheries, 2001). Another major objective outlined within the fisheries policy is the social and economic advancement of fishers and their families. The Fisheries Management Plan, developed through a consultative process with resource users, guides the work program of the Department of Fisheries and outlines specific management plans for major fisheries of Saint Lucia (Department of Fisheries, 2006).

The Department of Fisheries is cognizant of the need to ensure that proper management regimes are in place to guide the management and development of the fisheries sector. In light of such, the Department of Fisheries with technical assistance from the Food and Agricultural Organisation, in 2001, reviewed the existing legislation with the aim of revising the legislation to encompass many of the new fisheries management paradigms. Many consultations and meetings were undertaken with stakeholders resulting in a proposed new Fisheries Act and Fisheries Regulations and at present the legislation is at the Attorney's General Office for review.

3. Fisheries management and conservation activities

The Plan for Managing the Fisheries of St. Lucia (1999) highlights sustainability of the fishery as the primary management objective for the flyingfish fishery. It also notes that the selection of specific management options for this fishery should be largely dependent on development of a sub--regional approach to management of this shared stock. The plan also includes the provision of support to sub-regional initiatives aimed at establishing a sub-regional management plan for the fishery and improving the local collection of catch/effort and biological data relevant to the fishery. Constraints on implementing such actions in the short term include the shortage of manpower and finances faced by the Department of Fisheries and the need for a sub-regional mechanism to effect such management of shared stocks.

4. Statistics, Research and Resource Assessment

One of the task of the Department of Fisheries (DOF) is to collect data on catch, effort and biological data, registration of fishermen and vessels, registration of scuba diving establishments, sports fishing vessels and spear gun fishers, in addition to licensing of fishing vessels. However, due to human resource and financial limitations the DOF is unable to capture all the data required.

The main aim of the data collection system is to monitor the status of the stocks that are being exploited. However, it focused mainly on gathering data and performing simple analyses. The full potential of the system has yet to be realized due to administrative, financial and human resource constraints.

The Department's current data collection system for capturing fish landing data is based on a stratified random sampling system of three major spatial strata: primary, secondary and tertiary landing sites based on the number of vessel operating, the fishery types and the volume of fish landed (W.B. Joseph, unpublished b). Of the 22 landing sites, from which the fishers operate, catch and effort data are collected from nine on a permanent basis. In past years, funding was provided for biological data collection of

various fish species through the Government of St. Lucia in collaboration with various agencies such as "CRFMP". However, the collection of such data has not been sustained after the termination of these externally funded projects.

At each of the sites being sampled, catch and effort data are collected for every other returning vessel, over a fifteen day period, which is randomly selected on a monthly basis. Information such as area fished, species caught, gear used, hours fished, total vessels out, etc are recorded and submitted monthly to the data section of the Department of Fisheries

V - NATIONAL REPORT – ST. VINCENT AND THE GRENADINES

Compiled By
CHERYL JARDINE-JACKSON and KRIS ISAACS

A FISHERY AND FLEET DESCRIPTION

The Fishing industry of St. Vincent and the Grenadines is small scale and artisanal, using traditional gear, method and vessels. The Fishing vessels are open and powered by outboard engines. These vessels exploit both oceanic and inshore pelagics as well as the shelf and deep slope demersals. Fishermen are daily operators, who go out to sea in the early morning and return to land in the late afternoon or evening. St. Vincent and the Grenadines also have a Highseas fishing fleet which are foreign owned vessels registered in St. Vincent and the Grenadines. The Highseas fishing fleet is of an industrial nature, harvesting tuna and tuna like species. There are thirty-two (32) such vessels fishing in the Atlantic.

Table 1: Description of fishery in SVG. Source: Fisheries Division Data Unit 2007 - 2011

GROUP	DESCRIPTION
Offshore Pelagics	These are fast swimming migratory fish that inhabit the deep sea. Species include tuna, billfish, dolphin, kingfish. These species contribute approximately 20.5% of the total estimate of fish landed over the five year period (0.4 million pounds annually), realizing annual value of 3.2 million EC dollars.
Inshore Pelagics	These are near shore fish found in mid water or surface water in sheltered bays. They are generally smaller than offshore pelagics, e.g. jacks, robin, dodger. On average these species contribute approximately 45% of the landings to the local market (0.83 million pounds annually), realizing an annual value of 2.9 million dollars.
Demersals	These are fish dwelling at the sea bottom, e.g. rock hind, blem (queen snapper), groupers, parrotfish. These species contribute approximately 18% (0.34 million pounds annually) to the local market, realizing an annual value of 2.9 million dollars.
Shellfish	Shellfish are marine species usually living at the sea bottom and protected by a shell. E.g. lobster, conch. Average annual contribution to landings is 3.5% (0.064 million pounds) with an average value of 0.7 million dollars. However, shell fish contribute an estimated 24% to average annual exports.
Sharks	Sharks are fast swimming migratory fish that inhabit the deep sea and have a cartilaginous skeletal structure. Sharks are not particularly targeted in the fishery, however, by catch could be significant especially in the longline fishery. Estimate annual landing for shark is less than 18,000 pounds contributing about 1% of landings to the local market.
Turtles	Turtles are reptiles that spend the majority of their lives at sea, however, the females come on land to lay their eggs. Marine sea turtles are taken mostly opportunistically by fishers. Estimated annual landings are 20,000 pounds. Poaching and catches out of season would probably contribute to this figure being higher.
Whales & Porpoises	These marine mammals are migratory, or pelagic in the case of porpoises. They give suckle to their young e.g. humpback whales and blackfish. There is a traditional significance with respect to the harvesting of marine mammals in St. Vincent and the Grenadines. Humpback whales are targeted in Bequia while the pilot whale and other porpoises are targeted in Barrouallie and by some Kingstown Fishers.

Table 2: Description of the local fishing fleet, Source: Fisheries Division, CARIFIS 2011

Vessel Types	Description	No. of Vessels
Flat Transoms (Bow & Sterns)	These are commonly called bow and stern or dories. They are open boats of 3 – 6 m (11- 27ft) in length. They are constructed from wood or marine plywood which in many cases are covered by epoxy or fiberglass, which provides a waterproof covering. They are often powered by one or two outboard gasoline engines ranging from 14 – 115 horsepower. Oars maybe the only form of propulsion on rare occasions. These vessels are used mainly in the lobster and conch fishery in the Grenadines.	230
Pirogues	These are open boats with a pointed bow and flat transom, however, the bow is much higher than that of the flat transom boats and they tend to be slightly larger, ranging from 7 – 10 m (19 – 30 ft) in length. They are constructed from fiberglass and powered by one or two outboard gasoline engines ranging from 40 -85 horsepower. These vessels are predominantly used in the trolling and demersal fisheries.	390
Double enders	Double enders or "two bows" are open wooden boats ranging from 3 – 9 m (10 – 29 ft) in length. Both ends of the boat are shaped like the bow of a boat. In most cases the only means of propulsion are oars, but occasionally, they may be powered by a small outboard gasoline engine specially rigged at one end of the boat. These engines range from 6 – 48 horsepower. These vessels are used mainly in the beach seine fishery.	69
Multipurpose	In SVG these vessels range from 34.7 ft – 48.5 ft in length. The main type of longliner is a Yanmar type made of glass reinforced plastic (GRP) powered by inboard diesel engines ranging from 90 – 190 hp. They are multi-purpose in nature and designed to operate up to 150 nautical miles from the islands with a 3 to 5 day stay at sea. These vessels are used primarily for tuna longline fishing, but may be utilized for trolling, bottom longline fishing, pot fishing and angling.	30
Others	These includes, canoes, rowboats etc.	18

*The CPUE for most of the vessels and fishery type is calculated using the gear, the number of trips per year and the sample weight in lbs per year.

B. STATISTICS AND SAMPLING

Table 3	QUICK FACTS TABLE
Per Capita Consumption	16.7 lbs annually (Average fish landings 2007-2011*).
Socio-Economic	1.7 % contribution to GDP 2,500 full and Part time fishermen 500 vendors, traders, gutters etc. 750 registered fishing vessels (CARIFIS Jul 2011) Average cost of fishing vessel with gear: $15,000.00 Estimated investment in the fisher: $10 million
Fish Landings and Export	Approximately 1.8 million lbs of fish landed annually (2007-2011*) Approximately 0.2 million lbs of fish exported annually (2007-2011*)
Physical Characteristics	Land area—345 square kilometers EEZ—27,500 square Kilometers Shelf area—7,800 square kilometers

*Source: Fisheries Data unit

The level of infra- structural development at the various landing sites throughout the state has improved significantly over the last two decades. In 1992 the New Kingstown Fish Market (NKFM) was the only landing site with marketing facilities such as, vending stalls, ice machines, chillers, etcetera. Today, similar facilities now exist in Paget Farm, Bequia; Britannia Bay, Mustique; Friendship, Canouan; Clifton, Union Island; Calliaqua, Barrouallie, Chateaubelair and Owia, St. Vincent.

The landing sites are zoned and categorized (stratified). There are seven zones and thirty six (36) landing sites. Categorically, a site is designated as either primary, secondary or tertiary. The assignment into any one of these categories is based on three main variables, i.e., the number of fishing boats that regularly land fish at the site; the amount of fish landed; and the level of infra-structural development. There are two (2) primary sites (Kingstown and Barrouallie); fourteen (14) secondary and twenty (20) tertiary sites. In addition to these on-shore landing sites, several trading vessels take fish directly from the fishermen and they are also classified as landing sites.

The catch and effort data follows a stratified sampling methodology. In this approach the sampling frame (which is all the identified fish landing sites within the country) is first partitioned into groups or strata, and the sampling is then performed separately within each stratum. This method combines the conceptual simplicity of simple random sampling with potentially significant gains in reliability.

The sampling units (landing sites) are stratified prior to sampling into three groups (primary, secondary and tertiary) based on the variables mentioned above. The technique of simple random sampling is then used to select the days of the month each landing site is sampled. Sampling is not carried out on Saturdays, Sundays and major holidays, nevertheless, every day is considered as a potential fishing day. This simplifies data analysis and does not seem to be a great source of error since fishermen fish whenever they can regardless of what day it is.

An estimate of the amount of fish landed in the country is obtained by summing the totals of all the estimates for the individual landing sites.

The Highseas tuna fishing vessels flagged with St. Vincent and the Grenadines and operating within the ICCAT Convention Area generally land and transship their catches at two major transshipment ports in Trinidad and Tobago. While there is ongoing collaboration and good communication with ship owners for obtaining fishery statistics, St. Vincent and the Grenadines sees the need to establish an independent port sampling programme to verify landings and transshipping activities at these ports. For this purpose, St. Vincent and the Grenadines have submitted a proposal to ICCAT to establish a 12-month sampling programme at Trinidad and Tobago's transshipment ports.

Table 4: Summary of the St. Vincent High Seas fleets. (Source: Fisheries Division)

Type of data & information	
Numbers of vessels	32 (2011)
Number of vessels > 24 m LOA	14 (2011)
General fishing areas	Two main areas: (i) Between 5 - 20^{o} N and 30 - 60^{o}W (ii) Between 20 - 30^{o} S and 30 - 45^{o}W
species landed 2000 - 2010	Yellowfin tuna, Albacore, Big Eye tuna, Skipjacks, Sail fish, Kingfish, Dolphin fish (Mahi mahi), Spear Fish, Sword fish.
Average annual catches (MT) of major tuna species 2000-2010	3,404
Key landing / transshipment locations	Port of Spain and Chaguaramas (Trinidad and Tobago)

C. NATIONAL FISHERIES POLICY AND MANAGEMENT OBJECTIVES

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. The strategies and policies concerning fisheries management and development will be under continuous review with the involvement of all stakeholders. Management regimes will serve to enhance the opportunities for fisheries to play a greater role in national food supply, thereby helping to alleviate under-nutrition and contribute to national food security. 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.

Fisheries development and management will take full account of the present and potential contributions from marine fisheries. Essential factors of production such as fishing boats, gear and technology, skilled personnel and research capability will be considered.

D. FISHERIES MANAGEMENT OBJECTIVES

- Develop and increase the potential of living marine resources to meet human nutritional needs, as well as social, economic and development goals of the sector.
- Ensure that the fishing industry is integrated into the policy and decision-making process concerning fisheries and coastal zone management
- Take into account traditional knowledge and interests of local communities, small-scale artisanal fisheries and indigenous people in development and management programmes.
- Maintain or restore populations of marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors, taking into consideration relationships among species.
- Promote the development and use of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species.
- Ensure effective monitoring and enforcement with respect to fishing activities
- Protect and restore endangered marine species
- Preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas, especially coral reef ecosystems, estuaries, mangroves, sea grass beds and other spawning and nursery areas.
- Promote scientific research with respect to fisheries resources
- Cooperate with other nations in the management of shared or highly migratory stocks.

E. MANAGEMENT OBJECTIVES BY FISHERY

Table 5: Fishery Types and Management Objectives

FISHERY	TARGET SPECIES	OBJECTIVES
Shallow Reef Fishes	Hinds, parrotfishes, squirrelfishes, grunts, surgeonfishes, triggerfishes	To promote stock recovery by • encouraging fishers to fish further off-shore • continue to enforce the fisheries laws as it relates to destructive fishing practices • not increasing the current effort of harvest
Deep Slope Fishes	Snapper, groupers	Maximize catches within the limits of the potential yield
Coastal Pelagics	Jacks, herrings, silversides, anchovies, ballyhoo, robins, small tunas	Encourage co-management of the fishery Maintain artisanal nature of the fishery
Large Pelagics	Tunas, billfishes, dolphinfish, wahoo, sharks, swordfish, whales, porpoises	Cooperate with member of ICCAT particularly Caribbean states to assess, protect and conserve the large pelagic resources Promote development of the commercial and sport fisheries.
Lobster	Spiny lobster	Rebuild stocks in depleted areas by continuing to observe • the Closed season. • Conservation areas

		• Size limits • Restrictions on moulting • Berried lobsters • Certain harvesting practices ("Scrubbing")
Conch	Queen conch	Rebuild stocks in depleted areas by continuing to observe • Minimum size limit • Closed areas

D. RESEARCH

Over the years the Fisheries Division has done research in the areas of (1) fish use to determine how many people in St. Vincent and the Grenadines prefer fish to other animal protein (2) the assessment of red hind (Epinephelus guttatus) fishery to determine the abundance and distribution.

At present the Division is involve with the fleet expansion programme which is designed to encourage fishermen to upgrade their fishing fleet with safety requirements, which will allow them to target higher valued species and hence improve productivity and their livelihood.

The National Sea Turtle Conservation Programme which aims to conserve the present nesting and foraging populations of the sea turtle in St. Vincent and the Grenadines.

A recent study of the marine habitat was conducted through ecological surveys conducted at 15 sites throughout St. Vincent and the Grenadines. Data was taken on fishing communities, invertebrate populations, reef structure and health as well as the status of other benthic coverage.

In the near future the division will be embarking on several other researches such as the lobster and conch abundance and distribution survey because of a noticeable decline in catches. Also monitoring and data gathering will be done on two artificial reefs which are located in the Grenadines. One of the artificial reefs is located in Bequia and the other in Mustique.

E. LEGISLATION AND MANAGEMENT REGULATIONS

The Fisheries of St. Vincent and the Grenadines has the following legislation to assist with the management and development of the sector.

- The Maritime Areas Act (1983) – Act No. 15 of 1983, declares and establishes the marine area of St. Vincent and the Grenadines. This enables the State to define the following areas (1) Internal waters (2) Archipelagic waters (3) Territorial sea. (4) Contiguous Zone (5) Exclusive Economic Zone (EEZ) (6) Continental Shelf (7) Territorial Extent and (8) Safety Zones.
- The Fisheries Act (1986) and Regulation (1987), which form part of the OECS harmonized legislation, covers, Fisheries access agreements, local and foreign fishing licensing, fish processing establishments, fisheries research, fisheries enforcement and the registration of fishing vessels. The legislation also specifies conservation measures such as prohibiting the use of any explosive, poison and other noxious substance for the purpose of killing, stunning, disabling, or catching fish; closed seasons, gear restriction, creation of marine reserves. The legislation gives the Minister responsible for fisheries, the authority to create new regulations for the management of fisheries when necessary.
- Fish Processing Regulations of 2001 drafted in response to international pressure for monitoring and controlling the quality of fish and fish products leaving and entering SVG. The legislation

makes provisions for the control of marketing, handling, transporting and storage of fish and the operation of fish processing establishments.

- The High Seas Fishing Act of 2001, which provides the legal basis for the regulations of St. Vincent and the Grenadines registered vessels fishing on the High Seas. The act provides for constant monitoring of these fishing vessels in a effort to produce accurate information, which under provisions of the act is mandatory in order to be compliant to the International Convention for the Conservation of Atlantic Tunas (ICCAT)
- Other Fisheries Related Legislation – Town and Country Planning Act (1992) – Coastal Zone Management, Forestry Act (1945) – Mangrove Protection, Mustique Conservation Act (1989) - Management of the conservation areas on and around Mustique.

APPENDIX 4: Draft 2012 Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean

Executive Summary

The 2008 Sub-regional Eastern Caribbean Flyingfish Management Plan has provided valuable guidance for the management and conservation of flyingfish resources in the Eastern Caribbean. Since 2008, a number of events have taken place that warrant an update of the 2008 management plan. These include the adoption of a Common Fisheries Policy for CARICOM states, the establishment of a CRFM Ministerial Sub-committee on Flyingfish and the establishment of a joint CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean, along with scientific meetings and studies.

The draft 2012 Flyingfish Management Plan updates the 2008 Flyingfish Management Plan, adopted at the Third Meeting of the WECAFC ad hoc Flyingfish Working Group of the Eastern Caribbean (FAO. 2010). The general management objectives underlying the update are: (a) sustained flyingfish resources (biological objective), (b) optimal use of the flyingfish resource for long-term benefit (socio- economic objective) and (c) sustained ecosystem health (ecological objective).

Acknowledging shortcomings in flyingfish data collection and analysis, following the precautionary approach to fisheries management and with the ultimate objective to safeguard the socio-economic well-being of the fishers, the flyingfish industry in the sub-region and the ecosystem that sustains the flyingfish fishery, the update of the sub-regional management plan proposes a 2-year sub-regional freeze on any expansion of the flyingfish fleet.

During this freeze of flyingfish fishing capacity in the sub-region, the monitoring, control and surveillance and hence the overall management of the fishery will be greatly improved by:

- improving and harmonizing data collection and analysis in the sub-region;
- improving and harmonizing flyingfish vessel licensing and registration in the sub-region;
- establishment of a sub-regional flyingfish catch and effort database to be managed by the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with the CRFM Secretariat;
- establishment of a sub-regional flyingfish vessel registry database to be managed by the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with the CRFM Secretariat;
- formalizing the relationship with Martinique and Guadeloupe to ensure their involvement in the management process as far as the flyingfish fishery in their EEZs are concerned;
- improved control and surveillance of flyingfish fisheries and ending IUU fishing and
- promotion of fishing access agreements between and among states.

This management approach shows that the CRFM and the Eastern Caribbean sub-region are taking meaningful steps towards the conservation of the shared fisheries resources and ecosystems and are acting as competent and responsible regional fisheries management and conservation stewards to conserve and sustainably manage flyingfish resources and their ecosystem.

This updated sub-regional fisheries management plan further proposes a number of studies, which aim to: (i) generate information about the flyingfish industry that is needed to attract investments in sustainable harvesting and value addition of flyingfish, and (ii) further understand the health of the marine ecosystem, which supports the flyingfish fishery.

It is intended that this updated 2012 sub-regional draft management plan be explained to and reviewed by stakeholders at the national and regional level through consultative processes that include public hearings, public posting of management plans and comment periods in addition to reviews by FACs. On adoption of the final amended 2012 sub-regional flyingfish management plan, similar consultative processes will be used to facilitate participation of stakeholders in the implementation of the management plan.

It is anticipated that feedback will also be provided to stakeholders on progress with the implementation of the plan, including information on catch and effort trends, number of licenses issued/renewed, results of stock assessments, industry performance evaluations, etc. Thereafter the management plan will be renewed / updated on a regular basis and inputs from stakeholders will be encouraged and given due regard.

Last but not least, in countries, where present laws and regulations do not provide for limiting entry into a fishery or where no management plan is currently in force, legislation and regulations need to be changed/implemented or management plans need to be created and brought into force to allow for application of the management measures agreed in the sub-regional plan

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REFERENCES

1. PREFACE

This Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean represents the outcome of an extensive research process, which started in the late 1990s and involved numerous scientific studies, stock assessments, workshops and meetings.

The plan is the first management plan prepared under the Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP). The CCCFP has as one of its objectives to develop harmonized measures and operating procedures for sustainable fisheries management, post-harvest practices, fisheries research and fisheries trade and the administration of the fishing industry. The agreement is guided by the principle of applying internationally recognized standards and approaches, in particular the precautionary approach to fisheries management and the ecosystem approach to fisheries management.

The development and implementation of this sub-regional plan is among the agreed actions and measures to be taken by the members of the Western Central Atlantic Fishery Commission (WECAFC) under its 2012 "Resolution on strengthening the implementation of international fisheries instruments" and under its endorsed Programme of Work. Moreover, the plan addresses joint actions proposed in the 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism (CRFM).

Recent regionally coordinated scientific evaluations using data, expertise and inputs from the Fisheries Divisions in Barbados, Dominica, Grenada, Martinique (France), Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, as presented to the WECAFC, CRFM and to the Caribbean Large Marine Ecosystem (CLME) Project, indicate that the stock of flyingfish in the Eastern Caribbean is not overfished with respect to the objective of maximum sustainable yield. However, in view of significant gaps in data and information, especially highlighted by stakeholders, a precautionary approach is warranted. It is therefore appropriate to establish a multi-annual sub-regional plan with the objective of ensuring that the stock will be exploited under sustainable biological, economic, environmental and social conditions.

For this purpose, the sub-regional plan should aim at progressive implementation of an ecosystem-based approach to fisheries management, and should contribute to efficient fishing activities of the flyingfish resource within an economically viable and competitive small-scale fisheries sector, providing a fair standard of living for those who depend on fishing four-wing flyingfish and taking the interests of consumers into account.

This Sub-regional Management Plan is not a legally binding instrument, which can form the basis of a legal challenge. The Sub-regional plan can be modified at any time and does not restrict the national authorities' discretionary powers set out in the national Fisheries Acts of the participating countries. The national authorities can, for reasons of conservation or for any other valid reasons, propose modifications to any provision of this plan.

In order to ensure compliance with this sub-regional management plan, the participating countries are requested to adhere to (at least) the following articles of the CCCFP:

- Article 12: Conservation and Management of Fisheries Resources
- Article 13: Registration and Licensing
- Article 14: Inspection, Enforcement and Sanctions

2. MISSION

This Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean aims to assist the flyingfish stakeholders to implement an ecosystem approach to fisheries management, and to contribute to efficient fishing activities of the flyingfish resource within an economically viable and competitive small-scale fisheries sector, providing a fair standard of living for those who depend on fishing flyingfish and taking the interests of consumers into account.

3. GUIDING PRINCIPLES AND VISION FOR THE FUTURE

This flyingfish management plan is guided by:

A. The principles as set out in the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF), and particularly Article 6 of the Code on Fisheries Management.

B. The fundamental principles of the Caribbean Community Common Fisheries Policy (CCCFP), as outlined in Article 5 of the Agreement establishing the CCCFP, which include many that have been adopted from the CCRF:

(a) use of the best available scientific information in fisheries management decision-making, taking into consideration traditional knowledge concerning the resources and their habitats as well as environmental, economic and social factors;

(b) application of internationally- recognized standards and approaches, in particular the precautionary approach to fisheries management and the ecosystem approach to fisheries management;

(c) the principle that the level of fishing effort should not exceed that commensurate with the sustainable use of fisheries resources;

(d) the participatory approach, including consideration of the particular rights and special needs of traditional, subsistence, artisanal and small-scale fishers;

(e) principles of good governance, accountability and transparency, including the equitable allocation of rights, obligations, responsibilities and benefits; and

(f) the principle of subsidiarity, in particular, that the Competent Agency will only perform those tasks which cannot be more effectively achieved by individual Participating Countries.

(g) Recognition that National Authorities responsible for fisheries management in the participating countries carry the main responsibility for implementing this sub-regional management plan within their national jurisdictions and for monitoring and evaluation of the status of implementation against the objectives and indicators agreed upon.

The vision for the flyingfish fisheries is, in line with the Caribbean Community Common Fisheries Policy, an effective cooperation and collaboration among participating countries in the conservation, management and sustainable utilization of the flyingfish resources and related ecosystems in the Eastern Caribbean region in order to secure the maximum benefits from those resources for the people and for the Caribbean region as a whole.

4. GEOGRAPHY OF THE REGION

Physical Geography

Hydrography, currents and bathymetry:

The eastern Caribbean is characterised by a series of volcanic islands forming the Lesser Antilles island arc. This includes Grenada, St. Vincent and the Grenadines, St. Lucia, Martinique and Dominica. These islands typically have high relief and very limited island shelf area. There is a deep (6000 m) trough to the east of the islands, known as the Tobago Trough. Barbados, which is not volcanic, sits to the east of this trough on sedimentary material, has low relief, is capped by coral limestone and also has very limited shelf area. Trinidad and Tobago on the other hand sit on a relatively wide continental shelf associated with the South American mainland (see Table 1 for estimates of shelf area).

Circulation patterns in the Caribbean are complex and governed by fresh-water runoff, topography, sea-surface temperature, wind stress and primarily by the North Equatorial Current. Atlantic water enters the Caribbean through the passages between the eastern Caribbean islands, forming the westward flowing Caribbean Current (see Figure 1). Atlantic water also flows north westwards up the island chain, via the Antilles Current. These two currents ultimately re-merge to form the Gulf Stream. However, the relative strengths of the currents and thus the water supplying the North Equatorial Current varies seasonally, as a result of the annual displacement of the Inter-tropical Convergence Zone (ITCZ). The ITCZ moves northwards to about 10 ^{o}N by August-September and southwards to just south of the equator by January-March.

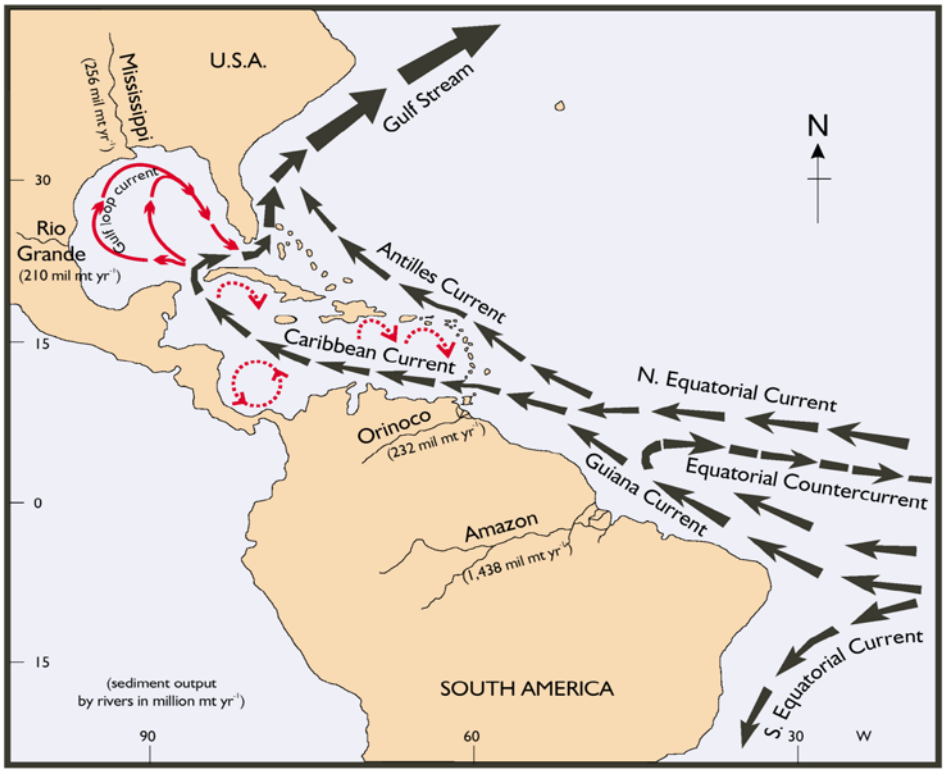

Figure 1. Major surface currents and river outflows affecting the wider Caribbean. Adapted from Oxenford (1985)

During summer through winter the North Equatorial Current is supplied by oligotropic (low nutrient) oceanic waters of the North Atlantic. However from around February to June, when the North Equatorial Countercurrent weakens, the Guiana Current, flowing northwestwards along the South American mainland and fed by the South Atlantic Equatorial Current, brings eutrophic (high nutrient) waters influenced by the outflow of the Amazon and Orinoco Rivers to join the North Equatorial Current and enter the Caribbean via the eastern Caribbean island passages. As such the source and the primary productivity of the waters around the eastern Caribbean are variable with season.

The influence of South American river outflow on the eastern Caribbean varies seasonally and among islands. Trinidad is heavily influenced by Orinoco outflow all year round. Tobago, Grenada and the Grenadine Islands are influenced by the Orinoco outflow to a lesser extent, and seasonally during the rainy period. The other eastern Caribbean islands are not usually affected by this water mass. However, Amazon water which sheds from the coast of Brazil in mesoscale eddies between October and March, is brought into the Caribbean via the Guiana Current, and tends to influence the eastern Caribbean islands as far north as St. Lucia. These approximate boundaries of influence are illustrated in the diagrammatic map (Mahon 1996; Figure 2).

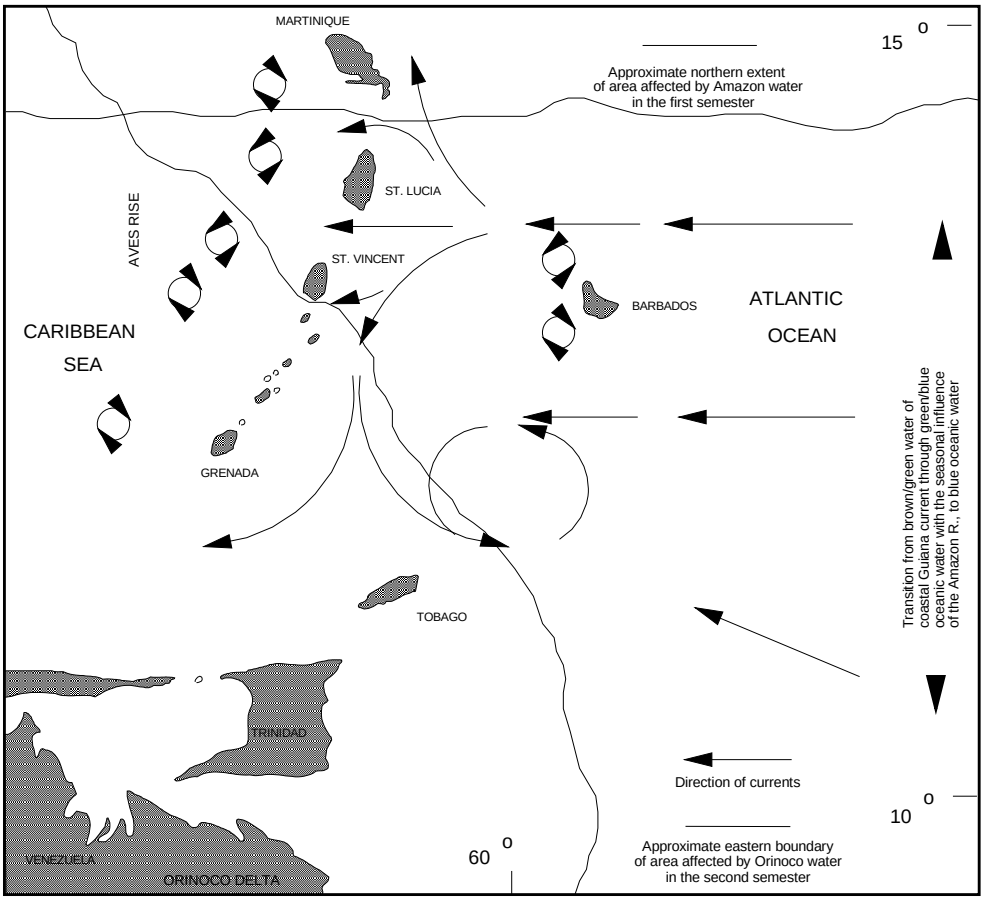

Figure 2. A synthesis of physical oceanographic characteristics of possible significance to fisheries in the eastern Caribbean. From Mahon (1996)

Mesoscale current patterns in the eastern Caribbean are also extremely complex but not well documented. A series of mesoscale eddies, which eventually shed, are formed downstream of the islands as the Caribbean Current flows westwards. There is also some evidence for periods of current reversal and larger scale eddies in the lee of Barbados and Tobago (Mahon 1996).

Climate and weather

The eastern Caribbean has a typical tropical maritime climate with relatively constant air temperatures throughout the year, and a diurnal range of between 24 and 34 ^{o}C. The climate of the region does however have a seasonal cycle dominated by the displacement of the ITCZ. When the ITCZ is displaced to the south (December-April), the region is influenced by strong steady NE Trade winds, clear sky, low rainfall, high atmospheric pressure and strong surface water currents. When the ITCZ is displaced to the north (June-October) the region is influenced by low wind speed, high cloud cover, high rainfall, low atmospheric pressure and low current speeds. It is during this time that the region is also affected by tropical storms/hurricanes. Tropical storms generally follow the path of the major surface currents of the Caribbean and Gulf Stream System after spawning in the central Atlantic. Most tropical storms develop during the summer, when surface water temperatures are highest, with September being the month of greatest activity. Hurricanes generate coastal sea level rise as high as 6 m, and storm waves that in coastal areas may have wave heights as great as 15 m at the time of breaking (Maul 1993).

Political Geography

The eastern Caribbean (Lesser Antilles) sub-region is one of the most compact multinational archipelagos in the world. The eastern Caribbean flyingfish (*Hirundichthys affinis*) stock is shared by seven different states (Barbados, Dominica, Grenada, Martinique (France), St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago), each with a national democratic government (see Table 1 for details of governance). With the exception of Martinique, which remains a department of France, the other islands are all independent, most belonging to the commonwealth (Table 1). Furthermore, membership to regional and international organisations with responsibility for fisheries management and development in the wider Caribbean varies amongst the islands (Table 2).

All of the eastern Caribbean countries have declared 200 nmi EEZs, although most boundaries between some neighbouring countries are still to be negotiated. Grenada, St. Vincent and the Grenadines, and Trinidad and Tobago have also been granted Archipelagic Status under UNCLOS (Figure 3.)

Demography and Economy

The islands of the eastern Caribbean are diverse in their demographic and economic characteristics as illustrated by the summary of key demographic indicators given in Table 2.

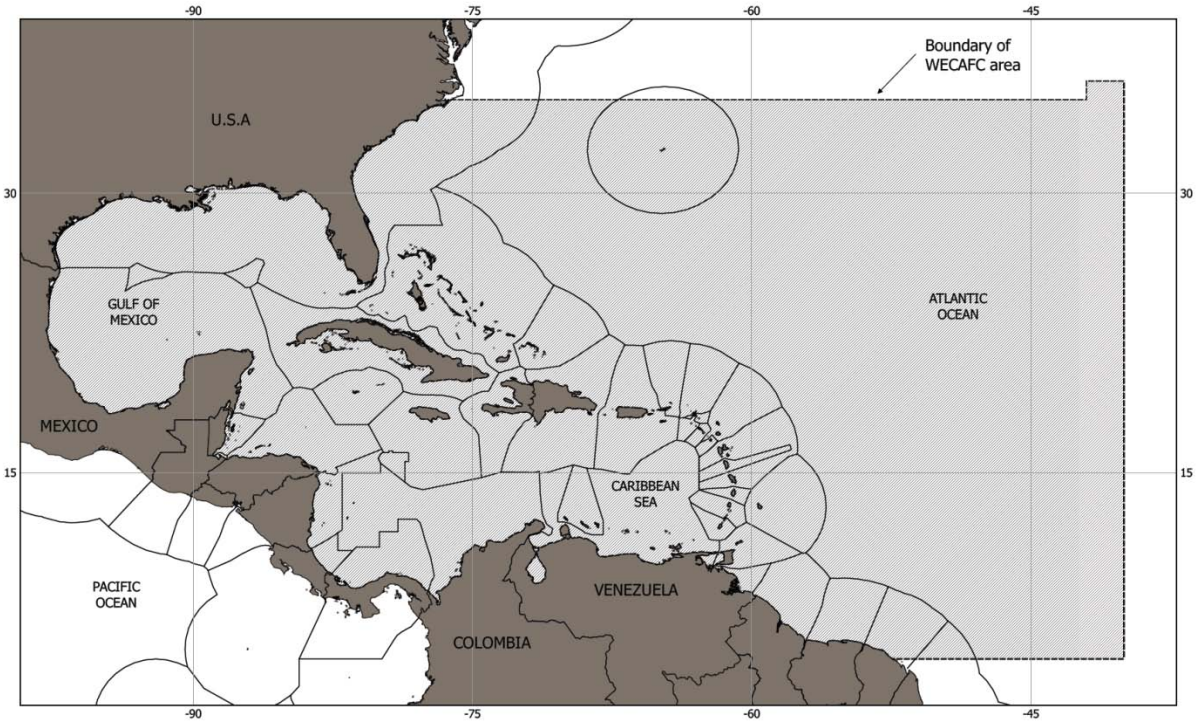

Figure 3. Map of wider Caribbean showing potential EEZs (VLIZ, 2012)

Table 2. Country profiles for the eastern Caribbean islands providing basic statistics for geography, governance, demography, and economy. Primary data source: CIA (2009) The World Factbook. Other data sources include: [1] Mahon (1993); [2] International Labour Organisation Caribbean Office (2009) @ www.ilocarib.org.tt/portal/index.php; [3] FAO (1993) Status of Caribbean Aquaculture; [4] FAO (2008) Yearbook; St. [5]Lucia-Central Statistical Office.

Geography	Barbados	Dominica	Grenada	Martinique	St. Lucia	St. Vincent and the Grenadines	Trinidad and Tobago
Location	13°10'N 59°35'W	15°30'N 61°20'W	12°00'N 61°45'W	14°30'N 61°00'W	14°00'N 61°00'W	13°15'N 61°15'W	10°30'N 61°15'W
Land area (km^2)	432	754	344	1,100	616	388	5,128
Coastline (km)	92	148	121	350	158	150	362
Shelf area (km^2)[1]	320	303	1,595	1,013	522	1,800	?
Approx. EEZ area (km^2)[1]	48,800	10,200	7,700	13,000	4,700	9,500	80,000
Maritime claims (nmi)	EEZ 200 Territorial sea 12	EEZ 200 Contig. zone 24 Territorial sea 12	EEZ 200 Territorial sea 12	EEZ 200 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12
Climate (rainy season)	Tropical (June - October)	Tropical (June - October)	Tropical (June - October)	Tropical (June - October)	Tropical (May - August)	Tropical (May - December)	Tropical (June - December)
Terrain	Coralline and relatively flat	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Plains and low mountains
Elevation (m)	337	1,447	840	1,397	950	1,234	940
Governance							
Type	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy, Republic in Commonwealth	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy Overseas department of France	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy
Capital	Bridgetown	Roseau	St. George's	Fort de France	Castries	Kingstown	Port of Spain
Administrative divisions	11 parishes	10 parishes	6 parishes, 1 dependency	0	11 quarters	6 parishes	8 counties, 3 municipalities, 1 ward
Independence	30 November 1966	3 November 1978	7 February 1974	None	22 February 1979	27 October 1979	31 August 1962
Constitution	30 November 1966	3 November 1978	19 December 1973	28 September 1958	22 February 1979	27 October 1979	1 August 1976
Legal system	English common law	English common law	English common law	French legal system	English common law	English common law	English common law

Continued…….

Table 2. Continued

Demography	Barbados	Dominica	Grenada	Martinique	St. Lucia	St. Vincent and the Grenadines	Trinidad and Tobago
Population (year)	284,589 (2009 est.)	72,660 (2009 est.)	90,739 (2009 est.)	425,966 (2003 est.)	160,267 (2009 est.)	104,574 (2009 est.)	1,229,953 (2009 est.)
Population growth (annual %)	0.383 (2009 est.)	0.208 (2009 est.)	0.468 (2009 est.)	0.85 (2003)	0.416 (2009 est.)	- 0.344 (2009 est.)	- 0.102 (2009 est.)
Language	English	English French patois	English	French Creole patois	English French patois	English	English Hindi, French, Spanish, Chinese
Literacy (% over 15 yr)	99.7	94	96	93	90.1	96	98.6
Ethnicity	black 90% Asian/mixed 6% white 4%	black 86.8% Amerindian 2.9% white 0.8%	black 82% mixed 18% Amerindian (trace)	black/mixed 90% white 5% others <5%	black 82.5% mixed 11.9% East Indian 2.4% other 3.1%	black 66% mixed 19% East Indian 6% Amerindian 2% European 4% other 3%	black 37.5% Indian 40% mixed 20.5% other 2%
Labour force[2] Male[2] Female[2] Fishers[3] Other fishery related[3]	132,200 (2008) 68,700 63,500 2,200 3,800	33,420 (1997) 18,120 15,300 1,500 (1983) ?	41,015 (1998) 23,171 17,844 1,500 (1991) 120	126,900 (2008) 62,500 64,400 ? ?	90,114 (2011)[5] 46,700[5] 43,414[5] 2,502 [5] ?	58,000 (2008 est.) 35,000 24,000 2,000 (1983) 2,500	597,600 (2008) 353,500 245,900 7,300 (1985) 4,400
Unemployment rate[2] (%) Males[2] Females[2]	8.1 (2008) 6.8 9.4	11.0 (2001) 11.9 9.5	? ? ?	21.5(2008) 19.0 23.8	21.2[5] 10.0[5] 11.2[5]	22 (1997) ? ?	4.6 (2008) 3.5 6.2
Annual per capita fish consumption (kg)[4] (Average 2003-2005)	36.5	30.2	38.1	15.4	36.3	15.0	16.9
Economy							
Currency (exchange US$) (equivalency to 1 US$)	Barbados dollar (2 fixed)	Eastern Caribbean dollar (2.7 fixed)	Eastern Caribbean dollar (2.7 fixed)	Euro (0.68 floating)	Eastern Caribbean dollar (2.7 fixed)	Eastern Caribbean dollar (2.7 fixed)	Trinidad & Tobago dollar (6.29 floating)
GDP (purchasing power parity in billions US $)	5.425 (2008 est.)	0.720 (2008 est.)	1.161 (2008 est.)	11.250 (2006)[2]	1.778 (2008 est.)	1.070 (2008 est.)	29.010 (2008 est.)
Per capita GDP (purchasing power parity in US $)	19,100 (2008 est.)	9,900 (2008 est.)	12,900 (2000)	28,014 (2006) [2]	11,100 (2008 est.)	10.200 (2008 est.)	23,600 (2008 est.)
External public debt (millions US $)[2]	668 (2003)	213 (2004)	347 (2004)	?	257 (2004)	223 (2004)	3,302 (2008 est.)
Main sectors (% GDP)	service/tourism (78) industry (16) agriculture / fish (6) (2000 est.)	agriculture / fish (17.7) ind. / commerce (32.8) services (49.5) (2004 est.)	services / tourism (76.6) light industry (18) agriculture / fish (5.4) (2003)	services / tourism (83) industry (11) agriculture / fish (5) (1997)	services (80) industry (15) agriculture / fish (5) (2005 est.)	services (64) agriculture / fish (10) industry (26) (2001 est.)	services (37.2) industry (62.3) agriculture / fish (0.5) (2008 est.)

Table 3. Membership of eastern Caribbean islands to regional and international organisations with responsibility for fisheries management and development.

Country	ACS	WECAFC	CARIFORUM	CARICOM	CRFM	OECS	ICCAT
Barbados	Y	Y	Y	Y	Y	N	Y
Dominica	Y	Y	Y	Y	Y	Y	N
Grenada	Y	Y	Y	Y	Y	Y	N
Martinique (Department of France)	Y	Y	N	N	N	N	Y
St. Lucia	Y	Y	Y	Y	Y	Y	N
St. Vincent and the Grenadines	Y	Y	Y	Y	Y	Y	Y
Trinidad and Tobago	Y	Y	Y	Y	Y	N	Y

5. BIOLOGY AND ECOLOGY

Most of the information presented in this section is drawn from the research conducted by the IDRC / UWI / McGill University Eastern Caribbean Flyingfish Project (ECFFP) (1987 - 1993) in collaboration with the Eastern Caribbean Fishery Departments of Barbados, Dominica, Grenada, Martinique, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago. Subsequent postgraduate research at the University of the West Indies has further informed the genetic population structure of the fourwing flyingfish in the central western Atlantic. This body of research is widely published in the scientific literature, but appears under one cover with synopses of the biological characteristics and management options for the fourwing flyingfish in Oxenford *et al.* (2007a).

Other substantive ECFFP documents include the Proceedings of the Project Development Workshop in 1985 (Mahon et al. 1986); and the OECS Fishery Report 9 (Oxenford et al. 1993) which contains the Proceedings of the Interim and Final Project Workshops of 1987 and 1992, the two Flyingfish Research Cruise Reports of 1988 and 1989, and the six project News Bulletins published from May 1987 – Jan 1991.

Other research efforts that have focused on the biology and assessment of the eastern Caribbean fourwing flyingfish include some early studies by Hall (1955), Lewis et al. (1962) and Storey (1983), a preliminary stock assessment for the flyingfish fishery of Tobago conducted in 1991 under a UNDP / FAO Project for the Establishment of Data Collection Systems and Assessment of the Fisheries Resources (Samlalsingh and Pandohee 1992) and various review papers and national reports produced under the Small Coastal Pelagics and Flyingfish Sub-project of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) (e.g. CFRAMP 1996) and the WECAFC ad hoc flyingfish working group of the eastern Caribbean (FAO 1999, 2002, 2010).

Description and Distribution of the Species

Although around 13 species of flyingfish (Exocoetidae) occur in the eastern Caribbean region, only three species (*Hirundichthys affinis*, *Cypselurus cyanopterus* and *Parexocoetus brachypterus*) are known to be exploited. However, the target species of the offshore flyingfish fisheries of the eastern Caribbean (accounting for ~ 99% of all flyingfish landed) is the fourwing flyingfish (*Hirundichthys affinis*). *H. affinis* is a relatively small (maximum length around 25 cm standard length (SL), mean size taken by the fisheries is around 20-22 cm SL) epipelagic species, distributed throughout the western tropical Atlantic (Figure 4) where it supports important commercial fisheries seasonally in the eastern Caribbean, Curaçao and off northeast Brazil (Parin 2002). *H. affinis* is also reported from the eastern tropical Atlantic (Parin 2002).

H. affinis is seasonally available to the fishing gear (November to July), and is patchily distributed across the eastern Caribbean. A tagging study has demonstrated that individuals move freely between islands of the eastern Caribbean (Oxenford 1994). Results from a flyingfish abundance survey cruise conducted in the eastern Caribbean in 1988 suggest that *H. affinis* is likely to be available in commercially viable quantities beyond the present range of local fishing fleets (Oxenford *et al*. 1995).

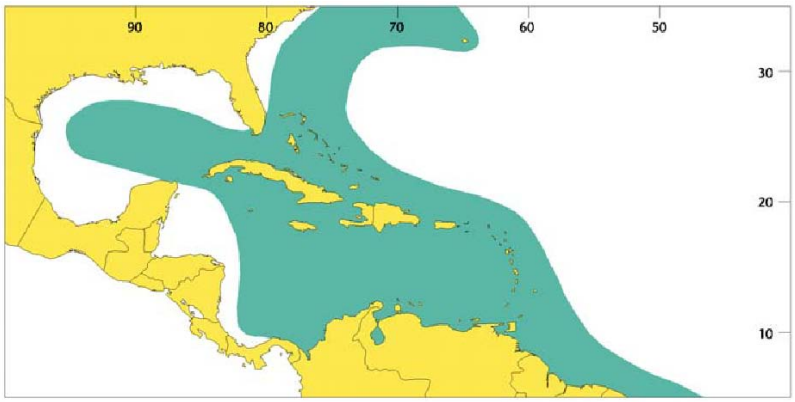

Figure 4. Distribution of the fourwing flyingfish, Hirundichthys affinis, in the Western Central Atlantic, after Parin (2002).

Age, Growth and Longevity

H. affinis is a short-lived, essentially annual species with a maximum age of around 18 months (Campana et al. 1993). *H. affinis* grows relatively fast when immature, reaching around 19 cm fork length (FL) in the first six months. Thereafter growth rate is slow, with fish reaching around 22.5 cm FL at age one year and a maximum size of around 23 cm FL at 18 months (Oxenford et al. 1994).

Direct aging through counting daily growth checks is relatively straightforward in juvenile specimens (up to 150 days) and has been validated through laboratory rearing (Oxenford *et al*. 1994), but becomes problematic as growth rate slows down markedly as fish mature. Confirmation of longevity required radio-chemical dating of adult otolith cores (Campana *et al*. 1993).

Best estimates of standard von Bertalanffy growth parameters for *H. affinis* based on validated size-at-age and longevity data are: L_∞ = 24.5 cm FL, k = 0.01 (daily basis), t_0 = 2.85 days (Oxenford *et al*. 1994)[2] [3].

[2] These estimates were adjusted slightly by Oxenford et al. (2007) to give values (L_∞ = 23.2 cm FL, k = 0.01, t_0 = 4 days)

Reproductive characteristics

H. affinis may reach first maturity as small as 18.0 cm FL (around 5 months of age). The majority of fish are mature by 20.3 cm FL (around 7 months of age) (Storey 1983, Khokiattiwong et al. 2000)[4]. They have relatively high gonosomatic indices (GSI values of around 11.5% for females and 6.5% for males) and are batch spawners, with females laying around 7,000 relatively large eggs per batch (Storey 1983, Khokiattiwong *et al*. 2000). Individual fish are believed to spawn several times within the November to July spawning season. Furthermore, there appear to be two peaks in spawning activity during the spawning season, with a minor peak from November to January and a major one in April / May. This tends to be reflected in higher catches by the commercial fisheries at these times, and results from the fact that the fishing gear and methods target spawning fish (Hunte *et al*. 2007).

Eggs are non-buoyant and highly adhesive, and are spawned on floating materials including natural flotsam, and the FADs and gillnets used to catch adult flyingfish. The scarcity of flotsam in the eastern Caribbean may be constraining flyingfish population size, or flyingfish may alternatively be using submerged spawning substrates. This issue needs further investigation and may reveal preferred spawning areas for this species (Hunte *et al*. 2007).

Mortality

The average life span for *H. affinis* is around one year (maximum 18 months), so mortality rates must be high.

Several crude estimates are available for instantaneous natural mortality (M) on an annual basis, using empirical formulae after Pauly (1980) and Alagaraja (1984) (e.g. M = 4.4, Oxenford *et al*. 1993, Oxenford *et al*. 2007b; M = 1.8 to 3.1, Samlalsingh and Pandohee 1992), which translate to actual natural mortality rates of somewhere between 83.5% and 98.8% of the population dying per year.

A crude catch curve estimate of instantaneous total mortality (Z = 5.8) on an annual basis is reported by Samlalsingh and Pandohee (1992), translating to an actual mortality of 99.7% of the population per year. This parameter is equivalent to the production/biomass ratio and was used in the trophic model of the Lesser Antilles pelagic ecosystem by Mohammed et al. (2008), although they recognised that the value was very high and probably represented a combination of both mortality and migration.

A crude estimate of the instantaneous fishing mortality (F = 3.3) on an annual basis is also given by Samlalsingh and Pandohee (1992) using Z = M + F. Again they recognise that this is probably a significant over-estimate.

Recruitment

H. affinis becomes vulnerable (recruits) to the commercial fishing gear (gillnets and dipnets) at first sexual maturity (from around age 5 months, i.e. about 18.0 cm FL). The population is considered fully vulnerable at age 7 months (20.3 cm FL) when the majority of flyingfish are mature (Mahon *et al*. 2000). The relationship between recruitment and the adult stock that produces those recruits (i.e. the stock recruitment relationship) for *H. affinis* has been investigated in a preliminary manner (Mahon 1989). Results indicate that *H. affinis* has a stock recruitment relationship typical of short-lived pelagic species,

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[3] Alternative estimates are available for Tobago caught flyingfish (L_∞ = 25.7 cm FL, k = 0.141 (daily basis), t_0 = -18.6 days) based on unvalidated size-at-age for 20 specimens (Samlalsingh and Pandohee 1992)

[4] These estimates are loosely corroborated by Samlalsingh and Pandohee (1992) reporting a wide size range for first maturity of between 10.3 – 17.5 cm FL or 2.9 – 7.2 months).

in which the number of recruits is more strongly influenced by the abiotic and biotic environment (including predation and food supply), than by adult population size, at least over a wide range of adult population sizes. Over the range of spawning stock sizes so far investigated for *H. affinis* in the eastern Caribbean (i.e. those occurring over the years 1958 – 1984 as indicated by CPUE data from the Speightstown, Barbados fishing fleet) the average recruitment has been fairly constant, although interannual fluctuations are high. As such, the eastern Caribbean flyingfish stock seems to be characterised by a high degree of interannual variation in abundance (with adult fish biomass fluctuating by a factor of +/- 60% from year to year). This variability is believed to be primarily due to the physical environment (rather than adult population size) and is therefore largely unpredictable. Indications are however, that if flyingfish harvest levels increase by more than 40% over the average harvest levels in the 1980s, this may well lead to a decline in recruitment (recruitment overfishing) (Mahon 1989).

Species interactions

The diet of *H. affinis* comprises largely zooplankton (particularly pteropods/copepods) and nekton (larval fish) (Hall 1955, Lewis et al. 1962), indicating that they are relatively low down in the food web. They are believed to occupy a trophic level of 3.8 (www.fishbase.org; Froese and Pauly 2009). Predators of juvenile and adult *H. affinis* include many of the large oceanic pelagic species (e.g. dolphinfish, wahoo, large tunas, billfishes) (Oxenford and Hunte 1999, Heileman *et al*. 2008). As such, *H. affinis* is an important baitfish for fisheries targeting these large pelagic species.

The strong trophic dependence of dolphinfishes on flyingfishes has been demonstrated using an Ecopath with Ecosim (EwE) model of the Lesser Antilles pelagic ecosystem (LAPE) (Mohammed *et al*. 2008), and is further explained in Fanning and Oxenford (2011).

Critical habitat

Critical habitat for adult *H. affinis* is clearly open ocean with availability of floating objects to use as spawning substrate. Preferred spawning areas are likely to be present but not well defined at the present time.

A tagging study of *H. affinis* off Tobago has indicated retention of spawning adults in the area (Oxenford 1994). This information, together with anecdotal information from fishers suggests that the shelf area off the northwest coast of Tobago may be a preferred spawning area. An abundance survey of *H. affinis* juveniles across the eastern Caribbean indicated a greater density in the area to the northwest of Trinidad and Tobago (Oxenford *et al*. 1995b), however, this could not be corroborated by the relative distribution of *H. affinis* eggs and larvae (Hunte et al. 1995).

Carrying capacity

New estimates of carrying capacity were developed during the 2011, bioeconomic assessment of the Eastern Caribbean flyingfish fishery (CRFM, 2011). These are: a base carrying capacity(k) of 44 302 tonnes; an intrinsic growth rate (r) of 0.28/year; - amplitude of k fluctuation (s_k) of 4276 tonnes; and an environmental cycle of carrying capacity of 44 years.

6. LEGAL CONTEXT

6.1 International law and agreements

Internationally agreed fisheries instruments of direct relevance to flyingfish fisheries in the Eastern Caribbean include the following legally binding treaties and agreements:

- 1982 United Nations Convention on the Law of the Sea (UNCLOS), which came into force in 1994;
- 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (FAO Compliance Agreement), which came into force in 2003;
- 1995 United Nations Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement), which came into force in 2001;

Other significant international instruments include the following non-binding declarations / codes:

- 1992 UN Agenda 21: Programme of Action for Sustainable Development, Chapter 17: Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas and coastal areas, and the protection, rational use and development of their living resources. This action plan was agreed to at the 1992 United Nations Conference on Environment and Development (UNCED).
- 1994 Declaration of Barbados on the Sustainable Development of Small Island Developing States (SIDS) and its related Programme of Action for the Sustainable Development of Small Island Developing States.
- 1995 FAO Code of Conduct for Responsible Fisheries, which although largely voluntary, has certain provisions that are already, or may become, legally binding. The code covers all aspects of fisheries, including harvest, fishing operations, management, post-harvest, trade and research, and gives particular attention to Small Island Developing States and small-scale fisheries.
- 2001 Reykjavik Declaration**,** representing a voluntary commitment to adopt an ecosystem- based approach to fisheries management.
- 2005 Rome Declaration on IUU Fishing, recognizing the impacts of IUU fishing on small-scale fisheries, and calling for improved national and regional monitoring, control and surveillance of unauthorized, illegal fishing and implementation of severe punitive measures.
- 2010 United Nations General Assembly Resolution “Towards the Sustainable Development of the Caribbean Sea for Present and Future Generations” (UNGA 65/155, adopted on 20 December 2010)

Other relevant international considerations include the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the 1992 Convention on Biological Diversity (CBD), the 1973 / 78 International Convention on the Prevention of Marine Pollution from Ships (MARPOL), and the 2002 World Summit on Sustainable Development (WSSD) Johannesburg Plan of Implementation.

The 2009 FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (Port State Measures Agreement), will in the coming years become an important international instrument for fisheries management in the Caribbean region.

Membership to these conventions and treaties among the eastern Caribbean states is shown in Table 4.

TABLE 4: Membership to international and regional conventions and treaties of relevance to fisheries (as of June 2012)

Country	UNCLOS	UN Fish Stocks Agreement	FAO Compliance Agreement	CITES	CBD	MARPOL IMO	Cartagena Convention	SPAW Protocol	FAO Port States Measures Agreement
Barbados	√	√	√	√	√	√	√	√	-
Dominica	√	-	-	√	√	√	√	-	-
Grenada	√	-	-	√	√	-	√	-	-
Martinique (France/ EU)	√	√	√	√	√	√	√	√	-
Saint Lucia	√	√	√	√	√	√	√	√	-
Saint Vincent and the Grenadines	√	√	-	√	√	√	√	√	-
Trinidad and Tobago	√	√	-	√	√	√	√	√	-

6.2 Regional and bilateral arrangements

Three regional agreements and arrangements govern and support flyingfish fisheries and management in the Eastern Caribbean. These include the following:

1) The Agreement on the establishment of the Caribbean Regional Fisheries Mechanism (CRFM) under the Caribbean Community (CARICOM) was signed in February 2002. The mission of this inter-governmental organization is "To promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region" and as such its three bodies – the Ministerial Council; the Caribbean Fisheries Forum; and the CRFM Secretariat, aim to further the objectives of CRFM. Barbados, Dominica, Grenada, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago are all active members of the CRFM.
2) The Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP) was endorsed by the CRFM Ministerial Council in 2011. It will (once ratified) govern the fisheries through establishment of measures for conservation, management, sustainable utilization and development of fisheries resources and related ecosystems; the building of capacity amongst fishers and the optimisation of the social and economic returns from their fisheries and the promotion of competitive trade and stable market conditions.
3) The Western Central Atlantic Fishery Commission (WECAFC) was established by the FAO Council in 1973 as a Regional Fishery Body under Article VI of the FAO constitution. All above CRFM member countries are members of WECAFC as well as France (Martinique). WECAFC aims to promote the effective conservation, management and development of the living marine resources in FAO Area 31, in accordance with the FAO Code of Conduct for Responsible Fisheries, and to address common problems of fisheries management and development faced by members of the Commission.

The members of CRFM and WECAFC have established the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean through a decision by the 14th session of WECAFC (Panama, February 2012) with the specific tasks to:

- update and finalize the draft Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean, taking into account the need to develop an ecosystem approach to fisheries (EAF) management and climate change issues;
- establish and commence improved monitoring of fishery performance trends, consistent with agreed management objectives for the operation of the Eastern Caribbean flyingfish fishery;
- monitor and advise on the implementation of the agreed fisheries management plan;
- provide advice on the status of the fishery and its management to the CRFM Ministerial Sub-Committee on Eastern Caribbean Flyingfish and to WECAFC;
- take other necessary actions on emerging issues pertaining to the sustainable use of Eastern Caribbean flyingfish.

Also of particular relevance in the region are the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (i.e. the Cartagena Convention), which entered into force in 1986, and the associated 1990 Protocol for Specially Protected Areas and Wildlif**e** (SPAW), which entered into force in 2000. Membership to these is also shown in Table 4above.

The following declarations and resolutions are also of importance for the management of flyingfish fisheries in the Eastern Caribbean:

- 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism;
- 2012 Resolution of the members of the Western Central Atlantic Fishery Commission on Strengthening the Implementation of International Fisheries Instruments**.**

None of the above regional arrangements and agreements has at present any specific jurisdiction over flyingfish resources and their management in the Eastern Caribbean. Therefore the Sub-regional Management Plan is not a legally binding instrument, which can form the basis of a legal challenge. The sub-regional plan, however, harmonizes the fisheries management and conservation of the flyingfish resources in the Eastern Caribbean. The national authorities' regulatory powers (under the national Fisheries Acts of the participating countries) will enable implementation of the management plan corresponding with the provisions of the international and regional arrangements and instruments.

6.3 National policies, laws and regulations

In terms of fisheries legislation, all of the Commonwealth Caribbean countries have Fisheries Acts, and those of the Eastern Caribbean countries (Dominica, Grenada, St. Lucia and St. Vincent and the Grenadines) are nearly identical, because they were based in large part upon OECS model laws (CRFM 2012b). The Commonwealth Caribbean fisheries statutes are generic in nature in the sense that they do not tend to have provisions specific to particular fisheries, such as those for flyingfish, but rather contain provisions applicable to all forms of fishing.

While none of the Fishing Acts currently in force expressly requires fisheries authorities to follow the ecosystem approach and fisheries-related principles such as the precautionary principle, in most of the current Acts there are references to key concepts such as conservation, management, sustainability and use of scientific information.

Like the fisheries statutes, most existing national fisheries management plans and policies are of a more generic and general nature, some still in draft form and in the process and need of being revised and

updated. They do not contain specific provisions for the management and conservation of flyingfish with the exception of, in some cases, meshsize regulations for gillnets.

7. MANAGEMENT UNIT

At present, three genetically discrete sub-regional stocks of *H. affinis* have been identified so far in the Western Central Atlantic. These are located in the eastern Caribbean, the southern Netherlands Antilles and off northeast Brazil. As such, the eastern Caribbean H. *affinis* may be considered as a unit stock, shared by the countries of the eastern Caribbean. There is also considerable movement of adult flyingfish between the eastern Caribbean countries, particularly prior to spawning. This suggests that the minimum appropriate management unit for H. *affinis* should be the combined EEZs of the Eastern Caribbean countries, from Dominica south to Tobago (FAO 2010).

8. FISHERY CHARACTERISTICS

8.1 Ecosystem services of the pelagic ecosystem

Flyingfish fisheries in the eastern Caribbean are part of the pelagic ecosystem. The pelagic ecosystem provides a range of ecosystem services, which can be divided into provisioning, regulating, cultural and supporting services. The provisioning services include the provision of fish for food and for commercial, recreational and subsistence fishing; the generation of wave energy, oxygen provision, and the provision of a medium for transportation, i.e. shipping and pharmaceutical products. The prominent regulatory service of the pelagic ecosystem is climate regulation. Cultural ecosystem services include recreational and tourism services and values, knowledge systems and educational values as well as spiritual and inspirational values. Supporting ecosystem services of the pelagic ecosystem include habitat for a variety of marine plant and animal life, including critical habitat for eggs and larval stages of fish and shellfish, transport of eggs and larvae to feeding and recruitment grounds as well as biodiversity functions related to sea turtles, sea birds and marine mammals.

8.2 Flyingfish fisheries in the Eastern Caribbean

In the central western Atlantic, the four-wing flyingfish supports commercially important fisheries in three geographically separate areas: the eastern Caribbean islands, the southern Netherlands Antilles and northeast Brazil. Tagging and genetic studies suggest that there is a single stock of four-wing flyingfish (*Hirundichthys affinis*) within the southeastern Caribbean area expanding from Dominica to Trinidad and Tobago.

The four-wing flyingfish is essentially an annual species. The strong seasonal variation in catches is probably due to combination of:

- peak seasonal spawning behaviour (flyingfish being much more readily caught when spawning), and
- their variable abundance resulting from high post spawning mortality and a one-year lifespan, such that there is a gap in between successive adult cohorts occurring over the summer months when adults are dead and juveniles have not yet grown into the fishery (recruited).

Flyingfishes are an important prey group for a number of large pelagic predators such as bigeye tuna, dolphinfishes, billfishes, blackfin tuna as well as squids.

The four-wing flyingfish supports important small-scale fisheries in the region in terms of employment generation, food security and supply of bait for fisheries targeting large pelagic fish species. Like other small-scale fishers in the Caribbean, fishers involved in flyingfish fisheries often belong to the lower socio-economic strata of society.

Flyingfish fisheries are concentrated in the southern end of the Lesser Antilles chain. Barbados, Tobago, Martinique and Saint Lucia all have large flyingfish fisheries and to a lesser extent Dominica and Grenada. Best estimates of total annual catches of flyingfish from the eastern Caribbean stock, over the period 1950-2010 have been reconstructed from landings records and data interpolation (FAO, 2010; CRFM, 2011) and are shown in Figure 5. Barbados accounts for about two thirds of the regional catch. Compared to other countries in the region, Barbados also adds more value to flyingfish catches through processing and sale to the tourism sector. Altogether 1700 boats of small to medium size are engaged in flyingfish fisheries. The annual value of the flyingfish catch in Barbados alone is estimated at USD 15 million (Mahon *et al*., 2007)

The total annual recorded catch of flyingfish in Barbados was 2292 tonnes in 2009 (CRFM, 2012a). The average annual recorded catch of flyingfish between 1997 and 2009 was 1736 tonnes, fluctuating from a low of 922 tonnes in 2006 to a high of 2680 tonnes in 1998. In the case of Barbados, flyingfish accounted for approximately 62 percent of fish landings over the period 1998-2007. More than 90 percent of the catch is landed by the ice-boat and day boat fleets. In 2007, there were 167 ice boats and 242 registered day boats. The flyingfish fishery is the most important fishery in Barbados employing 2000 fishers, 500 vendors as well as 325 persons employed as de-boners or workers in fish processing plants (FAO, 2012).
Other countries in the area also have important flyingfish fisheries. In Trinidad and Tobago, the flyingfish fishery is located on the Caribbean Sea coast of the island of Tobago. The main fishing craft used is the fiberglass pirogue, ranging from 6.7–9.8 m. The number of boats involved in the fishery between 1988 and 2008 averaged 50 boats per season (FAO, 2010). In Saint Lucia, 331 vessels were engaged in the flyingfish fishery in 2007 (FAO. 2010). According to figures provided by the department of fisheries, the total flyingfish catch of Saint Lucia was 109.35 tonnes in 2010.The total annual catch of flyingfish in Martinique was 47.6 tonnes in 2009 and 64.6 mt in 2010. There are no targeted flyingfish fisheries in Saint Vincent and the Grenadines. In the case of Dominica there has been a shift from the flyingfish fishery to the large pelagic fishery within the last eight years due to the increased use of FADs. The annual flyingfish landings in Dominica were reported to be 54.22 tonnes in 2011 (Commonwealth of Dominica. 2012, p. 11). [5]

The fishing effort for flyingfish is highly seasonal (December – June), driven by the seasonal availability of both flyingfish and the large pelagic species, particularly dolphinfish. The most recent estimates of fishing effort in the sub-region, in terms of the number of fishing trips during which flyingfish were caught, were assembled by Medley et al. (2009) for Barbados, Tobago and St. Lucia for the period 1988-2008. The monthly mean fishing effort over this period is shown in Figure 6 and demonstrates the very low fishing effort during the summer (July – November). The mean total number of flyingfish fishing trips conducted per year by the fleets of these three countries over this period is in excess of 78,200. Barbados day boats account for the majority of fishing trips averaging 43 300 per year, followed by Barbados ice boats averaging around 21 800. Tobago day boats contribute on average 10 800, while Saint Lucia day boats make some 2 300 trips per year.

[5] Additional information on social and economic indicators of the importance of flyingfish fisheries in the Eastern Caribbean is provided by FAO (2010, p. 71) and in country reports.

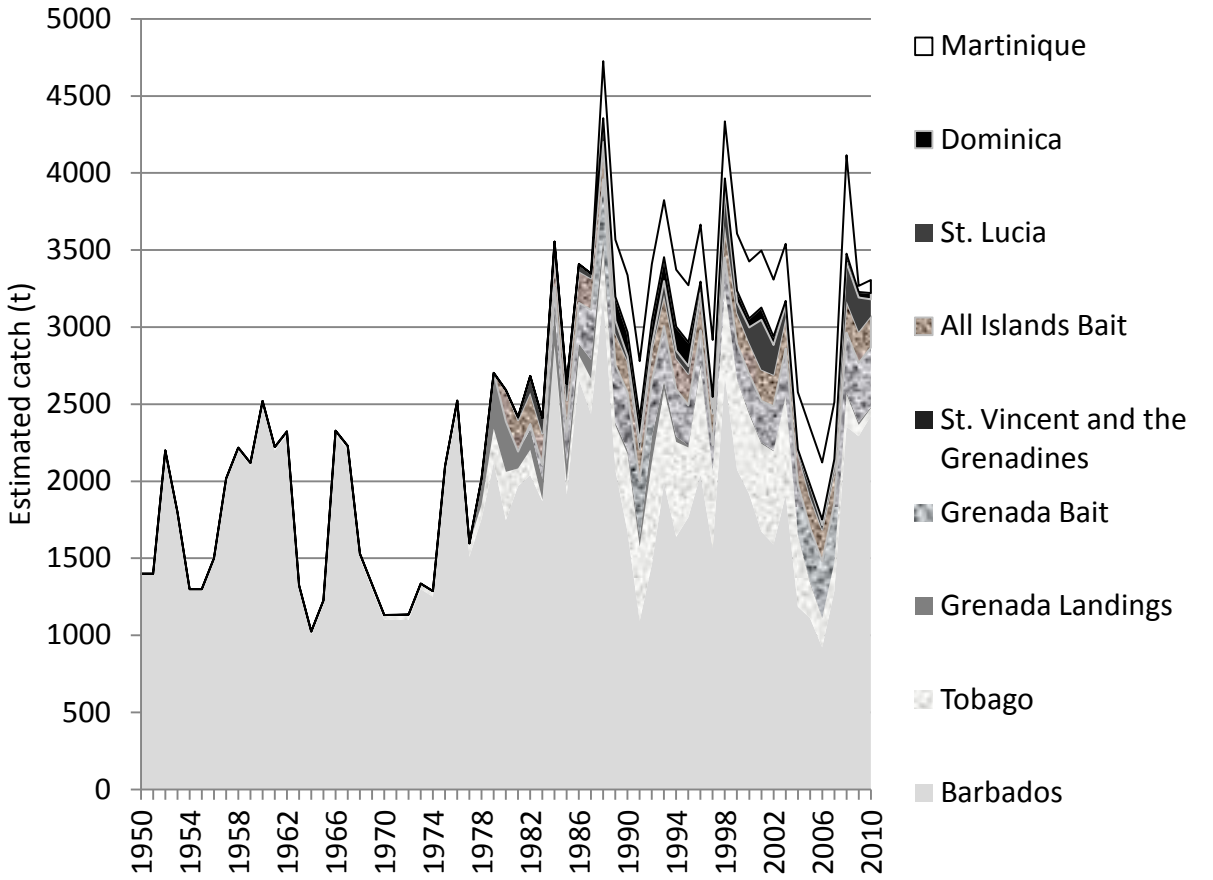

Figure 5. Stacked chart, showing the estimated total annual catches of flyingfish for the eastern Caribbean (1950-2010). After FAO (2010).

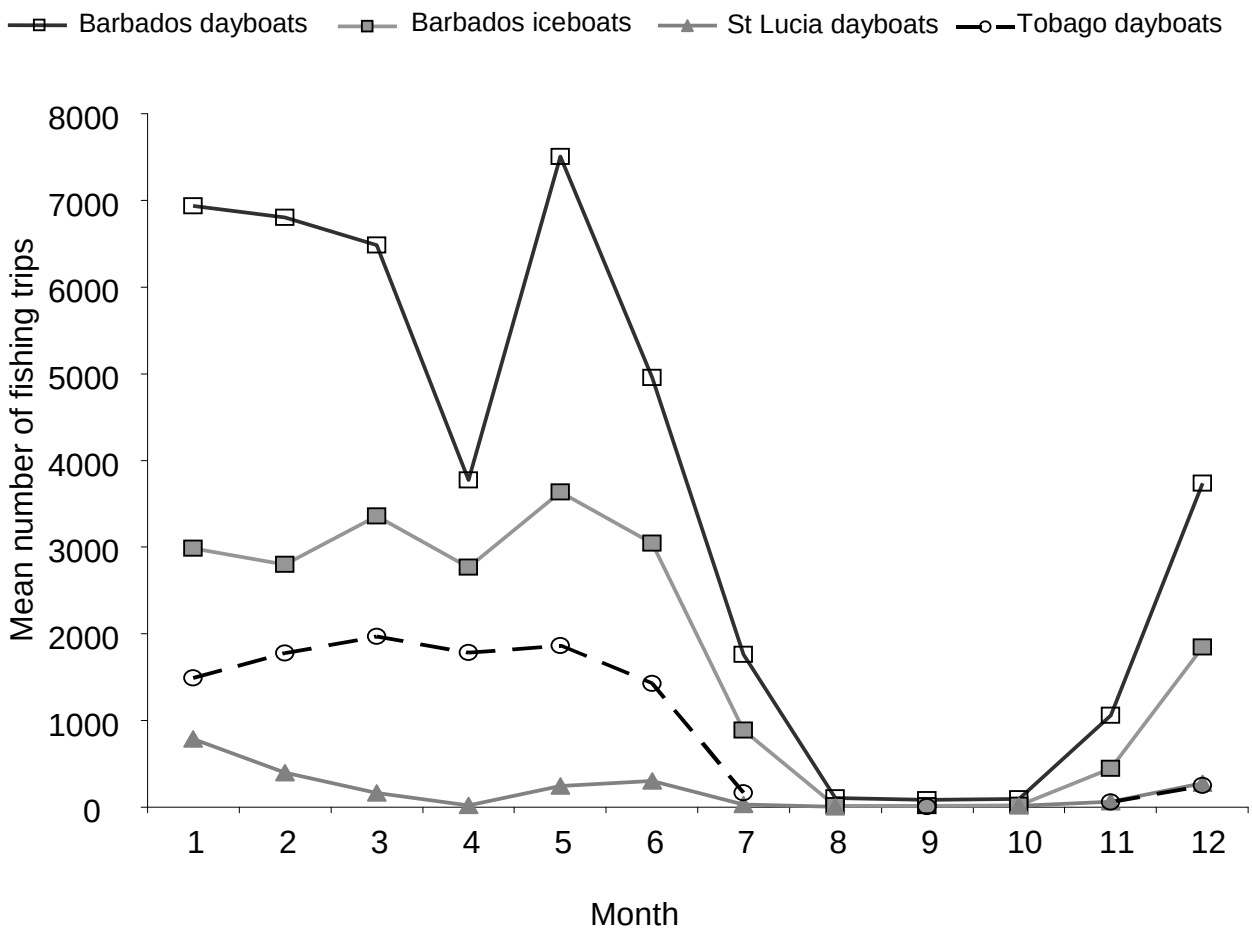

Figure 6. Seasonality of fishing effort shown as monthly mean number of recorded fishing trips (1988-2008) by the flyingfish fishing fleets of Barbados, Tobago and St. Lucia (FAO, 2010)

A further complication, when examining the regional fishing effort database, is the difference in fishing power among the different boat types and national fleets. This is particularly problematic when using catch per effort (catch per fishing trip) as an index to examine trends in flyingfish abundance over time. Medley et al. (2009) attempted to standardise the catch per unit effort data of Barbados, Tobago and St. Lucia for the last two decades (1988-2008) against the January catches of the dayboat fleet in Barbados each year. The resulting catch per unit effort time series is shown in (Figure 7) and suggests that flyingfish abundance has remained stable over the long term.

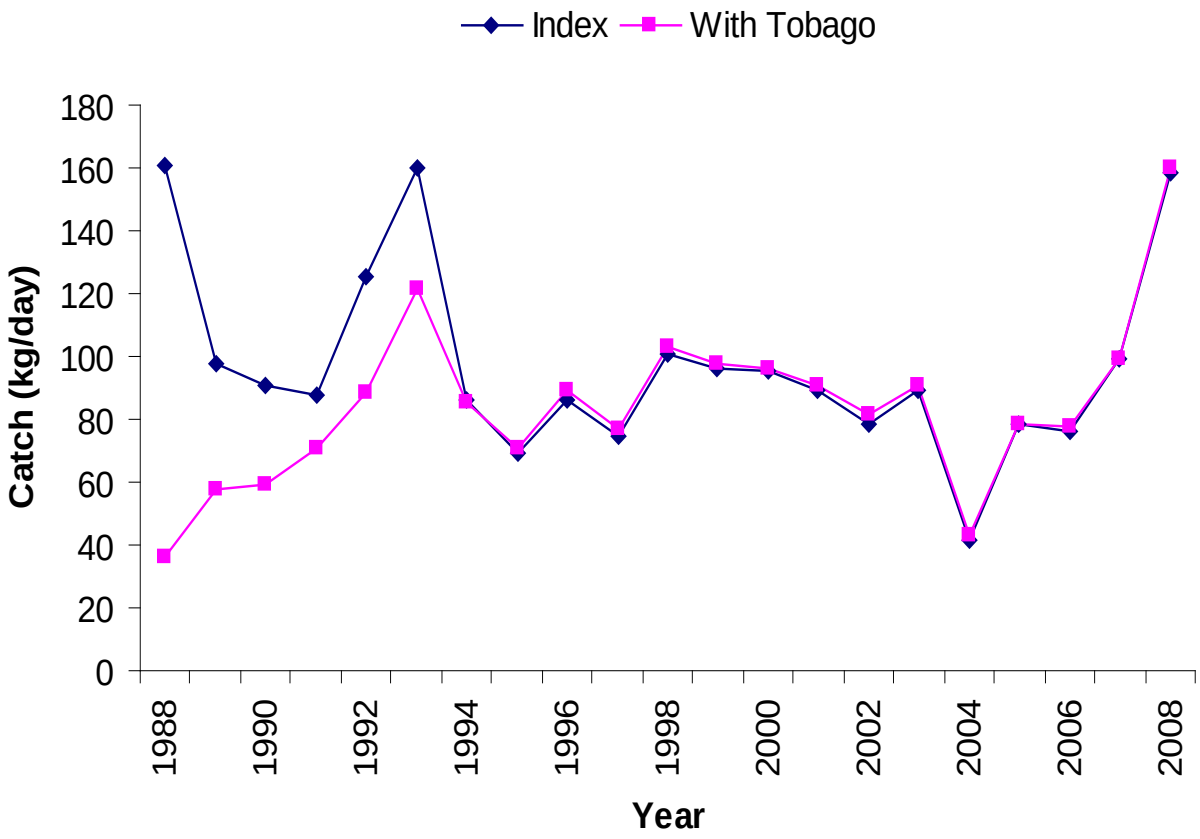

Figure 7. Standardised index of abundance for eastern Caribbean flyingfish representing catch per unit effort data for Barbados, St Lucia and Tobago, standardized annually to Barbados January dayboat effort (trips) (FAO, 2010).

The flyingfish fishery targets the four-wing flyingfish (*Hirundichthys affinis*) although small catches of other species are also reported. Flyingfishes are caught as they form large schools and aggregate to spawn around floating objects on which they deposit their sticky eggs to maintain buoyancy. The fishing gears employed consist primarily of: (i) floating surface gillnets (or driftnets) attached to the boat; (ii) mats of floating palm fronds or sugarcane leaves prepared for attracting flyingfish in search of suitable floating spawning substrate, and hence which serve as FADs (called 'screelers' in Barbados); and (iii) handheld dip nets. While the flyingfish fishery is a directed fishery, it is at the same time part of a multi-species, multi-gear fishery, which also targets regional large pelagic species. When traveling to the fishing ground and while gillnets are soaking, stationary or trolled, hooks and lines are used for regional large pelagic species such as dolphinfish, wahoo and other species. Flyingfish is also used as bait to catch these species.

An important ecosystem linkage of flyingfish concerns the growing longline fisheries for large pelagics in the region. These fisheries depend to an unknown degree on flyingfish fisheries for bait. Beach seine fisheries also provide bait for longlining. This seems to be particularly important in Trinidad and Tobago and Grenada with their growing longline fisheries.

The high demand for flyingfish and other small pelagic fish catches of beach seines to be used as bait for longlining has a negative impact on the food security of local populations. Flyingfish and beach seine catches have traditionally been a source of low cost food and protein in rural areas. The increased demand for these species as bait in the longline fisheries has resulted in increased prices and in some cases removed some coastal pelagics altogether from local food supplies.

8.3 Trophic interactions, food web and habitat

The four-wing flyingfish is one of thirteen species of flyingfishes (*exocoetids*) that have been reported in the Eastern Caribbean. As far as their role in the ecosystem is concerned, flyingfishes are an important component of the pelagic food web as shown by a recently completed study of the Lesser Antilles Pelagic Ecosystem Project of the Food and Agriculture Organization of the United Nations regarding the four-wing flyingfish.

The findings of the study confirm the previously known trophic dependence of dophinfishes (*coryphaenids*) on flyingfishes in the eastern Caribbean. The findings highlight the vulnerability of dolphinfishes to any substantial decrease in the abundance of flyingfish, even without any change in fishing pressure on dolphinfish.

Four-wing flyingfish are relatively low in the food web. Their diet largely comprises zooplankton (particularly pteropods/copepods) and nekton (larval fish). While critical habitat for adult four-wing flyingfish is the open ocean with availability of floating objects to use as substrate, spawning areas can be in coastal waters such as the shelf area off the northwest coast of Tobago, which are impacted by land based human activities. Anecdotal information suggests that sea based human activities such as oil and gas exploration and shipping can have negative impacts on the abundance of flyingfish.

9. STATUS OF THE FISHERY

9.1 State of the stock

Based on quantitative assessments completed in 2008 (FAO, 2010) and in 2011 (CRFM, 2011), there is no immediate action required by management to conserve the stock, unless there is a significant increase in catches.

Estimates of annual total flyingfish landings for the eastern Caribbean are available in FAO (2010). The landings, estimated for Barbados, Trinidad and Tobago, St Lucia, Grenada, St Vincent and the Grenadines, Dominica and Martinique vary considerably from year to year. These estimated landings ranged from 1,025 to 2,523 tonnes per year between 1950 and 1979 and appeared to have increased thereafter, ranging from 2,121 to 4,725 tonnes per year between 1980 and 2007. The estimated average annual landing between 2002 and 2007 was 2,512 tonnes.

These data, however, are to be treated cautiously as they are likely underestimates of the true catches in the sub-region. In the case of bait fisheries the catches have not been well documented. There are also gaps in available data, which required interpolation to estimate landings for years without data. Generally, several countries lack a clear methodology for estimating total catches from recorded data. Consequently, there is tremendous uncertainty in the level of historical catches of flyingfish for the Eastern Caribbean. Estimates of fishing effort are also uncertain.

The 2008 assessment identified that an annual catch trigger reference point of 5,000 t should be established when action may be taken to ensure the stock does not become overfished. This trigger point

therefore defines when further management action should be undertaken. The maximum recorded annual catch to date is 4,700 t. The 2008 assessment indicated that any fisheries development exceeding 5,000 t per year would have unpredictable consequences. Among the actions that should be taken if catches rise to, or above, the trigger point, are a freeze on further fishery development until a full scientific re-assessment of the stock has been completed. An improved stock assessment may lead to further international fishing controls.

The 2011 assessment explored the bio-economic dynamic impacts of managing the multi-fleet and multispecies flyingfish fishery and undertook risk analysis of alternative fishery management decisions (CRFM 2011).

The results of this preliminary dynamic bio-economic analysis were, among other things, that under open access, harvest rates in the neighbourhood of 5000 ton /year could result in collapse of this pelagic fishery. According to CRFM (2011) this could be prevented with catch quotas, or effort controls to reduce exploitation rates by 30% to allow the resource to recover its natural fluctuations over time.

The multi-species nature of this fishery involves additions to the flows of revenues to the fishery over time coming from the harvest of valuable large pelagic species like dolphinfish, tunas, and wahoo, among others. Therefore, under open access, fishermen will not react by reducing their effort when encountering lower biomass levels of flyingfish because the other species harvested will tend to cover the variable costs of the fishing trip. Also, it was pointed out that price of flyingfish has been very seasonally sensitive to supply (harvest rates over time), tending to reach substantial increases in price with low catch rates. This effect not explored in the quantitative analysis will tend to accentuate the need for managing the fishery with the input and output control measures mentioned above.

The most significant uncertainty in the 2008 and 2011 assessments stem from the poor data available on catches and effort. Improved data collection and monitoring is required to ensure sustainable use of this and other fishery resources.

9.2 Social status of fishers

A recently completed general diagnostic study to determine poverty and vulnerability levels in CARICOM fishing communities (CRFM, 2012c) covered Barbados, Grenada, Saint Vincent and the Grenadines and Trinidad and Tobago (other countries with flyingfish fisheries were not included). The study included capture fisheries, aquaculture and fish processing. Poverty and vulnerability were identified with reference to unsatisfied basic needs (UBN). Households with more than one UBN were classified as poor households. Households with one UBN were classified as vulnerable.

In the case of Grenada and Saint Vincent and the Grenadines, more than 5 percent of the households in the fisheries / aquaculture sectors were classified as being poor; 6.61 and 5.41 percent, respectively (CRFM, 2012c). In both countries, these households were involved in capture fisheries. In Trinidad and Tobago, the percentage of fisheries households living in poverty was 1.32 percent. Poverty in fisheries households was not an issue in Barbados.

Compared to poverty, vulnerability was found to be a much more important issue in all four countries covered by the study. Grenada topped the list with 25.62 percent of fisheries households being vulnerable, followed by Trinidad and Tobago with 15.23 percent, Saint Vincent and the Grenadines with 10.81 percent and Barbados with 7.37 percent. [6]

[6] The main components of poverty and vulnerability were lack of access to services, poor quality of dwellings, semi-illiteracy and low levels of education as well as low economic capacity and productivity. Large household and family sizes as well as high illiteracy and semi-illiteracy levels figured prominently among the demographic

Any approach to the management of flyingfish fisheries must ensure that other users also do their share to restore and conserve fishery resources. This includes efforts to efficiently regulate industrial fishing fleets, efforts to end IUU fishing, the reduction and prevention of water pollution and coastal erosion caused by housing, quarries, removal of sand and industrial development, and the proper management of other factors, which have an impact of fisheries resources and aquatic habitat.

9. 3 Issues and constraints

A number of problems currently exist which are constraining the development and management of the flyingfish fishery in the eastern Caribbean. Some of the key issues and constraints are listed below (not in any order of importance):

- lack of a regional mechanism for managing shared resources;
- inadequate fishery information and statistics (particularly socio-economic data) for planning and management;
- inadequate human capacity in fishery departments to conduct required level of research and data analysis;
- inadequate development of participatory management with all stakeholders at national and sub-regional levels;
- constrained access of far-ranging vessels (e.g. Barbadian ice-boat fleet) and other near-ranging fleets (e.g. French boats) to fishing areas occupied by the shared *H. affinis* stock;
- market gluts occurring as a result of bunched landings and inadequate distribution leads to lowered incentive to harvest flyingfish when plentiful;
- marked seasonality in availability of *H. affinis* leads to discontinuous market supply and seasonal fishing effort;
- limited facilities for disposal or use of fish offal at landing sites;
- limited landing site and marketing facilities in some countries;
- inadequate post-harvest technology to ensure a good quality product and reduce fish wastage, i.e. poor quality of landed fish from improper bulk storage at sea and ashore;
- some eastern Caribbean countries have significant difficulties with producing cost-competitive local exports of fresh flyingfish or fish products as a result of very different national economies;
- labour shortage and lack of adequate blast freezing facilities for processing plants;
- vulnerability and poverty of fishers and their family and household members;
- negative impacts of sea and land based human activities such as oil and gas exploration, shipping, pollution, shoreline erosion, runoffs etc. on the marine ecosystems;
- IUU fishing;
- lack of, or inadequate, safety equipment and navigational training of crew for some boat types;
- difficulties with accessing credit in the fisheries sector;
- lack of, or inadequate, monitoring, surveillance and enforcement;
- competition for use of the coastal zone (landing and launching areas);
- evaluation of risks due to global environmental change.

9.4 Opportunities

A number of expansion and development opportunities exist within the flyingfish fisheries of the sub-region.

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characteristics of poor and vulnerable households. Another characteristic, poor and vulnerable fisheries households had in common, was that they depended more strongly on fisheries for their income as compared to other households.

Current opportunities include:

- implementation of a Common Fisheries Policy in the CARICOM;
- availability of new international instruments and regional initiatives to end IUU fishing such as the 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism (CRFM) and the FAO Port State Measures agreement;
- availability of international support for the ecosystem approach to fisheries management initiatives, and food security through fisheries;
- development of local value-added flyingfish products of competitive quality;
- accessing specialized niche markets in North America and the United Kingdom of Great Britain and Northern Ireland;
- expanding frozen fish storage facilities to reduce seasonality of fish availability;
- expanding range of current fishing fleets into geographic range of the eastern Caribbean *H. affinis* unit stock;
- development of gear to target underutilized flyingfish species available in the region (e.g. *Parexocoetus brachypterus*);
- development of products utilizing fish offal;
- development of flyingfish deboning skills in all Eastern Caribbean islands to increase value of fresh fish;
- development of better fish distribution mechanisms for marketing fresh fish in rural areas.
- Increasing interest of stakeholders in information and management measures

10. MANAGEMENT OBJECTIVES

The management objective is to ensure responsible and sustained fisheries, such that the *H. affinis* resource in the waters of the eastern Caribbean is optimally utilized for the long-term benefit of all people in the eastern Caribbean region. Responsible management in the face of uncertain information on the true status of the flyingfish stock requires a precautionary approach.

The significant trophic, technical and economic linkages between the flyingfish fisheries and the fisheries targeting large oceanic pelagic species (e.g. dolphinfish, wahoo, tunas, billfishes) provide strong justification for an ecosystem approach to the management of these fisheries. The flyingfish stock is shared among the eastern Caribbean islands and as such these islands are legally obligated to collaborate in its management. An institutional arrangement allowing for sub-regional collaborative management is therefore critical.

Management of flyingfish in the Eastern Caribbean is to be guided by three management goals, which are further sub-divided into general objectives. These are shown in Table 5 together with their assessment criteria and descriptions drawing on (CRFM, In press)

10.1 Stakeholder contributions

Two recent studies, carried under guidance of the Caribbean Large Marine Ecosystem Project, documented the management priorities for stakeholders participating the Eastern Caribbean flyingfish fishery (CRFM, In press). These studies showed that stakeholders overwhelmingly supported sustaining the flyingfish resource as the foundational management objective, to be supported by accurate information and monitoring systems and effective management strategies. Another management priority of equal concern to stakeholders was the optimal use of the fishery for social benefits. Ecological objectives and criteria tend to be given a comparatively lower priority (CRFM, In press), although stakeholders acknowledge their support for an ecosystem approach to fisheries management.

The findings of these two studies were used to develop a first practical working set of fishery management goals and objectives, and to propose a first set of suitable operational objectives, indicators and reference points for evaluating fishery performance, relative to the priority objectives identified. These are provided in table 5.

Table 5: Updated Management objectives, general objectives, operational objectives, indicators and reference points.

Management Goals (category)	General objectives (sub category)	Operational Objectives	Indicators	Suggested reference points
1.Sustained fishery resource biological	**1.1 Sustained resource** Ensuring that there are flyingfish available for future generations. Preventing overfishing to maintain a healthy stock	• Current average catch rates sustained over the long-term and throughout the area of distribution • Stock biomass is maintained at or above MSY level	• National CPUEs (spatial) • Total national landings	• Long-term average catch rate • Total sub-regional annual landings (catch trigger point of 5000 tonnes
	1.2 Accurate information Ensuring that an effective data collection system is in place to provide accurate information and knowledge about the state of the fishery	• National data collection improved and gaps filled	• Sampling coverage • Sampling design	• Adequate coverage of landing sites • Adequate sampling design
	1.3 Effective management Ensuring that there is an effective system for adaptive and responsive management and enforcement	• Establish a harmonized sub-regional database	• Sub-regional database operational	• Harmonized sub-regional database established and maintained
		• Timely submission of data and information to CRFM	• Annual submission of data	• Current data in database
		• Establish authorized access to fishery	• License / permit system specifically for flyingfish	• All sub-regional flyingfish fleets licensed
		• Establish precautionary measures as required	• Variety of indicators as required (e.g. fleet size)	• Adjustment of related reference points
		• Ensure ability to make and enforce management decisions.	• Legislation and regulations in place • Compliance levels	• Laws and regulations in place and enforced • Established level of compliance

		• Ensure ability to collaborate effectively with stakeholders and other countries and organizations both vertically and horizontally	• Level of stakeholder engagement (consultation and feedback) • Stakeholder network indicators	• Adequate level of stakeholder engagement
		• Adaptation to external drivers / perturbations	• Invasive species (Sargassum)	
2 Optimal use of fishery for long-term benefit - socio–economic	**2.1 Social benefits and economic / financial returns** Optimal social, economic and financial benefits for all involved in the fishery	• Optimize social, economic and financial benefits derived from the fishery	• Employment level • Income level • Return on investment • Credit access	• Adequate levels of: • Employment Income • Return on investment • Credit access
	2.2 Affordable food source	• Ensure that flyingfish remains an affordable and available source of food for the future	• Per capita consumption • Percentage of population consuming flyingfish • Market price of flyingfish • Relative market price	• Preferred levels of consumption (health, dietary aspects) • Average market prices of flyingfish
	2.3 Fair access to fishing grounds	• Ensure fair access to fishing grounds • Minimize conflict / competition with other resource sectors / users.	• Access indicators (e.g. number of vessels, fishers and licenses / permits) • Bilateral / multilateral access agreements • Number of conflicts with other resource users	• Degree of fair access to fishing grounds • Degree of competition from other resource sectors. • Resource sharing between countries.
	2.4 Optimal utilization / processing for domestic and export markets	• Promote fish quality and safety for consumers • Develop value addition for the post-harvest sector for domestic and export markets	• Fish and fishery products related SPS standards (e.g. HACCP) • Value of post-harvest production • Export value	• Quality and safety standards and requirements met • Adequate level of post harvest processing • Fish and fishery products trade balance

3. Sustained ecosystem health – ecological	**3.1 Healthy habitat** Healthy habitat with minimal degradation and minimal impact from pollution or other negative effects	• Maintain off-shore pelagic habitat health • Minimize habitat degradation	• Water quality parameters • Marine debris / pollution occurrence	
	3.2 Healthy and resilient ecosystem (with balanced trophic levels)	• Maintain aquatic biodiversity and balanced ecosystem • Adaptation to climate change and weather extremes	• Species composition of catches (including size) • Trophic levels (predator –prey composition) • Adaptation and vulnerability indicators	

10.2 Reference points

Under the 2008 Draft Sub regional Fisheries Management Plan for flyingfish in the Eastern Caribbean, a trigger point of 5000 tonnes annual catch had been established (FAO 2010) relative to the agreed biological objective. The assessment stated that sustained catches at or above this level are expected to bring about an unacceptable risk of overfishing. The assessment further stated that either catches are maintained below this level, or further research, data collection and stock assessment work is required to enable a new higher limit to be set while still ensuring that the limit is safe. In comparison, a bio-economic analysis (CRFM, 2011) suggests that in a fishery targeting an annual species, which reacts rapidly to environmental changes , biomass and catch target reference points and limit reference points (TRP and LRP, respectively) would have to be determined and adjusted over time because there is no equilibrium biomass or constant maximum sustainable yield.

Since these two recent assessments, the underreporting of flyingfish catches and data quality concerns have not been addressed, and some stakeholders have expressed concern about the impact of this on the accuracy of the available stock assessments. However, the present assessment has used the best available data, and as data are improved in the future, this will facilitate improved estimation of stock status.

11. Data, monitoring and research requirements

The statistical system needs to be developed to capture the range of indicator variables identified in Table 5. At present, only certain types of data are typically collected, e.g. catch and effort. However, in view of the range of management priorities identified by stakeholders, which was noted earlier and also reflected in table 5, the statistical systems will need to be expanded to incorporate collection and storage of other types of data, e.g. price, consumption, export value, data on water quality, etc.

11.1 Catch / effort and vessel data

The most important shortcomings of the present data collection on flyingfish catch/landings data can be summarized as follows:

- Flyingfish caught for bait is not covered at all by the present system of data collection. Catch statistics in the region for flyingfish are incomplete, due to poor data collection systems and underreporting.

Under this sub-regional flyingfish management plan, the following steps will be taken to address above shortcomings

(a) Expansion of coverage of data collection systems to systematically include flyingfish caught for bait. The Fisheries Authorities, in collaboration with other stakeholders (such as flyingfish fishers, buyers of flyingfish to be used as bait, fisherfolk associations and other stakeholders) should identify a suitable data collection system and support interpretation and use of data collected.

(b) Improvement of collection of catch statistics on flyingfish catches and effort in sub-region as part of ongoing efforts to improve fisheries statistics systems.

(c) Fisheries Authorities in collaboration with stakeholders (such as flyingfish fishers, buyers of flyingfish to be used as bait, fisherfolk associations and other stakeholders), should be involved in interpretation and use of data collected.

(d) Allocation of sufficient and appropriately skilled staff and sufficient resources for the collection, recording and analysis of fisheries statistics. This should include adequate training, orientation and involvement of staff dealing with the collection, analysis and sharing of flyingfish and other fisheries statistics.

(e) Establishment of a sub-regional database for catch and effort data of the Eastern Caribbean flyingfish, which should eventually also encompass biological, ecological, oceanographic, economic and social data. The database should be managed by CRFM in cooperation with the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean. It should draw on regional data sets assembled at the 3rd Meeting of the WECAFC Ad Hoc Working Group on Flyingfish in the Eastern Caribbean and the 7th CRFM Annual Scientific Meeting for the assessment of the Eastern Caribbean flyingfish stock. The data base should also include flyingfish catches and effort from Martinique.

(f) Harmonization and improvement of national vessel registration and licensing systems and expansion of the use of suitable software to clearly identify vessels fishing for flyingfish. LRS should track the change of ownership, base of operation and use of vessels and provide information on licensed/registered flyingfish vessels to CRFM to be incorporated in a future regional LRS data base of CRFM in the context of the implementation of Common Fisheries Policy.

11.2 Economic, social and ecological information

The sub-regional fisheries management plan further encourages investigations / research which aims at strengthening the flyingfish fishing industry including: utilization and trade, the social and economic status of industry participants, the contribution of flyingfish fisheries to food security / nutrition and to poverty alleviation. These investigations will lead to a better understanding of the ecosystem which supports the flyingfish fishery, and of the threats to the health of that ecosystem.

The proposed studies ultimately aim to generate information about the flyingfish fishing industry which is needed to attract investments in sustainable harvesting and value addition, and in the restoration of the health of the marine ecosystem, which supports the flyingfish fishery.

11.3 Research needs

The following studies are proposed:

Economic and Social Evaluations of Flyingfish Fisheries

- Conduct of a sub-regional cost and earnings study and comparison of the economic and financial performance of flyingfish fisheries and flyingfish value addition in selected countries of the Eastern Caribbean.
- Conduct of a socio-economic study of flyingfish fishers and processors in selected countries of the Eastern Caribbean.

Studies on Ecosystems and Trophic Interactions

- Conduct study on the impact of sea and land based human activities on habits, life cycles and food webs of flyingfish and the productivity of related marine ecosystems.
- Conduct studies to improve understanding and estimation of the risks associated with climate change, extreme weather events, and other aspects of global environmental change.

Bio-economic research

In addition to the cost and earnings, socio-economic and ecological studies suggested above, future bio-economic research for this important fishery of the CLME, should consider the following (CRFM 2011):
1. Long-term stock fluctuations associated with changes in the abundance of predators (i.e. dolphinfish, and other large pelagic species) and competitors (other small pelagic) targeted by other fleets? 2. The cycle of long-term fluctuating stocks within a changing environment and the associated adequate vessel capacity.

12. MANAGEMENT ADVICE AND IMPLEMENTATION OF THE PLAN

12.1 Management advice

Taking into consideration shortcomings in data collection and analysis, following the precautionary approach to fisheries management, and with the ultimate view to safeguard the socio-economic well-being of the flyingfish industry in the sub-region and the health of the ecosystem that sustains the flyingfish fishery, this updated sub-regional management plan proposes the following management measures:

1. Per 1 June 2013, establishment of an authorized entry (license/permit) system for flyingfish fisheries, which enters into force for the flyingfish fisheries season 2013/2014.
2. Adoption of a sub-regional total annual catch trigger point of 5000 tonnes, at which point action shall be taken to ensure the stock does not become overfished.
3. Precautionary introduction of a2-year sub-regional freeze on expansion of flyingfish fishing capacity.

The overall management of the flyingfish fisheries needs to be improved by taking the following actions:

- improving and harmonizing data collection and analysis in the sub-region;
- improving and harmonizing flyingfish vessel licensing and registration in the sub-region;
- establishment of a sub-regional flyingfish catch and effort database to be managed by the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with the CRFM

Secretariat; establishment of a sub-regional flyingfish vessel registry database to be managed by the CRFM / WECAFC Working Group of Flyingfish in the Eastern Caribbean in cooperation with the CRFM Secretariat;

- formalizing the relationship with Martinique and Guadeloupe to ensure their involvement in the management process as far as the flyingfish fishery in its EEZ are concerned;
- improved control and surveillance of flyingfish fisheries and ending IUU fishing; and
- promotion of fishing access agreements between and among states.

12.2 Institutional and legal arrangements

CRFM is the appropriate regional flyingfish management advisory authority to be tasked with the implementation, review and evaluation of the 2012 Sub-regional Flyingfish Fisheries Management Plan. The task will be carried out with technical advice from the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with Fisheries Authorities, fishers' organizations and the fishing industry at large. The management functions to be carried out by CRFM will be along the lines of the ones adopted by the recently established CRFM Ministerial Sub-committee on Flyingfish. They are summarized in ANNEX III.

In countries, where present laws and regulations do not provide for limiting entry into a fishery or where no management plan is currently in force, legislation and regulations will need to be changed / implemented or management plans created and brought into force to allow for application of the proposed management measures. The following general steps are envisaged for the implementation of the management plan.

Table 6: Implementation of the 2012 Sub-regional Flyingfish Fisheries Management Plan for the Eastern Caribbean

Broad Steps	Activities related to Steps	Responsible party	Timeframe
Finalization and adoption of plan (Working Group)	1. Finalization of 2012 draft Sub-regional Flyingfish Fisheries Management Plan for the Eastern Caribbean	CRFM / WECAFC	End of August 2012
Finalization and adoption of plan (Working Group)	2. Approval of draft FMP by CRFM / WECAFC	CRFM / WECAFC WG on Flyingfish in the Eastern Caribbean	End of September 2012
Finalization and adoption of plan (broader membership of stakeholders)	3. Reviewed by stakeholders at the national and regional level through consultative processes that include public hearings, public posting of management plans and comment periods in addition to reviews by FACs	National fisheries authorities, CFRM, WECAFC	End of December 2012
Finalization and adoption of plan (Working Group)	4. Adjustment of FMP by incorporating inputs from consultations	CRFM / WECAFC	End of February 2013
Formal adoption of plan (CRFM Ministerial Sub-Committee & Council)	5. Discussion and approval of FMP by Caribbean Fisheries Forum and Ministerial Sub-Committee on flyingfish & Council	Caribbean Fisheries Forum & Ministerial Sub-Committee on flyingfish & Council	End of March 2013

Putting plan into action (individual countries)	6. Change, creation or implementation of legislation, regulations or management plans to allow for application of proposed management measures, as necessary	National fisheries authorities	Starting in June 2013
Putting plan into action (individual countries)	7. Adoption of FMP	CRFM Member States with a real interest in flyingfish fisheries	Beginning in January 2013 (to be ready by June 2013)
Formal adoption of plan (WECAFC)	8. Regional recognition of FMP by WECAFC's 15th Session	WECAFC	March 2014
Formal adoption of plan (France)	9. Adoption of FMP by France (Martinique)	French/Martinique fisheries authorities	From April 2014 onwards
Plan evaluation & revision	10. Annual review and adjustment of FMP	National fisheries authorities in consultation with stakeholders, CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean	Annually

During implementation of the updated sub-regional flyingfish management plan, consultative processes will be used to facilitate participation of stakeholders in the monitoring and adjustment of the management plan. Feedback will be provided to stakeholders on results of the implementation of the plan including information of catch and effort trends, number of licenses issued / renewed, results of stock assessments, industry performance evaluations, etc. The updated management plan will be renewed / updated on a regular basis and inputs from stakeholders will be encouraged and given due regard.

12.3 Co-management

The present functioning and structure of national Fisheries Advisory Committees (FACs) should be revised to assure participation of all fisheries sub-sectors. Stakeholders from sectors other than fisheries, who have an impact or interest in flyingfish fisheries and its ecosystem, should also be represented. This could be facilitated through national inter-sectoral committees that are established under the CLME project for promoting the ecosystem approach to fisheries. The selection process for members of Fisheries Advisory Committees should be made transparent and carried out in close consultation with the groups which are to be represented on the FAC. The structure and functioning of the FACs should be more clearly defined and operational ensuring, among other things, that the chairperson of the committees has sufficient time and resources to fulfill her / his task.

Impact and outcomes of management decisions on flyingfish stocks, stakeholders and marine ecosystem should be regularly reviewed at the national and regional levels and evaluated together with concerned stakeholders who should be representative of the entire ecosystem affecting flyingfish fisheries. Depending on the outcome of these evaluations, management plans and measures should be adjusted on a regular basis consistent with an ecosystem approach to fisheries management.

12.4 Control and surveillance (CS)

Control and surveillance of flyingfish fisheries will be carried out by the national fisheries authorities in close cooperation with the Caribbean Fisheries Forum, CRFM Ministerial Sub-committee on Flyingfish and the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean. The functions of CRFM will include the development of a harmonized control and inspection scheme to ensure compliance with management and conservation measures, to review compliance with adopted conservation and management measures and to implement adopted control, surveillance and enforcement measures.

12.5 Financing

Financing the implementation of this sub-regional flyingfish fisheries management plan will largely be done at the national level. However, additional funding will be required for the establishment and maintenance of regional data bases as well as for carrying out regional management functions of advisory and MCS nature. This funding will be secured by CRFM and the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean with support of multi- and bilateral donor agencies and funds.

12.6 Monitoring and Evaluation

The agreed deadlines noted in table 6 will guide monitoring of the steps outlined for implementation of the current sub-regional fisheries management plan. This monitoring will be coordinated by the CRFM-WECAFC Working Group that comprises those States having a real interest in the Eastern Caribbean flyingfish fishery, together with scientific observers and representatives of both the CRFM and WECAFC Secretariats. For each step, the responsible party or parties will be asked to submit brief progress reports to the CRFM-WECAFC Working Group outlining the level of achievement with regard to the specific activity or activities identified. The CRFM-WECAFC Working Group, in its turn, will be responsible for reporting to both the CRFM and WECAFC decision-making bodies on the implementation of the agreed plan.

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APPENDIX 5: Resolution on the Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean

Proposed to be adopted by the CRFM Ministerial Council
Ministerial Sub-Committee on Flyingfish

The Ministers and other respective authorities responsible for fisheries and aquaculture in the Eastern Caribbean states:

Mindful of the social and economic importance of flyingfish fisheries to the Eastern Caribbean states, and particularly of the role of flyingfish in local fish consumption traditions, as provider of coastal livelihoods and for tourism purposes;

Recognizing that recent regionally coordinated scientific evaluations using data, expertise and inputs from the Fisheries Divisions in Barbados, Dominica, Grenada, Martinique (France), Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, as presented to Caribbean Sub-regional Fisheries Mechanism (CRFM), Western Central Atlantic Fishery Commission (WECAFC) and to the Caribbean Large Marine Ecosystem (CLME) Project, indicate that the stock of flyingfish in the Eastern Caribbean was not overfished up to 2010, but remains at risk under the current open access arrangement;

Noting the limitations in the data and information available to inform management decision making, which requires application of a precautionary approach to fisheries;

Committed to individually and collectively taking measures and actions to implement the Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP) in terms of managing the shared flyingfish resources in the Eastern Caribbean;

Recalling the relevance of the CRFM 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing and the 2012 Resolution of the members of the WECAFC on strengthening the implementation of international fisheries instruments for flyingfish fisheries in the Eastern Caribbean;
Agree to make all efforts to implement an ecosystem approach to fisheries management with stakeholders, which contributes to efficient fishing activities of the flyingfish resource within an economically viable and competitive small-scale fisheries sector, providing a fair standard of living for those who depend on fishing flyingfish and taking the interests of consumers into account.

Agree to the following sub--regional flyingfish management measures:

1. Per 1 June 2013, establishment of an authorized entry (license/permit) system for flyingfish fisheries, which enters into force for the flyingfish fisheries season 2013 / 2014.
2. Adoption of a sub--regional total annual catch trigger point of 5000 tonnes, at which point action shall be taken to ensure the stock does not become overfished.
3. Precautionary introduction of a 2-year sub--regional freeze on expansion of flyingfish fishing capacity.

Agree that the overall management of the fishery will be greatly improved by the following joint actions:

- improving and harmonizing flyingfish data collection and analysis in the sub-region;
- improving and harmonizing flyingfish vessel licensing and registration in the sub-region;
- establishment of a sub--regional flyingfish catch and effort database to be managed by the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with the CRFM Secretariat;

- establishment of a sub-regional flyingfish vessel registry database to be managed by the CRFM / WECAFC Working Group of Flyingfish in the Eastern Caribbean in cooperation with the CRFM Secretariat;
- formalizing the relationship with Martinique and Guadeloupe to ensure their involvement in the management process as far as the flyingfish fishery in its EEZ are concerned;
- improved control and surveillance of flyingfish fisheries and ending IUU fishing; and
- promotion of fishing access agreements between and among states.

Request the Fisheries Divisions / Departments, following up from the 2012 national consultations (in each of the participating countries), communicate this resolution and discuss the implications of this Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean with all relevant stakeholders.

Request the CRFM / WECAFC Working Group on Flyingfish in the Eastern Caribbean to inform the CRFM at every session on the progress made in the implementation of the regional management plan.