

CRFM Fishery Report 2010



VOLUME 1, Suppl. 1-

National Reports

Report of Sixth Annual Scientific Meeting -
Kingstown, St. Vincent and the Grenadines
07-16 June 2010

**CRFM Secretariat,
Belize, 2010**

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CRFM FISHERY REPORT - 2010. Volume 1, Suppl. 1 – National Reports.
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Correct Citation:

CRFM. 2010. Report of Sixth Annual Scientific Meeting – Kingstown, St. Vincent & the Grenadines, 07 - 16 June 2010 - National Reports. *CRFM Fishery Report – 2010*. Volume 1, Suppl. 1. 55p.

ISSN: 1998-1015

ISBN: 978-976-8165-35-0

Published by the Caribbean Regional Fisheries Mechanism Secretariat,
Belize

Foreword

The Sixth Annual Scientific Meeting took place during 07-16 June 2010 in Kingstown, St. Vincent and the Grenadines. During this Meeting, CRFM Resource Working Groups examined data from the following fisheries: the reef fisheries of Montserrat, especially the red hind (*Epinephelus guttatus*) and queen triggerfish (*Balistes vetula*) fisheries; and the dolphinfish fishery of the Eastern Caribbean. The LPWG also reviewed blackfin tuna data available from the ICCAT database, and discussed country-specific details of landings information.

An inter-sessional plan for the bio-economic study of the Eastern Caribbean flyingfish fishery was developed by the SCPWG. The CLWG and the SGWG did not meet in 2010; however an inter-sessional study on the economics of the queen conch fishery in the Turks and Caicos Islands was completed during this Meeting. Inter-sessional studies completed for the Eastern Caribbean flyingfish fishery, and the spiny lobster fisheries of Belize and Jamaica under the United Nations University-Fisheries Training Programme in Iceland were also presented and discussed at the Meeting.

The first formal meeting of the Working Group on Data, Methods and Training (DMTWG) was convened, during which a 1½-day basic training course in the use of R (statistical software) was successfully conducted. A plenary session was also held to review and discuss issues and recommendations pertaining to data, methods and training, as well as identify inter-sessional activities for the DMTWG.

The Report of the Sixth Annual Scientific Meeting is published in two Volumes: Volume 1 contains the proceedings of the plenary sessions and the full reports of the CRFM Resource Working Groups for 2010. Six national reports were submitted for consideration by the Sixth Annual Scientific Meeting, and these are published as Supplement 1 to Volume 1. Volume 2 contains part A (Overview), and the fishery management advisory summaries of individual fishery reports comprising part B of each Working Group report, where relevant. Volume 1 is intended to serve as the primary reference for fishery assessment scientists, while Volume 2 is intended to serve as the main reference for managers and stakeholders.

The covers for this volume were designed and prepared by Mr. Shaun Young, while the photographs were provided by Ms. Maren Headley, Mr. Derrick Theophile, and Dr. Susan Singh-Renton. These contributions are gratefully acknowledged.

Table of Contents

List of Acronyms and Abbreviations.....	1
NATIONAL REPORTS – CRFM MEMBER STATES	2
NATIONAL REPORT OF BELIZE	3
1. Fishery and Fleet Description.....	3
2. National Fisheries Policies and Management Objectives.....	5
3. Research.....	6
4. Legislation and Management Regulations	6
NATIONAL REPORT OF JAMAICA	8
1. Fishery and Fleet descriptions	8
2. National Fisheries Policy and Management Objectives.....	10
3. Research.....	12
4. Legislation and Management Regulations	14
NATIONAL REPORT OF ST. KITTS AND NEVIS.....	16
1. Country Profile	17
2. Fisheries Development: St. Kitts Agricultural Development Strategy 2007 - 2011	17
3. Description of Fisheries.....	18
4. Fisheries Management.....	18
5. Research and Development	19
6. Fishery Organizations.....	19
7. Programs – Resources Management.....	22
8. Data Management.....	25
9. Aquaculture	26
10. Roles and duties of the Fisheries Department	27
11. Problems Facing Fisheries.....	27
NATIONAL REPORT OF SAINT LUCIA	29
1. Overview of the Saint Lucia Fisheries Sector	29
2. Fisheries Management Objectives.....	30
3. Description of the Fishery	30
4. Fisheries Policy and Regulations.....	37
5. References	39
NATIONAL REPORT OF TURKS AND CAICOS ISLANDS.....	40
1. Introduction	40
2. Description of Fisheries and Fleet.....	41
3. National Fisheries Policy and Management Objectives	41
4. Research.....	43
5. Legislation and Management Regulations	43
NATIONAL REPORTS - OBSERVERS.....	45
NATIONAL REPORT OF BRAZIL.....	46
1. Fishery and Fleet Description.....	46
2. Statistics and Sampling.....	48
3. National Fisheries Policy and Management Objectives	49
4. Research.....	49

5. Legislation and Management Regulations	53
6. Acknowledgements	54
7. References	54

List of Acronyms and Abbreviations

BFC	-	Basseterre Fisheries Complex
BFD	-	Belize Fisheries Department
CARICOM	-	Caribbean Community
CARIFIS	-	Caribbean Fisheries Information System
CERMES	-	Centre for Resources Management and Environmental Studies
CFRAMP	-	CARICOM Fisheries Resource Assessment and Management Programme
CITES	-	Convention on International Trade in Endangered Species
COP	-	Conference of Parties
CPUE	-	Catch Per Unit Effort
CRFM	-	Caribbean Regional Fisheries Mechanism
DECR	-	Department of Environment and Coastal Resources
DOF	-	Department of Fisheries
EEZ	-	Exclusive Economic Zone
FAC	-	Fishery Advisory Committee
FAD	-	Fish Aggregating Device
FAO	-	Food and Agriculture Organization of the United Nations
FD	-	Fisheries Division
GDP	-	Gross Domestic Product
GOB	-	Government of Belize
HACCP	-	Hazard Analysis and Critical Control Points
ICCAT	-	International Commission for the Conservation of Atlantic Tuna
IUU	-	Illegal, Unregulated and Unreported
JICA	-	Japanese International Cooperation Agency
MT	-	Metric Tonne
OECS-ESDU	-	Organization of Eastern Caribbean States - Environment and Sustainable Development Unit
OECS-NRMU	-	Organization of Eastern Caribbean States – Natural Resources Management Unit
STATIN	-	Statistical Institute (Jamaica)
TCI	-	Turks and Caicos Islands
UNCLOS	-	United Nations Convention on the Law of the Sea
USA	-	United States of America
UWI	-	University of the West Indies

NATIONAL REPORTS – CRFM MEMBER STATES

NATIONAL REPORT OF BELIZE

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1. Fishery and Fleet Description

The fishing industry of Belize is characterized as small scale and artisanal in nature and is divided into two components: capture fisheries and aquaculture sector. The capture fisheries sector employs low fishing technology. Commercial fishing started in the mid to late 1950s with lobster and conch as the principal target species harvested mainly for export to the USA. At present, the capture fisheries sector remains as an important economic activity. The majority of fishermen are organized into fishing cooperatives. Traditionally, the fishing cooperatives have been the only organizations licensed to export lobster, conch and other fishery products.

Commercial fishing for lobster is carried out primarily in the shallow waters (5-15 m) within the reef lagoon, an area between the barrier reef and the mainland and along the entire length of the barrier reef, which extends for about 300 km from north to south along the coast. Commercial fishing is done exclusively by free (skin) diving and use of SCUBA gear is strictly prohibited by the fisheries regulations.

In 2008, the capture fisheries sector contributed US\$10.25 million to the national economy. Overall, capture fisheries landings increased by only 2.2% from 535 tons in 2007 to 544 tons in 2008 but export earnings decreased by 9.6% from US\$11.35 million in 2007 to US\$10.25 million in 2008 (Belize Fisheries Department 2008).

In 2009 there were 2,759 licensed fishermen, which shows an increase of 21.7% compared to 2008. In addition to these direct jobs, it is estimated that some 15,000 Belizeans also benefited indirectly from fisheries related activities. It is noteworthy that the number of licensed fishermen increased from 1,731 in 2004 to 2,267 in 2008, representing a cumulative increase of 30% and an increase of more than 7% in comparison to 2007 when 2,110 fishermen were licensed to fish. The number of boats also increased from 621 in 2007 to 643 in 2008 showing an increase of over 8%. Despite the increase in fishing effort however, catches increased by only 2.42% when compared to 2007 (Belize Fisheries Department 2008).

Lobster Fishery

Lobsters are harvested throughout the inner reef system of the Barrier Reef using lobster traps or pots, shades or “casitas” and “hooksticks”. The fishing vessels used in lobster fishing are constructed of fiberglass or wood and are powered by outboard engines (25-75HP). Wooden boats equipped with cloth sails and outboard engines are also used. These wooden boats carry up to 8 small canoes and 8 divers per fishing trip that can last up to 8-10 days.

A declining trend in lobster landings has been observed during the last 10 years while fishing effort shows an increase (See figure 1).

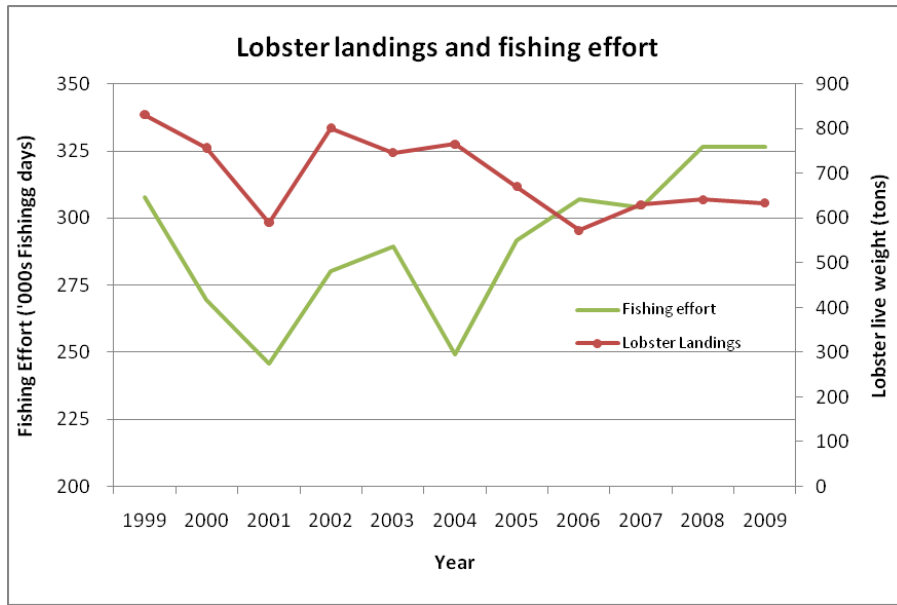


Figure 1: Lobster landings (live weight) and fishing effort during the period 1999 to 2009.

Conch Fishery

This fishery continues to be the second commercially important commodity in Belize. Conch is harvested solely by free diving to depths from 10- 90 feet. Conch fishing is undertaken in all six fishing areas in Belize for nine months of the year. The conch fishery is an artisanal and seasonal fishery. During the closed lobster season the fishermen who had previously targeted lobster now target conch, and when the seasons are running concurrently they fish both. Conch is caught along the fore-reef, and the inner lagoons, and is fished exclusively by diving, because the species is sedentary. Wooden sailing sloops measuring up to 30 feet are used in the conch fishery. These are equipped with sails and auxiliary engines (30 Hp). They carry up to 8 small canoes and as many as 11 fishermen and remain out at sea for 6 to 12 days. Six hundred and twenty-eight (628) vessels were licensed in 2009, which showed a decrease of 2.3% compared to 2008.

Conch production by the five fishermen cooperatives has remained fairly stable over the past 5 years ranging between 633,070 lbs. and 736,000 lbs. In 2009, 736,018 lbs of conch meat was produced. This showed an increase of 19.9% in production compared for the year 2008. The conch season in Belize opens from 1st October - 30th June of each year allowing fishermen to harvest conch from the main fishing grounds. Other regulations also exist to protect the conch fishery.

In 2009 the fishing cooperatives exported 691,900 lbs. of market cleaned conch meat to the U.S.A. valued at \$7.6 million Bze. This showed an increase in foreign exchange earnings of 17.2% and 12.6% in export weight for conch meat compared to 2008. Tremendous fishing pressure has been placed on the conch fishery due to rising prices on the international market.

Statistics and Sampling

Fisheries statistical data for lobster, conch and shrimp are gathered through the two main fishermen cooperatives based in Belize City.

Sampling of lobster and conch (during open fishing season) is done weekly at landing sites (fishermen cooperatives) to gather biological and CPUE data directly from fishermen. All

shipments of conch meat are inspected to ensure compliance with regulations before a CITES export permit is issued by the Fisheries Department.

Since mid-June 2009, lobster samplings at sea (Fishing Zone 5) were done every month until mid-February 2010. Biological, CPUE and morphometric data were collected from whole lobsters harvested by commercial fishermen. In mid-June this year (2010) the lobster data collection program will expand and two hundred (200) lobster data sets will be collected in each of the eight marine reserves and in Fishing Zone 5.

Finfish production data is collected monthly from fish markets in the principal coastal fishing communities including Corozal Town, Belize City, Dangriga Town and Punta Gorda Town. Monthly landings data collected in these communities include catches by species, catches, area fished, gear used and days spent fishing.

2. National Fisheries Policies and Management Objectives

The national policy is directed at ensuring a sustainable supply of marine products, particularly, lobster, shrimp and conch. While present policy measures include minimum size, closed season and licensing requirements, the GOB recognizes the need to harvest other species in deeper waters since it is aware that sustainable levels of production for conch, lobster, and shrimp have already reached their maximum. The strategies will facilitate proper management of marine resources and contribute towards its long-term viability and sustainable development. The major policy objective for the fisheries sector is to maintain a sustainable yield of the fisheries resources while continuing to contribute to food production, foreign exchange earnings and improved nutritional status in the longer term. Specifically, the fisheries policy will:

- Encourage and promote sustainable fish production systems in both sea areas and inland fisheries.
- Diversify production of the underutilized fish species in traditional waters so as to reduce pressure on high valued fish.
- Encourage deep-sea fishing to take advantage of the 12-mile zone.
- Increase value added activities in the production system, fish processing and prepared fish food.
- Improve management of the ecological systems and marine environment of fish habitats.
- Expand production of non-traditional fish species.
- Retain product quality and remain competitive in export markets.
- Improve the economic and social well being of fishers and their communities.

Actions to achieve these objectives will focus on:

- improving quality control systems;
- encouraging joint venture activities with foreign fishers;
- developing an inter-sectoral approach to fisheries management that include improved planning of crop development, settlement and tourism development, particularly, in coastal and fragile areas that increase pollution and affect fish habitats;
- more effective coastal zone management through an inter-institutional and inter-disciplinary approach;
- rehabilitation of rivers and better management of inland stocks;
- expanding aquaculture activities, particularly, shrimp farming and coastal impoundment;
- improving fisheries management to reduce over-harvesting and maintain sustainable yields;

- strengthening regulations, enforcement/compliance; and
- providing training in testing, quality assurance and processing activities.

3. Research

Fisheries research is directed at the two main commercially important fishery resources: Spiny lobster (*Panulirus argus*) and Queen conch (*Strombus gigas*).

The collection of Spiny lobster biological data and Catch Per Unit Effort (CPUE) data is an ongoing process and will continue in 2010. This year, the field data collection will expand to include all eight marine reserves of Belize in addition to the regular open fishing areas. Data collection is scheduled to start in mid-June at the opening of the lobster fishing season. In addition to biological and CPUE data collection, a juvenile lobster and lobster larvae recruitment program will be initiated in mid-June in the marine reserves of Belize. This program is a long term study and the aim is to gather sufficient scientific data that will hopefully enable the forecasting of lobster production in future years.

The National Conch Survey is scheduled to be carried out during the period August 1 to September 15, 2010 to allow for adequate time to analyze the data to determine a Catch Quota for the fishing season October 2010 to June 2011. This field exercise is carried out every two years and the results will be subsequently passed on to the Convention for International Trade of Endangered Species of Flora and Fauna (CITES) Secretariat as required.

The most recent fisheries research paper entitled “Assessment of the Spiny lobster (*Panulirus argus*) of Belize based on fishery-dependent data” was completed in March 2010. This work was done by Mauro Gongora (Belize Fisheries Department) as part of the course completion requirement of the Fisheries Training Programme of the United Nations University in Iceland. An attempt was made to assess the Spiny lobster of Belize based on fishery-dependent lobster tails export data collected from two fishing cooperatives. The results show lobster catches consist of two age groups (ages 2 and 3), which represent about 98% of catches. The few age groups identified did not allow for an adequate age-based cohort analysis and therefore caution should be observed in the interpretation of results. Catch per unit effort, stock size and recruitment levels appear to have declined during the period 1999 to 2009. Also, fishing mortality appears to be high and the fishery could be experiencing some over-fishing. Management intervention to reduce fishing effort could benefit the fishery. An increase in the minimum size limit is recommended.

4. Legislation and Management Regulations

The Fisheries Act and Regulations of 1977, Fisheries Act Chapter 210 Revised Edition 2000, Chapter 210s Revised Edition 2003 and the High Seas Fishing Act Chp210:01 Revised Edition 2003 along with amendments and additions in the following years establish the legal framework for fisheries management, conservation, marine reserves and law enforcement functions of the Belize Fisheries Department (BFD).

The BFD is responsible for overall fisheries management in the country. The fisheries regulations are applicable to marine and inland waters. They include regulations on minimum size limits, closed fishing seasons, marine reserves, and regulations for spiny lobster, queen conch (*Strombus gigas*), marine shrimp (all marine species), Nassau grouper (*Epinephelus striatus*) and a freshwater turtle locally known as Hicatee (*Dermatemys mawii*). The fisheries regulations prohibit commercial

fishing using SCUBA gear. The regulations also prohibit the capture and possession of marine turtles, whale shark, bonefish and corals.

The principal regulations for the two main commercially important fishery resources are given below:

Lobster fishery regulations

1. No person shall take in the waters of Belize or buy, sell or have in his possession lobster:

- (a) if the carapace length is less than 74 mm or the tail weight is less than 113.4 g;
- (b) between the 15th February and the 14th June, inclusive, in any year;
- (c) that is berried, has eggs or spawn;
- (d) that has had the berries, eggs or spawn removed;
- (e) that is moulting or has a soft shell; and
- (f) fillet or diced lobster tail meat, except under a special permit issued by the Fisheries Administrator.

2. Notwithstanding the provisions of subregulation (1) above -

- (a) Lobster with a carapace length of less than 74 mm may be taken in the waters of Belize for aquaculture purposes under a special licence granted by the Minister; and
- (b) Lobster that is berried, (has eggs), may be taken in the waters of Belize for aquaculture purposes under a special licence granted by the Minister.

3. No person shall detach or otherwise remove from any female lobster any eggs or spawn or the setae or fibre to which any eggs or spawn are or have been attached.

4. No person shall take any soft shelled crustacean.

5. No person shall take fish (definition includes lobster) in the waters of Belize using SCUBA equipment except under special permit from the Fisheries Administrator.

6. No person shall with intent to take fish (definition includes lobster), use any trap or other device constructed of net or wire in any area within a distance approximately of one km of the barrier reef.

Conch fishery regulations

- Market clean conch (85%) weight should exceed 3 ounces or 85 grams
- Conch fillet (100% clean) weight should exceed 2.75 ounces or 78 grams
- The shell length should exceed 7 inches or 17.6 cm
- Closed Season (From 1Jul -30 Sept)
- Quota (Set by Fisheries Administrator)
- Gear restrictions (No SCUBA diving)
- Area closure (8 marine reserves)
- Diced conch is prohibited

NATIONAL REPORT OF JAMAICA

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1. Fishery and Fleet descriptions

The Jamaican fishery is made up largely of artisanal fishermen operating from open canoe type boats powered by either outboard motors or oars. The artisanal fishery which operates over inshore and offshore areas has been considered by many to be the 'employer of last resort'. The fisheries of Jamaica have over 20,000 fishers (19,616 registered fishers as at April 2010); most of these are artisanal fishers operating from open canoes or reinforced fiberglass-type boats powered by either outboard motors or oars. There are approximately 9,000 boats (4,860 registered boats as at December 2008), ranging from 4 to 9 meters, operating from 187 fishing beaches distributed around the Jamaican territorial waters. Vessels 12m and above, powered by inboard engines are considered industrial vessels.

The inshore fishery takes place in the coastal waters of the Island shelf and its nine proximal banks. Historically, this area has supported the bulk of the fishery activities in terms of manpower and vessels. The major fishing gear used for reef fish is the Z-shaped Antillean fish trap. Other common gear includes the gill nets, seine nets, hook-and-line, and spear guns. There is some collection of crustaceans, molluscs and algae by SCUBA or skin divers. Larger decked vessels target lobster and conch on the offshore banks (primarily Pedro and Morant Banks; also Formigas, Henry Holmes and Grappler Banks).

In the early 1980s, large companies and investors began processing and exporting conch and lobster caught on offshore banks. The vast majority of the catch is sold fresh for domestic consumption. Most lobster tails, conch and valuable finfish species such as snappers are exported to hard currency markets in a chilled or frozen state. Most of the remaining catch is sold in relatively small quantities to a large number of vendors who then take the fish to the nearby towns and communities where it is sold on local markets.

Landing Sites

The fisheries landing sites in Jamaica range from beaches with a small number of canoes through to hundreds of vessels including steel-hulled industrial ships. Key fishing beaches are located in Old Harbour Bay, Port Royal, Rocky Point and the modern fishing port complex in Whitehouse, Westmoreland.



Figure 1: Major marine fish landing sites of Jamaica

Landings Estimates

Annual catches of both marine and inland fishes for the period 2000 to 2009 are shown in the table below.

Table 1. Jamaica fish production trend 2000-2009 (MT)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Artisanal (Finfish)	4,585.55	4,348.57	7,000.00	4,594.92	8,811.03	7,158.39	12,329.85	11,048.24	9,475.01	12,544.43
Conch	0	946.00	946.00	504.25	550.00	640	650	640	400	400
Lobster (Industry)	517.3	943.39	358.67	300.00	134.49	362.00	97.98	150	150	150
Shrimp	36.67	38.5	37.54	37.00	-	875.04	476.10	-	-	105
Others	-	51.38	144.00	456.00	-	-	-	-	-	5.6
Total Marine Fish Production	5,139.52	6,327.84	8,342.21	5,436.17	9,495.5	9,035.43	13,067.83	11,838.24	10,025.01	13,205.03
Total Tilapia Production	4,500.00	5,000.00	5,995.44	2,968.50	4,200.00	4,795	7,543.35	5,600	5,800	5,030
TOTAL Fish Production MT	9,639.52	11,327.84	14,337.65	8,404.67	13,695.52	13,830.43	21,087.28	17,438.24	15,825.01	18,235.03

Table 2. Imports, exports and re-exports of fish and fishery products along with the total value

	IMPORT DATA			
	2004	2005	2006	2007
Total Net Weight (kg)	18,352,807.00	18,369,946.89	22,125,333.36	22,062,187.51
Total J\$ Value	2,565,934,480.79	3,302,913,630.74	3,868,123,103.03	4,347,768,254.55
Total US\$ Value	41,872,292.08	52,832,165.16	58,814,667.40	63,133,544.39
	EXPORT DATA			
	2004	2005	2006	2007
Total Net Weight (kg)	0	1361819	1530512	1104775
Total J\$ Value	0	584228122.5	689564273.3	576723701.4
Total US\$ Value	0	9382105.377	10497136.77	8385922.539
	RE-EXPORT DATA			
	2004	2005	2006	2007
Total Net Weight (kg)	0	25000	22058	166245
Total J\$ Value	0	5219214	12098250.13	45617523.88
Total US\$ Value	0	84700	182516.3887	666572.1967

Table 3. Source and Consumption of Fish in Jamaica, 2001-2007

Year	Estimated domestic marine catch (mt)	Total imports of fish (mt)	Farmed Tilapia (mt)	Estimated total fish consumption (mt)	Estimated total fish consumption (kg)	End of Year Population	Estimated per capita consumption (kg/cap)
2001	6,327.84	31,225.18	5,000.00	42,553.02	42,553,022.00	2,611,100	16.30
2002	8342.21	33,546.55	5995.44	47,884.20	47,884,203.00	2,619,400	18.28
2003	5436.17	36,052.10	2968.5	44,456.77	44,456,765.00	2,632,000	16.89
2004	9,495.50	18,352.81	4,200.00	32,048.31	32,048,307.00	2,644,100	12.12
2005	8,536.78	18,369.95	4,795.00	31,701.73	31,701,726.89	2,656,700	11.93
2006	13,067.83	22,125.33	7,543.35	42,736.51	42,736,513.36	2,669,500	16.01
2007	11,838.24	22,062.19	5,600.00	39,500.43	39,500,427.51	2,682,100	14.73

Sources: Fisheries Division, Ministry of Agriculture & Fisheries and Statistical Institute of Jamaica (STATIN)

2. National Fisheries Policy and Management Objectives

The main goals of the National Fisheries Policy are:

- (1) Contribute to economic growth and reduction of poverty
- (2) Contribute to sustainable livelihood of Jamaicans through employment in fisheries and related activities
- (3) Contribute to the provision of Food security

Its immediate objectives are:

- (1) Ensure sustainable development of the fisheries sector
- (2) Promote efficiency of the fishing and aquaculture industry
- (3) Promote economic and social development of fisheries sector
- (4) Improve systems and procedures for the management of the fishing and aquaculture industry
- (5) Promote partnerships with stakeholders in the management and development of capture fisheries and aquaculture, and ensure transparency and accountability in the governance of fisheries resources.
- (6) Comply with international standards and best practices for capture fisheries and aquaculture development and management in keeping with Jamaica's commitments under various agreements and conventions.

The National Fisheries Policy provides a framework for the formulation of strategies designed to address the important issues and challenges and opportunities facing the industry, including: globalization, trade expansion, economic efficiency, industry structure and governance, and food safety and quality.

The goal to be achieved from proper management of the marine fisheries of Jamaica is the sustainable use of fisheries resources for the maximum benefit of the people of Jamaica. The management objectives for each fishery are discussed below.

a) Shallow-Shelf and Reef Fishery

Objective: to rehabilitate reef fisheries to sustainable levels within the context of coastal zone management and conservation-oriented fishing practices.

Most of the catch is taken by artisanal fishers using mainly Antillean Z-traps. However prohibited fishing practices such as dynamite, poisons, and other noxious substances remain problematic. Fish biomass has already been reduced by up to 80% on the fringing reefs of the north coast, mainly as a result of intensive artisanal fish trapping. It is hoped that fishing activities could be diverted from the reef for a period, which would in effect reduce fishing effort. Co-management of the fishery should be encouraged. Increased surveillance and enforcement of legislation is also needed to stop persons destroying the reef.

b) Deepslope Fishery

Objective: to prohibit fishing effort on spawning aggregations and protect areas where these species normally inhabit during the early life stages.

The deepslope fishing areas within Jamaican waters are relatively small. Catches from the deep slope represent approximately 10% of total annual catch of marine fish. The fishery needs to be better studied. There is also need for increased awareness among fishers of the vulnerability of the stock and the potential for over-fishing.

c) Coastal Pelagics

Objectives: to ensure the viability of the fishery through maintaining and enhancing habitat, and protection of nursery areas.

The coastal zone where this fishery is based is an area in use by many other interests (water sport, tourist, harbour use). Management strategy must include some arrangement to reduce conflicts,

arrangement to control land-based pollution and coastal development and discourage the use of any destructive practices in the zone.

d) Large Pelagics

Objectives: the sustainable development of the fishery, to cooperate with other states (particularly Caribbean states) to assess, protect and conserve the large pelagic resource.

This fishery will need to be studied preferable on a regional basis, and a regional management plan developed.

e) Lobster

Objective: to restore/rehabilitate the fishery through protection of lobsters and protection and enhancement of their habitat.

There is already legislation in place to prevent the taking of berried lobster and to prohibit the landing of lobsters during the close season. There is need for gear restrictions, effort reduction and co-management arrangements.

f) Conch

Objectives: To ensure optimum sustainable yields and develop the fishery in other areas.

The introduction of a large-scale industrial fishery, which has almost totally displaced the artisanal conch fishery of the years prior to 1980, has increased production substantially. Conch is particularly susceptible to over-fishing because it is sedentary and aggregates in specific habitats. Estimated catches (based on export data) increased from 50 MT in 1987 to 2,051 MT in 1994; however actual catches may be much higher due to illegal fishing. The fishery therefore needs close supervision and a strong management framework.

New regulations (The Fishing Industry (Amendments Of Schedule) Order 2000) provided for quantity of conch in storage to be declared before the closed season, provides for the inspection of conch in holding areas, establishes minimum size restriction for conch and reserve the coastal shelf for the artisanal fishery.

g) Shrimp

Objectives: ensure sustainability and full efficient use of the fishery.

Some of the gears used in this fishery take excessive bycatch due to the inefficiency of the gear. There is need therefore to introduce bycatch reduction devices to the fishery.

3. Research

The Fisheries Division conducts research and implements policies and legislations in order to manage and preserve a sustainable fishing industry. Current projects/researches along with resources necessary for their completion are listed below.

Lobster Casitas

Casitas are small artificial habitats that lobsters can be fished from. The Lobster Casita Project will seek to investigate a more efficient and sustainable system for the lobster fishery through investigation of the use of casitas in major fishery areas, establishment of juvenile enhancement systems and establishment of pueruli (lobster larvae) monitoring programmes. Although a national

project, Bowden Bay in St. Thomas was previously being used as the pilot site. However, with the technical assistance from Cuban experts other suitable sites have been identified and include Old Harbour Bay and Discovery Bay. A total of twelve (12) puereli collectors and thirty-one condos have been deployed in all three areas and monitoring activities are expected to occur on a monthly basis.

Fisheries Officers were recently trained in conducting biological assessment using the lobster fishery as a platform. The project will continue to train staff in the use and management of casitas, condominiums, and larval monitoring systems, and provide a basis from which to introduce the use of casitas to commercial fishermen in other areas.

Fish Aggregation Device (FAD)

FAD is particularly effective in initiating an innovative and sustainable way of easing fish capture through aggregation of [large quantities of] fish into prescribed areas where these artificial floating objects are placed. A trial of this device will be done in Whitehorses, St. Thomas by the fishers and is endorsed by the Fisheries Division.

Assessment of Fish Production

The Division through its sampling plan collects catch and effort and biological data to be used for stock assessment and management and for detecting fish production trends. The fisheries targeted include reef and pelagic resource, lobster and conch, coastal pelagic resource, shrimp and ground fish. There are however a few limitations:

- Limited staff to cover a larger number of beaches thereby increasing the number of sampling days
- Additional resources are needed human, transportation and otherwise

Monitoring Fisheries Activities during and out of close seasons

The Division continues to execute its regular enforcement activities island-wide during the Lobster (April 1 – June 30) and Conch (gazetted each year) Close Seasons. During these times of enforcement, the Division relies on the support of the hotel industry in providing accommodation as the money allocated is not sufficient to cover all costs.

Development of Fisheries policy and New Legislation

This project will address the problems of declining production in the Jamaica marine capture fisheries; it will develop a framework to improve both the institutional capacity and the present management practices in the industry. A new legislation which prohibits persons from having lobsters during the Close Season took effect in 2009.

Aquaculture

The Aquaculture Branch has its main emphasis in Fingerling production, Research and Extension Services.

- *Fingerling production* of the Red Tilapia hybrid male is the main type produced and sold to farmers.
- For *Extension Services*, the Aquaculture Branch provides expert advice on Site Selection, Pond Construction, Stocking, Feeding, Harvesting and Marketing through its resource persons or extension officers.
- *Research*: work is currently being done to involve salt water culture of Tilapia. Investigations are also being done on growth and survival of the mangrove oyster *Crassostrea rhizophorea*.

Oyster Culture

Objectives of the oyster culture project include developing marketable products produced from oysters; promoting and marketing the products developed. The Scientific Research Council has responded affirmatively to the request to investigate the development of products using oysters.

Ornamental Fish Production

Ornamental fish production is a blooming area in aquaculture. One of the aims of the Aquaculture Branch is to establish ornamental fish production as a small business enterprise in inner-city communities.

In addition to the ongoing projects of the Division four major sub-projects have been added, namely:

1. Fishing beach infrastructure redevelopment for thirty (30) beaches.
2. Fisheries conservation and rehabilitation which seeks to improve capture fisheries by the rehabilitation of destroyed habitats.
3. Strengthening stakeholder capacity
4. Declaration of ten fish sanctuaries.

4. Legislation and Management Regulations

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) was ratified by Jamaica on March 21, 1983. Subsequently, Jamaica has pursued a consistent policy of updating its laws to ensure full compliance with the provisions of UNCLOS.

The pieces of legislation relevant to the maritime zones and areas of Jamaica are the Maritime Areas Act 1996 and the Exclusive Economic Zone Act 1991. The Maritime Areas Act is an important piece of legislation that has significantly increased Jamaica's jurisdiction over maritime space. The Exclusive Economic Zone Act 1991 established Jamaica's 200 nautical miles EEZ. The enactment of this piece of legislation establishes a maritime regime (about 274,000 km²) that is approximately 25 times the size of the landmass of mainland Jamaica.

The main pieces of legislation presently governing fisheries activities in Jamaica are the Fishing Industry Act 1975, the Fishing Industry Regulations 1976 and the Morant and Pedro Cays Act 1907, administered by the Fisheries Division of the Ministry of Agriculture, and the Aquaculture, Inland, Marine Products and By Products (inspection, licensing and export) Act 1999 administered by the Veterinary Division.

The main pieces of legislation relating to the management of marine fisheries of Jamaica are the Morant and Pedro Cays Act 1907 and the Fishing Industry Act 1975. These laws establish the system of registration and licensing of fishers and fishing vessels.

Several other statutes contain provisions relevant to fisheries. These are the Exclusive Economic Zone Act 1991, Maritime Areas Act 1996, Natural Resources Conservation Authority Act 1991, Beach Control Act 1956, and the Wildlife Protection Act 1945.

LEGISLATION	OBJECTIVE & SCOPE
PRIMARY LEGISLATION	
Fishing Industry Act, 1975 and Fishing Industry Regulation, 1976	licensing and fishing regulation with territorial and archipelagic seas.
OTHER FISHERIES-RELATED LEGISLATION	
Morant and Pedro Cays Act, 1907	licensing of fishers based on offshore banks
Wildlife Protection Act, 1945	prohibit deleterious fishing practises (eg. Dynamite); protection of manatees; turtles etc.
Natural Resource Conservation Act, 1991	management of coastal zone resources
Natural Resource (National Parks) Regulation, 1993	management of marine parks
Exclusive Economic Zone Act, 1991	management of resource outside 12-miles territorial limit
Town and Country Planning Act	mangrove clearance
Beach Control Act, 1945	infrastructure development on beaches; protection of black coral and organisms
Harbours Act, 1971	conduct of vessels at sea
Territorial Sea Act, 1971 The Maritime Areas Act, 1996	declaration of Archipelagic State and territorial seas
The Meat, Meat products and Meat by-products Inspection (Export to specified countries) Act, 1989	export license for seafood and inspection of processing plant

LEGISLATION	OBJECTIVE & SCOPE
INTERNATIONAL CONVENTION & LAWS	
United Nations Conventions on the Law of the Sea (UNCLOS)	<ul style="list-style-type: none"> - legal order for the seas and oceans which will facilitate international communication and will promote the peaceful uses of the seas and oceans - conservation of living resources - the study, protection and preservation of the marine environment - navigational rights, territorial sea limits, economic jurisdiction, legal status of resources on the sea-bed beyond limits of national jurisdiction
Caribbean Community CARICOM, 1973	<ul style="list-style-type: none"> - economic integration (Caribbean Common Market) - co-operation in non-economic areas and operation of certain common services - co-ordination of foreign policies of independent member states
Conservation and Management of Straddling Fish Stocks and highly Migratory Fish Stocks	<ul style="list-style-type: none"> - part of the implementation of the provisions of the UNCLOS
Convention on Biological Diversity, 1992	<ul style="list-style-type: none"> - conserve bio-diversity - promote the sustainable use of its component - encourage equitable sharing of the benefits arising out of the utilization of genetic resources

NATIONAL REPORT OF ST. KITTS AND NEVIS



Legend

- 1...Basseterre East
- 2...Basseterre West
- 3...Old Road

- 5...Dieppe Bay
- 6...Charlestown
- 7...Jessups
- 8...Cotton Ground
- 9...Jones Bay

- 11. Long Haul
- 12. Indian Castle

1. Country Profile

Geography	People
<p>Location: See map on page two</p> <p>Area: 261 km²</p> <p>Coastline: 135 km</p> <p>Maritime claims:</p> <p>EEZ: 200 nm;</p> <p>Territorial sea: 12 nm</p> <p>International disputes: none</p> <p>Climate: subtropical tempered by constant sea breezes; little seasonal temperature variation; rainy season (May to November)</p> <p>Terrain: volcanic with mountainous interiors</p> <p>Natural resources: negligible</p> <p>Environment: subject to hurricanes (June to November)</p>	<p>Population: 38, 958 (July 2005 est.);</p> <p>Growth rate: 0.38 % (2005 est.)</p> <p>Ethnic divisions: Predominantly Black, some British, Portuguese, and Lebanese</p> <p>Languages: English</p> <p>Literacy: 97%</p> <p>Labour force: 18, 172 (June 1995)</p>

% GDP Constant

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1.29	1.43	1.55	1.40	1.73	1.86	2.59	4.20	4.68	

2. Fisheries Development: St. Kitts Agricultural Development Strategy 2007 - 2011

The program for fisheries development seeks to transform the industry, during the next five years, from a largely artisanal one to a more modern one in which improved technology and management systems are incorporated. It seeks to achieve the following:

1. A better organized fishing sector that is technology driven and commercially oriented
2. Production increase of approximately 25% over the five year period from 414,495 kg to 518,105 kg
3. Development of a fledging agricultural sector to achieve a production target of approximately 5,000 kg per annum
4. A reduction of imported fish
5. Greater price stability for fish in the local market

The strategy to achieve the above targets will be based on the following actions:

1. Construction of improved landing and storage facilities in existing fishing areas.
2. Adopt modern technologies in fish production.

3. Support capacity building in order to better manage fishery stocks, development of new resources and the adoption of modern technology.
4. Support the use of better equipped and larger fishing vessels to exploit the sea resources.

3. Description of Fisheries

3.1 Landing Sites: 11 on St. Kitts and 8 on Nevis

There are eleven landings sites on St. Kitts and eight on Nevis. On St. Kitts there are five major sites which account for nearly 70% of the total of the vessels in the Federation. Some of these sites are characterized by their major or unique fishing activity. For example, most conchs are landed at East Basseterre, the location of the Basseterre Fisheries Complex. Old Road is known for their coastal pelagics, like jacks, ballyhoo and gars, while Dieppe Bay is famous for lobster landings and boats from Nevis that bring their catch to St. Kitts do so by using the West Basseterre landing site. The largest landing area in Nevis is adjacent to the Fisheries Complex in Charlestown. This facility provides gear and equipment, ice and walk-in freezers, outboard motor repairs, fish processing, and stalls for marketing the fish.

3.2 Fishermen

679 on St. Kitts (about < 30 % full-time); 300 on Nevis (about 70% full-time).

4. Fisheries Management

4.1 Coastal zone management

Consideration is being given to the creation of a Marine Areas Management system for St. Kitts and Nevis. This will comprise of Marine reserves, Fishing Priority areas and other areas that allow all of the users of these resources to do so in a responsible, organized and sustainable way.

4.2 Fisheries Legislation

Primary legislation:

- *The Fisheries Act* (1984) and the Fisheries regulations (1995).

The Fisheries Act (1984) covers the establishment of a Fisheries Advisory Committee (FAC), fisheries access agreements, local and foreign fishing licensing, fish processing establishments, fisheries research, fisheries enforcement and the registration of fishing vessels. Also, the Act specifies conservation measures such as prohibiting the use of any explosive, poison or other noxious substance for the purpose of killing, stunning, disabling, or catching fish; closed seasons, gear restrictions, creation of marine reserves.

4.3 Department Vision

To provide employment opportunities within the Fisheries sector, while ensuring that all of the fish and fishery products that are available for local consumption and export, are obtained while practicing conservation measures that will protect their sustainability.

4.4 Fisheries Enforcement

Objective - Promote compliance with Fisheries Regulations

Focus - Fishing vessels inspection, monitoring and registration, regulation enforcement

4.5 Fisheries Extension

Objective - To promote co-management and the exchange of ideas and technical information between all stakeholders.

Focus - Fisher and Cooperatives development.

5. Research and Development

Objective - To promote activities and services that will enhance Fisheries Development.

Focus - Development of public awareness programs and coordination of research activities.

5.1 Basseterre & Old Road Fisheries Complexes

In January 2003, the Basseterre Fisheries Complex (BFC) commenced operation. February of 2007 also saw the commencement of the operation of the Old Road Fisheries Complex. Both of these complexes have contributed major developments in the Fisheries sector. With these new developments, many opportunities and benefits have been created for fishers and the general public. The Department of fisheries has as its main aim “To provide technical and other services that will lead towards optimizing the management of fishery resources in a sustainable manner”

Objective - To stimulate fisheries development in order to attain broader economic and nutritional benefit and improve balance of payments through reduced fish imports.

Focus - Improved production through improved marketing facilities; and improved quality through improved product handling.

6. Fishery Organizations

- Sandy Point Fishermen Cooperative Society (St. Kitts)
- Old Road Fishermen Marketing Supplies Cooperative Society (St. Kitts)
- Dieppe Bay Fishermen Cooperative Society (St. Kitts)
- Nevis Fishermen's Marketing and Supplies Cooperative Society (Nevis)

6.1 Description of Department Core Business

List of Department's Clients & Beneficiaries

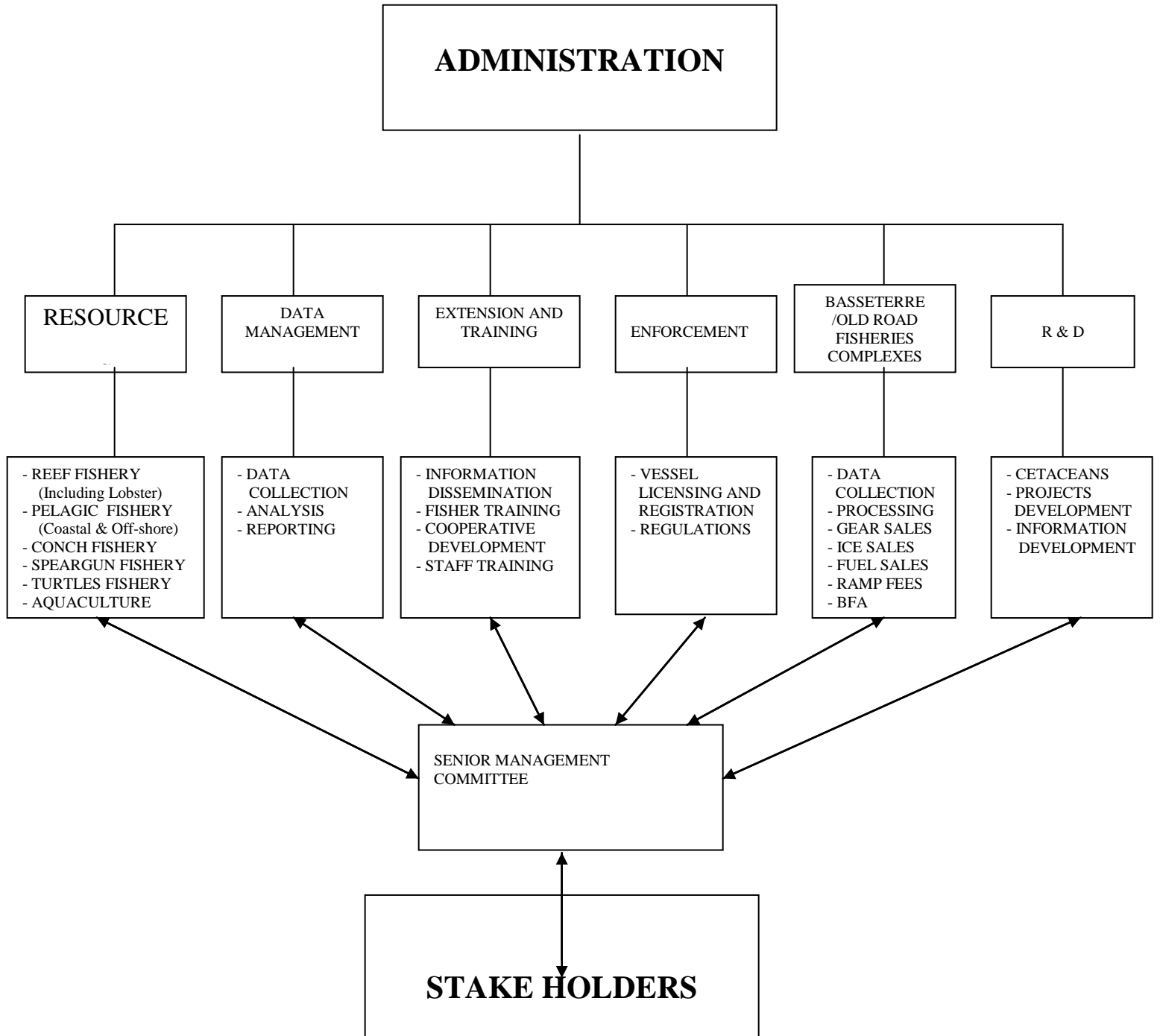
Fishers
Vendors
General public
Fisher's organizations
Caribbean Regional Fisheries Mechanism
St. Christopher Heritage Society
JICA

List of Department's Partners

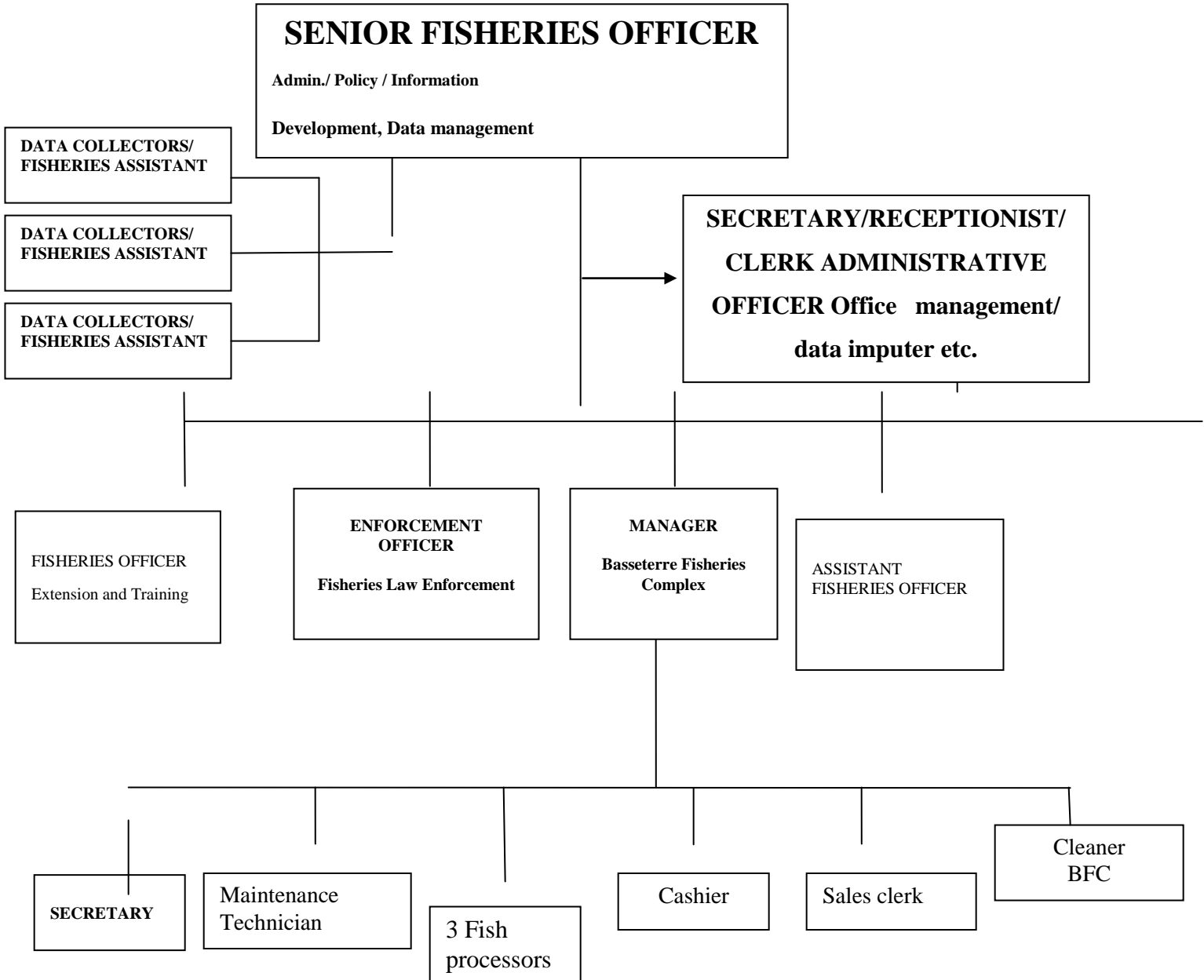
- *Customs and Excise* - control of seafood imports/export.
- *Physical Planning Unit* - management and development of the coastal zone around Nevis.
- *Department of Cooperative* - support and administration for the cooperatives.

6.2 Organizational Structure - Department of Fisheries

OPERATIONAL FRAMEWORK (current)



STRUCTURE



7. Programs – Resources Management

7.1 Coastal Pelagic Fishery

Catches of pelagics are seasonal. Larger pelagics are harvested by commercial and sport fishermen mainly by trolling during the months of January to June. The commercial fishery is conducted by about 25 fishers using fifteen vessels, outfitted with trolling hooks and lines. Most vessels have a crew of 2 to 3 including the captain. Trolling lines are normally 80 – 100 lbs test with a single hook. Artificial lures are sometimes used, especially for the tuna and mackerel. Fishers prefer to use ballyhoo or flying fish to catch dolphin fish. Some fishers have been using Fish Aggregation Devices (FADs) in conjunction with long lines to catch yellow fin tunas.

An unknown quantity of large pelagics is caught illegally by foreign vessels in the waters of St. Kitts and Nevis. Nevis is instituting a fishing tournament targeting mainly Wahoo.

Objective - Promote the positive aspects of the traditional nature of this fishery and encourage new entrants.

Focus - Enforcement of fisheries regulations.

Data

Year	1999	2000	2001	2002
Qty (lbs)	225,950	250,740	243,390	289,740
Value EC\$	1,280,830	1,361,161	1,092,370	1,491,580

Year	2003	2004	2005	2006
Qty (lbs)	222,510	295,340	229,063	194,000
Value EC\$	1,391,950	1,548,020	1,603,441	1,350,000

Year	2007	2008	2009	
Qty (lbs)	82679	354,120	51850	
Value EC\$	661,432	916,715	515,180	

7.2 In-Shore Pelagic Fishery

Fish are mostly caught by seines used on the beach. Seining is discouraged in Nevis because of the damage to the bottom and coral reefs. Gill nets (fixed or drifting) are used sometimes for catching jacks. Cast nets are also used along the beach. Fish are sold fresh at the landing sites by fishermen or by vendors. Market demand may limit catches at certain times. In-shore pelagics are also used as bait in long line, trolling and trap fisheries.

Approximately seven vessels using seine nets are involved in the fishery and approximately 30 persons are employed in this fishery.

Objectives – (i) Increase landings; (ii) Increase use of Fish Aggregating Devices (FAD)

Main Focus – (i) Catch handling and preservation; (ii) Availability of gear

Data

Year	1999	2000	2001	2002
Qty (lbs)	49,270	63,500	67,250	95,890
Value EC\$	348,225	438,250	461,070	671,230

Year	2003	2004	2005	2006
Qty (lbs)	49,040	100,090	107,376	49,170
Value EC\$	378,030	571,300	859,008	393,360

Year	2007	2008	2009
Qty (lbs)	185,782	145,673	94440
Value EC\$	1,300,474	966,352	560,160

7.3 Reef Fishery

These species are taken with traps, hand lines, gill nets and spear guns and are fished at various depths throughout the extensive shelf area. The quality of the catch ranges from miscellaneous reef fish (more commonly taken in shallow areas) to snappers and groupers (more commonly taken in deeper areas). Because of the high local demand for reef fish of any size, the fishery is susceptible to overfishing.

At most locations demersals are fished from small open boats, but a few larger boats (29 -45 ft) now specialize in deep-water line fishing for snapper and groupers. In the past traps were only baited to catch lobster, however recently traps are baited to catch a variety of fish.

In Nevis, Antillean Z-traps of various sizes are mainly used as are rectangular and arrowhead traps in St. Kitts. Fishermen haul their traps 2-3 times a week, and may haul 25-45 traps each trip. Often traps (pots) are set without buoys to reduce pot stealing which accentuates the problem of ghost fishing by lost traps.

Objective - Promote stock recovery.

Focus – (i) Reduction in landing of juvenile species; (ii) Regulation enforcement and conservation measures.

Data

Year	1999	2000	2001	2002
Qty (lbs)	199,850	122,150	337,210	295,570
Value EC\$	1,609,810	874,970	2,071,820	2,173,030

Year	2003	2004	2005	2006
Qty (lbs)	289,010	386,070	298,097	221,740
Value EC\$	2,274,490	3,174,930	2,640,653	1,914,370

Year	2007	2008	2009
Qty (lbs)	180,744	172,365	199,644
Value EC\$	1,514,292	15030	1,981,622

7.4 Lobster Fishery

The lobster is part of the reef fishery, but has been separated by management due to its importance to the economy and very long life cycle. Lobsters are taken in the same traps that catch reef fish and to a lesser extent by divers. Lobsters are usually caught in small numbers and stored in holding cages until they are sold. Most of the catch is exported but sales to local restaurants and hotels are increasing. Lobster populations are considered to be over-exploited in near shore areas. Fishermen report increasing scarcity in a number of areas in St. Kitts.

Objective - Promote stock recovery.

Focus – (i) Control the landing of and exportation of juveniles and lobsters with eggs; (ii) Regulation enforcement.

Data

Year	1999	2000	2001	2002
Qty. (lbs)	32,090	11,850	33,790	21,180
Value EC\$	385,080	142,200	405,480	254,160

Year	2003	2004	2005	2006
Qty. (lbs)	5,440	8,430	57,890	28,970
Value EC\$	68,280	101,160	694,680	347,640

Note! Lobster data 2003 incomplete

Year	2007	2008	2009
Qty. (lbs)	21,378	26,960	47,850
Value EC\$	256,536	363,960	588,530

7.5 Conch Fishery

This fishery is carried out by SCUBA and free divers usually over sea grass beds and coral rubble, with some fishers operating without permits and other being uncertified divers. The majority of the fishing is undertaken from small wooden open fishing boats with an average length of 5 m with motors ranging from 25 to 40 HP. Each boat fishes with approximately three persons. Conch populations are considered to be heavily exploited within the Federation especially on the leeward side of the islands. However, conch are beginning to reappear in near shore areas in response to the concentration of fishing effort in deeper waters and the slowdown in exports to EU markets.

Objective - Promote stock recovery.

Focus - (i) Education and certification of conch divers; (ii) Preparing industry to deal with international requirements (HACCP).

Data

Year	1999	2000	2001	2002
Qty. (lbs)	45,980	67,960	102,620	78,670
Value EC\$	275,880	407,760	718,340	550,690

Year	2003	2004	2005	2006
Qty. (lbs)	96,550	136,670	263,220	120,230
Value EC\$	675,850	716,520	1,843,240	841,400

Year	2007	2008	2009
Qty. (lbs)	148,066	94,597	107,970
Value EC\$	1,036,462	756,776	863,760

7.6 Turtle Fishery

Objective - Rehabilitate turtle populations.

Focus - Activities relating to sand mining, beach front lighting, regulation enforcement.

8. Data Management

The departments of Fisheries on both islands have the same method of data collection and analysis which is based upon the CARICOM region data systems CARIFIS.

Objective - To develop and implement systems for proper fisheries information collection, analysis and reporting.

Focus - Continuation and improvement of the CARIFIS Data Collection Program.

Data

(Registered Boats and Fishers and boats)

Year	1999	2000	2001	2002
Boats	224	287	287	303
Fishers	309	338	373	450

Year	2003	2004	2005	2006
Boats			361	385
Fishers	477	490	501	542

Year	2007	2008	2009
Boats	396	414	439
Fishers	600	634	679

9. Aquaculture

Currently there is only one aquaculture project. This project is privately owned and the owner is experimenting with the growing of tilapia in ponds near the ocean, using seawater. This project began in 1999 as a challenge, after learning that a fisherman in Jamaica caught a tilapia in his seine net. SNAPPER, which is a private entity run and coordinated by Dr. Barrington Brown, has made positive strides through its 9 years of existence.

The Department of Fisheries has attached an officer to the SNAPPER program. Together Mr. Brown and Assistant Fisheries Officer, Sam Heyliger, have made a positive impact in the production of snappers and tilapia. A major development of SNAPPER was the transfer from brackish water to 100% Atlantic salt water where tilapia is reared from fry stage to grow out stages.

Within the area of aquaculture, Ross University of Veterinary Medicine has expressed an interest in assisting with the development of SNAPPER in providing some pathological analyses of sick and dying fish. SNAPPER is now established as a research development and implementation entity.

In upcoming years aquaculture will be a very vital and important area in our fisheries sector due to the fact that aquaculture reduces pressure on our marine resources.

Project Objective (Benefits)

- the removal of an aversion to fresh or brackish water fish;
- the introduction of the first sustainable enterprise which encompasses food security and embraces food safety (zero possibility of fish poisoning); and
- provide viable hands-on training and employment in aquacultural skills for unemployed residents of the project and other geographic areas demonstrate acceptable and effective Environmental Management of the coastal area

9.1 Summary of Challenges and suggested Solutions

Aquaculture

Challenges

- St Kitts is devoid of suitable and substantial running rivers and sealing clay deposits
- Freshwater ponds
- Lakes
- Streams
- Cheap underground water sources
- Other freshwater fish friendly water sources
- These were the initial limitations to be addressed
- Slow development of aquaculture
- Obtaining funding
- No Aquaculture Policy
- SNAPPER being a private entity

Solution

- Obtain an approved Aquaculture policy. This will guide the decisions on matters involving aquaculture.

- SNAPPER become a “joint venture between Government and the Project” or a non-profit organization of persons interested in aquaculture. This will open new areas for “grant” funding.

Objectives – (i) Encourage Aquaculture production as a viable production enhancement method; (ii) SNAPPER become a “joint venture between Government.

Focus – (i) Provision of technical assistance and information; (ii) Improving funding and aiding

Presently there are no policies and practical measures taken for marine farming for stock enhancement in St. Kitts and Nevis.

9.2 Research and training

Research is been conducted on the potential of Shell Fish Aquaculture in St. Kitts and Nevis.

The activity is basically a joint venture with St. Kitts Fisheries Department and Ross University School of Veterinary Medicine. Head of operation is John Brake, Marine Biologist.

10. Roles and duties of the Fisheries Department

- To maximize the development of the fishery sector.
- To maintain or restore populations of marine species at levels that can produce the optimal sustainable yields
- To ensure effective monitoring and enforcement with respect to fishing activities.
- To protect and restore any endangered or threatened marine species.
- Provide extension services and training to the Fisheries sector
- Promote sustainable fishing practices
- Provide effective monitoring, control and surveillance
- Promote stakeholder participation in Fisheries management
- Develop work plans
- Provide advice on Fisheries management and development
- Provide technical and other assistance to fishers
- Facilitate and support activities of Fishers organizations
- Provide facilities where fishers can market their catch
- Provide fresh, processed fish for sale to the general public and hotels, restaurants etc.

11. Problems Facing Fisheries

- Inadequate monitoring, surveillance and law enforcement
- Lack of ability to assess stocks
- No inland fishery
- Illegal fishing from foreign vessels
- Overfishing in the reef and bank / deep slope fishery
- Exploitation of the parrot fish

11.1 Activity in tackling problem

- Determine the status of the fish stocks being fished
- Review data collection and management programme.

- Establish target and limit reference points for the fish stocks being fished.
- Continue to introduce fishers to the use of appropriate fishing technologies for catching fish.
- Promote stock recovery by reduction in landing of juvenile species
- Regulation, enforcement and conservation measures
- Adopt modern technologies in fish production
- Encourage the continued development of aquaculture, particularly of tilapia and shrimp
- Conduct research on the life cycle of conch and lobster and formulate measures for conservation
- Implement survey(s) of the marine stocks to assess the potential for future fisheries development

NATIONAL REPORT OF SAINT LUCIA

Prepared by the Department of Fisheries

This report has been updated from earlier versions prepared for previous annual CRFM Scientific Meetings. As such it has benefited from the input of a number of past and present staff of the Department of Fisheries, including: Williana B. Joseph, Patricia Hubert-Medar, Sarita Williams-Peter, Allena Joseph, Yvonne Edwin, Nansha Medard, Kate St Mark.

1. Overview of the Saint Lucia Fisheries Sector

Introduction

Saint Lucia, an independent island state, in the Eastern Caribbean, is approximately 539 km² in area and lies between latitude 13° and 14° north and longitude 60° and 61° west. With a population of 160 620 (Statistics Department, 2003), Saint Lucia enjoys a tropical climate moderated by the northeast Trade Winds. Nearshore fishing takes place along the coastline, which extends for 158 km. The island has a narrow coastal shelf area of 522 km² and a total Economic Exclusive Zone (EEZ) of 4700 km² (Statistics Department, 2003). The western coast is characterized by a narrow, steep, insular shelf in contrast to the eastern coast, which has a fairly extensive, less steep, insular shelf. The southern coast has a wider shelf area extending southwards. Similar to other islands of the Lesser Antilles, two water bodies wash its shores, the Atlantic Ocean on the east and the Caribbean Sea on the west. The marine habitat comprises the full range of tropical marine and coastal habitats including estuaries, mangroves, lagoons, sea grass beds, fringing, patch and barrier reefs, slopes off the island platform, deep bank reefs and open oceans. Nearshore, at depths between 30 m and 80 m on the outer island shelf, are submerged Holocene or early Pleistocene reefs (Mahon, 1990). Two important fishing banks with a total shelf area of 14 km² are located a few miles south and northeast within the 200-m depth contour.



The Ministry of Agriculture, Lands, Forestry and Fisheries, through its Department of Fisheries, is responsible for the management and development of the fisheries sector. It works with a range of other government agencies and non-government organisations and institutions, including fisher cooperatives which are based in most fishing communities.

The Government of Saint Lucia is committed to the conservation and sustainable use of its fisheries resources for the long-term benefit of the people of Saint Lucia.

2. Fisheries Management Objectives

- To contribute to the attainment of self-sufficiency and food security.
- To sustainably optimise the net incomes of the fishers and the communities involved in fisheries, and related economic activities.
- To sustainably optimise employment opportunities for those dependent on fisheries and aquaculture for their livelihoods.
- To maintain or restore populations of marine and freshwater species at levels that can produce optimum sustainable yields.
- To preserve rare or fragile ecosystems, as well as habitats and other ecologically sensitive areas, especially mangrove forests, sea grass beds, reefs and other spawning and nursery areas.
- To sustainably optimise the amount of fish protein available for domestic consumption.
- To improve on fisheries infrastructure and promote the use of appropriate fishing technologies with a view to sustainably optimise catch.

3. Description of the Fishery

The fisheries resources of Saint Lucia comprise demersal, coastal pelagic and offshore pelagic fisheries. Although there is some year-to-year variability among these resources in terms of time, the fishing year of Saint Lucia can be divided into two main seasons: a “high” season that extends from December to May when significant landings of offshore migratory pelagics occur and a “low” season that extends from June to November when relatively large quantities of demersal fishes are landed. However, the main “pot-fishing” season extends from June to February.

The offshore pelagic fishery contributed approximately 62% of the annual landings by weight for the period 2009 (Department of Fisheries, 2009) which is made up of a number of migratory species including dolphinfish (*Coryphaena hippurus*); mackerel (*Stromberomorus* spp.); Wahoo (*Acanthocybium solandri*); blackfin tuna (*Thunnus atlanticus*); yellowfin tuna (*Thunnus albacares*); Skipjack tuna (*Katsuwonus pelamis*); sharks (various families); billfishes (Istiophoridae, Xiphiidae) and flying fish (*Hirundichthys affinis*) (Figure 1).

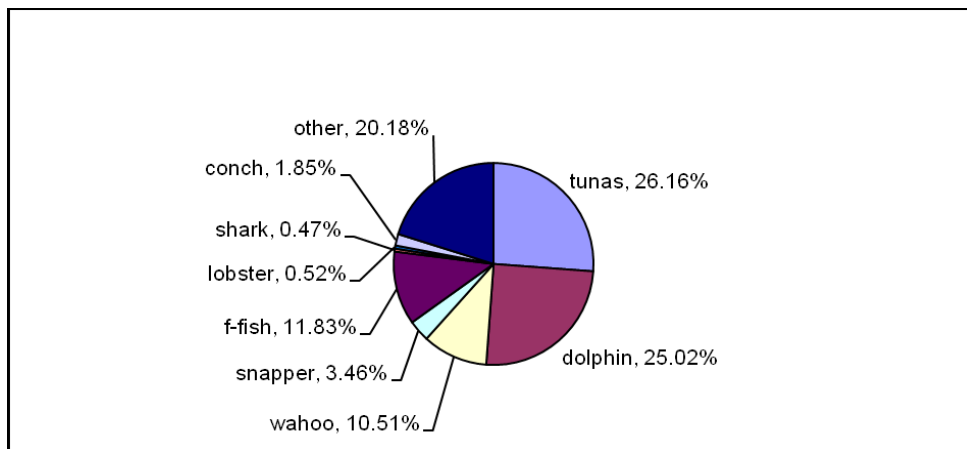


Figure 1: Percentage of landings for different families 2009.

The coastal pelagic fishery comprises of an array of species including: ballyhoo (Hemiramphidae spp.); barracudas (Sphyraenidae spp.); herrings (Clupeidae spp.); jacks (Carangidae spp.); mackerels (*Decapterus macarellus*); needlefishes (Belonidae spp.).

The demersal fishery lands the most highly priced and valuable species for the local, tourism and export sectors which includes: 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 decreased over the years. The decreased landing trends observed in the demersal fishery can be attributed to the increased pressure on the offshore fishery during this period and possibly the movement of some fishers into the tourism industry.

Overview of Vessel Fleet

The Department's vessel fleet range from 3-25m and are powered by engines ranging from 5hp – 350hp. On average, vessels engaged in the fishery are 8m long and are propelled mainly by 75 horse power outboard engines.

The Department of Fisheries' database comprises of 600 registered fishing vessels (Department of Fisheries, 2009). Notably, in 2008, the Department undertook a verification exercise to clear the system of non-existing and decommissioned vessels. Additionally, in 2002, the fishing vessel fleet was reclassified under the following categories: canoes, pirogue, transom, shaloo, whaler, longliner and other. Table 1 below illustrates the fleet categories that are presently used and the vessel figures as of December 31, 2009.

Table 1: Fishing Vessel Fleet for Saint Lucia for the period ending December 31, 2009.

Vessel Category	Canoe	Pirogue	Transom	Shaloo	Whaler	Longliner	Other	Total
Total	86	448	37	14	3	8	4	600

Over the years, fibreglass reinforced pirogues (FRP) have been gradually replacing the traditional canoes. According to the Department of Fisheries' Licensing and Registration database, whereas the traditional canoe fleet represented 36.8% of the total fishing fleet in 2000, it was represented by 14.5% in 2009. However, the FRP represented 45.3% of the total fishing fleet in 2000 while it was increased to approximately 75% in 2009. Therefore, it is evident that there has been an inverse relationship between the traditional canoes and the FRP.

It is worth noting that, due to the multi-species nature of the fishery in Saint Lucia, fishing vessels are generally equipped with the following gear types: trolling lines; flying fish nets; longlines (palangres); gillnets; handlines; and fishpots (traps).

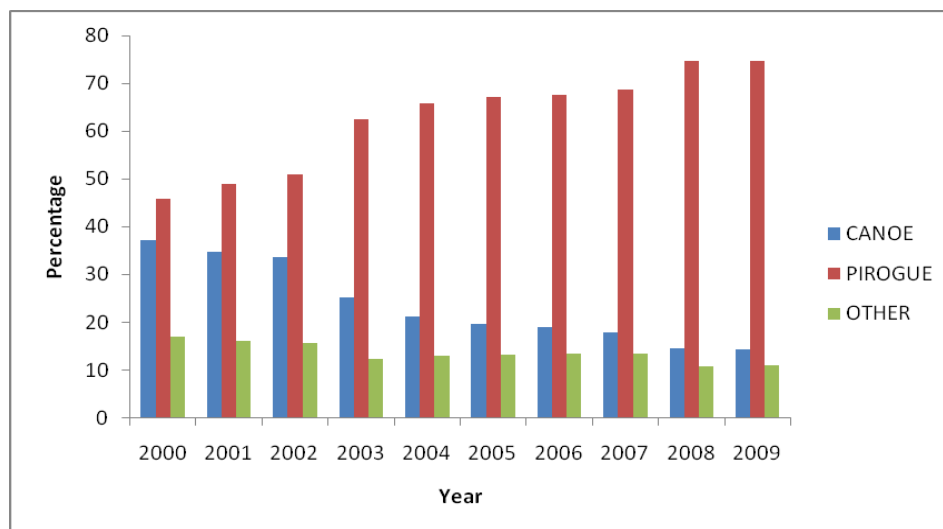


Figure 2: Percentage of registered canoes and pirogues from 2000- 2009

Fisheries Statistics and Sampling Plan

The catch and effort sampling plan is based on a stratified random sampling regime of three major strata: primary, secondary and tertiary landing sites. This classification is based on the number of vessels operating at the site, the fishery types and the volume of fish being landed.

The island's fishery operates out of 22 landing sites. Nonetheless, catch and effort data is collected from ten landing sites. These sampled sites include: Anse La Raye, Banannes, Gros Islet, Castries, Soufriere, Choiseul, Vieux Fort, Micoud, Laborie and Dennery (Table 2). Data is collected for every other returning vessel for fifteen randomly selected days of each month.

Information such as area fished, species caught, gear used, hours fished, and total vessels out are recorded and submitted monthly to the Department of Fisheries. In addition, since the island's coastal waters are divided into two fishing zones for offshore pelagic and three fishing zones for nearshore and bank species, the fishers are asked which zone or zones that they fished from and this information is also noted.

Table 2. Fish landing sites and their category

Site	Category	Site	Category
<i>Anse la Raye</i>	S	Marigot	NS
Banannes	S	Marisule	NS
Canaries	NS	Micoud	S
Castries	S	Monchy	NS
Choiseul	S	Praslin	NS
Cul De Sac	NS	River Doree	NS
Dennery	S	Roseau	NS
Gros Islet	S	Savannes Bay	NS
Laborie	S	Soufriere	S
Other minor sites in Vieux Fort area	NS	Vieux Fort	S

S = Sample site

NS = Non sample site

Lobster Fishery

Introduction

Panulirus argus is the most commercially important of the three *Panulirus* species (*P. argus*, *P. guttatus* and *P. laevis*). However, *P. guttatus* is protected from commercial exploitation since it rarely attains the legal size limit of 95 mm. The majority of Caribbean lobster landings come from traps that are set at depths in excess of 30 m (Luckhurst & Auil-Marshalleck, 1995). However, a more recent research study indicated that traps were set with a 5-50m depth. Previously, lobsters were fished with trammel nets that are now banned from the island fishery; nevertheless, they are still used illegally on a small scale. Caribbean spiny lobsters are also illegally fished with spearguns by recreational fishers.

It is economically significant to sustain the livelihood of pot fishers of coastal communities, particularly during the low period, since there is not much opportunity for alternative employment. It is regulated with a seven-month fishing season, extending from August 2 to February 28 or February 29 every leap year both days inclusive.

The management objective for the lobster fishery is to rebuild the stocks and to ensure sustainable use of the fishery resources.

Trends in landings during 1995- 2009

Table 3 below, gives a comparison of the annual total landings with that of the lobster landings (*P. argus*) between 1995 to 2009. Lobster recorded an average annual production of 17.6 tons whilst the total annual landing recorded 1555 tons during that period 1995 – 2009. Notably, lobsters contribute approximately 1% to the total fish landings data (Table 3). After the observed peak in 2001 lobster landings have generally decreased and the majority of lobster landings occur during the first four months of the open season.

Table 3: Lobster landings (tons) from 1995- 2009

Year	Total Fish Landings (tons)	Total Lobster Landed (tons)
1995	981	13
1996	1315	13
1997	1311	13
1998	1461	32
1999	1718	30
2000	1860	24.9
2001	1967	36.1
2002	1608	9.52
2003	1447	23.37
2004	1520	10.6
2005	1386	15.35
2006	1440	9.36
2007	1509	12.66
2008	1810	12.64
2009	1856	9.63
Average	1546	17.6

(Source: Department of Fisheries, 2009)

Fisheries legislation and regulations

The primary legislation governing management of the lobster fishery are the Fisheries Regulations No. 9 of 1994. Under these regulations, it is illegal to harm or have in one's possession any lobster that is undersized, carrying eggs, or moulting. It is also illegal to spear, hook a lobster, or remove the eggs from a lobster. In 2001, the Department of Fisheries with assistance from FAO, embarked on an initiative to review and revise the existing fisheries legislation. The following are proposed amendments regarding lobster management:

I No person shall:

- *Attempt to catch or catch lobster with the use of SCUBA and/or Hookah*
- *Keep any lobster confined to a holding pot during the closed season; and*
- *Disturb, damage, take from the fishery waters, have in his possession, purchase, import, expose for sale, or sell any lobster from the 1st day of March to the 1st day of August in every year, or during a closed season as declared by the Minister by notice published in the Gazette and in a newspaper which is printed or circulated in the State.*

II All establishments engaged in the sale and trade of lobsters and their products shall declare their lobster stocks to the Department of Fisheries by mid March of every year. All establishments engaged in the sale or trade of lobster shall dispose of all lobsters within one month from the allocated close season.

Conch Fishery

The Queen conch, *Strombus gigas* (Linnaeus, 1758) is one of the single species nearshore fisheries of Saint Lucia. Presently, nearshore stocks have been over exploited, resulting in the exploitation at deeper depths with the use of SCUBA gear. Although this species is thought to be distributed around the island, only two significant populations have been identified, one to the north and the other to the south of the island (Nichols & Jennings-Clark, 1994). Information obtained from a survey of vessels targeting conch resources which was conducted in 2003, indicated that divers harvest conch regularly from various areas off Cas en Bas, Esperance, Grand Anse, Gros Islet, Mennard and Marisule in the north; Vieux Fort and Caille Bleu in the south; and Dennery on the east coast. The report also indicated that conch vessels target, on average, three areas on a rotational basis and were mainly landed at two landing sites: Gros Islet, located at the north of the island; and Laborie on the south west coast. Moreover, conch is more heavily targeted in the north of the island than the south (Joseph, 2003).

Conch is exploited commercially all year by over 40 fishers in depths ranging from 11 m to 43 m and fishers operate mainly out of fibreglass pirogues ranging in length from 7.02 m – 8.45 m which are powered by outboard engines of 115 – 250 hp. Joseph (2003) reported that whilst conch are targeted commercially by some fishers throughout the year, other fishers focus their efforts on this resource during the low period for “offshore” pelagic species, for an average of five months. While most conch fishers undertake more than three dives a week and land an average of 300 conch per trip, the number of conch landed per trip is dependent on the number of divers and the number of dives undertaken during a trip, and can range from 100 - 500 conch (Joseph 2003). Joseph (2003) further indicates that two divers enter the water per trip and each diver undertakes between three to four dives (inclusive of decompression dive). However, subsistence exploitation occurs in shallower areas, but the extent is unknown.

The management objective for the fishery is to rebuild the conch stocks, especially nearshore and to ensure sustainable use of the resource.

Trends in landings during 1995-2009

Table 4 gives an indication of the annual production of Queen Conch between 1995 and 2009 which shows an average annual production of 36.6 tons during that period. Although conch does not contribute significantly to the total landings (Table 4), this fishery is economically significant to the livelihood of fishers, particularly in Gros Islet where the highest landings of conch are recorded.

Table 4: Landings (tons) of conch from 1995 to 2009

Year	Total Fish Landings (tons)	Total Conch Landed (tons)
1995	981	31.9
1996	1315	26.8
1997	1311	24.5
1998	1461	28.2
1999	1718	33.3
2000	1860	40.3
2001	1967	41.4
2002	1608	60.4
2003	1447	47.5
2004	1520	45.6
2005	1386	42
2006	1440	34.7
2007	1509	18.2
2008	1809	39.8
2009	1856	34.39
Average	1546	36.6

(Source: Department of Fisheries, 2009)

Fisheries legislation and regulations

The Fisheries Regulations No. 9 of 1994 provide the mandate for the management of the conch fishery at the national level by prohibiting the harvesting of conch of less than 180 mm total shell length, less than 1 kg total weight and less than 280 g meat weight, not including digestive glands. In addition, these Regulations restrict harvesting of immature conch, defined as individuals without a flared lip. However due to financial and manpower limitations, enforcement focuses on only one of these Regulations - the harvesting of individuals with flared lips due to the ease of implementation in the field. The Fisheries Regulations also make provisions for a closed season but, to date, this management measure has not been implemented.

The Department of Fisheries with assistance from the Food and Agriculture Organization (FAO) has embarked on an initiative to review the fisheries legislation. The following are amendments regarding conch in the proposed revised fisheries legislation:

- (1) *No person shall -*
 - I. *take from the fishery waters, sell, purchase, or at any time have in his possession any immature conch; or*
 - II *take from the fishery waters, expose for sale, purchase or at any time have in his possession any conch during the closed season for conch or taken from a closed*

area for conch as specified by the Minister by notice published in the Gazette and in a newspaper which is printed or circulated in the State

III. take from the fishery waters, have on board any fishing vessel or land any conch out of its shell.

(2) In this Regulation -

- “conch” includes the whole or any part of any conch;
- “immature conch” means a conch with -
 - a shell with a lip thickness of less than 5 millimetres;
 - a total weight of less than one kilogramme or
 - a shell which does not have a flared lip.

Large Pelagic Fishery

This fishery, like the other fisheries in Saint Lucia, is primarily conducted from fibreglass open pirogue boats, with trolling lines operated by hand. The offshore pelagic fisheries contributed to just over 75% of the total annual fish landings by weight (Department of Fisheries, 2009) which is made up of a number of migratory species such as dolphinfish (*Coryphaena hippurus*); mackerel (*Stromberomorus* spp.); Wahoo (*Acanthocybium solandri*); blackfin tuna (*Thunnus atlanticus*); yellowfin tuna (*Thunnus albacares*); Skipjack tuna (*Katsuwonus pelamis*); sharks (various families).

The catch is highly seasonal, with the majority of activity and landings occurring between December and June, but peaking between January and April each year. This fishery is active at all landings sites, but is more prominent at Dennery located to the east and Vieux Fort in the south of the island. The offshore pelagic fishery through the introduction of new fishing technologies such as the Fish Aggregating Device (FADs) and new fishing techniques such as longlining has contributed to increasing landings.

Unlike the near shore fisheries, such as lobster and conch, which are regulated at the national level under the Fisheries Act No.10 of 1984 and the Fisheries Regulations No. 9 of 1994, the pelagic fishery is currently not regulated. The management objectives for this fishery, as outlined in the Fisheries Management Plan of 2006, include:

- The promotion of the sustainable development of the commercial and sport fisheries for large pelagic species;
- Cooperation with other Caribbean States to manage the large pelagic resources

The landings trends for large pelagics have remained progressive over the last few years. Additionally, over the period 1995 – 2009, the large pelagic fishery accounted for an average of 64% of the total fish landings (Table 5).

Table 5: Large Pelagic Landings (tons) from 1995-2009

Year	Total Fish Landings (tons)	Total Large Pelagic Landings (tons)
1995	981	594
1996	1315	872
1997	1311	928
1998	1461	870
1999	1718	1227
2000	1860	1277
2001	1967	1082

2002	1608	975
2003	1447	918
2004	1520	1053
2005	1386	844
2006	1440	986
2007	1509	1056
2008	1809	1021
2009	1856	1145
Average	1546	989.9

(Source: Department of Fisheries 2009)

Figure 3 below indicates that large pelagics has contributed to the largest proportion of total landings and reflects a fairly steady increase over the years. This increasing trend in pelagic landings may be contributed to the efforts undertaken by the Department of Fisheries to promote the fishery as an alternative to the near shore fishery and the increased use of Fish Aggregating Devices (FADs).

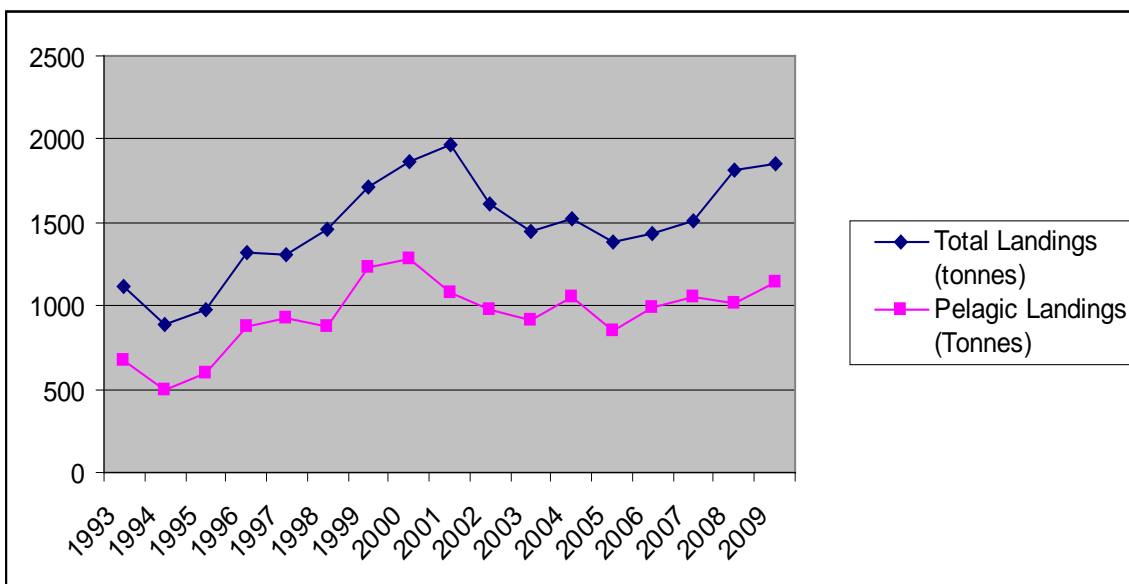


Figure 3: Proportion of large pelagics that contributed to the total landings between 1993- 2009

4. Fisheries Policy and Regulations

The primary legislation governing management of the island's marine resources is 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, closed seasons and creation of marine reserves. A list of relevant fisheries related legal instruments is given in Annex 1. 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, 2006). 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. At present the legislation is at the Attorney's General Office for review.

Other Fisheries-related Legislation:

- *Forest, Soil and Water Conservation Ordinance* (1945): controls use of mangroves.
- *Crown Lands Ordinance* (1946): established the Crown Land Committee to review and make recommendations on the allocations/use of crown lands.
- *The Minerals Vesting Act* (1966): deals with the exploitation of minerals.
- *Land Development (Interim) Control Act* (1971): established a Development Control Authority to review and determine development plans.
- *Fishing Industry (Assistance) Act No. 33 of 1972 and Fishing Industry (Assistance) Regulations No. 25 of 1973*: provides for the granting of assistance to the fishing industry.
- *Pesticides Control Act* (1975): controls use of pesticides.
- *Public Health Act (1975) and Regulations*: provides regulatory oversight for sewage, industrial and solid waste disposal.
- *Saint Lucia National Trust Act of 1975*: deals with the preservation of areas of natural beauty/historic interest, including submarine areas.
- *Wildlife Conservation Act* (1980): deals with the control of protected species.
- *Tourism Industry Development Act* (1981): promotes tourism development.
- *Water and Sewage Authority Act* (1984): regulates sewage treatment and disposal.
- *The Maritimes Areas Act No. 6 of 1984*: addresses some aspects of marine pollution.
- *Solid Waste Management Authority Act* (1996): makes provision for a Solid Waste Management Authority and details their function.
- *National Conservation Act* (1999): controls, maintains and develops beaches and protected areas.
- *Oil in Navigable Water Act* (cap 91): covers some aspects of oil pollution within the marine environment.
- *Fisheries (Snorkelling Licence) Regulations No. 223 of 2000*: regulates commercialised snorkelling activities.

Annex 1

Primary Fisheries Legislation of Saint Lucia:

- The first official legislation in Saint Lucia was the Turtle and Fish Protection Ordinance Cap. 45 of 1911, which was replaced by the Turtle, Lobster and Fish Protection Act No. 13 of 1971. The latter was in turn replaced by the *Fisheries Act No. 10 of 1984*. The Fisheries (Turtle, Lobster and Fish Protection) Regulations No. 67 of 1987 were then established, which were replaced by the *Fisheries Regulations No. 9 of 1994*
- *Fisheries Act (No. 10 of 1984) and Regulations (No. 9 of 1994)*, which are based on the OECS harmonized legislation, cover the establishment of a fisheries advisory committee, fisheries access agreements, local and foreign fishing licensing, fish processing establishments, fisheries

research, fisheries enforcement and the registration of fishing vessels. This Act also specifies conservation measures such as prohibiting the use of any explosive, poison or other noxious substance for the purpose of killing, stunning, disabling, or catching fish; closed seasons, gear restrictions and creation of marine reserves. It gives the Minister responsible for fisheries the authority to create new regulations for the management of fisheries as and when necessary.

- In 2001, technical assistance was provided by the United Nations Food and Agricultural Organisation to review the existing legislation, to take into account more recent international fisheries agreements and the national requirements for fisheries management and development.
- A number of consultations were held with stakeholders and a proposed new Fisheries Act and Fisheries Regulations were developed. The draft Act and Regulations are in their final stages and have been submitted for finalisation by the Attorney General.

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NATIONAL REPORT OF TURKS AND CAICOS ISLANDS

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1. Introduction

The Turks and Caicos Islands (TCI) fisheries are relatively small in comparison to the Caribbean region. However, the fishing industry is the third largest contributor to the GDP in the Turks and Caicos Islands, with tourism being number one followed by offshore banking. The TCI is a small chain of islands that are comprised of approximately 430 sq km and coastal banks comprised of approximately 1635 sq km. Data collection of the fisheries started in the 1800's with the export of dry conch to neighbouring countries such as Haiti; and has continued to accumulate over the years. Until recently, Queen Conch (*Strombus gigas*) and spiny lobster (*Panulirus argus*) were the highly sought products based on high economical value. However, with economic downturns and a regional decrease in spiny lobster catch, pressure has placed on the local people. In an effort to ease financial constraints, the Department of Environment and Coastal Resources (DECR) has tried to promote diversification from these two fisheries to reef and slope fish as well as deepwater and pelagic, but with little success.

Over the past years, the TCI has been able to make assessments (catch and effort) on queen conch, spiny lobster and scale fish at the CRFM annual scientific meetings. Upon review of the TCI Fisheries Management Plan, the following goals must be sought:

1. To manage the fisheries resources of the Turks and Caicos Islands at or above the levels necessary to ensure their continued productivity for present and future generations.
2. To minimise the impacts of fishing on the physical environment (habitats, nursery, spawning areas) and on non-target (by-catch), associated and dependent species.
3. To ensure that the levels and patterns of exploitation are determined on the basis of best available scientific information, and according to the precautionary principles.
4. To maximise the net incomes of the participants (e.g fishers) in the respective fisheries.
5. To increase the sector's contribution to Gross Domestic Product by expanding production, through better management of existing fisheries, the promotion of new ones and the continued development of value added products for export.
6. To optimise employment and promote job creation in the harvesting and processing, and encourage use of underutilised and unutilised living marine resources, particularly in those islands that do not have many other opportunities for economic growth.
7. To ensure that the fishing industry is integrated into the policy and decision-making processes concerning the environment protected areas and the wider developmental issues.
8. To promote and encourage the involvement and participation of stakeholders in the management of the fishery resources.

9. To ensure that the development of the fisheries sector is enhanced by regional and international cooperation (e.g. CRFM, FAO), and in keeping with international and regional obligations.

Goals 1-3 have and continue to be addressed with assessments; however, 4-6 have not been able to be addressed properly. In order to fully assess the state of the fisheries inclusive of economic and social influences, the TCI will conduct an evaluation of the fisheries at the CRFM 2010 annual scientific meeting.

2. Description of Fisheries and Fleet

The Turks and Caicos Islands base commercial fishing on the shallow water banks, primarily the Caicos Bank and the Turks Bank. The Mouchoir Bank is considered within the territorial water of the TCI, but currently used only for the purpose of capture of fin fish. The vessels most often utilized in the TCI are small retrofitted V-hull boats ranging in length from 18 ft-20 ft with an 85-115 hp out board engine. Larger vessels rigged with electronic reels and/or traps are in limited number based on financial constraints.

Commercial fishermen from the TCI often work more than one fishery at a time. Using only free diving methods with no underwater breather apparatus, fishers are found diving in depths ranging from 3 meters to 30 meters. The normal day for a fisher entails leaving the dock between 7:00 and 8:00 a.m. and returning between 4:00 and 5:00 pm, considered 1 boat-day. Commercial fishermen are found to be opportunistic in their catch. During the open season of lobster, fishermen largely capture spiny lobster and land them whole. Until recently, fishers would re-prioritize capture and work the queen conch fishery near the beginning of the next annual year. However with the decrease catches of spiny lobster, fishers work the conch fishery from the start of the season in October and are now working a reef/slope fishery for local sales.

Within the past ten years, the commercial fisheries have directly employed an average of 350 fishers per year. In 2009/2010 fishing season, the number of commercially licensed persons dropped with the refusal of foreign assistance to 300. Similarly the number of commercially licensed vessels average at 150 licensed vessels but in 2009-2010 there were 143 commercially licensed vessels.

When referring to the catch and effort, effort is measured by the number of days at sea and catch is measured in pounds. The larger individual boats carry between 5-12 men on the vessel each day. Smaller vessels carry between 1-3 people on board.

3. National Fisheries Policy and Management Objectives

Policy Summary

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

The Fisheries Policy aims to ensure the sustainable use of the living marine resources and ecosystems through increased cooperation and collaboration with all the stakeholders for the improved welfare of the people of the TCI. It is founded on the belief that all natural marine living resources of the TCI, as well as the environment in which they exist and in which

mariculture/aquaculture activities may occur, are national assets and the heritage of all the people, and should be managed and developed for the benefit of present and future generations in the country.

The long-term vision of the Government of the TCI includes:

- Pursuance of well-informed strategic, economic and financial policies, which promote sustainable development and a decent standard of living for the people of the TCI.
- Achievement of greater functional and geographical diversification of economic activity, so as to reduce the TCI's economic vulnerability and to spread the benefits of economic growth more widely among its inhabitants.
- Implementation of policies and strategies to protect the interest of the TCI Islanders, thereby empowering them to derive optimum benefits from the development of the TCI.
- Initiation of measures contributing to the fusion of a dignified and confident nation at peace with itself and the world, a nation whose people believe in themselves and who, in their entrepreneurial, professional and other daily pursuits, and energized by dignity and national pride.
- Provision of sound health and educational services, which are available to all.
- To use our natural resources wisely, being fair to present and future generations.

Management Objectives

- Ensure that the catch in any one-year does not exceed the Maximum Sustainable Yield.
- Restore and maintain populations of marine species to sustainable levels.
- Conserve local populations of endangered species and ensure sustainable harvesting and trade.
- Promote and enhance scientific research capabilities in order to obtain relevant information on the fisheries resources such as carrying capacity, stock status, etc.
- Enhance income generation by a factor of 15% by improving and creating market opportunities for fish and fish products at the national, regional and international levels.
- Ensure that the benefits from the exploitation of the fisheries resources are optimized by Belongers.
- Promote diversification in resource exploitation of the TCI fisheries.
- Streamline, monitor and regulate the importation of marine products.
- Establish mechanism to reduce over capitalization in the fishing industry.
- Develop and seek opportunities for resource users to obtain financial assistance /credit from credit agencies.
- Achieve environmental and developmental awareness of marine resources in all sectors of society from primary school through adulthood.
- Ensure that post harvest handling, processing and distribution of fish and fishery products is carried out in a manner that maintains quality, nutritional value.
- Develop and implement food processing and handling guidelines/regulations for quality assurance.
- Improve the manpower and resources of the Fisheries Division to ensure effective monitoring, control and surveillance of fishing activities.
- Promote and maintain a "Zero Tolerance" in enforcement of the legislations.
- Develop and Implement strategies to deter and combat Illegal, Unregulated and Unreported (IUU) fishing in the waters of the Turks and Caicos Islands
- Improve stakeholder participation in the management of the marine resources.
- Achieve inter and intra-agency collaboration on the matters that may affect the fisheries resources and associate habitats.

- Improve relationship with other Overseas Territories in the management of the marine resources and the environment.
- Improve TCI's collaboration and participation in regional and international initiatives in the management of the fisheries resources.
- Promote talks to delineate and conclude maritime boundaries discourse between the TCI and The Dominican Republic as well as The Bahamas.
- Develop and implement mariculture/aquaculture guidelines and regulations.
- Promote and encourage mariculture/aquaculture of indigenous species of invertebrates and fish as a means of diversifying income and diet.
- Achieve environmental and developmental awareness of marine resources in all sectors of society from primary school through adulthood.

4. Research

Monitoring Activities

- Catch and effort data for all fisheries are being collected at the landing docks and processing facilities. Captains are interviewed for the number of days at sea, number of crew, location, number of sets. Individual biological measurements are taken from subsamples of catch including
 - Scale fish-standard length, fork length, total length, weight and species name
 - Spiny Lobster-carapace length, weight, moulting, breeding and sex
- Export data is collect for both commercial and personal. Scale fish is not exported on a commercial scale.
- The Department of Environment and Coastal Resources (Fisheries Sub-unit) has collected local consumption data of marine products to determine the seafood consumption rate. The data is available but not completely analyzed.
- Data on large and coastal pelagic are collected during local fishing tournaments. This data is stored and shared with international monitoring organizations such as ICCAT and the FAO. To increase surveillance, officers are now monitoring recreational landing sites.
- Catch data from confiscated international vessels poaching in the waters of the Turks and Caicos Islands are also monitored. By monitoring the catches from these vessels, the Department can assess the amount of product that may be obtained illegally and removed from the TCI without any documentation.
- The Department is also actively monitoring the number of persons, number and sizes of vessels, sizes of engines, and gear types being used in each fishery through the licensing system so as to determine "effective effort" exerted on the respective fisheries.
- Although the Department has conducted numerous socio-economic surveys in the past, this research approach for the most part was underutilised. Until 2009-2010, the DECR did not make this area priority. However, in 2010 socio-economic surveys were carried out with commercial fishermen and processors to determine financial costs, benefits, employment, resource strategy and decision making tools.

5. Legislation and Management Regulations

- Fisheries Protection Ordinance. Cap. 104: This is the main legislation which provides the legal basis and regulations for managing the fishery resources of the Turks and Caicos Islands. (Strongest Legislation based for monitoring, enforcement and surveillance).

Other Fisheries Related Legislation

- Fishery Limit. Cap. 105: Defines the Territorial Waters and Economic Exclusion Zones (EEZ) of the Turks and Caicos Islands.
- National Park Ordinance. Cap. 80: Provides the legal basis for the establishment and management of marine protected areas such as National Parks, Marine Reserves, and Sanctuaries.
- Coastal Protection Ordinance: This legislation combines several pieces of legislations, such as the national parks ordinance, fisheries protection ordinance and others to provide protection for the coastal zone.
- Endangered Species Bill: This legislation is currently in draft form. On completion, it will provide the legal basis for protection of endangered species in the Turks and Caicos Islands. (Will provide the backing for monitoring of exports such as CITES)
- Wild Birds Protection Ordinance. Cap. 84: Allows for the management of ancillary species in order to protect biodiversity
- Mineral (Exploration and Exploitation) Ordinance. Cap. 79: Provides for the protection of the marine habitat from direct mining impacts or from indirect terrestrial mining activities.

NATIONAL REPORTS - OBSERVERS

NATIONAL REPORT OF BRAZIL

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On behalf of the Brazilian Scientific sub-committee on Tuna and Tuna-like species

1. Fishery and Fleet Description

The Brazilian fisheries are developed in marine and freshwater habitats and range from small to large scale. The workforce that is directly in the fishing sector is around 450 thousand (13% females; FAO & World Fish 2008, Table 1). Around one hundred thousand small and middle-sized boats are estimated to operate in Brazilian waters (FAO & World Fish 2008). There is also a large scale inland fishery in the mouth of the Amazon River for *piramutaba* (11% of inland production, FAO & World Fish 2008).

Table 1- Summary of main features for the fisheries sector in Brazil. The numbers are best estimates for the year 2006 from Brazilian experts for the FAO Big Numbers Project. MT – metric tonne.

	Small-scale fisheries			Large-scale fisheries			All fisheries
	Marine	Inland	Total	Marine	Inland	Total	Total
EMPLOYMENT							
Number of fishers ^a	118.013	148.744	266.757	51.49	5.522	57.012	323.769
Number of other jobs ^b	37.346	47.071	84.417	16.294	1.747	18.042	102.459
Ratio	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	155.359	195.815	351.174	67.784	7.269	75.054	426.228
Woman	19.838	25.004	44.842	10.774		10.774	55.616
Men	135.521	170.811	306.332	57.011	7.269	64.28	370.612
PRODUCTION AND UTILIZATION							
Total Annual Catch (MT) ^c	316.302	219.926	536.228	250.389	27	277.389	813.617
Value (million US\$) ^d	343	275	617	327	35	363	980
Value US\$/MT	1.083	1.248	1.151	1.307	1.307	1.307	1.204
CONTRIBUTION TO DOMESTIC ANIMAL PROTEIN INTAKE							
% of catch used for domestic human consumption	92%	100%	95%	87%	0%	79%	90%
Catch/Fisher(MT)	2.7	1.5	2.0	4.9	4.9	4.9	2.5

Source: FAO & World Fish Center 2008.

a. Fulltime and parttime (not including occasional). Division between marine/inland calculated using average catch/fisher rates for other countries and assuming this relation between the two subsectors

b. Estimate based on data from FAO Fishery Country Profile Brazil (ratio fisheries+ aquaculture primary/ secondary sectors 790,000/250,000).

c. Large scale fishery inland from FAO Fishery Country Profile Brazil (piramutaba fishery). Total inland catches 47,636 mt replaced by average 2004-2006 from FishStat Plus.

d. Exchange rate 2006: 1 BRL=0.46 US\$.

Most tuna and tuna-like fisheries, however, are performed by large scale industrial boats. The Brazilian fleet is composed both of national and foreign (chartered) boats, ranging from 12.6 m to 58 m in length and 10.8 t and 778 t of gross register tonnage (GRT; Hazin 2006; Figure 1). The first large scale operation in Brazil started in 1956 with foreign boats. The national fleet started to operate in the mid-sixties.

The evolution of the foreign fleet operating off Brazil may be divided in four periods (Hazin 2006): (i) 1956-1964 – start of the operations in 1956 with two Japanese boats operating off Recife (Pernambuco State, PE, Northeastern Brazil) and three other Japanese boats operating off Santo (Sao Paulo State-SP, Southeast Brazil); in 1964 the activities ceased; (ii) 1971-1979 – resuming of operations in 1976 with three Korean boats operating off Recife and the Japanese boats operating off Rio Grande do Sul State (RS); (iii) 1980-1990 – stability of fleet only 3 to 6 Japanese boats per year were operating in Brazil off RS, at the end of the period one Honduran boat started operations in Santa Catarina State (SC); (iv) 1991-2000 – expansion of the fleet: boats from several flags operated in Brazil (Korea, Taiwan, Portugal, Panama, Equatorial Guinea, Barbados, Spain, Belize, EUA, Uruguay, St. Vincent) together with the Japanese and Honduran boats; the operations expanded to two other locations: Cabedelo (Paraíba State- PB, Northeastern Brazil) and Pará State (PA, North Brazil).

Similarly, the evolution of the national fleet may also be divided into four periods (Hazin, 2006): (i) from 1966 to 1982 – start of the commercial fisheries by national fleet; two to five boats based in Santos operated in this period. In 1982, a longline boat started operations in Rio Grande do Norte State (RN, Northeastern Brazil); (ii) from 1983 – 1988 – **small increment in the fleet**; in 1983 another boat was added to the Rio Grande do Norte operation and two boats started to operate in the extreme south of Brazil (RS). Around twelve boats were in operation per year during 1984 to 1987. At the end of the period, there was a decrease in the size of the fleet with the interruption of the operations in RS; (iii) 1989-1995 – **oscillation in the size of the fleet**: the fleet increased at the beginning of the period to 21 boats operating off Santos (SP) and Natal (RN) and decreased in 1991 due to the ceasing of the operations of several boats based in Natal; (iv) from 1996 to 2000 – **expansion of the fleet**, boats from RS resumed their operation and boats from SC started to operate.

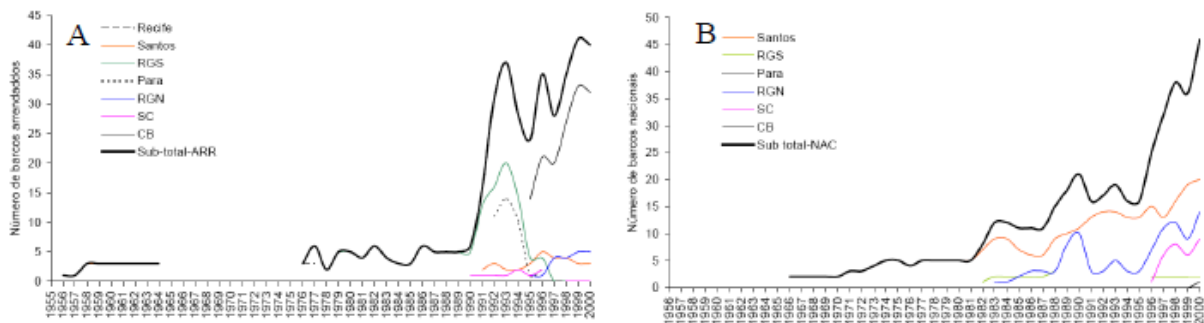
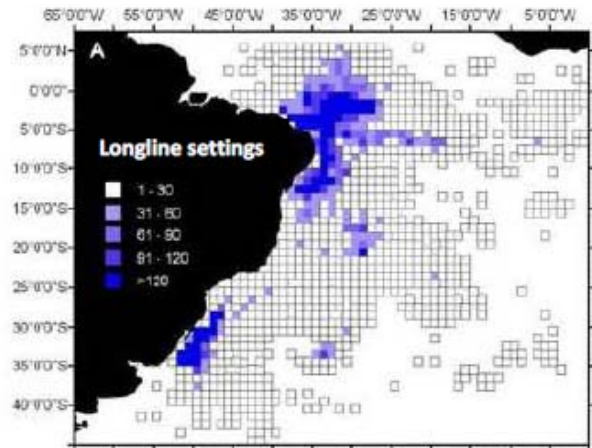


Figure 1. Evolution of the foreign (A) and national (B) longline fleets operating off Brazil by location of landing port (Hazin 2006): number of vessels operating by year. North: Pará State; Northeast: RGN (Rio Grande do Norte State), CB Cabedelo (Paraíba State), Recife (Pernambuco State); Southeast: Santos (São Paulo State- SP), is the main fishing port; South: SC – Santa Catarina State, RGS – Rio Grande do Sul State.

The foreign fleet is composed mainly of large size boats (20.5 to 58 m and 78 to 778 t GRT). The fleet used longlines with on average 2000 hooks that are immersed for around 20 hours with operations both during the day and the night. The national fleet is composed of smaller boats (12.6 to 33 m long and 10.3 to 182 t GRT). The fleet used longlines with on average 1000 hooks, immersed for around 16 hours with operations mostly at night. There are five areas of operations (Figure 2); (i) North of 4°S; (ii) from 5°S to 7°S and 17°W to 32°W; (iii) from 5°S to 14.5°S and 30°W to 38°W; (iv) from 17°S to 21°S and 27°W to 30°W; (v) south of 27°S. The main species targeted by the fleets are: albacore *Thunnus alalunga*, swordfish *Xiphias gladius*, yellowfin tuna *T. albacares*, blue shark *Prionace glauca* and bigeye tuna *T. obesus* (Hazin, 2006).

Figure 2. Spatial distribution of fisheries operations of national and foreign fleets operating off Brazil (1978 to 2000). Source: Hazin (2006).



In the late 80s the fleet from Itaipava (Espírito Santo State, 20°S) estimated to be around 500 small boats, begun to shift from targeting demersal stocks to highly migratory stocks of tuna and tuna-like species (Martins *et al*, 2005). Boats from this fleet land not only in their home port but also in ports all over the coast.

2. Statistics and Sampling

The National Institute of Geography and Statistics (IBGE) compiled fisheries landing statistics from 1980 to 1989, when this activity ceased due to budget and logistic constraints. Simultaneously other agencies collected fisheries data such as IBAMA (Brazilian Environmental Agency) and IP (Instituto de Pesca de São Paulo). There is a gap on the Brazilian statistics from 1990 to 1994. In 1995, the National System of Information of Fisheries and Aquiculture (SINPESQ – *Sistema Nacional de Informações da Pesca e Aqüicultura*) was created (Presidential Decree 1694), but it was never fully implemented. IBGE was officially the institution in charge of the system, but de facto data collection of national catches was performed by IBAMA, and several partners (such as the Instituto de Pesca de São Paulo). Currently, the national fisheries sampling programme is under the mandate of the Ministry of Fisheries and Aquiculture (MPA). The strategy of MPA was to put in place a network of collaborations in order to increase the coverage of the system. The landing statistics will be collected by several partners such as NGOs, universities, research institutes, through formal agreements with MPA. The partners will be in charge of obtaining mainly catch and effort data. In some cases, biological information, such as size structure will also be obtained. For large scale fisheries, there is a fishing logbook system, where the skipper records effort and catches by species (mandatory for foreign boats since 1995, and for all large boats since 2005, Interministerial IN 26, July 19th 2005). The fishing logbooks and the monitoring of fish landings are the main sources of Task 2 data for ICCAT (International Commission for the Conservation of Atlantic Tunas). The Task 1 data are obtained from fishing companies (total catch and effort) and boat registries (fishing power). There is also the Vessel Monitoring System (PREPS – Programa de rastreamento das embarcações par satellite) mandatory for vessels larger than 15m that fish in marine waters (Interministerial IN 2, September 4th 2006).

3. National Fisheries Policy and Management Objectives

The National Fisheries Policy has recently been established in the new fisheries act of 2009. The overall objectives of the National Policy are to promote (a) the sustainable development of fisheries and aquaculture as source of food, employment, revenue and leisure, guaranteeing the sustainable use of the fisheries resources and the optimum economic rent, in harmony with the maintenance and conservation of the environment and biodiversity; (b) the management, the development and the enforcement of fishing activities; (c) the maintenance, conservation and rebuilding of fisheries and aquatic ecosystems; and (d) the socio-economic, cultural and professional development of the people and communities that practise fishing activities.

4. Research

The largest coordinated research initiative for the assessment of marine fisheries resources was the REVIZEE (Assessment of Renewable Resources off the Brazilian Exclusive Economic Zone) that aimed to estimate the potential for use of living resources in Brazilian marine waters in order to comply with the UNCLOS (United Nations Convention on the Law of the Sea). The REVIZEE was funded by the federal government. There are, however, several research groups in universities, research institutes and NGOs that perform research on fisheries all over the coast and inland Brazil. The main sources of funding for research in fisheries are the federal Ministry of Science and Technology (MCT), the Ministry of the Environment (MMA) and the Ministry of Fisheries and Aquaculture (MPA). Some States also have their own funding agencies.

The main research findings for the three species (dolphinfish, blackfin tuna and wahoo) to be assessed during the Sixth Annual CRFM Scientific Meeting are summarized below.

Dolphinfish *Coryphaena hippurus*

The dolphinfish is caught by artisanal fisheries in Northeastern Brazil (12% of landings in 30-40°W 0-12°N, IBAMA 2000 *apud* Duarte-Neto *et al* 2008) as well as by industrial fleets (7.3% of catches of the fleet that targets swordfish, Evangelista *et al* 1998), throughout the coast. From 2002 to 2006, 11476 t of dolphinfish were landed (15% of landings) in Espirito Santo State, and 9252 t (3% of landings) in Rio de Janeiro State, where dolphinfish is an important part of the catch landed in several ports, such as Cabo Frio, Macaé and Paraty (FAERJ, SEBRA-RJ 2009). In Cabo Frio, 150 of the 329 boats that normally operate there, direct their effort during October to February to target dolphinfish. Those boats are medium size (11 to 14 m long and 20 GRT, Pimenta and Resende, unpublished report, Table 2). The Itaipava fleet, operating off Santa Catarina State during the summer, targets mostly dolphinfish (95% of catches) for export (data for 2001-2005, Dallognolo & Andrade 2008).

Table 2. Fisheries landings of dolphinfish in Cabo Frio (Rio de Janeiro State, 23°S 42°W). MT – metric tonnes.

year	biomass landed (MT)	% of total landings	effort (fishing hours)	number of fish	average weight (kg fish ⁻¹)
2003	118	86.8	14256	18048	6.55
2004	77	75.5	3528	8960	8.55
2005	20	78.6	2500	3666	5.48
2006	92	89.9	4608	14777	6.22
2007	140	84.0	9840	22538	6.22
2008	35	87.3	3384	4649	7.48

Source: Pimenta and Resende (unpublished report).

Oxenford and Hunte (1986) suggested that there might be two migratory circuits for dolphinfish in the Caribbean, one of which would include Brazilian waters. Lessa (2003) suggested that the

dolphinfish in Brazilian waters might include a third migratory circuit (and possibly a different stock) restricted to the east coast of Brazil (Figure 3). Data from timing of peaks of catches, growth studies and morphometry of otoliths corroborate this hypothesis (Lessa 2003, Lessa *et al* 2004, Duarte-Neto *et al* 2008).

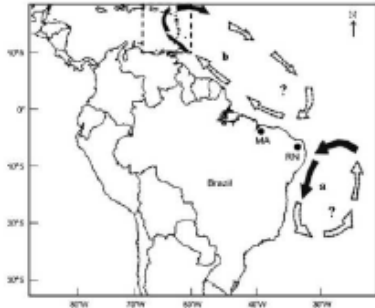


Figure 3. Migration circuits and the hypothesis of two stocks off Brazil proposed by Oxenford and Hunte 1986 (b) Lessa 2003 (a), corroborated by growth studies and morphometry of otoliths from fish landed at Maranhão State MA and Rio Grande do Norte State RN (black dots in the map). Seasonal size data are available for regions with black arrows, whilst white arrows show the hypothesized continuation of the migratory circuit. Source: Duarte-Neto *et al* (2008).

Lessa *et al* (2008) estimated the Von Bertalanffy growth parameters from daily growth increments in *sagittae otoliths* to be $L_{\infty} = 1941$ mm SL, $K = 0.897$ year⁻¹, $t_0 = 0.0811$ year (n=933 fish from 3°S 13°S). The analysis of gonadosomatic indices GSI indicated that the dolphinfish reproduces year round in this area. The relationship between total weight WT (g) and standard length (mm) was $PT = 0.000SL^{2.669}$.

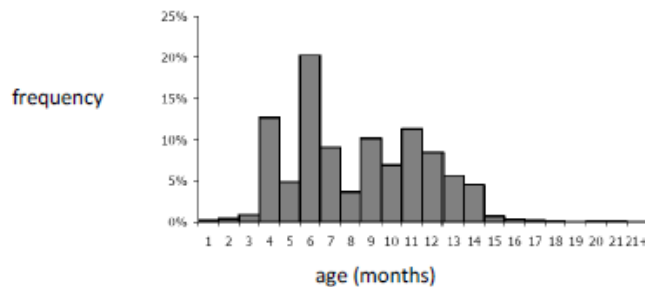


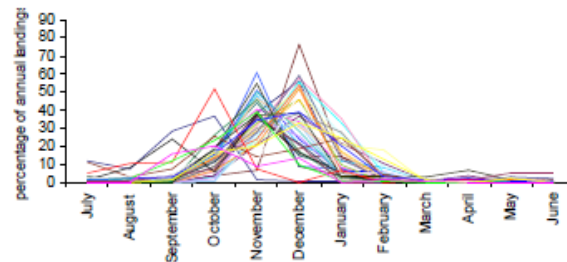
Figure 4. Age structure of dolphinfish off Northeastern Brazil (3°S to 13°S) for aggregated samples from 1998 to 2000. The age was determined from daily growth increments in *sagittae otoliths*. Source: Lessa *et al* (2008).

The size at first maturation was found to be 350 mm or 3 months old (Lessa *et al* 2008). The dolphinfish recruits to the fishery at six months old. The total mortality estimated from the age structure was $Z = 6.27$. The natural mortality was estimated to be $M = 0.95$ using the growth parameters and the temperature (according to Pauly 1980), thus the fishing mortality was estimated to be $F = 5.32$. The exploitation rate to be $E = 0.85$ and the survival to be $S = 0.19$.

Viana *et al* (Unpublished data) studied the dolphinfish from the São Paulo Archipelago (00°55'10N, 029°20'33"W) caught by the longline fleet off Natal. They found the sex ration to be 1.7 females to 1.0 male. No young individuals were collected. All individuals analyzed seemed to be sexually mature. Males in the sample ranged from 62 to 150 cm standard length SL and females and 64 to 124 cm. Although there seemed to be reproductive activity all year round, higher GSI were found in February.

Amorim, Arfelli, Domingues and Piva-Silva (unpublished data) assembled a monthly catch and effort time series of dolphinfish landed in Santos (São Paulo State, SP, 23°S) from 1971 to 2009, which clearly shows the seasonality of landings, with the main peaks happening in November or December (Figure 5).

Figure 5. Percentage of annual catches by month of dolphinfish landed in Santos São Paulo State, SP, 23°S, from 1971 to 2009. Note the start of the graph in the month of July. Unpublished data from Amorim, Arfelli, Domingues and Piva-Silva. (Instituto de Pesca de São Paulo).



Blackfin tuna *Thunnus atlanticus*

Freire (2008) reports that no landings of blackfin tuna were recorded in the official data for Brazil before 1995. For the Northeastern States of Brazil nothing was recorded between the years 1980 to 2000; for Rio de Janeiro State, São Paulo State and Santa Catarina the landings averaged 172 t between 1995 and 2000. She concluded that the landings of this species (albacorinha) may have been recorded under another species (albacora) both in the Northeastern Brazil and the rest of the country. The fishery for this species is mainly done in Baía Formosa (South of Rio Grande do Norte State) from September to January. Almost all landings recorded as albacore for Baía Formosa are, in fact, blackfin tuna. The artisanal catch of this species oscillated from 11.6 to 48.0 t, from 1993 to 2001.

Before 1950, the fishery in Baía Formosa was performed with sailboats (Freire 2008, Freire *et al* 2005). In the late 90s the registered fleet of 96 boats was composed of 38 sailing boats, 28 motor boats and 30 rafts (jangadas). However, boats from the North of the State join this fleet during the peak of the harvesting for blackfin tuna (October to December). For the last 30 years the stock has been exploited using trolling line (linha de corso) with lines around 81 m long, hook no. 15 and the womb of the fish as baits. Most sailing boats perform daily trips with a crew of 3 fishers; the motor boats and some sailing boats that carry ice stay 3 to 5 days fishing with a crew of 4 fishers. The fish is either consumed locally or sold to other RN cities or neighbor States (Paraíba and Pernambuco).

Samples of the landings performed during 1998 to 2000 for the REVIZEE programme allowed to estimate the size structure and biological parameters (Freire 2008, Freire *et al* 2005). The landed fish ranged from 360 to 890 mm. Most landings were recorded from September to January, every year (Figure 5). The size with 0.5 probability of capture by hand line was 622 mm SL. The Von Bertalanffy growth parameters, estimated using the ELEFAN I software and length frequencies from 1996 to 1998, were: $L_{\infty} = 910$ mm, $K = 0.62$. The t_0 was assumed to be -0.22, after Doray *et al* (2004). The relationship between eviscerated weight (WE g) and standard length (SL mm) was $WE = 0.00001SL^{3.0284}$ ($n=5209$ fish). Viera *et al* (2005a) reported the total weight (WT g) to total length (TL cm) relationship to be $TW = 0.0255 TL^{2.8438}$, for females, $TW = 0.0108 TL^{3.0588}$, for males, and $TW = 0.0128 TL^{3.0165}$, for sexes combined; the total length to fork length FL to be : $TL = 1,3381 + 1,0449 FL$, for females, $TL = 1,3456 + 1,0449 FL$, for males and $TL = 1,2496 + 1,0459 FL$, for sexes combined.

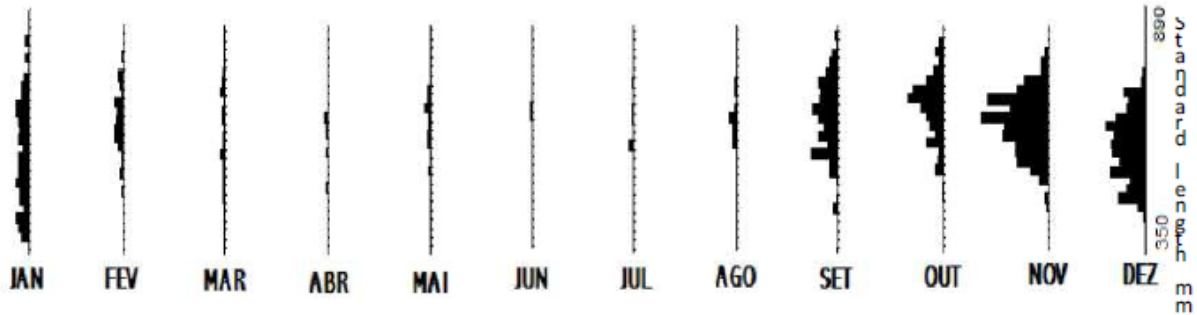


Figure 6. Standard length frequency (mm) for blackfin tuna *Thunnus atlanticus* sampled from 1998 to 2000 during the REVIZEE program in the Northeastern Brazil (3°S to 13° S, n=1082 fish). Data aggregated by month. Source: Freire (2008).

The reproductive activity was assessed for the months when there were enough samples (October to January 1996, Freire 2008), and it was detected for all those months. The size of first maturation (L_{50}) was 492 mm SL for females and 513 mm for males. Viera *et al* (2005b) sampled fish from September 2000 to January 2001 landed in Baía Formosa and observed reproductive activities in the whole period. The L_{50} was estimated to be 510 mm total length TL for females, while the L_{100} was 575 mm TL. The absolute fecundity ranged from 224,708 oocytes of a specimen that was 520 mm TL (1800g TW 18,58 mg of gonadal weight GW) to 4.874,389 oocytes (722 mm TL, 5800g TW and 260,06 mg GW). Viera *et al* (2005b) concluded that coastal waters off Northeastern Brazil are a reproduction area for the blackfin tuna. Viera *et al* (2005a) found that the sex ratio of landings favours males: 2.1 male to 1 female (946 specimens sampled).

Freire (2008) estimated, from the catch curve (data for 1998 to 2000), a total mortality of $Z = 2.13$, and a natural mortality, estimated from the growth parameters and temperature (following Pauly 1980), of $M=1.3$. Therefore the fishing mortality was $F=0.83$, the exploitation rate was $E = 0.4$ and the survival rate was $S=12\%$.

Wahoo *Acanthocybium solandri*

Viana *et al* (2008) studied the fisheries performed off São Pedro and São Paulo Archipelago (00°55'10"N, 029°20'33"W) caught by the longline fleet off Natal from 1998 to 2006 and found that the annual landings of wahoo ranged from 30 to 50 t and represented on average 20% of the total landings. Most of the landings were composed of tunas (56%, mainly yellowfin tuna). The fishing activity is carried out within a radius of about 10 nm from the archipelago, by vessels of about 20 m in length overall, operating within longline, hand-line and trolling, which is the main fishing method for wahoo. The average annual CPUE was relatively stable and ranged from 40 kg boat⁻¹ day⁻¹ (1999) to 100 kg boat⁻¹ day⁻¹ (2002) (Figure 7), but it was much lower than the value of 264 kg boat⁻¹ day⁻¹ estimated by Oliveira *et al* (1977 *apud* Viana *et al* 2008) based on catches obtained during a research cruise.

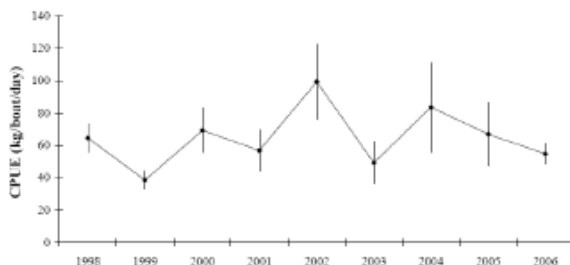


Figure 7. Catch per unit of effort (kg boat⁻¹ day⁻¹) of wahoo from São Pedro and São Paulo Archipelago (00°55'10"N, 029°20'33"W) caught by the longline fleet off Natal from 1998 to 2006. Source: Viana *et al* (2008).

The size of wahoo from the archipelago increased gradually from January to August, with an apparent displacement of the size-class mode from 100-110 cm to 130-140 cm fork length FL, with the modal size class remaining the same from August on (Viana *et al* 2008). Viana *et al* (unpublished manuscript) found that the size ranged from 63 to 183 FL for females and 67 to 197 FL for males, and that the sex ratio was 1.1 males to 1.0 female (n=1162). Most of the landings are adult fish (only 14.3% of juvenile), which support the hypothesis that this area is used for reproductive aggregation. The size at first maturity L_{50} was estimated to be 110 cm FL for females. By the analysis of the GSI and histology of ovaries, these authors concluded that the spawning season for wahoo in the vicinity of the archipelago ranged from February to September with a peak in April-May. The fecundity (n=10 ripe gonads ranged from 287,040 oocytes (121 cm FL and 130g gonad weight GW) to 2,494,512 oocytes (150 cm FL and 612 g GW).

Amorim, Arfelli, Domingues and Piva-Silva (unpublished data) assembled a monthly catch and effort time series of wahoo landed in Santos (São Paulo State, SP, 23°S) by the longline fleet from 1971 to 2009, which shows the seasonality of landings similar to dolphinfish, with the main peaks happening in November or December.

5. Legislation and Management Regulations

The Brazilian Navy (*Ministério da Marinha*) was the first to be in charge of fisheries issues mainly of boats and fishers registries, in the late XIX century. The first document dealing with fisheries administration dates to 1934 (*Código de Caça e Pesca*), the same year when the new Constitution was approved and fishing was declared to be under the competency of the federal government. In the 30s, fisheries were transferred from the Navy to the Ministry of Agriculture. In the early 60s a specific agency (SUDEPE) was created within the Ministry of Agriculture that focused mostly on the development of the industrial sector, and relied strongly on subsidies (Abdallah & Sumaila 2007). In the late 80s, SUDEPE and two other agencies that dealt with environmental issues (rubber and forestry) were merged to constitute the IBAMA within the Ministry of the Environment. IBAMA was in charge of fisheries management from 1989 to 2003. In 1998 another department (Departamento de Pesca e Agricultura, DPA) was created within the Ministry of Agriculture and Supply, mostly to promote the development of the fisheries sector and to enhance fish production. DPA was extinct in 2003 when the Special Secretariat for Aquaculture and Fisheries (SEAP) was created during the first term of the Lula government (Law N. 10.683, 28 May 2003). IBAMA and SEAP shared and overlapped duties. In 2007, IBAMA was also split into two agencies: IBAMA and ICMBio (Instituto Chico Mendes de Conservação da Natureza). IBAMA is currently in charge of environmental permits while ICMBio deals mainly with conservation units, of which Extractive Reserve and Sustainable Development Reserves overlap with fisheries management. The history of fisheries agencies dealing with fisheries in Brazil may be found in Dias-Neto 2003, Rossi-Wongtschowski 2007, and Hazin *et al* 2007.

In 2009, SEAP was transformed into the Ministry of Fisheries and Aquaculture (Law No 11.958. 26 July 2009). The national Policy for the Sustainable Development of Aquaculture and Fisheries (*Política Nacional de Desenvolvimento Sustentável da Aquicultura e da Pesca*) was just established in a recent law (No 11.959, of 29 June 2009). The fisheries management in Brazil is a shared mandate between the Ministry of Fisheries and Aquaculture and the Ministry of the Environment (Decree no 6.981, 13 October 2009, Interministerial IN 2, 13 November 2009). There are management groups composed of representatives of several ministries, fishers and civil society for the main resources such as sardine, tunas, lobsters and bottom species, which should meet regularly for taking management decisions.

International Agreements

The international agreements related to fisheries issues in which Brazil is member are:

- 1966 – International Commission for the Conservation of Atlantic Tuna (ICCAT) – joined since the foundation in 1966, Brazil has the presidency since 2008 and was re-elected to 2011.
- 1975- Ratification of the convention on International Trade in Endangered Species (CITES)
- 1992- Convention on Biological Diversity
- 1994- Ratification of the United Nations Convention of the Law of the Seas (UNCLOS)
- 1995- United Nations International Agreement on Straddling Stocks and Highly Migratory Fish Stocks
- 2008- Signed the FAO Compliance Agreement
- 2009- Signed the FAO Agreement on Port State Measures

6. Acknowledgements

This report benefited from the suggestions and unpublished data of Fábio Hazin, Humberto Hazin, Eduardo Pimenta, Humber Andrade, Flávia Lucena, José Heriberto M. De Lima, Luis Henrique de Lima, Marcelo Vianna, Alberto Amorim, Carlos Arfelli, Marília Previero, Danielle Viana.

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