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A report review of Countries

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Disclaimer

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TXOTX : Technical eXperts Overseeing Technical eXpertise (FP 7, Nº 212188)

D 2.4 A report review of Third Country Agreements

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Summary of the review report of Countries

Please note that these reports do not necessarily reflect or represent the views of the countries surveyed.

This document summarises the activities undertaken and information sources utilised in the development of country reports for WP2 of the EU TXOTX project. These reports are based on information sourced from questionnaires, interviews and/or web searches by TXOTX project partners.

Activities

Information was collected using a number of approaches. The primary means was the use of structured questionnaires. Wherever possible the questionnaires were applied in structured face-to-face interviews with representatives of fisheries institutions, government organisations, NGOs and/or other stakeholders. However, it was not possible to collect information using questionnaires for every country. Some fisheries organisations failed to respond to repeated requests for interviews. Other organisations failed to provide information, despite initially agreeing to participate in the project. In some cases, members of the TXOTX team were prevented from conducting personal interviews in some countries where unstable political situations made travel hazardous. When information from questionnaires was scarce or lacking it was supplemented by literature and web searches. The information collected for each country was subsequently summarised as a series of synthesis reports which are presented in this document.

Contributors

The authors of each country reports, their affiliate organisations and the sources of information on which reports are based are listed below:-

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1. Questionnaires were administered but were not provided for analysis. A summary report was submitted based on the information collected in the questionnaires.
2. Questionnaires were not administered. A summary report was submitted based on information available in the public domain (e.g. web searches).
3. Questionnaires were administered and were provided for analysis. A summary report was submitted based on the information collected in the questionnaires.

Each chapter in this document represents a separate country report and chapters are grouped by region according to the following sequence:-

Region	Country
South Pacific	Federated States of Micronesia
	Kiribati
	Solomon Islands
West Africa	Cape Verde
	Gabon
	Guinea
	Guinea Bissau
	Ivory Coast
	Mauritania
	Morocco
	Sao Tomé and Principe
	Senegal
East Africa	Kenya
	Mozambique
	Tanzania Mainland
	Zanzibar
Indian Ocean	Comoros
	Mauritius
	Seychelles
North Atlantic	The Faroe Islands
	Greenland
	Iceland
	Norway
South Atlantic	Chile
	Ecuador

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Chapter 1: Federated States of Micronesia

1. EXECUTIVE SUMMARY

The Exclusive Economic Zone of the Federated States of Micronesia (FSM) covers over 2.9 million sq. km of the Western and Central Pacific Ocean making it the third largest zone within the Forum Fisheries Agency membership. It is a zone with abundant marine resources of which tuna, namely skipjack (*Katsuwonis pelamis*), yellowfin (*Thunnus albacares*), and bigeye (*Thunnus obesus*), is the primary stock being exploited commercially by the major distant water fishing nations of Japan, Taiwan, Korea, People'sRepublic of China, Philippines, and the United States.

The tuna fishery is dominated by foreign fishing vessels licensed to fish under bilateral, sub-regional and multilateral fishing arrangements. Over the past two decades, tuna catch has ranged between 60,000 mt to just over 200,000 mt annually with purse seiners accounting for nearly 98% of the total catch. The EEZ's geographical proximity to the world's largest tuna markets and relatively large lagoons makes the EEZ an attractive trans-shipment point for tuna purse seiners and fresh tuna longliners. These trans-shipment activities have resulted in substantial contributions to the local economies in addition to the revenues from licensing foreign fishing vessels that goes into the national treasury.

The responsibility of managing and conserving both living and non-living marine resources within the EEZ rests with the National Oceanic Resource Management Authority (NORMA).

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

There was a total of 398 vessels registered to fish in the FSM EEZ in 2003 under bilateral, sub-regional and multilateral fishing arrangements. By gear, there were 206 longliners, 37 pole and line, 154 purse seiners and one group seiner Japanese longliners dominated the longline fishery accounting for 45% (94) of the longliners registered followed by Taiwan with 31 or 65% and the PRC reduced to a mere 11% (24). Taiwan however still claims the largest purse seine fleet operating with 35 purse seiners followed by Japan with 34, Korea and United States with 27 and 26 respectively. For the first time in recent years, one group seiner was licensed from the Philippines. The pole and line fleet remains exclusively Japanese with 37 pole and line vessels registered to fish under the bilateral agreement.

The access agreement (Agreement) with Japan involves an umbrella agreement with the three major fisheries associations in Japan. They are National Offshore Tuna Fisheries Association of Japan (Kinkatsukyo), Federation of Japan Tuna Fisheries Co-Operatives Association (Nikatsuren) and Japan Far Seas Purse Seine Fisheries Association (Kaimaki). Nikatsuren represents longline, pole and line and purse seine fishing vessels. Kinkatsukyo is an association of longline and pole and line fishing vessels while Kaimaki is exclusively a purse seine fishing association. The Agreement allows for two types of licensing schemes; the per-vessel per trip (PVPT) and the quarterly licensing system. The per-vessel per trip (PVPT) system is where a vessel applies for a fishing

permit for each trip that they want to enter the FSM EEZ to fish. The quarterly licensing system is for fresh tuna longliners that are based in Guam and carry out occasional trans-shipment visits to FSM ports.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The following information is sourced directly from the EU Commission website http://ec.europa.eu/fisheries/cfp/international/agreements/micronesia/index_en.htm)

The fisheries partnership agreement concluded between the Community and the Federated States of Micronesia covers the period 26.2.2007 – 25.2.2016 with a financial contribution of 559 000 € out of which 18 % is dedicated to the support of the fisheries policy of Micronesia.

This fisheries agreement allows community vessels mainly from Spain, Portugal and France to fish in the Micronesian waters and is part of the tuna network fisheries agreements in the Pacific.

Duration of the Agreement:	9 years renewable for a period of 3 years (26.2.2007 – 25.2.2016)
Duration of the Protocol:	3 years (26.2.2007 - 25.2.2010)
Initialisation:	13 May 2004
Nature of the FPA:	Tuna Fishery Agreement
Financial contribution:	**559 000 €** out of which 18 % has been earmarked for the support of the Micronesian sectoral fisheries policy in order to promote sustainability in its waters.
Fee for ship owners:	35 € per tonne caught.
Advances:	- Tuna seiners: 15 000 € per year (ref catches: 428 t.) - Surface longliners: 4200 € per year (ref catches: 120 t.)
Reference tonnage:	**8 600 t./year**

CURRENT PROTOCOL
Fishing possibilities

	SPAIN	FRANCE	PORTUGAL	TOTAL
Tuna seiners	75%	25%	-	4 vessels
Surface longliners	8	-	4	12 vessels

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable

5. FISHING ADMINISTRATION

Jurisdiction over marine resources in the Federated States of Micronesia is broken down into two main sections. From 12 nautical miles to the edge of the 200 nm exclusive economic zone the Federal (national) government has control of marine resources with the National Oceania Resource Management Authority (NORMA). Each of the four states of Micronesia has control of the resources from their coasts out to 12 nm.

NORMA began operation on January 1, 1979, at the same time as legislation entered into force establishing the FSM's 200 Mile Extended Fishery Zone. The mission of the Authority is to be an effective guardian and manager of the marine resources in the Exclusive Economic Zone of the Federated States of Micronesia for people living today and for generations of citizens to come. The Authority works to:
(a) Ensure that these resources are used in a sustainable way;
(b) Obtain the maximum sustainable economic benefits from the resources; and
(c) Promote economic security for the nation through their use.

The Authority consists of five members/Directors, appointed by the President subject to the advice and consent of Congress. Four of the five are appointed after consultations with the Four States and one appointed at-large. The Executive Management of the Micronesian Maritime Authority (MMA) has the broad responsibility for
(a) providing information, advice and, where appropriate, recommendations to the NORMA board for decisions on policy, management and financial matters,
(b) implementing decisions of the Authority and reporting to the President and Congress on the affairs of MMA,
(c) formulating, reviewing and promoting fisheries management measures within the EEZ.

The Research Section of NORMA is responsible to the Executive Management for the conduct of its program to ensure effective fisheries management and conservation by collecting, monitoring and analyzing catch and biological information by all means at its disposal.

The Licensing, Statistics and Computer Section is responsible for licensing of all fishing vessels operating in the EEZ, including the undertaking of all prerequisite checking prior to licensing and providing analysis of aggregated catch and vessel information in support of access negotiations.

The FSM became a signatory of the "Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (MHLC)" on September 4th, 2000. The nation is a signatory of the parties to the Niue Treaty improving regional fisheries surveillance including a Memorandum of Understanding with The Republic of Palau and the Republic of the Marshall Islands for information exchange on surveillance matters and is a signatory on the Nauru Agreement which aims to improve cooperation in the management of fisheries of common interest.

As a result of the FSM's commitment to this convention, NORMA has developed through multi-stakeholder workshops and a review process a "Plan for the Management of Tuna in the FSM" (http://www.un.org/esa/agenda21/natlinfo/wssd/micronesia.pdf).

6. LIST OF IMPORTANT STOCKS

FSM's offshore fisheries target three main tuna species: skipjack, yellowfin and bigeye. Albacore are also taken incidentally by longline. Other species commonly caught in association with industrial tuna fishing include black marlin, blue marlin, striped marlin, swordfish, sailfish, wahoo, and various species of sharks.

Coastal resources include finfish (scarids, lethrinids, lutjanids, and carangids), beche de mer, trochus, giant clam, lobster, and turbo.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

The following is sourced directly from the Project Global report on Micronesia[1].

"Marine mammals are not protected in FSM under the Marine Resources Act. To date there has been no dedicated surveys of marine mammals in Micronesian waters (Miller 2007).

Seabirds are not protected. Sea turtles are also not protected at the national level but have varied amounts of protection in the different states. Each state has different laws for the hunting of turtles (Buden 2001). In Pohnpei, the law states that no hawksbills can be taken while on shore and their eggs are also protected. There is a minimum size for both hawksbills and green turtles and there are closed seasons for all turtles from December to the end of January and then again from June to the end of August. However it is well known that these laws are not strictly enforced nor rigorously observed (Buden 2001)."

The following species of marine fish, birds and mammals are listed in the IUCN Red List of Threatened Species for the Solomon Islands (http://www.iucnredlist.org/).

Species name	Common name	Year assessed	Population trend	Red List status
Alopias pelagicus	Thresher Shark	2004	decreasing	Vulnerable
Bolbometopon muricatum	Bumphead Parrotfish	2007	decreasing	Vulnerable
Cheilinus undulatus	Giant Wrasse	2004	decreasing	Endangered
Chelonia mydas	Green Turtle	2004	decreasing	Endangered
Cromileptes altivelis	Baramundi Cod	2008	decreasing	Vulnerable
Epinephelus lanceolatus	Brindle Bass	2006	decreasing	Vulnerable
Eretmochelys imbricata	Hawksbill Turtle	2008	decreasing	Critical
Hippocampus kuda	Common Seahorse	2003	decreasing	Vulnerable
Isurus oxyrinchus	Shortfin Mako	2004	decreasing	Vulnerable
Isurus paucus	Longfin Mako	2006	decreasing	Vulnerable
Lepidochelys olivacea	Olive Ridley	2008	decreasing	Vulnerable
Phoebastria immutabilis	Laysan Albatross	2008	decreasing	Vulnerable
Physeter macrocephalus	Sperm Whale	2008	unknown	Vulnerable

[1] http://bycatch.env.duke.edu/regions/oceania/Micronesia.pdf

Plectropomus areolatus	Polkadot Cod	2008	decreasing	Vulnerable
Plectropomus laevis	Blacksaddled Coral Grouper	2008	decreasing	Vulnerable
Pterodroma cervicalis	White-necked Petrel	2008	increasing	Vulnerable
Rhincodon typus	Whale Shark	2005	decreasing	Vulnerable
Sphyrna mokarran	Hammerhead Shark	2007	decreasing	Endangered
Taeniura meyeni	Black-blotched Stingray	2006	unknown	Vulnerable
Thunnus obesus	Bigeye Tuna	1996	-	Vulnerable
Tridacna gigas	Giant Clam	1996	-	Vulnerable

Currently bycatch data is collected by observers and is analyzed by SPC. The only paper published on cetacean bycatch was related to illegal unreported and unregulated (IUU) fishing in Micronesia (Dalebout 2008).

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

The National Fisheries Corporation (NFC) is a public corporation established by the FSM Government in 1984. The aim of the corporation is to develop and promote a profitable and long-term commercial fishery within the FSM. In addition to the National Fisheries Corporation's own industry development programs, the corporation works closely with the individual states in joint fishery projects.

The Fisheries Section of the National Government Department of Economic Affairs provides national and state governments with technical services and support for development and management of marine resources, including non-living resources. The Section is also responsible for administration of the National Aquaculture Centre in Kosrae, established in 1991 as a focal point for aquaculture demonstration, training and advisory services.

Various government departments and semi-government agencies are involved in marine resource use and management at the state level, including:
The Pohnpei Marine Resources Division;
The Pohnpei Economic Development Authority;
The Kosrae Marine Resources Division;
The Chuuk Department of Marine Resources;
The Yap Marine Resources Management Division;
The Yap Fishing Authority.

9. DATA COLLECTION

9.1 BIOLOGICAL

The Micronesian Fisheries Authority employs a staff biologist whose main tasks are to analyze catch and effort data of the foreign and domestic fleets and operate the Authority’s onboard observer programme. The FSM National Oceania Resource Management Authority established an observer program in 1979, and currently operates

between 10-12 observers (WCPFC 2009). The observer programme completed a total of 42 observed trips in 2007 for both the longline and purse seine fleets Observer coverage of the longline fleet was 24% (16 trips) in 2007 and 17.7% (26 trips) for the purse seine fleet (WCPFC 2009). The observer data is given to SPC to analyze and bycatch information is not publicly available.

NORMA also has a port sampling program in Pohnpei and monitors unloading and transshipment of activities in FSM ports Port sampling coverage for purse seine tranashipment is 70% and longline coverage is around 88% (WCPFC 2009).

Currently there are no databases that house fisheries information in Micronesia as all information is sent to the Secretariat of the Pacific Community for analysis.

The following is sourced directly from the NORMA website –

NORMA is responsible for carrying out scientific research and data verification activities of the Authority through an Observer Program and Port Sampling Program. This section coordinates observer placements with distant water fishing nations fishing in the FSM EEZ and also conducts training of fisheries observers. Observers collect information on fishing gear, weather conditions, gonad samples, effort, effort, species caught, length frequencies, and amount of catch be species (target species, bycatch and other information generally not requested in log sheets and other pertinent information regarding the fishing trip.) the Authority maintains pool of 8-12 trained fisheries observers. This section is also responsible for managing the Port Sampling Program in the four FSM States. These port samplers take samples from fish, measure length frequencies to determine changes in population structure and report amount of catch exported and rejected. They submit reports of their activities and data collected monthly to the main office. There are five port samplers in all four States. This section collaborates with the Oceanic Fisheries Program at the SPV on tune resources assessments/studies and analysis of catch reports. This section also collaborates with other regional and internationally recognized research institutes involved in tune research.

This section is also responsible to monitor and report on catch and effort of all foreign and domestic fishing operators and advise the Executive Director on management issues at national regional and international levels.

<u>The Fisheries Observer Program (FOP)</u>
The NORMA fisheries observer program (FOP) has been operating since the initiation of the Authority in 1979. The program was initially small scale with only a few placements per year on Japanese purse seiners and some longliners. The program was expanded in 1992 to cover the rapidly diversifying fleets and to make the data more scientifically useful in stock assessment.

In 2001, the Authority adopted a Plan for the Management of the Tuna in the Federated States of Micronesia. This management plan establishes the principle objective of the plan as “to ensure that the nation’s tuna resources are used in a sustainable way.” Within this framework, a set of specific goals was established in order of priority, its main goal being “to ensure that the tuna catch does not exceed sustainable levels.” The

establishment of the management plan has highlighted to importance that the Authority collect accurate data and hence the necessity of the NORMA FOP.

The NORMA FOP main objectives are:

· To collect, catch and effort data during fishing operations that can be used to validate information received from vessels, such as logbooks and catch reports;

· To report on fishing operation and activities of foreign vessels and others such as fishing strategies, gear specifications/models, hourly fishing locations, and other fisher information required by the Authority;

· To carry out biological sampling for research purposes as required by the Authority;

· To record the vessel catch compositions of both discards and target species, and other protected species such as marine mammals;

· To collect information on the activity of other fishing vessels encountered at sea for compliance with the current licensing agreements.

The trend in coverage for the program has been positive with a general increase in coverage over the past few years. The observer coverage is restricted each year by observer program logistics such as the budget and by a memorandum of understanding that limits the number of trips made on Japanese vessels to 6 longline, 5 purse seine, and 2 pole and line vessels per agreement year. The larger Japanese and Taiwanese fleets that base in Guam also add difficulties and expense to placements.

9.2 ENVIRONMENTAL
No information currently available

9.3 ECOSYSTEM
No information currently available

9.4 SOCIO-ECONOMIC
No information currently available

9.5 FUNDING
No information currently available

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

There is a long heritage of tuna research in FSM - over 75 tuna research and exploratory projects have been carried out in the Micronesian area since the 1920s. These have been undertaken mainly by the Japanese and U.S. governments, as well as by Pacific Island regional organizations. Three major tuna tagging programs were carried out in FSM and surrounding countries by the Secretariat of the Pacific Community (SPC) in the late 1970s, the late 1980s, and in the late 2000s. Log sheet catch and effort data covering the major Japanese fleets prior to 1979 are available from the Fisheries Agency of Japan.

Although the FSM scientific research policy on the tuna fisheries has not been formalized into a document, aspects of a research policy can be inferred from past and present activities. Major elements of the FSM tuna research policy can be construed to be:

- Making significant efforts to obtain reliable tuna resource assessments, including double-checking these assessments;
- Maintaining in-house tuna research expertise in the form of a tuna biologist;
- Operating a very active observer program that allows for data verification;
- Utilizing high quality outside scientific expertise; and,
- Recognition that for tuna conservation efforts to be effective, FSM should promote and be actively involved in regional and international efforts.
- Research funding

The fisheries research policy is very different at the state level. There appears to be a general lack of awareness or understanding of the marine resource base that is available to support coastal fishery development. Few assessments have been carried out of inshore resources, and comparative information from elsewhere has not been extrapolated to the FSM situation. In general, at the political level there is an over-optimistic view of the degree to which coastal resources of the states can support commercial development and a lack of appreciation of the need for, and benefits of, fisheries research.

Several donors and agencies have provided assistance to FSM in the fisheries sector in recent years. These include Asian Development Bank, United Nations Development Programme, Secretariat of the Pacific Community, Forum Fisheries Agency, Food and Agriculture Organization of the United Nations, World Bank, Japan International Cooperation Agency, South Pacific Regional Environment Programme, South Pacific Project Facility of the International Finance Corporation, Republic of Korea, the Australian Agency for International Development, the Nature Conservancy, and the U.S. National Oceanic and Atmospheric Administration.

The areas receiving donor support in recent years include aquaculture, fisheries wharves, community-based management, fishing vessels, and marine biodiversity conservation.

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

Since the inception of the SPC regional tuna fishery database in 1979 FSM has been carrying out a relatively comprehensive observer program, and one of the objectives has been to verify the accuracy of logbook data. Over-all assessments of the tuna resources of FSM are done periodically by the SPC.

10.4 ASSESSMENT FUNDING

NORMA is funded by the National Government of FSM.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Annual fishery reports, press releases and newsletters relating to the national fishery are available on the NORMA website
http://www.norma.fm/NORMA_files/Publications.htm

Data on catch and effort by nation and commercial fleet for tuna species caught within the WFPFC Convention Area and the FSM EEZ is reported to the Scientific Committee of the WFPFC. This data is collected by observers, port sampling and compulsory logbooks and is available in the form of annual reports on the website of the WFPFC and SPC.

12. MANAGEMENT PROCESSES

The objectives of fisheries management in FSM vary considerably depending on the level of government. In FSM there are three levels which have special significance for fisheries management:

- National government: has jurisdiction over fisheries management in the zone outside 12 miles from islands up to the outermost limits of the exclusive economic zone.
- State governments: the four states (Chuuk, Kosrae, Pohnpei, and Yap) have jurisdiction over fisheries management in the waters in their respective 12-mile zones. Each state has its own administrative organisations, several agencies involved in fisheries, and its own plans for fisheries development and management.
- Local governments: In some of the states, local communities have a high degree of autonomy in the management of nearshore fisheries resources.

In practical terms, the national government manages the industrial tuna fisheries, in which most of the participating vessels are from distant-water fishing nations.

The objectives of fisheries management at lower levels of government are not as well articulated and therefore must be inferred from context. In most of the states, the common objectives appear to be prevention of destructive fishing, deterring of over-harvesting, and protection of endangered species. The objectives of management at the village level mainly revolve around assuring the sustainability of local marine foods.

There is a very large difference in fishery management arrangements at the national level (outside 12 nautical miles) and the state level (inside 12 nautical miles). There are also great differences between the states. At the national level NORMAhas the authority under the fisheries law to adopt regulations for the management, development and sustainable use of fisheries resources in the exclusive economic zone. Regulations adopted by the Authority have the full force and effect of law, and are considered an integral part of the fisheries law. Management measures have historically revolved around strict vessel licensing requirements and effective enforcement to achieve the objective of obtaining national revenue from foreign fishing access agreements. In recent years the objective of ensuring resource sustainability has received considerable attention, with restriction of purse seine effort being the main supporting measure.

At the state level the most common type of fishery management measure used are various types of bans (e.g. destructive fishing techniques) and closed seasons. Example of common ban is the prohibition of fishing for trochus except during short open seasons. The use of marine protected areas is increasing.

Chuuk State has by far the largest state fishery agency in FSM, it is also the state with the most serious fishery management problems. High and rapidly growing population is creating greater pressure on fishery resources. There are large numbers of boats in the lagoon (reportedly over 2 000). Although many of these are used primarily for transport, many are also used for fishing, at least occasionally. Good air connections exist to Guam, which provides a market for a component of the catch. Dynamite fishing is prevalent, and dredging and sand-mining for building materials are largely uncontrolled. The State's numerous municipalities nominally have some authority to control access to their fishing areas but these seem to be upheld only in the outer islands and more remote parts of Chuuk proper, and are largely ignored close to the population centres.

Kosrae State is the state with the least complex fishery management environment. A single small island with a small population (who are historically not such ardent fishermen as those of other FSM states), limited resources, and far from most commercial marketing opportunities, Kosrae's fishery management problems are mainly related to the smallness of the resource. Harvests of certain key species such as trochus and crabs are or need to be controlled, but most threats to coastal resources come from land-based developments, which cause increased runoff, pollution or sedimentation. However Kosrae probably has the best-developed coastal management system of any state, with environmental review procedures being progressively implemented for all coastal development projects.

Pohnpei State is something of an intermediate case in terms of resources, degree of exploitation, and the extent of fishery management problems. The general perception in Pohnpei seems to be that resources are not yet in crisis but that the time is quickly approaching when management action will be needed, at least on Pohnpei proper. Unfortunately there is also something of a fatalistic view that management will not be possible until a crisis situation develops. As in other states, enforcement of State fishery laws by State police or conservation officers is largely ineffective, while the absence of traditional tenure systems on Pohnpei proper may impede the development of community-based management arrangements.

Yap State is unique in the degree to which traditional marine tenure arrangement have been preserved, both in Yap proper and in the outer islands. Inshore fishery management in the state essentially needs to be community-based because the state constitution and laws recognise that communities and their leaders have absolute authority over access to and use of coastal areas. Relative to other states, Yap has a large resource base and small population, and in this sense management issues related to over-exploitation are not pronounced. Nevertheless some resources, especially of sessile types such as clams and beche-de-mer, have been seriously over-exploited in the past, demonstrating that the traditional system of tenure does not guarantee responsible stewardship.

13. FUTURE OPPORTUNITIES

The presently under-utilized assets of the failed government fisheries companies could represent a significant foundation for a private sector firm. Despite past failed attempts at privatization, if the buildings, cold storage, dock facilities could be expeditiously cut loose from government control, these could be the basis, or at least a component, of generating substantial economic activity by the private sector.

Improving attractiveness of FSM ports to foreign fishing vessels is likely to result in a large expansion of on-shore expenditures by foreign fleets.

14. STAKEHOLDERS

As FSM is a collection of a large number of small islands with a population highly dependent on marine resources, virtually everybody in the country is a stakeholder in fisheries, due to its contribution to nutrition, employment, and support to government.

The main national government stakeholders in tuna fisheries, in addition to NORMA and NFC (described above), are:

- Congress- for approval of access agreement involving ten or more vessels
- The Justice Department – for coordination of surveillance and enforcement activities
- Foreign Affairs Department – for fisheries aspects of bi-lateral and multi-lateral treaties and for attendance at regional fisheries management meetings
- The Office of the President – for Cabinet meetings (Norma Executive Director is a Cabinet member), approval of travel, and for appointment of NORMA board members
- Finance Department – budget matters and all disbursements except for fishery observer activities
- The Department of Economic Affairs – for coordinating the activities of the DEA Fisheries Section in matters concerning tuna

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WEBSITES

www.norma.fm – The website of the National Oceanic Resources Management Authority

www.comfsm.fm/fmi - The website of the Fisheries and Maritime Institute

www.fsmgov.org/nfc - The website of the National Fisheries Corporation

www.spc.int/coastfish/Countries/FSM/FSM.htm - Information on FSM fisheries, links to other sites concerning FSM and its fisheries, and some SPC reports on FSM fisheries

Chapter 2: Kiribati

1. EXECUTIVE SUMMARY

Kiribati's Exclusive Economic Zone (EEZ) comprises the Gilbert region in the west, the central Phoenix region and the Line Islands in the east. It encompasses 33 islands within an area of 3.5 million square kilometres. Tuna is the most important commercial species in national waters but technical and economic difficulties associated with Kiribati's remoteness, lack of infrastructure and variability in resource abundance have all contributed to the failure of several ventures aimed at developing a national tuna fishing industry[1]

Kiribati has a small-scale artisanal tuna and reef-fish fishery based on trolling and vertical hand-lining from canoes and skiffs. The catch is used for direct subsistence and supplies the local markets. Distant water fleets (DWFs) of Korea, Spain, China, Taiwan, New Zealand and the U.S. are licensed to fish for tuna in Kiribati waters. The major fishing gears employed include purse-seining, long-lining and pole and lining. Tuna licensing fees represent the most significant source of government revenue and were mostly responsible for subsidizing the government budget. In 2009, the fees collected from offshore licensing for tuna fishing composed 35% of the total major revenue for the Government. Current levels of fishing effort yield Kiribati $25 million–$30 million annually in foreign fishing vessel license fees.

The tuna fishery is immensely important to economy of Kiribati, therefore national, regional and international cooperation and collaboration is essential for the long-term development and sustainable management of this resource (WCPFC 2010) but the country has an uneven track record in terms of its commitment to collective management arrangements through the FFA, SPC and WFPFC[2].

Seaweed production black pearl culture, integrated aquaculture-livestock operations (assisted by Japan) and culture of milkfish and prawns (supported by Taipei and China) are some of the aquaculture projects that have been touted as potentially enhancing outer island incomes but have not yet demonstrated commercial feasibility. There is a thriving aquarium fish trade based on Kiritimati. Pet fish are exported by air to Honolulu amid growing concern regarding over-exploitation of the more popular species. The bonefish sport fishery, which is the basis of the tourist industry on Kiritimati, is also threatened by the over-exploitation[2].

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Kiribati 's EEZ is an important tuna fishing zone for industrial fleets from a number of distant-water fishing nations (DWFNs) including Japan , China , Korea , the United States , New Zealand, Spain, Chinese Taipei, EU, Tuvalu, the Cook islands and the

[1] http://www.spc.int/coastfish/Sections/Community/kiribati.htm
[2] http://www.fao.org/fi/oldsite/FCP/en/KIR/body.htm

Federated States of Micronesia (FSM). Access for these fleets is granted under various licensing arrangements, some of which are concluded on a government to government basis and others on a government to industry basis. In 2009 over 500 foreign fishing vessels including supporting vessels licensed to operate in Kiribati's waters[1].

Recently, the Government has entered into other industrial fishing ventures, notably a joint-venture purse-seine arrangement with a Japanese company. The Government has also undertaken negotiations with potential joint-venture partners with the intention of establishing a long-line fishing base for the production of fresh tuna for sashimi markets (WCPFC 2010).

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The information in Section 3 is sourced directly from the EU Commission website (http://ec.europa.eu/fisheries/cfp/international/agreements/kiribati/index_en.htm).

The fisheries partnership agreement concluded between the Community and Kiribati covers the period 16 September 2006 – 15 September 2012 with a financial contribution of 478 400 € out of which 30 % is dedicated to the support of the fisheries policy of Kiribati.

This fisheries agreement allows community vessels mainly from Spain, Portugal and France to fish in the Kiribati waters and is part of the tuna network fisheries agreements in the Pacific.

Duration of the Agreement :	6 years renewable (16.9.2006 – 15.9.2012)
Duration of the Protocol:	6 years renewable (16.9.2006 – 15.9.2012)
Initialisation:	19 July 2006
Nature of the FPA :	Tuna Fishery Agreement
Financial contribution:	**478 400 €** out of which 30 % has been earmarked for the support of the Kiribati sectoral fisheries policy in order to promote sustainability in its waters. The second year, this percentage will increase to 40 %, and to 60 % the following years.
Fee for ship owners:	35 € per tonne caught.
Advances:	- Tuna seiners: 21 000€ per year (ref catches: 600 t.) - Surface longliners: 4200€ per year (ref catches: 120 t.)
Reference tonnage:	**6 400 t./year**

CURRENT PROTOCOL
Fishing possibilities

	SPAIN	FRANCE	PORTUGAL	TOTAL
Tuna seiners	73%	27%	-	4 vessels
Surface longliners	6	-	6	12 vessels

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable

5. FISHING ADMINISTRATION

The development and management of the marine resources within Kiribati falls under the jurisdiction of the Fisheries Division of the Ministry of Fisheries and Marine Resources Development. The Ministry of Natural Resources Development (MFMRD) is also known as Ministry of Fisheries and Marine Resources Development (MNRD). The Ministry of Fisheries and Marine Resources Development is divided into the following departments:

- Licensing unit
- Fisheries division
- Mineral unit
- Planning unit
- IT unit

The MFMRD has comprehensive responsibility for policy and management matters relating to Kiribati's marine resources. The Fisheries Division is the key agency dealing with marine resource development and management and is charged with undertaking research, data collection, project implementation, project evaluation, and the commercialization and privatization of marine resource projects (Gillett 2006).

The Fisheries Division is subdivided into some sections which are as follows-

- Training
- Research
- Project
- Sea Cucumber
- Pearl
- Eco-farm

The staff structure of the Fisheries Division is two tiered, with over 115 staff . The Division is headquartered at Tanaea, in South Tarawa, with fisheries officers stationed in each island of the Gilberts group, as well as the inhabited islands of the Line and Phoenix groups.

The Fisheries Division liaises with regional and international fisheries organizations. Kiribati is a member of the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA), the Western and Central Pacific Fisheries Commission (WCPFC) and the South Pacific Regional Environmental Programme (SPREP). Kiribati is also party to a number of treaties and agreements relating to the management of regional fisheries, including:

The Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America, also known as the South Pacific Tuna Treaty (SPTT). This treaty entered into force in 1988 and has been extended several times with the current agreement set to expire in June of 2013 (NMFS 2008). The latest

extension provides licenses for up to 40 US purse seiners, with an option for 5 additional licenses reserved for joint venture arrangements, to fish for tuna in the EEZ's of the Pacific Island Parties represented by the Forum Fisheries Agency (NMFS 2008). In return for licenses, the US provides economic assistance to the Pacific Island Countries. The 2002 agreement has updated methods for reporting, use of VMS, fishing capacity, revenue sharing, and linkages between the Treaty and the WCPFC. (NMFS 2008). The Following 17 countries are involved in the treaty Australia, Cook Islands, Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, PNG, Samoa, Solomon Islands, Tonga, Tuvalu, US and Vanuatu. The treaty establishes terms and conditions to granting access to tuna resources in the Pacific. Access is granted through an arrangement of fixed annual vessel license fees and technical assistance payments paid by industry, coupled with an annual payment from the US government for development assistance (Herrick 1997).

In the National Development Strategy 2000–2003 the policies and strategies (2000–2003) for marine resources as stated are to:

- Promote private sector production and marketing of marine products;
- Identify specific marine commodities having highest commercial feasibility, and target a small number of these for development support;
- Accord high priority to selected commodities that can be produced and marketed by smallholders in the outer islands;
- Formulate strategy for promoting fish transhipment by foreign vessels and for achieving greater utilisation of onshore facilities by these vessels;
- Complete development plan for the cultured pearl industry; and
- Complete development plan for the milkfish industry.

Kiribati is a party to The Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region calls for Pacific Island countries to cooperate and rely on each other for the control and enforcement of their fisheries regulations within their EEZs. France, Australia and New Zealand have provided assistance for the development surveillance capacity with FFA member nations. Part of this assistance includes surveillance patrol flights over the region's management area. (Veitayaki, 2005) The cooperation this treaty has fostered is best illustrated between Tonga and Tuvalu because Tonga agreed to use its patrol boats, donated by Australia, to patrol both nations' exclusive economic zones (South and Veitayaki, 1999). Surveillance is costly and logistically difficult for an EEZ the size of Kiribati's and because of the difficulties of doing surveillance for any one Pacific island country alone, the PNA group is exploring a joint surveillance program. It was agreed to in principle in late 2005 (Barclay and Cartwright 2007).

Kiribati is a party to the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Concern. The parties to this agreement have set forth the minimum terms and conditions of access to fisheries zones of the parties by tuna purse seine fishing vessels (FFA 2008). This agreement forms an alliance of Pacific Island states whose exclusive economic zones collectively account for a significant bulk of the region's tuna catch and almost all of the purse seine catch (Dunn 2006).

In support of the Nauru Agreement, Kiribati is also a signatory to The Palau

Arrangement for the Management of the Western Pacific Purse Seine Fishery. The Arrangement sets a limit on the number of purse seine vessels that could be licensed by the Parties and allocates these licenses by fleet (Dunn 2006). This agreement is based on restriction of the total allowable number of vessel licenses available and allocation of these licenses among fleets operating in the western and central pacific purse seine fishery. The new management scheme sets a total allowable effort level (in terms of purse seine effort days) which is then allocated among the Palau Arrangement parties (Dunn 2006).

The FSM Arrangement is a treaty between states of the PNA for access to the fishing resources of other parties for domestic vessels. Signatories are the Federated States of Micronesia, the Marshall Islands, Kiribati, Nauru, Palau, Papua New Guinea and the Solomon Islands. This arrangement provides access for domestic vessels on terms no less favourable than those granted to distant water fishing nations. This Arrangement was also designed to encourage foreign operations to relocate or base their vessels within the Parties to the Arrangement[3].

6. LIST OF IMPORTANT STOCKS

Four main species of tuna occur in Kiribati waters and are targeted by both commercial tuna vessels of the Distant Water Fishing Nations (DWFN) and the commercial, semi commercial and the artisanal fishing vessels of the domestically based fishermen. The four main commercial species are Skipjack tuna, Bigeye tuna, Yellowfin tuna and Albacore (Awira 2004). The most important species in economic terms is Skipjack, which makes up around 75 per cent of purse seine catches, and almost all the catch of pole and line vessels. Yellowfin is important both to the purse seine fishery and the longline fishery. Skipjack and yellowfin catches are also the basis of local small-scale tuna fishing. Bigeye is important to the long-line fishery because of its higher value, but is also caught as bycatch by purse seine vessels. Currently, Albacore is not as significant as the other 3 tuna species but may become more important in the future (Awira 2004).

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

The following species of marine fish, birds and mammals are listed in the IUCN Red List of Threatened Species for Kiribati (http://www.iucnredlist.org/).

Species name	Common name	Year assessed	Population trend	Red List status
Alopias vulpinus	Common Thresher Shark	Vulnerable	2007	decreasing
Bolbometopon muricatum	Bumphead Parrotfish	Vulnerable	2007	decreasing
Cheilinus undulatus	Giant Wrasse	Endangered	2004	decreasing
Chelonia mydas	Green Turtle	Endangered	2004	decreasing
Epinephelus lanceolatus	Brindle Bass	Vulnerable	2006	decreasing
Isurus oxyrinchus	Shortfin Mako	Vulnerable	2004	decreasing

[3] http://bycatch.env.duke.edu/regions/oceania/Kiribati.pdf

Nesofregetta fuliginosa	White-throated Storm-petrel	Vulnerable	2008	decreasing
Physeter macrocephalus	Sperm Whale	Vulnerable	2008	unknown
Plectropomus areolatus	Polkadot Cod	Vulnerable	2008	decreasing
Plectropomus laevis	Blacksaddled Coral Grouper	Vulnerable	2008	decreasing
Rhincodon typus	Whale Shark	Vulnerable	2005	decreasing
Thunnus obesus	Bigeye Tuna	Vulnerable	1996	
Tridacna gigas	Giant Clam	Vulnerable	1996	

To date, there have been no dedicated studies of bycatch of seabirds, marine mammals, sea turtles or other marine species in Kiribati waters (PG). All locally caught fish are consumed in some manner and the idea of bycatch is not a familiar concept to Kiribati nationals (Johannes & Yeeting 2000, Thomas 2003).

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

The Fisheries Division, usually with the support of external donors or organisations, undertakes fisheries and aquaculture research in Kiribati. The objectives of the Division's Research Unit are to conduct research on marine resources that have potential for development and to coordinate collaborative research activities with regional research organisations. Current research activities include:

- the Seaweed Growth Monitoring Programme, which investigates *Eucheuma* seaweed growth rates at various locations and under various conditions with the aim of determining optimum sites and seasonally for farming;

- monitoring of the bêche-de-mer fishery, including plans to investigate the potential to culture some commercial species;

- Giant Clam Stock Assessment, including plans to investigate the potential for farming;

- the Pearl Oyster Collaborative Project, which is funded by the Australian Centre for International Agriculture Research, is investigating the potential for developing Kiribati's black-lipped pearl oyster resources with the longer-term view of establishing commercial pearl farming.

Past research has included studies of deep-bottom fish, deep-water prawns, tuna baitfish, pelagic fish species in the Line Islands , and other resources. The Division's Aquaculture Unit is also involved in research aimed at eradicating tilapia from the Tarawa milkfish ponds.

Marine and fishery sector training in Kiribati is aimed mainly at enabling Kiribati citizens to find overseas employment on cargo or fishing vessels. The Kiribati Marine Training Centre (MTC) was established in the late 1970s in partnership with a commercial shipping agency to provide training for merchant seamen. For several years KMS also offered a training programme aimed at the fishing sector but this function has now been taken over by the Fisheries Training Centre (FTC), which was established in 1989 with Japanese aid support.

A certain amount of academic-level training in marine resources is available in Kiribati via the Atoll Research Centre, which is affiliated with the University of the South Pacific (USP), as well as through USP's Kiribati Extension Centre.

9. DATA COLLECTION

9.1 BIOLOGICAL

Tuna fishing vessels are required to record and submit logbook forms containing position, effort, and catch information. This routinely-collected data is processed by the Fisheries Division's Licensing and Enforcement Unit**Error! Bookmark not defined.**. Currently there are no fisheries statistics databases in Kiribati because all collected information is sent to the Secretariat of the Pacific Community for further analysis[1].

Logsheet submission from Kiribati's national fleets and licensed foreign fishing vessels has still not accomplished the required 100% coverage. Retrieval of logsheet data from licensed foreign long-line vessels is hampered by poor compliance of fishing masters to submit logsheets in a timely manner coupled with delays in the submission of logsheets which usually occur only after the completion of lengthy fishing trips (often over a year in duration) (WCPFC 2010). The Foreign Licensing Unit enforces data submission by fining vessels that failed to submit logsheets (Barclay & Cartwright 2007))

National Observer Program

In 2008 there were 15 fisheries observers in the Kiribati Observer program but only 3 were eligible for the regional observer program. Five observers were stationed at Christmas Island and were mainly engaged in boarding of Korean long-line vessels. The remaining observers were located on purse seine vessels and were based in Tarawa. In 2007, a total of 21 fisheries observers were placed on Korean, Japanese and Taiwanese fishing vessels. Purse seine observer coverage was 20% and long-line coverage was low with only 3 vessels boarded (WCPFC 2009).

The major drawback for Kiribati to provide good quality observer data include the lack of qualified observer de-briefers to check the quality of observer data and to brief observers, especially new recruiters prior boarding fishing vessels. All observer and port sampling data is sent to the Secretariat of the Pacific Community (SPC) for analysis.

Port Sampling

Port sampling data collection in Kiribati is carried out by trained port samplers and observers. In 2009, 176 out of the 209 boats entering Kiribati's water were sampled for transhipment. Data collected was scanned and sent to SPC for re-processing and analysis.

Unloading/Trans-shipment Data

Kiribati is engaged in the collection of unloading data from two designated ports, Betio port in the Gilbert group and Christmas port in the Line Islands. At sea trans-shipments by vessels in the licensed foreign long-line fleets (within Kiribati's EEZ) are permitted only the presence of an observer.

Artisanal Fishery Data Collection

An ongoing fisheries survey collects data such as number of boats employed, total tuna catch by species and other fisheries baseline information from the artisanal fishery.

9.2 ENVIRONMENTAL

The National Environment Management Strategy relevant to fisheries promotes –

- Documentation of traditional knowledge and management systems
- Establishment of database on natural resources
- Protection of special habitats and species
- Conservation of mangroves
- Workshops on the conservation and management of reefs and living marine resources.

Another strategy promoted by the environment community is the use of biodiversity conservation areas. About half of Tarawa Atoll was declared in the mid-1990s to be a conservation area by the Minister of Environment and Social Development.

9.3 ECOSYSTEM

No information available

9.4 SOCIO-ECONOMIC

No information available

9.5 FUNDING

No information available

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

The Project Global country profile on Kiribati**Error! Bookmark not defined.** states that-

"More species research is needed throughout Kiribati on sea birds, marine mammals and sea turtles to assess their population status and the current threats. A quantified study on cetacean diversity is needed, as is information on olive ridley, loggerhead and leatherback turtle populations. Important nesting beach habitats are important to identify, as are estimates of annual direct harvest.

In terms of bycatch in fisheries, Kiribati needs to align its national observer programme with the Forum Fisheries Agency and Secretariat of the Pacific Community (SPC)

regional observer programmes in order to ensure the information gathered by observers can be utilized in all avenues for analysis."

10.2 RESEARCH FUNDING

Bilateral programmes of technical cooperation, collaboration and assistance have been provided by the Governments of Japan, Australia, New Zealand , United Kingdom , and USA and by multilateral bodies including UNDP, ADB, FAO and UNCDF. Kiribati also enjoys technical assistance or the channelling of multilateral donor assistance from various regional agencies including, FFA, SPC, and SOPAC. Significant assistance projects have included:

- Japanese funding for Outer Island Fish Centres, a pilot bêche-de-mer hatchery, funding for the Tarawa Fishermen's Cooperative, provision of a cargo and passenger vessel to help link outer island fisheries centres, and assistance in the establishment and upgrading of Te Mautari Limited;

- Australian funding for the overseas training of fisheries personnel, a pilot black-lipped pearl oyster hatchery, and provision of fish processing equipment for a private venture on Tarawa;

- New Zealand assistance in the overseas training of fisheries personnel, and support to the establishment of *Eucheuma* seaweed farming, including the formation of the Atoll Seaweed Company;

- British funding of management personnel for Te Mautari Limited and assistance to Outer Islands Project activities on Butaritari, Abemama and Abaiang;

- United Nations Development Programme support to the establishment of milkfish farming on Tarawa, initial design of Te Mautari fishing vessels, an artisanal boat building project, overseas training for fisheries personnel, and a brine shrimp project on Kiritimati;

- Asian Development Bank assistance has been provided for a study of export market development, institutional strengthening of the Environmental Unit and a soft loan to the Bank of Kiribati to support a fishing vessel credit scheme, and;

- European Union funding of a Marine Resource Sector Review and support to the Atoll Seaweed Company

Source: (http://www.spc.int/coastfish/Sections/Community/kiribati.htm).

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

Assessments are routinely performed by the SPC and WFPFC.

10.4 ASSESSMENT FUNDING

No information available for this section.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Annual reports of the Fisheries Division have not been published since 1994.

12. MANAGEMENT PROCESSES

The Ministry of Natural Resources Development (MNRD) has comprehensive responsibility for policy and management matters relating to Kiribati's marine resources (Gillett 2006). The development and management of the marine resources within Kiribati falls under the jurisdiction of the Fisheries Division of the Ministry of Fisheries and Marine Resources Development. The Fisheries Division of MNRD is the key agency dealing with marine resource development and management and is charged with undertaking research, data collection, project implementation, project evaluation, and the commercialisation and privatisation of marine resource projects. Fisheries management activities include resource assessment, monitoring, regulation and enforcement. The Ministry of the Environment and Social Development and its Department of Environment and Conservation are responsible for evaluating the environmental impacts of marine resources and protecting subsistence fisheries, marine habitats, and marine life. The Ministry of Commerce, Industry and Tourism is charged with evaluating foreign investment in the marine resources sector, local companies involved in marine product export, and private sector development (Gillett 2006).

The current strategies of the Kiribati government to achieve fishery objectives have not been articulated in documents readily available to the public but may be assumed to include-

- Licensing of foreign fishing activity.
- Monitoring fish landings throughout Kiribati.
- Promotion of conservation-oriented fisheries aid projects.
- Formulation of a lagoon management plan.
- The use of aquaculture to relieve pressure in inshore resources and for alternative income generation.
- Support to specific externally-funded projects having relevance to fisheries.
- Recognition of traditional fishing rights of Kiribati communities.
- Promotion of fish aggregating devices to encourage a transfer of fishing effort offshore.

13. FUTURE OPPORTUNITIES

The key priority area for Kiribati is to develop its Tuna Fishery in a sustainable manner and generate more employment and income to local people. In 2009, the Government began consultations with foreign companies with the view to establishing joint venture fishing operations and fish processing facilities with interested foreign companies.

Over the years there have been many attempts by the government to maximise local revenue from the tuna industry in the country, however, to date, these development projects have failed to produce any long-term positive outcomes. Awira (2004) outlined the main reasons for these failures as-

- the lack of skilled manpower to effectively operate local fishing vessels,
- the improper transfer of knowledge and technology by donor countries who were at also operating simultaneously as DWFNs,
- the geophysical nature and isolation of our islands, making it difficult to develop our land based support facilities for the tuna industry

Building the human resources capacity in the Ministry of Fisheries is seen as a necessary component for realising aspirations towards effective resource management, as well as management for economic development. Other areas where Ministry and Fisheries Division staff could benefit are from studies in fisheries and business management (Barclay & Cartwright 2007).

14. STAKEHOLDERS

Stakeholder input in the decision making process is obtained by consultation between officials of the Ministry of Natural Resources Development and concerned parties. Additional stakeholder input occurs by dialogue with members of parliament.

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Chapter 3: Solomon Islands

1. EXECUTIVE SUMMARY

The nine administrative provinces of the Solomon Islands have considerable autonomy in matters of self-government, including fisheries[1]. Over the years, civil disturbances have had a major effect on the fisheries situation in the country and severe ethnic tensions have resulted in sporadic periods of violence and unrest[2]. In 2000, civil disturbances caused many fishing enterprises to close, air service to the country was suspended, institutions were closed and fishery exports substantially declined (Gillett 2006).

Both subsistence fisheries and offshore industrial fisheries are economically vital to the Solomon Islands. Since 90% of the Solomon Islands population is resident in remote rural areas, local fishing activities are of great importance for subsistence. The offshore fisheries are responsible for a large percentage of formal jobs in the country, while both processed and raw tuna are major export commodities. The license fees from foreign vessels fishing in the Solomon Islands' EEZ are a substantial source of revenue for the government.

Marine fisheries operate in both offshore and coastal areas. Offshore fisheries are undertaken on an industrial scale by both locally-based and foreign tuna vessels: pole-and-line, longline, and purse seine. Coastal fishing is primarily carried out for subsistence purposes, but there are some sales for local markets, and exports of high-vale products. There is also an industrial-scale coastal fishery for baitfish that are used in offshore tuna fishing.

The Solomon Islands tuna fishery can be divided into 2 broad categories, (i) the commercial tuna industry and, (ii) Non- commercial tuna fishery. The commercial tuna industry comprises of (i) the commercial domestic (national) fleet and (ii) the foreign distant water fleet. Generally these two fleets are equally important to the national economy. The commercial domestic (National) fleet comprises of the purse seine vessels operated by the National Fisheries Development Ltd (NFD), the pole and line fleet by the Soltai Fishing and Processing Ltd and the long line fleet by the Solgreen Enterprise Ltd. The Foreign fleet on the other hand comprises of purse seine, long line and pole and line vessels, which fished in Solomon Islands waters under (i) bilateral arrangements, (ii) multilateral arrangements and (iii) joint venture (development) agreements (WCPFC 2010). The non-commercial component is the subsistence or artisanal tuna fishery. This sector is characterized as using of traditional dug-out canoes or outboard motor powered canoes. The artisanal fishery had been existed well before the introduction of the commercial tuna industry and has long played an important role in the rural food security.

The main trends in the fisheries sector include:

- An expansion of the purse seine tuna fishery and a decline in the longline and pole-and-line tuna fisheries

[1] http://bycatch.env.duke.edu/regions/oceania/Solomons%20Islands.pdf
[2] ftp://ftp.fao.org/FI/DOCUMENT/fcp/en/FI_CP_SB.pdf

- Over-exploitation and decline of production in the coastal commercial export fisheries.
- Subsistence fisheries being affected by a rising population.
- A significant deterioration of the quality of governance in the fisheries sector during the period of ethnic tension – and subsequent efforts by the government and donors to strengthen fisheries institutions.

Some of the major issues in the fisheries sector include[3]:

- Considerable difficulty in reconciling the economic and political importance of the cannery and pole-and-line fishing to the nation with the fact that those operations require large inputs of government and donor funds.
- The need to strengthen the Fisheries Department in a way that is (a) appropriate for the management required for the nation's fisheries, (b) acceptable to fishery stakeholders and existing staff, and (c) within the budget likely to be available in the future.
- Measures to redress the failure to meet the demand for fish in the Honiara urban area must be balanced with the fact that past attempts to establish the necessary operational and transportation infrastructure in the outer islands have been expensive and have had many failures.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

The foreign fleet consists of the vessels that are licensed to fish in Solomon Islands waters under bilateral, multilateral arrangements, and joint venture or development agreements. The bilateral arrangements include the distant waters fishing nations (DWFN) such as Japan, Korea, Taiwan and the Spain. The other arrangements include the US treaty and FSM arrangements. The vessels under these arrangements are directly administered by the Forum Fisheries Agency (FFA) on behalf of the pacific Island member countries. The vessels licensed under the joint venture or development arrangements, involves a foreign company and a local company or agent. Under the arrangement the vessels are registered and flying foreign flags.

In 2008, a total of 322 longline, pole and line and purse seine fishing vessels were licensed to fish in the FSM EEZ which were predominantly foreign fishing vessels. By gear type, longliners accounted for 126, pole and line 25, and purse seiners 171. Of the 133 longliners, Japan accounted for 58 followed by Chinese Taipei with 40, FSM 21 and China 7. In the case of purse seiners, Chinese Taipei accounted for 38 followed by Japan with 35, Korea 30, United States with 26, FSM 5, and Vanuatu 15. Japan is the only country employing the pole and line gear with 25 licensed in 2008 (WCPFC 2009)

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

There a provisional agreement in place. The previous agreement between the Community and Solomon Islands covered the period 9.10.2006 – 8.10.2009 with a

[3] www.sprep.org/att/IRC/eCOPIES/Countries/Solomon_Islands/9.pdf - information on the fishery resources of the Solomon Islands

financial contribution of 400 000 € out of which 30 % was dedicated to the support of the fisheries policy of the Solomon Islands. This fisheries agreement allowed community vessels mainly from Spain, Portugal and France to fish in the Solomon Islands waters and was part of the tuna network fisheries agreements in the Pacific.

Since October 2010 there has been an Agreement in the form of an Exchange of Letters on the provisional application of the Fisheries Partnership Agreement between the European Union and Solomon Islands but the official treaty is yet to be brought into force.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

See above.

5. FISHING ADMINISTRATION

Under the Fisheries Act 1998 the administration of fisheries is under the Minister for Fisheries and Marine Resources (MFMR). Until 2006, the government fisheries authority was a department under the Ministry of Natural Resources. In 2006, the Ministry of Fisheries and Marine Resources was created. The MFMR has five divisions. These are Research, Aquaculture, Licensing and Enforcement, Extension, and Statistics plus an administration unit. The latest annual report of the MFMR states that there are 65 established posts (of which 26 were vacant) and four non-established posts.

The MFMR is now being strengthened by the New Zealand-funded Solomon Islands Marine Resources Organizational Strengthening Program in its transition from the current organizational arrangements to new arrangements. The MFMR Corporate plan 2008 – 2011 states that the Programme will assist in several areas, including (a) agreeing on the new direction of the Ministry (reflected in strategic plan), (b) agreeing on and implementing an appropriate organizational structure able to provide strategic direction, (c) securing budget and other resources, and (d) building sound institutional capacity within the MFMR (financial, administration, IT, technical, policy). In general, the MFMR has elected to shift its focus away from attempting to be a full service provider to a role that enables it to more productively use the skills and resources available to it.

The Department of Fisheries and Marine Resources is vested with the responsibility of developing and managing, in cooperation with provincial authorities, the exploitation of all fisheries and marine resources found within the Fishery Limits in such a manner as to
Secure the optimum social and economic benefits for the people of Solomon Islands

The objectives of the Department are to-

- coordinate all fisheries activities operating within the 200 miles economic zone of Solomon Islands to achieve better and maximum benefit for the people of Solomon Islands;
- improve current fishing facilities to encourage local fishermen to effectively preserve and market their fish and other perishable marine products; and

- ensure that the harvesting practices of all marine resources are properly coordinated and monitored to ensure that certain resources are not depleted unnecessarily.

The Solomon Islands also has legal obligations and responsibilities to fulfil under a number of conventions and treaties, which directly or indirectly relates to fisheries. These include Western and Central Pacific Fisheries Convention (WCPFC), UN Convention on the Law of the Sea, UN Fish Stocks Agreement, Convention on Biological Diversity, Driftnet Convention, Food and Agricultural Organisation (FAO) Code of Conduct, FAO Compliance Agreement, FAO International Plans of Action, WSSD Fisheries Targets, South Pacific Forum Fisheries Agency (FFA) Convention and its Minimum Terns and Conditions, Lome Convention 1979 and the Multilateral Treaty on Fisheries with the USA.

6. LIST OF IMPORTANT STOCKS

In 2007 catch taken from the EEZ waters of the Solomon Islands was about 121 600 tonnes. The catch composition was about 24% yellowfin, 62% skipjack, 4% bigeye, 4% albacore, and 6% of other species. Groups that are common in the purse seine catch other than tunas are sharks, billfish, rainbow runner, and triggerfish. Groups that are common in the longline catch other than tunas are sharks, billfish, opah, wahoo, and dolphinfish[2].

The coastal fisheries catch a large variety of finfish and invertebrate species. A recent study by the Forum Fisheries Agency showed that approximately 180 species of reef finfish from 30 families are caught from shallow-water by the domestic fishery. Catches are dominated by the families Lutjanidae (snappers), Serranidae (groupers and rock cods), Lethrinidae (emperors), Scombridae (mackerels) and Carangidae (trevallies). Important commercial invertebrate species are beche-de-mer, trochus, green snail, and giant clams, crabs and lobsters.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

Currently there are no published bycatch studies or mitigation efforts for marine mammals,sea turtles or sea birds. No mitigation efforts or studies are conducted on other bycatch species such as sharks[1].

The following species of marine fish, birds and mammals are listed in the IUCN Red List of Threatened Species for the Solomon Islands (http://www.iucnredlist.org/).

Species name	Common name	Year assessed	Population trend	Red List status
Bolbometopon muricatum	Bumphead Parrotfish	Vulnerable	2007	decreasing
Carcharhinus longimanus	Oceanic Whitetip Shark	Vulnerable	2006	decreasing
Cheilinus undulatus	Giant Wrasse	Endangered	2004	decreasing
Chelonia mydas	Green Turtle	Endangered	2004	decreasing
Cromileptes altivelis	Baramundi Cod	Vulnerable	2008	decreasing
Dermochelys coriacea	Leatherback Turtle	Critical	2000	decreasing
Dugong dugon	Dugong	Vulnerable	2008	unknown
Epinephelus lanceolatus	Brindle Bass	Vulnerable	2006	decreasing
Eretmochelys imbricata	Hawksbill Turtle	Critical	2008	decreasing
Hippocampus kuda	Common Seahorse	Vulnerable	2003	decreasing
Isurus oxyrinchus	Shortfin Mako	Vulnerable	2004	decreasing
Isurus paucus	Longfin Mako	Vulnerable	2006	decreasing
Negaprion acutidens	Sharptooth Lemon Shark	Vulnerable	2003	decreasing
Physeter macrocephalus	Sperm Whale	Vulnerable	2008	unknown
Plectropomus areolatus	Polkadot Cod	Vulnerable	2008	decreasing
Plectropomus laevis	Blacksaddled Grouper	Vulnerable	2008	decreasing
Pseudobulweria becki	Beck's Petrel	Critical	2009	decreasing
Rhina ancylostoma	Bowmouth Guitarfish	Vulnerable	2003	decreasing
Rhincodon typus	Whale Shark	Vulnerable	2005	decreasing
Thunnus obesus	Bigeye Tuna	Vulnerable	1996	
Tridacna derasa	Southern Giant Clam	Vulnerable	1996	
Tridacna gigas	Giant Clam	Vulnerable	1996	
Urogymnus asperrimus	Porcupine Ray	Vulnerable	2005	unknown

The Solomon Islands regional populations of the indo-pacific bottlenose, pantropical spotted, and spinner dolphins and the melon-headed whale have been put on the Convention of Migratory Species Appendix II listing as populations that are 'vulnerable', mostly as a result of the drive hunts in the Solomon Islands.

There are two threatened species of seabirds – the critically endangered Beck's Petrel and the vulnerable Heinroth's Shearwater. The IUCN Red List of Threatened Species lists three sea turtles that inhabit the Solomon Islands waters, the leatherback, green and hawksbill turtles[1].

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Most of the recent fisheries research carried out in the Solomon Islands has been undertaken through cooperation with overseas partners[2] including:

- Aquaculture – with the WorldFish Center and NGOs
- Tuna – with the Oceanic Fisheries Programme of the Secretariat of the Pacific Community (SPC)
- Reef fish and invertebrates – with the Coastal Fisheries Programme of the Secretariat of the Pacific
- Community Corals – with the Foundation of the Peoples of the South Pacific International and the Secretariat of the Pacific Regional Environment Programme (SPREP)
- Spear fishing – with the Food and Agriculture Organization of the United Nations (FAO)
- Assessment of the biodiversity and status of coral reefs, seagrass beds, oceanic cetaceans, reef food fish, commercial invertebrates and associated habitats – with the Nature Conservancy (TNC)

The most prominent non-inter-government networks operating in the South Pacific are involved with establishing Marine Protected Areas (MPAs). Locally Managed Marine Area networks are operated by large NGOs such as FSPI (Melanesia, Kiribati and Tuvalu), TNC (Solomon Islands and PNG) and WWF (PNG, Solomon Island, Fiji, Cook Islands and New Caledonia). These NGOs have developed a network called the "Solomon Islands Locally Managed Marine Areas" (SILMMA) in order to improve capacity building and benefit from shared knowledge. The DFMR is considered an associate member but otherwise there is no official agreement between the SILMMA and the DFMR. There is a need for the SILMMA and DFMR to work together based on an official memorandum of understanding (Fa'asili 2006)

9. DATA COLLECTION

Domestic and foreign vessels are required to submit weekly logsheets, zone reports and transshipment logsheets to the DFMR. The weekly and zone reports are important for compliance purposes, data verifications and reconciliations. The trans-shipment logsheets (especially offloading figures) are purposely used for charging of trans-shipment levies for the Solomon Islands Government revenue and are also use for data verification.

Data coverage for the foreign fleet is estimated to be less than 50% annually. Poor return of logsheets is attributed to-

- most vessels do their offloading abroad,
- difficulties in communicating with boat operators/owners as they are based overseas,
- transmission of loghseets to Solomon Islands is not a priority for some,
- lack of cooperation from boat operators who may not understand the importance of the data to the Solomon Islands

9.1 BIOLOGICAL

There is no formal field research or survey carried out by the Solomon Islands Government to determine the status of the tuna stock in Solomon Islands. The only data source available which is currently used by the Solomon Islands Government is the catch and effort data submissions from the fishing industry (WCPFC 2010).

Port sampling has been suspended for the past years due to financial constraint and lack of human resources. The current number of active observers within the Solomon Island national observer programme is about 70 observers (WCPFC 2010).

The Arnavon Marine Conservation Area provides important habitat and research for sea turtles (MMTCF 2004). Beach surveys, weekly counts, satellite tracking and genetic sampling are conducted for juvenile green turtles. To date no turtle tags have been returned from past surveys (MMTCF 2004).

The Nature Conservancy completed a Rapid Environmental Assessment on cetaceans in the Solomon Islands in 2004 using acoustic surveys and photo identification to document presence of cetaceans. Eleven (11) species of cetaceans were recorded in the Solomon Islands (Kahn 2006). All eleven of these species coincide with species on both the IUCN and SPREP lists[1].

9.2 ENVIRONMENTAL
No information available

9.3 ECOSYSTEM
No information available

9.4 SOCIO-ECONOMIC
No information available

9.5 FUNDING
No information available

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

The Solomon Islands Fisheries Division (SIFD) undertakes a range of fishery research projects, often in association with external organisations or donor agencies. These have included:

- resource assessments of deep-bottom fish;
- studies on distribution, abundance and biology of tuna baitfish;
- monitoring of tuna transshipments;
- biological sampling of landings from tuna vessels;
- studies on distribution of pearl oysters;
- studies of the subsistence fishery;
- participation in a regional project to develop visual assessment methods for reef fish stocks
- fish consumption and market studies in Honiara.

The Coastal Aquaculture Centre (CAC) has undertaken a number of applied research projects in recent years, usually in collaboration with SIFD. These have included:

- development of village-based farming methods for giant clams. The operation of a giant clam hatchery at the CAC provides juvenile clams both for commercial grow-out and for the possible restoration of areas depleted of natural stocks;
- a large-scale sampling programme to collect black-lipped pearl oyster spat at five

lagoon areas;
- experimental culture of sea cucumbers (bêche-de-mer) to establish hatchery and husbandry techniques for these animals.

10.2 RESEARCH FUNDING

Important donors supporting major fisheries initiatives are the European Union (rural fisheries enterprises, seaweed culture, wharf at Noro), Overseas Fishery Cooperation Foundation (renovation of fisheries centres, a loan for cannery construction), Japan International Cooperation Agency (fisheries wharf, cold storage and social facilities), and the Nature Conservancy (fisheries centre, live reef fish management plan).

Japan has been a long term donor, for the rural fisheries centres, and for projects supportive of the domestically owned and run pole-and-line fishery, most recently for two new vessels for Soltai Fishing and Processing in 2005-6. Japanese fisheries aid also comes through organizations like the Overseas Fisheries Cooperation Foundation. This organization supports Japan-based technical training for a range of fisheries related personnel in the public and private sector, and also has funded two technical advisors in canning and engineering to work in the government-owned Soltai Fishing and Processing in recent years.

New Zealand is currently a major player in fisheries aid with its Solomon Islands Marine Resources Organizational Strengthening project focusing on the Ministry of Fisheries and Marine Resources since 2006. The EU funded long-term Rural Fisheries Development Project in the 1990s and 2000s, and has provided its assistance to two projects, one on seaweed production and another on pearl farming. Taiwan through its funding of the Rural Constituencies Development Fund provides its assistance in rural fisheries development. It also has injected funds into specific fisheries activities over the years. For example, it provided several million dollars to enable Soltai Fishing and Processing to reopen operations after having lain dormant for a year. FAO assisted in formulating a National Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU fishing) in Solomon Islands in 2009-2010.

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

The Solomon Islands Marine Assessment Coordinating Committee (SIMACC). SIMACC is comprised of:

- Government Partners: Department of Forestry, Environment and Conservation; Department of Fisheries and Marine Resources; Department of National Reform and Planning; and the Visitors Bureau.

- Local NGOs: Environmental Concern Action Network of Solomon Islands; and Foundations of South Pacific International.

- International NGOs: Worldwide Fund for Nature; International Waters Program; and The Nature Conservancy.

SIMACC conducted a comprehensive survey in 2004 to assess the marine resources of the Solomon Islands (Green *et al* 2006)

10.4 ASSESSMENT FUNDING

Past projects have been funded by various international NGOs including the Nature Conservancy Council and WWF. Funding has also been provided by the Australian government and Australian research institutions.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Some Annual reports of the Fisheries Division are published on the FFA, SPC and Reefbase websites.

12. MANAGEMENT PROCESSES

The following information is sourced directly from Anon. (2005)
The Solomon Islands is a member of the South Pacific Commission (SPC), the Pacific Islands Forum Fisheries Agency (FFA) the South Pacific Regional Environmental Programme (SPREP), and the Food and Agriculture Organization of the United Nations (FAO).

The National Government retains responsibility for offshore and commercial export fisheries such as tuna fisheries but coastal fisheries are devolved to provincial/state level where subsistence fishing in traditional management areas is mainly undertaken by village-level authorities. (Hunt 2001). In the Solomon Islands, the central government recognizes customary marine tenure and compensates villages for the extraction of bait fish used in pole and lien tuna fishing (Hunt 2001). At the national level, the Solomon Islands Fisheries Division of the Ministry of Fisheries and Marine Resources (DFMR) is responsible for managing marine fisheries in the Solomon Islands. The Ministry has five departments that deal with

1) technical and scientific advice,
2) licensing, surveillance and enforcement,
3) development and extension services,
4) aquaculture, and
5) statistics and information.

DFMR operates an observer program with about 12 observers (WCPFC 2009). However, the observer program does not operate to the targeted coverage of 20% due to funding and approval delays. The DFMR aimed to have 20% coverage by the end of 2008. Port sampling has been suspended for the past few years because of financial constraints and lack of human resources (WCPFC 2009). In 2004, the Solomon Islands put in a request to the Secretariat of the Pacific Community to assist in its database consolidation and strengthening (Anon. 2005).

The Fisheries Act 1998 states that the objective of fisheries management and development in Solomon Islands shall be to ensure the long-term conservation and the sustainable utilisation of the fishery resources of Solomon Islands for the benefit of the people of Solomon Islands.

The management objectives for the offshore fisheries is covered in the "Solomon Islands National Tuna Management and Development Plan" which came into force in June 1999. The plan states the following objectives:

- to ensure that the tuna resources of the Solomon Islands are not exploited beyond their optimal sustainable yields; and within the limit set by this conservation objective,
- to harvest the resource in such a way that maximises the economic and social benefits received by the people of the Solomon Islands

Formal management plans only exist for three fisheries, namely the offshore fisheries, live reef food fishery and the beche-de-mer fishery (Richards et al 1994). The management objectives for the coastal commercial fisheries are focussed on resource sustainability (or prevention of resource exhaustion) for the export species. Some management interventions (e.g. high taxes on the export of raw trochus) have the objective of encouraging the development of a local processing industry. The management objectives for the subsistence fisheries are much less formal, but usually involve some aspect of protecting village food supplies.

The current tuna management plan specifies that the management measures for the industrial fishery consist of a limit on the number of licences and restrictions on access by certain vessels to some areas. In the decade that the plan was in force, problems were experienced with implementing these measures, especially those related to restricting licences during the period of ethnic tensions. The licensing procedures have since been tightened, and further strengthening is anticipated in a new tuna management plan presently being formulated.

The institutional arrangements for tuna fishery management, as prescribed by the current tuna management plan are:

- Minister Responsible for Fisheries accountable for the sustainable use of fisheries resources retains all powers but works within agreed constraints prescribes tuna fishery regulations
- Fisheries Advisory Council advises Minister on management & research administers Fisheries Management & Development Fund
- Tuna Management Committee operational authority for implementing the Management Plan strategic direction
- Director of Fisheries legal authority for implementing the Management & Development Plan (acts on advice from the Tuna Management Committee)

The management arrangements for the coastal commercial export fisheries consist mainly of temporary and long-term bans, mostly enforced at the point of export. The 2006 national closure of the beche-de-mer fishery is an example of a national temporary ban. Gold-lip pearl shell, turtle shell, and crocodiles are under a long-term ban. The Fisheries Department typically formulates the measures and enforcement is done by non-fishery government officials at the point of export. Some coastal communities have other management arrangements for the management of coastal commercial fisheries that occur in their areas. The residents of Ontong Java atoll, for example, have alternating annual closures for beche-de-mer fishing and for trochus fishing.

Most of the areas where coastal subsistence fishing is undertaken are covered by traditional management arrangements. A recent study found that nearly 85% of the

inshore marine areas in the Solomon Islands are customarily owned and managed by local villages, tribal groupings and communities. There is a wide diversity of fishery management provisions
between areas, but most involve traditional authorities, often a hereditary chief, making management decisions after considering the views of their resident stakeholders. The measures often involve limiting access by outsiders to the fishing areas and various types of input restrictions on the fishing activities of local residents. Common restriction include periodic harvesting bans in specific areas and bans on gear types. In recent years some of the areas have an external management partner, such as the local branch of an international NGO.

13. FUTURE OPPORTUNITIES

Major constraints of the fisheries sector include the following:

- Many of the inshore fishery resources, especially those close to the urban markets, are fully or over-exploited.
- Small-scale fishers cannot economically access the relatively abundant offshore fishery resources.
- Although the government-owned cannery and tuna fleet is vitally important for the national economy and for the welfare of the people employed, those operations are unprofitable. The government cannot afford the financial injections required to keep them operating, but for political and social reasons it cannot afford to shut them down.
- There are considerable difficulties associated with marketing fishery products from the remote producing areas to the urban areas where the marketing opportunities are high.
- There was a large decline in the quality of governance of the fisheries sector during the period of ethnic tension.

The opportunities in the fisheries sector include:

- Upgrading the cannery to meet EU fish sanitary requirements
- Domestication of the purse seine fishery In-country processing of a greater proportion of the tuna catch taken by foreign fleets within the Solomon Islands' EEZ
- Expansion of the marine aquarium fishery
- Greater use of management partnerships (community, government, NGO) in the management of coastal fisheries
- Increasing the effectiveness of the Fisheries Department by enhancing staff capability and re-orientation of the Department to current needs

14. STAKEHOLDERS

With respect to fishery stakeholder institutions, there is no grouping that represents the interests of small-scale fishers in the country. For the offshore fisheries, the two individuals that head the tuna processing company and the tuna fishing company often meet informally to discuss issues of mutual interest. Although the Fisheries Act 1998 established a "Fisheries Advisory Council" consisting of stakeholders, that group has not met in several years.

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Chapter 4: Cape Verde

1. EXECUTIVE SUMMARY
Not provided

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Fisheries agreements:
Four bilateral agreements -FA-: 1991-1994; 1994-1997; 1997-2000 and 2001 – 2004 (2005), concerning tunas, deep longlines and cephalopods (excluded for the two last FA),
One fisheries partnership agreement -FPA-: 2006-2011, only for tunas, by bait boats, purse seine and surface longline.

Private licences:
Contact with Japan Tuna Association: since 1996 – 2009, and so on ....., for tunas (bigeye), by surface longline

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

Change of targeted species in the agreement:
Yes, lack of licences' demand due to the absence of interest from European fishermen
Transparency and policy dialogue:
Few or none, as the EU does not involve third country in any kind of evaluation (neither ex-ante nor ex-post one!)
Contribution towards rational and sustainable exploitation:
Few, at least from the view point of transparency and communication of data
Financial contribution:
Decreasing: from 2,6M Euros (1991-94 bilateral FA) to 385.000 Euros (2006-2011 FPA)

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU
Does not apply

5. FISHING ADMINISTRATION

Source of data for management measures
Catch / effort, stocks' status in few cases where assessments were conducted
For some socio-economic considerations
Compliance with regional and international management measures implemented in the area (RFMOs)

Cross checking between observations and declaration in case of observer program?
None, as there is no observer program (not provided by the agreements)

6. LIST OF IMPORTANT STOCKS

Those with interest for the EU:
Yellowfin tuna (*Thunnus albacores*) ; Skipjack (*Katsowonus pelamis) ;* Bigeye tuna (*Thunnus obesus*) ; Caranjidae (mainly *Decapterus macarallus*)

Those with interest for the third country:
Chicharro (S*elar crumenophthalmus) ;* Cavala preta (*Decapterus macarellus*) ; Dobrada (*Spicara melanurus*); Garoupa (*Cephalopholis taeniops*) ; Sargo d´areia (*Lithognathus mormyrus) ;*Lagosta verde (*Panulirus regius*), Lagosta castanha (*Panulirus echinatus*); Lagosta pedra (*Scyllarides latus*) ; Lagosta de profundidade (*Palinurus charlestoni*) ; Búzio cabra (*Strombus latus*)

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

List of PET species in the area of management
Sea turtles (5 species)
Sharks (2 species)
Cetaceans (22 species): Delphinidae (12 species), Balaenopteridae (4 species), Physeteridae (1 species), Zyphiidae (1 species), and Others (4 species)
Sea birds

Link with Red List species (IUCN) or CITES?
Most of them are IUCN Red listed.

PET species taken as by-catch and mitigation measures taken
None

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Areas of research
Marine resources and environment
Fish biology
Population dynamics and stock assessment
Fisheries Statistics
Oceanography: physics and biology
Aquaculture
Biodiversity Conservation

List of organisations or institutes that collaborate at the national and international level on research projects

At national level
UNIVERSIDADE DE CABO VERDE / DECMAR
DIRECÇÃO GERAL DAS PESCAS
DIRECÇÃO GERAL DO AMBIENTE
CÂMARAS MUNICIPAIS
ASSOCIAÇÕES E ONG's

At international level
ICCM – UNIVERSITY LAS PALMAS
ICCAT
UNIVERSIDADE DE KIEL – IFM-GEOMAR
EUROSITE'S
MERCATOR
UVIVERSIDADE DE CANARIAS

- **Collaborative projects covering species / stocks / groups of species of interest**
  Mainly two: (i) tunas in collaboration with ICCAT, and (ii) aquaculture with China

- **Gaps or overlapping in research being undertaken**
  None. Instead there is a strong need to develop more, in terms of data collection, statistics, stock assessment, aquaculture, oceanography, biodiversity conservation

- **Other coordination projects with output useful to research and management**
  Sub regional Program – PRCM
  Coastal Zone Conservation Program in Ouest Africa
  PRAOCTIVA- oprospecção e avaliação de stocks de camarão de profundidade
  APPECAO

- **Collaboration and reporting at the RFMO level**
  ICCAT: Task 1 & Task 2
  CECAF/FAO: Fisheries Statistics
  SCRP (Sub Regional Fisheries Commission): Fisheries Statistics, and other data necessary for joint assessment works

9. DATA COLLECTION

9.1 BIOLOGICAL

- **Data collection (e.g. type of data, collected by whom):** Biological data (length, weight, sex, maturity, etc), collected by INDP (National Institute for Fisheries Development) at both landing sites and markets, but never from European vessels
- **Share of data:** With ICCAT, for tunas
- **Biological information:** From domestic fisheries: some spatial distributions of fish spawners, through GSI (Gonado-Somatic Indices), histology, sexual maturation scales
- **Issues (e.g. quality, quantity, gaps, issues, needs):** Assessment works affected by data quality, quantity, no spatio-temporal coverage, unavailable data time series, inaccessible information, etc., things which affect the ability to provide necessary advice for management purposes. Needs for regular data collection: length, growth, stocks' structures and fisheries independent, thru R/V cruises, necessary data for models' calibration.

9.2 ENVIRONMENTAL

- **Data collection (e.g. type of data, collected by whom):** daily data for temperature, salinity, currents, etc., within a geographical square (13°-19°N and 20°28°W).
- **Dedicated programmes:** Project Mercator-Ocean, thru CIT (Centre for Information of Tunas) by modelling/mapping probabilities of capturing tropical tunas, to help fishermen to spot fish
- **Issues (e.g. quality, quantity, gaps, issues, needs):** optimistic to reach the objective by 2011. International cooperation provides help also (e.g. CRDI – Canadian Centre for International Research and Development, thru APPECCAO Project....

9.3 ECOSYSTEM

- **Data collection (e.g. type of data, collected by whom):** biological data for the main species (pelagic & demersal) on a regular weekly basis, by INDP, covering all islands, along with oceanographic information gathered thru dedicated programmes.
- **Dedicated programmes (research programmes, monitoring programmes):** INDP Oceanographic Observatory –TENATSO-, APPECCAO
- **Issues (e.g. quality, quantity, gaps, issues, needs):** lack of means is the main issue

9.4 SOCIO-ECONOMIC

- **Data collection (e.g. type of data, collected by whom):** all the necessary data for socio-economic analyses (catches/effort, investments, operational costs, prices, etc.)
- **Dedicated programmes:** Regular INDP monitoring programs.
- **Issues (e.g. quality, quantity, gaps, issues, needs):** works affected by data quality, quantity, difficult spatio-temporal coverage (many islands and many landing sites), unavailable data time series, inaccessible information, etc., things which affect the ability to provide necessary advice for management purposes. Needs for more human and funding resources.

9.5 FUNDING

Biology

National : State budget -Public Investment Programme-, +/- stable but insufficient
International: Cooperation with foreign institutions; instable and insufficient

Environement & Ecosystems

National : (i) State budget -Public Investment Programme-, +/- stable but insufficient, **(ii)** Service providing, not stable, very insufficient, **(iii)** General Direction of Environment

International: (i) Cooperation with foreign institutions and Sub regional Program -PRCM-; instable and insufficient, **(ii)** European Union / IFM Geomar (Germany), **(iii)** WWF, **(iv)** CRDI (Canadá)

Socio-economics

National : (i) State budget -Public Investment Programme-, +/- stable but insufficient, **(ii)** Service providing, not stable, very insufficient, **(iii)** General Direction of Fisheries
International: (i) Cooperation with foreign institutions and Sub regional Programs; instable and insufficient.

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Biological research

- Research done: (also see Section 8.1), so far 10 species have been covered in terms of stock assessment.
- Gaps: problems of stock structure, growth, age composition in catches (otolith reading), sampling strategy (lobsters case), surveys (bottom) and echo integration assessment (pelagics).
- Issues: Needs for regular data collection: length, growth, stocks' structures and fisheries independent, thru R/V cruises, necessary data for models' calibration.

Environmental research

- Research done: (also see Section 8.2), work undergoing: some physic-chemical parameters being collected
- Gaps: problems of funds and qualified human resource; if the work is being done that's because of international interests in carrying out research in the area
- Issues: how to set regular research programs, with necessary means, is the challenge

Ecosystem research

- Research done: not to much; the work has barely been launched
- Ecosystem modelling: none.
- Fishery interaction: none. But the aim is to establish some Marine Protected Areas
- Pollutant and contaminants: none.
- VMEs: the whole archipelago is considered as VMEs, because of its position in the Ocean, and its volcanic nature providing fragmented habitats.

Socio-economic

- Research done: mostly at national level (i) Experiments of new fishing gears, (ii) Socio-economic viability of fishing vessels, (iii) Community Involvement, (iv) Handling, transformation, conservation of fish, (v) Impacts of climate changes of marine resources (initial phase), both at national and regional level (Enda/Senegal)

- Use in analysis and advice: firstly for some economic indicators (IGP and GAV), then for advice in terms of fisheries management
- Gaps: **(i)** lack of coherent and systematic data, **(ii)** lack of data on fish sellers (number, incomes, etc., **(iii)** Fish prices.
- Issues: how to come out with sufficient means to solve the gaps

10.2 RESEARCH FUNDING

The same as Section 8.5

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

- Assessment methods used (primary and other tested) and associate software and evolution over time : VPA, CCA, YpRe, SSBpR,
- Use of fishery independent data: none
- Uncertainty: enormous
- Ecosystem assessment: none
- Structure of the advice (e.g. how is advice presented to management?): fragmented

10.4 ASSESSMENT FUNDING

All inclusive in what is done for research.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

- Sharing / dissemination of research results at both national and international levels: at 2-3 level of the questionnaire (up to Good), but somehow still confidential, at 2 level
- Who is responsible for dissemination?: Department of Fisheries resource for (i) the Bulletin of Statistics, (ii) Leaflets & brochures (thru Service of Information & Public Relations -SIRPP-), and Joint publications, mainly thru Posters (INDP and Department of Fisheries resource.
- Mechanisms in place to review the quality of data monitoring, science and outputs: Scientific Council

12. MANAGEMENT PROCESSES

- (Countries) Institute/organisation responsible for management: Department of Fisheries resource
- Current management measures: thru the most recent Biannual Fisheries Management Plan 2009 – 2010, concerning domestic industrial and coastal fisheries and foreign industrial fleets (EU one). See Resumo das medidas de gestão do Plano Bianual 2009- 2010
- Enforcement measures: none, lack of compliance means
- Bans on fishing: yes, thru area and time closures, and zoning
- Validation of declared catch: no way, lack of appropriate tools (observers, VMS, etc.)

- IUU: none
- VMS: none
- Management system (decision rules, reference points, discards, by-catch, observers): very few
- Migration / tagging programs: none

13. FUTURE OPPORTUNITIES

- Identification of priorities for data collection, specific research required and analysis: (i) Stock Assessment & Population Dynamics, (ii) Aquaculture, (iii) Statistics improvement (collecting, handling, analyses), (iv) Fisheries independent data collection, (v) Echo integration assessment, (vi) Regular oceanographic surveys, (vii) Socio economic studies
- Identification of areas for collaboration, coordination and adoption of best practice: many areas, at national, regional and international levels.

14. STAKEHOLDERS

- Involvement of stakeholders covering research on stock assessments, ecosystem, environment and social and economic aspects in:
    - Data collection
    - Data analysis
    - Dissemination of information
    - Research coordination
    - Experimental work
    - Decision making

} NONE FOR ALL

Chapter 5: Gabon

1. EXECUTIVE SUMMARY

There is a current (3 December 2005 – 2 December 2011) tuna fisheries partnership agreement between the Community and Gabon. The financial contribution for the agreement is €860,000 per year, out of which 60 % is dedicated to the support of the fisheries policy of Gabon. This fisheries agreement allows community vessels from Spain (12 tuna seiners and 13 surface longliners), Portugal (3 surface longliners) and France (12 tuna seiners) to fish and catch 11,000 tonnes/year in the Gabonese waters and is part of the tuna network fisheries agreements in West Africa.

Gabonese coastal waters cover an area of 265,000 km^2 and have a wide variety of fish and crustaceans, and support larger organisms such as marine mammals (whales, dolphins and manatees). The fishing sector employs about 21,000 people. It generates an annual turnover of 41.5 billion CFA francs, and contributes to gross domestic product (GDP) up 1.5%. The industrial fishing fleet in 2003 was 87 vessels. Shrimp is the dominant and catch, with 9 500 tonnes taken in 2005. Artisanal fisheries (marine and continental) include a wide variety of fish species, with a production of 32,240 tonnes in 2005 (http://www.odinafrica.org/index.php/learn-about-odinafrica/69-gabon).

Gabon together with 15 other countries has signed the FAO "Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing". Once notice of the 25th country ratification is received by FAO, the Agreement will become active. It will be the first legally binding international treaty focused specifically on the problem of illegal, unreported and unregulated (IUU) fishing.

The demersal species fisheries are estimated at a potential 312,480 tonnes per year. Small pelagic fisheries (such as sardines and mackerel), are estimated at 153,000 tonnes per year. The estimated potential of large pelagic fisheries is around 250,000 tonnes per year for the entire region of the Gulf of Guinea (http://www.odinafrica.org/index.php/learn-about-odinafrica/69-gabon). Large pelagic (tuna and other species) as well as the deep shrimp and cephalopods are operated on a seasonal basis within the framework of fisheries agreements with the European Union, Japan and China.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Some forms of agreements appear to exist with China and Japan but no information could be found to confirm the details and status of such agreements.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The tuna fisheries partnership agreement concluded between the Community and Gabon covers the period 3 December 2005 – 2 December 2011 with a financial contribution of €860,000 each year, out of which 60 % is dedicated to the support of the fisheries policy of Gabon (EU2006; EU 2007). This fisheries agreement allows community vessels from Spain (12 tuna seiners and 13 surface longliners), Portugal (3 surface longliners) and

France (12 tuna seiners) to fish in the Gabonese waters and is part of the tuna network fisheries agreements in West Africa. Fee for ship owners is €35 per tonne caught. Advances: Tuna seiners: €4,550 per year (ref catches: 130 tonnes), surface longliners: €2030 per year (ref catches: 58 tonnes). Reference tonnage: 11,000 tonnes/year. If the overall quantity of catches by Community vessels in Gabonese waters exceeds 11,000 tonnes per year, the amount of the annual financial contribution shall be increased by €65 for each additional tonne caught.
The previous fisheries partnership agreement between the Community and Gabon covered the period 3 December 2001 to 2 December 2005 (EU 2002). The fishing opportunities granted the Agreement between the European Community and the Gabonese Republic included: demersal freezer trawlers fishing for crustaceans and cephalopods (1200 GRT per month), 38 freezer tuna seiners and 26 surface longliner vessels. The financial contribution was fixed at €1 262,500 per year, comprising €378,750 financial compensation and €883,750 to the support of the fisheries policy. The financial compensation for tuna fishing was €787,500 per year and covered a catch weight in Gabonese waters of 10,500 tonnes of tuna. If the tuna caught each year by Community vessels in the Gabonese EEZ exceeded this weight, the amount referred to above was proportionately increased at the rate of €75 per additional tonne.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable.

5. FISHING ADMINISTRATION

No apparent stock assessment undertaken in Gabon or by Gabon authorities (neither by government or research institutes) on the tuna species. In general, little current information is available regarding data for management of coastal and marine resources. Gabon is a member of the International Commission for the Conservation of Atlantic Tuna (ICCAT).

6. LIST OF IMPORTANT STOCKS

There are important resident stocks supporting artisinal fisheries. There are also transboundary straddling stocks attracting large commercial offshore foregin fishing fleets. The major pelagic species on the Gabon shelf is the sardinella (e.g. *Sarinella aurita*). The demersal communities include croakers (e.g. *Pseudotolithus typus, P. senegalensis, P. elongatus*) and the threadfin (*Polydactylus Quadrifilis*) in nearshore waters, and sea bream (*Pagus pagrus*) and driftfish in deeper waters (NOAA 2003).

The deep-water rose shrimp (*Parapenaeus longirostris*) is distributed in the eastern Atlantic from the north of Spain to the south of Angola. The resource is targeted by a large fishing fleet in eastern Atlantic waters off Gabon and neighbouring areas (Deval et al., 2006).

About 30 fish species are of direct concern to ICCAT and hence also important to Gabon: Atlantic bluefin (*Thunnus thynnus thynnus*), skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), albacore (*Thunnus alalunga*) and bigeye tuna (*Thunnus obesus*); swordfish (*Xiphias gladius*); billfishes such as white marlin (*Tetrapturus albidus*), blue marlin (*Makaira nigricans*), sailfish (*Istiophorus albicans*) and spearfish

(*Tetrapturus pfluegeri*); mackerels such as spotted Spanish mackerel (*Scomberomorus maculatus*) and king mackerel (*Scomberomorus cavalla*); and, small tunas like black skipjack (*Euthynnus alletteratus*), frigate tuna (*Auxis thazard*), and Atlantic bonito (*Sarda sarda*).

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

Gabon waters are an important area for sea turtles. Leatherback turtles (*Dermochelys coriacea*) have their biggest nesting area in the world in the south of Gabon (Mayumba). An international team of scientists has identified a nesting population of leatherback turtle in Gabon from country-wide land and aerial surveys that estimated a population of between 15,730 and 41,373 female turtles using the nesting beaches (Witt et al. 2009). There are also important feeding areas for green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*) and hawksbill (*Eretmochelys imbricate*) turtles.

There are about 55 marine mammal species in the west African region of which about 25 can be found in Gabon waters including the west African Manatee (*Trichechus senegalensis*), the Atlantic humpback dolphin (*Sousa teuszii*) and the humpback whale (*Megaptera novaeangliae*), (Mbina 2002, Collins et al. 2004, Pomilla and Rosenbaum 2006). Five marine mammal species are regarded threatened (listed as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) according to the IUCN Red List).

The number of animals entangled and killed in net and trawl fisheries (bycatch) of the above mentioned species is not known (Maigret, 1994), but likely represents a threat to local populations.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

The Gabon Sea Turtle Partnership (http://www.seaturtle.org/groups/gabon/home.html) is a network of organizations concerned with the protection of the four species of marine turtles that frequent Gabon coastal waters. The coalition is working with local agencies to ensure that turtle populations are protected. The partners that make up Gabon's Sea Turtle Partnership are Aventures Sans Frontières (ASF), Ibonga, the Wildlife Conservation Society (WCS) and the World Wide Fund for Nature (WWF). In addition, the Wildlife Conservation Society (WCS) has led, along with US NOAA, the first ever at-sea trials of Turtle Excluder Devices (TEDS) in the industrial shrimp industry in Gabon. The work conducted in partnership with the government, the industry, and NOAA is leading the way to legal changes that may make TEDs mandatory, saving the lives of tens of thousands of sea turtles that get accidentally caught in shrimp nets (WCS 2010).

In 2002 the Gabonese government designated 13 new national parks (www.legabon.org), two with the specific purpose of protecting globally important turtle nesting beaches. Overall, there are five parks protecting important sea turtle habitat: Pongara National Park, Akanda National Park, Loango National Park, the Gamba Complex of Protected Areas (including Moukalaba-Doudou National Park) and Mayumba National Marine Park bordering on Congo's Conkouati-Douli National Park (www.seaturtle.org/groups/gabon/home.html).

As previously stated Gabon is a member of ICCAT and collaborate in ongoing research efforts conducted by ICCAT.

9. DATA COLLECTION

9.1 BIOLOGICAL

Several fishery resource surveys have been conducted in the Guinnea Current Large Marine Ecosystem (LME) (Mensah and Quaatey 2002, Zeller et al. 2005). Total reported landings show an increase from 1950 to the early 1990 with a peak at 900,000 tonnes (Figure 1). There is lack of detailed landings statistics per species hence a large proportion of the landings falls in the category "mixed groups". Since the 1960s, high fishing pressure by foreign and local industrial fleets has placed the fisheries in the Guinnea Current LME at risk (Kacynski & Fluharty 2002). Since the mid 1970s, the mean trophic level of the reported landings (Pauly & Watson 2005) has declined an indication of "fishing down" of the local food webs (Pauly et al. 1998).

Although the level of exploitation in the Guinnea Current LME was found to be significant, some fish stocks such as skipjack tuna, small pelagic fish in the northern areas of the northern part of the LME, and offshore demersal fish and cephalopods were believed to be underexploited (Mensah & Quaatey 2002). However, decline in fish stocks and unsustainable fishing as has been identified as major transboundary problems and reviews of the status of the LME's fisheries resources indicate that several fish stocks are either overexploited or close to being fully exploited (Ajayi 1994, Mensah & Quaatey 2002). These include small pelagic fish and shrimps in the western and central Gulf of Guinea and coastal demersal resources throughout the LME (Mensah & Quaatey 2002). There is further evidence of depletion of straddling and highly migratory fisheries stocks, with heavy exploitation of yellow-fin and big-eye tunas (Mensah & Quaatey 2002). Overexploitation has resulted in declining stock biomass and catch per unit effort, particularly for inshore demersal species, and this decline has been attributed to trawlers operating in inshore areas (Koranteng 2002.

The use of small-sized mesh, especially in trawl, purse and beach seine nets is a widespread problem, especially in the central part of the region. This practice leads to excessive bycatch, but because these catches, mainly of juvenile fishes, are generally utilised, they are discarded only in a few fisheries (e.g., the shrimp fishery). Other destructive fishing practices such as the use of explosives and chemicals are also commonly used in inshore areas.

There are indications that overexploitation has altered the ecosystem with impacts at all levels, including top predators. Species diversity and average size of the most important fish species have declined as a result of overexploitation (Koranteng 2002, FAO 2003). Perhaps the most significant changes in species abundance are reflected in sardinella (*Sardinella aurita*) and triggerfish (*Balistes capriscus*). The sardinella fishery experienced a collapse in 1973, and was followed by a large increase in the abundance of triggerfish between 1973 and 1988. The decline of the triggerfish after 1989 was followed by an increase of the sardinella to unprecedented levels during the 1990s (Cury & Roy 2002).

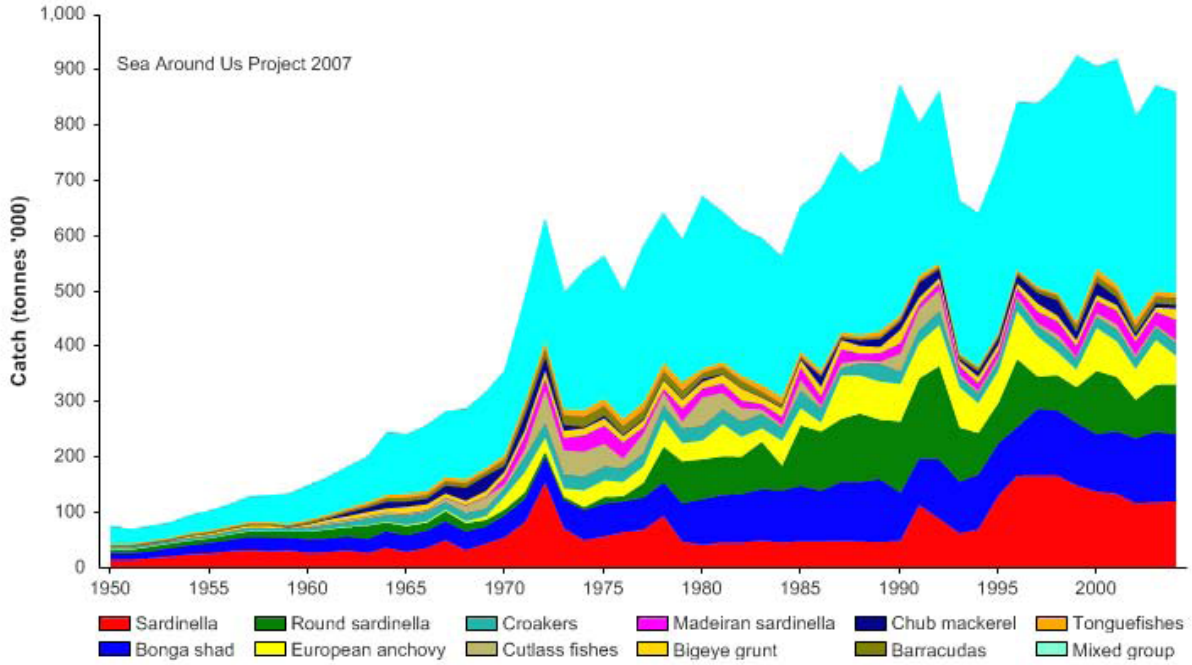

Figure 1. Total reported landings in the Guinea Current LME by species (Figure taken from Sea Around Us 2007).

9.2 ENVIRONMENTAL

The coastal and marine environments of the Guinea Current are heavily polluted in areas near large cities (Scheren & Ibe 2002). Gordon & Ibe (2006) provided an assessment of the state of the environment with respect to land-based sources of pollution in this region. Pollution from land-based sources is particularly important, and together with sea-based sources, has contributed to a deterioration of water quality in the bordering countries of the Guinea Current LME. Deterioration of water quality from land and sea-based activities has been identified as one of the the broad environmental problems in the LME (NOAA 2003). Despite being mainly localised, pollution has also transboundary impacts in through transport of contaminants by wind and water currents along the coasts. Organic waste from domestic, industrial and agricultural has also resulted in eutrophication and oxygen depletion in some coastal areas (Scheren & Ibe 2002). Chemical pollution is serious in some coastal areas where chemical contaminants enter the aquatic environment through the use of pesticides and persistent organic pollutants (POPs) in agriculture activities. Pollution from oil spills is significant, and originates mainly from spills at production points, loading points and from shipping lanes. Significant point sources of marine pollution have been detected around coastal petroleum mining and processing areas, releasing large quantities of oil, grease and other hydrocarbon compounds into the coastal waters of the LME (Heileman 2008).

9.3 ECOSYSTEM

In terms of habitat loss, mangroves and estuaries have suffered the most significant losses, followed by sandy foreshores and lagoons. The LME has large expanses of mangrove forests (the mangrove system of the Niger Delta is the third largest in the world).

9.4 SOCIO-ECONOMIC

The 16 countries bordering the Guinea Current LME have an estimated total population of about 300 million (Heileman 2008). At the present rate of growth, the population is expected to double in 20-25 years. Almost 50% of the population live within 200km of the coast and many of the region's poor are crowded in the coastal areas for subsistence activities such as fishing, farming, sand and salt mining and production of charcoal (Heileman 2008). The Guinea Current LME and its natural resources represent a source of economic and food security for the bordering countries. Fisheries are of major importance for food security in this region and also provide employment for thousands of people. Therefore a large proportion of the population could potentially be affected by overexploitation of fisheries. Over the past three decades, there has been evidence of reduced economic returns, loss of employment and conflicts between artisanal and large commercial trawlers for access to the fishery resources (Heileman 2008). The overexploitation of transboundary and migratory fish by offshore foreign fleets is having a detrimental effect on artisanal fishermen as well as on those coastal communities that depend on the near-shore fisheries resource for food (Heileman 2008). This is serious in the context of exploding demographics in the coastal areas and the fact that most of the fish catch is exported out of the region.

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Darwin Marine Biodiversity Action Plan for Gabon (2009-2012) (http://darwin.defra.gov.uk/project/17005/). This research project aims to help create a Biodiversity Action Plan for Gabon and focuses on three key biodiversity issues:
1. Major fishing resources: currently exploited through local industrial trawling and concessions to international fleets. There is marked under-capacity for spatial management and assessment/mitigation of bycatch which has the potential to be significant.
2. Globally important marine turtle populations: the world's single largest rookery for the leatherback turtle (as many as 100,000 nests/yr and animals use UK waters in St Helena/Ascension Island); regionally important, yet under-researched, nesting for olive ridley turtles; regionally important foraging sites for green and hawksbill turtles subject to intense harvest.
3. Globally important, yet understudied, marine mammal populations: humpback whales; Atlantic humpback dolphins; West African manatees.

The project expresses the needs for: a national Marine Biodiversity Action Plan integrating all available information on the spatial distribution of biodiversity and threats; increased local capacity to carry out research to further inform the development/implementation of the MBAP; increased awareness among key stakeholders and the general public as to the importance of marine biodiversity.

10.2 RESEARCH FUNDING

Darwin Marine Biodiversity Action Plan for Gabon (2009-2012). Project Funded by DEFRA,UK, £299,741 for the duration of the project

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

In general, little current information is available regarding data for management of coastal and marine resources.

10.4 ASSESSMENT FUNDING

No information for this section

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Again, little current information is available regarding data availability, sharing and dissemination.

12. MANAGEMENT PROCESSES

The countries bordering the Guinea Current LME participate in several bodies that work on various aspects of coastal degradation and protection of living marine resources. The LME comes under the UNEP Regional Seas Programme for the West and Central Africa Region. They have adopted several international environmental conventions and agreements, among which is the Abidjan Convention and the Dakar Convention. The GEF-supported Guinea Current Large Marine Ecosystem Project (Ibe & Sherman 2002, Ukwe et al. 2006) is an ecosystem-based effort to assist countries adjacent to the Guinea Current LME to achieve environmental and resource sustainability by shifting from short-term sectordriven management objectives to a longer-term perspective and from managing commodities to sustaining the production potential for ecosystem-wide goods and services (www.chez.com/gefgclme/). The second phase of this project 'Combating Living Resource Depletion and Coastal Area Degradation in the Guinea Current LME through Ecosystem-based Regional Actions', extended the pilot phase to include 10 additional countries (Angola, Congo Brazzaville, Congo-Kinshasa, Equatorial Guinea, Gabon, Guinea, Guinea-Bissau, Liberia, São Tomé and Príncipe, and Sierra Leone). This phase included the preparation of a Trans-boundary Diagnostic Analysis (TDA) to identify indicative priorities for ecosystem-wide marine environmental and natural resources protection and management concerns.

The Ministers of Environment of Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea Bissau, Liberia, Nigeria, Sao Tome and Principe, Sierra Leone and Togo, signed the Abuja Declaration on 22 September 2006, establishing the framework for an Interim Guinea Current Commission. The focus of the Interim Commission is on achieving sustainable development through integration of environmental concerns building capacity through multi-sector participation, management of transboundary water bodies and living resources of land, forests and biodiversity conservation, and development of information and data exchanges (Heileman 2008).

13. FUTURE OPPORTUNITIES

Research needed in basically all areas related to fisheries and marine resources.

14. STAKEHOLDERS

MARINE RELATED PROGRAMMES AND ORGANIZATIONS

- Institut de Recherche en Sciences Humaines (CENAREST), Libreville
- Institut de Recherche en Ecologie Tropicale (CENAREST), Libreville
- Institut National de Recherche sur l'Océan et le Climat (en création), Lebreville
- Union des Pétroliers du Gabon (UPEGA), Libreville (E-mail: upega@inet.ga)
- Direction Générale des Pêches et de l'Aquaculture
- Comité des Pêches pour l'Atlantique Centre Est (COPACE).
- Commission Intérimaire du Courant de Guinée (CICG)
- Commission du Courant de Benguela
- Comité Régional des Pêches du Golfe de Guinée (COREP)
- Direction de la Météorologie Nationale
- Gabon Sea Turtle Conservation Partnership
- Direction Générale du Droit de la Mer, Libreville (E-mail: dgdm@internetgabon.com)
- Direction Générale de l'Environnement, Libreville
- Ministère des Mines et des Hydrocarbures, Libreville
- Ministère de la Marine Marchande et des Equipements ;(website: http://marine-marchande-gabon.net).
- Université Omar Bongo de Libreville, Libreville
- Université des Sciences Techniques de Masuku, Franceville
- Gabon Ports Authority
- Gabon Ports Management

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Chapter 6: Guinea

1. EXECUTIVE SUMMARY

The marine fisheries of Guinea consist of two sub-sectors, made up of the industrial fisheries and the artisanal fisheries. The marine artisanal fishery fishes from the shore out to twelve nautical miles and the industrial fisheries from the twelve mile to the 200-mile limits, made up of national and foreign fleets. The Guinea government has made efforts to develop the national fisheries, however the national industrial fleet has still not yet developed to its full potential[1].

There have been three fisheries agreements between the Republic of Guinea and the EU since 2000. The principle difference between the three agreements (And their protocols) is in the fishing opportunities made available to EU fishers and the financial contribution made: although previous agreements included shrimp, finfish, cephalopods and tuna, the most recent proposal (2009) covers only tuna, involving 28 freezer tuna seiners and 12 pole-and-line vessels which is a reduction from the previous agreement. However, the Commission has withdrawn its proposal on the signing of the 2009 fisheries partnership agreement and suspended payments to Guinea following the recent acts of violence carried out by the Guinea government. As a final step in this process, the Commission has now adopted a proposal under which the Council will denounce the agreement altogether.

Management measures regarding the industrial fleets are increasing, however the artisanal fleets are still fairly unregulated. Scientific research is undertaken by the CERESCOR (Rogbanet Oceanographic Research Centre), the IRD (Institut de Recherche pour le Développement) and the CNSHB (National Centre of Fisheries Science of Boussoura). However information as to the type of data collected and research outputs are uncertain.

Due to the ongoing political situation the summary contained in this report is the result of a literature review.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

No information on existing fisheries agreements or licences other than with the EU was found.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The first fisheries agreement concluded between the European Union and the Republic of Guinea dates from 1983. Table 1 indicates the Agreements held between the EU and Guinea since 2000, detailing the fishing opportunities and the financial contribution provided for in the Agreement between the European Economic Community and the Republic of Guinea on fishing off the Guinean coast

[1] http://www.sfp-acp.eu/EN/Pays/Africa/Guinea/GuineaCountryProfile.pdf

The Agreement signed in 2000 was initially for a period of two years, but was extended by a year to 31st Dec 2000 to allow for the collection of data on the state of fish stocks in Guinea's waters before negotiating a new Protocol. However as the process was not completed in time, the two parties agreed to a further one year extension. EU vessels fishing under this Agreement were from Spain, France, Portugal, Italy and Greece, targeting shrimp, fish/cephalopods and tuna. Tuna fishing possibilities were provided for 68 vessels (38 tuna seiners, 14 pole and line vessels and 16 surface longliners). The EU financial compensation amounted to € 2,960,000 per year, almost half of which (€ 1,360,000) was allocated to targeted measures aiming to promote scientific research, monitoring and control, support for small-scale fisheries, training facilities and support for participation by Guinea in Regional Fisheries Organisations. In addition, the EU granted Guinea an annual premium of € 370,000 to encourage its endeavour to reduce fishing effort in its waters.

The following Agreement was established for a five year period from 2004 to 2008. For finfish and cephalopod trawlers this permitted 2 500 GRT per month averaged over the year in 2004, and 3 000 GRT per month for all other years. Additional fishing opportunities for finfish and cephalopod trawlers, were subject to the availability of scientific evidence of the sound state of stocks, the equivalent reduction in the quota of licences issued outside the scope of agreements and the satisfactory rate of use of fishing opportunities. The remaining fleet was limited to 1 500 GRT/month shrimp trawlers and 34 freezer tuna seiners, 14 pole-and-line vessels and 9 surface longliners for tuna fishing.

The EU's financial contribution included an amount for financing scientific and technical programmes for: improved information on fishery and biological resources of the Republic of Guinea's fishing zone, support for fisheries surveillance and management of fishing effort; support for small-scale fishing; institutional support for the Ministerial bodies responsible for fisheries; funding of training in different scientific, technical and economic disciplines related to fisheries and contribution to and participation by the Republic of Guinea in international fisheries organisations.

Table1. EU Fisheries Agreements with the republic of Guinea

Dates	Cost of Agreements (€)			EU Fleets Allowed	EU fleets
	Other	Compensation	Total		
01.01.1996-31.12.1997[2]	1 550 000	2 450 000	4 000 000	5 000 GRT/mo of demersal trawlers (finfish, cephalopods, shrimp) Tuna 28 seiners, 7 longliners, 7 pole in hole vessels	France Greece Italy Portugal Spain
01.01.2000-31.12.2001[3] (extended to 31.12.2003)	€ 370 000 Additional annual premium to encourage reduction of	€ 2 960 000	3 330 000 (annually)	1 500 GRT/mo for shrimp 2 500 GRT/mo for fin-fish/cephalopods. Tuna fishing, 68 vessels:	France, Spain, Portugal, Italy Greece

[2] Champing, A. 1997. Coherence Between EU Fisheries Agreements and EU Development Cooperation: The Case of West Africa (ECDPM Working Paper No. 52).

[3] http://ec.europa.eu/fisheries/press_corner/press_releases/archives/com02/com02_42_en.htm

	fishing effort			38 freezer tuna seiners 14 pole and line vessels 16 surface longliners	
01.01.2004- 31.12.2008[4] 2004 2005 2006 2007 2008	 1 400 000 1 625 000 1 950 000 1 950 000 1 950 000	 2 000 000 2 200 000 2 300 000 2 300 000 2 300 000	 € 3 400 000 € 3 825 000 € 4 250 000 € 4 250 000 € 4 250 000	Finfish and cephalopod trawlers: 2 500 GRT/ month in 2004, 3 500 GRT/month for 2005-2008 Shrimp trawlers: 1 500 GRT/month averaged over the year Tuna fishing: 34 freezer tuna seiners 14 pole-and-line vessels 9 surface longliners	
01.01.2009- 31.21.2012[5]		2009 2010 2011 2012	€ 1 050 000 € 1 050 000 € 1 050 000 € 1 050 000	Tuna fishing: 28 freezer tuna seiners, 12 pole-and-line vessels	Spain France Italy

The most recent protocol to the fisheries partnership agreement concluded between the Community and the Republic of Guinea covers the period from 2009 to 2012. A payment of 450 000€ is earmarked in its entirety to support the development of the fisheries sector. This is supplemented by a specific Community contribution of 600 000€ for the first year, 400 000€ for the second year and 300 000€ for the following years in order to reinforce the monitoring, control and surveillance system in Guinea's fishing zones and enable Guinea to acquire a satellite surveillance system. If additional fishing opportunities are granted after the first year of implementation, this financial contribution shall also comprise, as of 2010, an amount of up to 300 000€ per year in proportion to the increase in fishing opportunities. The agreement is for the tuna fisheries and vessels are mainly from Spain, France and Italy.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

By virtue of a Council decision of May 2009, the most recent Fisheries Agreement has been applied provisionally since 1 January 2009. However, following the political situation in which 150 civilians were killed by the ruling military junta in September 2009, the Commission has withdrawn its proposal on the signing of a fisheries partnership agreement and suspended payments to Guinea. These acts of violence were widely condemned by the international community and under the prevailing circumstances the Commission cannot make a financial transfer to the Guinean authorities. As a final step in this process, the Commission has now adopted a proposal under which the Council would completely denounce the agreement.

[4] Official Journal of the European Union, 2004
[5] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:156:0035:0055:EN:PDF

5. FISHING ADMINISTRATION

Guinea possesses major mineral, hydropower, and agricultural resources, yet remains an underdeveloped nation. Guinea's vulnerability to political and economic crisis has increased in recent years with declining economic conditions and popular dissatisfaction with corruption and bad governance. Long-run improvements in government fiscal arrangements, literacy, and the legal framework are needed[6].

THE MINISTRY OF FISHERIES AND AQUACULTURE

The Ministry of Fisheries and Aquaculture has overall responsibility for the development, policy formulation and management of the fisheries sector in Guinea, including the negotiation of fisheries agreements with other countries wishing to fish in Guinean waters. The fisheries are regulated under the Marine Fisheries Code L/ 95/ 13/ CTRN of 1995 and the Fisheries Plan is updated annually.

The Ministry, together with its scientific institutions, have responsibility for identifying priority fisheries, evaluating exploitation status, specifying the management objectives and optimum fisheries effort and specifying the management and conservation measures needed. Guinea has embarked on a policy of management of its fishery resources through co-management, application of the Code of Conduct for Responsible Fisheries and the Sustainable Fisheries Livelihoods Approach.

The ministry is made up of three bodies. The National Directorate of Maritime Fisheries (DNMP) is responsible for the execution of fisheries management plans, which are also executed at lower levels with associated directorates in place (Table 2). The National Centre for Surveillance and Protection for Fisheries is responsible for the execution of fisheries laws and conflict resolution. The National Centre of Fisheries Sciences of Boussoura is charged with research and advice for fisheries development in Guinea. This involves a team of 45 researchers, organised under five research units.

Table 2. The organisational structure of the Ministry of Fisheries in Guinea[7]

Ministry for Fisheries and Aquaculture (MPA)		
National Directorate of Maritime Fisheries (DNMP) Executing fisheries management plans	The National Centre for Surveillance and Protection for Fisheries (CNSP) Execution of fisheries laws Conflict resolution	The National Centre of Fisheries Sciences of Boussoura (CNSHB) Research and advice for fisheries management
Prefectoral Directorates of Fisheries Executing fisheries management plans at prefectoral level		
Local Directorates of Fisheries Executing fisheries management plans at local level		

[6] http://www.nationsonline.org/oneworld/guinea.htm

[7] Lenselink, (2002). Participation in artisanal fisheries management for improved livelihoods in West Africa. A synthesis of interviews and cases from Mauritania, Senegal, Guinea and Ghana. *FAO Fisheries Technical Paper.* No. 432.and http://www.asti.cgiar.org/pdf/Guinea_CB12.pdf

6. LIST OF IMPORTANT STOCKS

The shrimp fisheries in the Guinea Current Large Marine Ecosystem (GCLME) exploit both inshore and offshore penaeids. The inshore shrimps are represented by *Parapeneopsis atlantica*, brown shrimp and *Penaeuss notialis*, pink shrimp or coastal shrimp shrimp, which is fully exploited (Table 3). The offshore penaeids conist mostly of *Parapenaeus longirostris*, deep water rose shrimp for which results regarding its status are inconclusive.

The large offshore pelagics are essentially the Thunidae and Istiophoridae. The tuna fish species are represented mainly by: *Euthynnus allettaratus* (little tunny), *Katsuwonus pelamis* (skipjack) and *Thunnus albacares* (yellowfin tuna). The Istiophoridae are represented mainly by: *Istiophorus albicans* (Atlantic sailfish)[8].

Table 3. List of important stocks (CECAF, 2007).

Sub-Group/ Unit	Area	Status	Management recommendations
Demersal fisheries[9]			
Pseudotolithus elongatus	Guinea+ Sierra Leone	Overexploited	Fishing effort should be reduced
Pseudotolithus spp.	Guinea+ Sierra Leone	Fully exploited	As a precautionary measure, reduce the current level of fishing effort as this group of species is caught together with *P.elongatus*
Galeoides decadactylus	Guinea+ Sierra Leone	Fully exploited	Do not increase fishing effort
Arius spp.	Guinea+ Sierra Leone	Overexploited	Fishing effort should be reduced
Sparidae	Guinea+ Sierra Leone	Overexploited	Fishing effort should be reduced
Cynoglossus spp.	Guinea+ Sierra Leone	Overexploited	Fishing effort should be reduced
Pomadasys spp.	Guinea+ Sierra Leone	Overexploited	Fishing effort should be reduced
Shrimps-South			
Parapeneus longirostris	Guinea-Bissau and Guinea	Inconclusive results	As a precautionary measure do not increase the fishing effort awaiting actualisation and analyses of catch and effort data for 2002-2004
Penaeus notialis	Guinea	Fully exploited	Do not increase fishing effort
Cephalopods			
Sepia spp.	Guinea	Overexploited	Fishing effort should be reduced significantly
Small pelagics[10]			
Sardinella aurita	Guinea and Sierra Leone)	No reliable results. The	As a precautionary measure, catch level should not exceed the average

[8] GCLME, 2006. Transboundary Diagnostic Analysis
[9] CECAF, 2005. Report of the fourth session of the Scientific Sub-Committee. Accra, Ghana, 24–26 October, 2005. FAO Fisheries Report No.800. 52 p.
[10] CECAF, 2007. Report of the fifth session of the Scientific Sub-Committee. Casablanca, Morocco, 4-6 December 2007. FAO Fisheries Report No.869. 56 p. FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC

		CPUE series available shows an increasing trend until 2002	of the last 5 years (4 000 tonnes).
S. maderensis	Guinea and Sierra Leone)	Stock is overexploited.	As a precautionary measure, do not increase catches of this species until further analysis with more complete data on the stock is available. Catch level should not exceed the average of the last 5 years (13 000 tonnes).
E. fimbriata	Guinea	The model did not provide reliable results.	As a precautionary measure it is recommended not to increase catches above the average of last 5 years (42 000 tonnes).
Trachurus trecae	Guinea and Sierra Leone	Stock fully exploited, but level of current biomass too low.	As a precautionary measure, do not increase catches of this species. Catch level should not exceed the last year catch (2004) of 600 tonnes.
Decapterus spp.	Guinea and Sierra Leone	Stock fully exploited, but level of current biomass too low.	As a precautionary measure, do not increase catches of this species. Catch level should not exceed the last year catch (2004) of 2000 tonnes.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

A list of all PET species found in Guinean waters is found in Appendix 1. In terms of target species, the yellowfin tuna are already considered fully utilised, though are listed as 'of least concern' in the Red List[11]. However, bycatch is an issue as limitations are not clearly defined in the agreements and local legislation is rarely enforced[12]. In addition, under the EU's fishing agreement with the Republic of Guinea EU trawlers are allowed to catch almost five times more bycatch than a Guinean national trawler[13].

West African waters harbour several species of small cetaceans, however, in contrast to other regions in the world, the conservation status of small cetaceans in West Africa is not well known. Particularly notable endangered species caught as bycatch in Guinean waters include the West African Manatee (*Trichechus senegalensis*)[14] and the common bottlenose dolphins (*Tursiops truncates)*[15], listed as 'vulnerable' and 'decreasing' and respectively.

[11] http://www.iucnredlist.org/
[12] Kaczynski and Fluharty, 2002. European policies in West Africa: who benefits from fisheries agreements? *Marine Policy*, 26: 75–93

[13] http://www.ejfoundation.org/page175.html
[14] Silva and Araujo, 2001. Distribution and current status of the West African Manatee *(Trichechus Senegalensis)* in Guinea-Bissau. *Marine Mammal Science*, 17(2):418-424.

[15] Van Waerebeek et al., 2008. Indeterminate stautes of West African populations of inshore common bottlenose dolphins Tursiops truncatue causion agains opportunistic live-capture schemes. http://www.lafiba.org/var/plain/storage/original/application/231a941c95c5a000064d2e0389b231e7.pdf

Until recently, conservation of biodiversity was given a very low priority in the Republic of Guinea, and the country's biodiversity remains today one of the least well-studied in West Africa[16]. However, Guinea is one of 150 member countries of CITES and has ratified the Convention Concerning the Protection of World Culture and Natural Heritage (World Heritage Convention, Paris, 1972) and the Convention for the Cooperation in the Protection and Development of the Marine and Coastal Environment of the Western and Central African Region (Abidjan, 1981)[17]. Following a regional workshop in Conakry, Guinea, held in May 2000 on the conservation and management of small cetaceans of the African coast, the Convention on the Conservation of Migratory Species (CMS) showed its support at its 7th meeting (CoP 7) in September 2002. It supported the development of appropriate instruments for the conservation of small cetaceans in West Africa, notably through action plans and the establishment of a regional memorandum of understanding (MoU). However, the development of conservation action plans or a regional MoU for small cetaceans in West Africa are still pending[18].

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Guinea is a contracting party of the Fishery Committee for the Eastern and Central Atlantic (CECAF) and of the Western Central Atlantic Fishery Commission (WECAFC)19. Guinea is also a member of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean Tuna Commission (IOTC)[20].

The following collaborations and projects are important initiatives contributing to research:

- **FCC II** To assess the dynamics and the effect of management measures and management on the functioning of the fisheries sector (1999 - 2002). Funded by the Fund for Aid Cooperation (FAC).
- **System Information and Analysis for Fisheries** (SIAP). Working towards better management of fisheries resources in the countries of Northwest Africa (1999-2002).
- **Fishing ecology of Guinea** (PEG). To establish methods for the sustainable development of Guinea's fisheries[21].
- Pilot project "**Coastal fisheries Co-management**" or PP2 is the second sub-regional initiative undertaken by the Sustainable Fisheries Livelihoods Programme (SFLP). Budget US$ 1M (2002-2006). Improving natural resource

[16] Brugiere and Kormos, 2008. Review of the protected area network in Guinea, West Africa, and recommendations for new sites for biodiversity conservation. Biodiversity Conservation.
[17] *Wright and McCullough* An ecological, socio-economic and conservation overview of Northwestern Guinea. http://www.bioone.org/doi/pdf/10.1896/054.041.0106
[18] http://www.panda.org/who_we_are/wwf_offices/senegal/index.cfm?uProjectID=9F0781
[19] European Commission Directorate General Fisheries http://www.europa.eu.int/comm/fisheries/policies_en.htm
[20] http://www.dfo-mpo.gc.ca/international/dip-rfmo-map-eng.htm
[21] http://lefur.jean.free.fr/facpeg/1.0_FAC/index.htm

management through the collaboration of the coastal fishing communities, the Governments and civil society[22].

- **Guinea Current Large Marine** ecosystem (GLME) project. The goal of the project is to secure the development and adoption of regional Strategy Action Programmes (SAP) by member states. These facilitate regional commitment to integrated management of coastal area and marine ecosystem for sustainable utilisation of its resources through joint resource evaluation and information exchange[7].
- **Improving Scientific and Technical Advice for Fisheries Management** (ISTAM). This project aimed to coordinate scientific activities to provide methodological reinforcement of the fisheries resources monitoring and assessment instruments in the region, EC and IRD (2006-2008)[23].
- Protection of the **Canary Current Large Marine Ecosystem** (CCLME). Project goal to "enable the countries of the CCLME to address priority transboundary concerns on declining fisheries, associated biodiversity and water quality through governance reforms, investments and management programs. FAO and UNEP. US$27.5M (2008-2013)[24].

National scientific research activities are reported in CECAF working sessions in order to share knowledge among researchers and decision makers. The increase in this type of collaboration has been recommended as there are a high number of projects funded and implemented in the region by different agencies which are often uncoordinated and involve the duplication of efforts. Combined with the constraints in human resources available in the region to fulfil the objectives of the various projects, increased coordination would be beneficial[25].

9. DATA COLLECTION

There is a lack of strong research data on fishery resources in Guinea[11]. The National Centre of Fisheries Sciences of Boussoura, responsible for fisheries research has 45 reserachers who spend approximately 90 % of their time on research relating to fisheries, while the remaining 10 % of their time is spent on socioeconomic research[26].

Information on tuna catches is available to the coastal states of ICCAT member countries after reprocessing by national research institutes in Spain, France and other Atlantic tuna fishing countries[11]. However, the compatibility of global (FAO) and national statistical information systems has been questioned by the French Institute for Research and Development (IRD). Statistical zone actually used in official catch declarations are based on the wide geographical zone areas which are more biogeographical in nature than the legal zones. The spatial limits of these FAO zones cannot be super imposed on the defined ones in the national systems which are based on

[22] ftp://ftp.fao.org/docrep/fao/012/ak194e/ak194e00.pdf
[23] http://ec.europa.eu/research/fp6/ssp/istam_en.htm
[24] CCLME project document
http://www.gefweb.org/uploadedFiles/Projects/Work_Programs/Project%20Document(4).pdf
[25] Report of the fourth session of the Scientific Sub-Committee. Accra, Ghana,
24–26 October, 2005. FAO Fisheries Report No.800. 52 p.
[26] http://www.asti.cgiar.org/pdf/Guinea_CB12.pdf

the exclusive economic zones (EEZs), making the statistics produced by the two systems hardly compatible despite the often common source of the data. This has been identified as a particular issue for CECAF areas[27].

9.1 BIOLOGICAL

No information

9.2 ENVIRONMENTAL

No information

9.3 ECOSYSTEM

No information

9.4 SOCIO-ECONOMIC

No information

9.5 FUNDING

No information

10. RESEARCH, FUNDING AND ASSESSMENT

- RESEARCH

Scientific research is undertaken by the CERESCOR (Rogbanet Oceanographic Research Centre), the IRD (Institut de Recherche pour le Développement) and the CNSHB (National Centre of Fisheries Science of Boussoura). The mission of CNSHB is to contribute to a better understanding of the fishery resource. It includes a Department of Artisanal Fisheries, Department of Commercial Fisheries, a Department of Inland Fisheries, Department of Socio-Economics and a Department of Coastal Management.

The centre is responsible for managing the following projects[28]:

- Inventory Ponds five prefectures in the Upper Guinea;
- Campaign Assessment of demersal stocks;
- Evaluation of small pelagic
- Campaign observation of cetaceans;
- The fisheries of sharks;

[27] CECAF, 2007
[28] http://www.fao.org/fishery/countrysector/FI-CP_GN/fr

- Marine turtles;
- Study of Knowledge organic - eco-scale fishermen in Guinea;
- Parasites of freshwater fishes in Conakry: Determination of their impacts on artisanal fisheries;
- Evaluation of fish fauna in the Bay Sangaréah-Dubréka Prefecture;
- Study of interactions between artisanal and industrial fisheries for access to space and resource;
- Draft Integrated Natural Resources Management (PGIRN) of Guinea Maritime;
- Observatory of Guinea Maritime (GMOs);
- Regional Programme for Conservation and Coastal Shipping (PRCM);
- Proposed creation of the first Marine Protected Area (MPA) of Guinea;
- Trade Environment Fisheries Programme in West Africa (PCEAO).

No further information was found on biological, environmental, ecosystem or socio-economic research in Guinea in a literature search.

10.2 RESEARCH FUNDING

No information in this section

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

No information in this section

10.4 ASSESSMENT FUNDING

No information in this section

11. DISSEMINATION OF SCIENTIFIC INFORMATION

The Fishery Committee for the Eastern Central Atlantic (CECAF) was established in 1967 by a FAO Resolution. It is an advisory body integrated in the FAO organisation and has no specific administration or budget, yet it provides a basis for collaboration sharing of scientific information at an international level. At a national level, there is a national school of marine fisheries which provides an output for dissemination of fisheries information[28]

12. MANAGEMENT PROCESSES

National fisheries management measures are improving[11]. Article 17 of the Code of sea fishing in its paragraph 1 states "Fishing, including the exercise of fishing activities related to commercial purposes, is subject to first obtaining a fishing license issued by the Minister responsible for fisheries or on its behalf pursuant to this Code and the regulations ... "

The Code of sea fishing is completed annually by an additional fishing plan to provide support mechanisms for management, conservation, protection and exploitation of fishery resources in the Republic of Guinea. This is developed by the National Center

for Surveillance and Protection of Fisheries (NPSC), in close collaboration with the National Centre for Fisheries Science Boussoura (CNSHB) and The National Marine Fisheries (DNPM). Current management measures for industrial vessels include mesh size limitations, designated areas for trawling (including trawlers under 15 m in length), limitation of and accounting for by-catch and accepting an observer from the NPSC on board[29]. Destructive fishing practices such as explosives and poisons and fishing of marine mammals are prohibited, and all industrial fishing vessels require fishing licenses as well as the artisanal vessels targeting high value species.

However, the artisanal fishery is largely unregulated[30]:

- The Fishing Plan (2004) indicates that the artisanal fishing is not subject to limitations of fishing effort or fishing area and can take place over the entire EEZ.
- In order to reduce conflicts between artisanal and industrial fishing, restricted areas are reserved for artisanal fishing.
- The Code of sea fishing in its Article 17, paragraph 2 states that artisanal fishing boats which have licences granted will be subject to special regulatory measures. However, these special regulatory measures for artisanal fishing are thought not to exist (Diallo, 1999)[31].

IUU Fishing

In cases of non-compliance with fisheries laws, courts or other agencies can become involved in prosecution and enforcement of sanctions, however, this is rather weak and is often overlooked in fisheries management in Guinea[32]. Illegal fishing is extremely high in the eastern central Atlantic region and is increasing[33]. It is estimated that Guinea loses in excess of 34,000 tonnes of fish every year to illegal fishing, including around 10,000 tonnes of 'bycatch'[34].

One important area of enforcement of fisheries regulations is conflict management, although this is rather confusing in Guinea as there are three distinct government agencies which claim responsibility: the DNPM, the CNSP and; the ANAM, the national maritime navigation agency. Relations between the agencies are often such that it is not likely that one agency will contact another to ask for collaboration on a case. The result is that most cases remain unresolved. Parallel to the three settlement options

[29] http://www.fao.org/fishery/countrysector/FI-CP_GN/fr

[30] http://www.mpl.ird.fr/weblefur/index.htm

[31] Diallo, M.M. (1999) Apprehension and identification of a management system of the fisheries sector of Guinea. Memory D.E.S.S. Energizing Management and Development, Univ. Pierre Mendes France Grenoble II, 50 p.

[32] Lenselink, N.M. Participation in artisanal fisheries management for improved livelihoods in West Africa. A synthesis of interviews and cases from Mauritania, Senegal, Guinea and Ghana. FAO Fisheries Technical Paper. No. 432. Rome, FAO. 2002. 72p.

33 European Technical Centre for Agricultural and Rural Cooperation (CTA)

[34] DfID, 2009.

mentioned above, a fishers' association, namely ANOPECHE, has representatives of both artisanal and industrial fisheries. It is therefore in a good position to try and settle conflicts between members of its association as the process of settlement is quicker and more effective than taking a case to the formal agencies or to court. Unfortunately, ANOPECHE can only settle disputes arising between its members, and few industrial vessel owners and captains adhere to the association[31].

Actions taken to combat IUU fishing

The National Centre for Monitoring and Fisheries Protection carries out patrols and interdiction on illegal fishing activities and the Fishing Ministry also collaborates closely with national fisher organisations, namely the CONAPEG (National Confederation of Guinean Fishermen), UNPAG (National Union of Artisanal Fishermen of Guinea) and the National Union of Guinean Fish traders.

In a resolve to combat regional IUU fishing in the sub-region, member states of the Sub-Regional Fisheries Commission (SRFC), alone or in combination have undertaken certain actions. These include[35]:

- Harmonisation of their fisheries legislation;
- The setting up of national registers of fishing vessels as a prelude to the establishment of a sub regional register of fishing vessels;
- Organisation of numerous training programmes for boarding officers at both the national and sub-regional levels
- Introduction of VMS in some states which affords the opportunity to at least track licensed vessels;
- Sub-regional co-operation in cross border combined aero-maritime fisheries surveillance missions.
- Passing of a declaration (Nouakchott Declaration) in 2001, calling for the use of all means at its disposal to fight against IUU fishing activities in the EEZ's of all member states. The Ministers went further to request the international community to assist them in this fight.

13. FUTURE OPPORTUNITIES

Priority areas for future interventions

- Causes of ecosystem degradation and change in the Guinea Current region[7].

Shrimps

- Compilation of information at a regional level to be made available
- Catch and effort statistics by fishing gear
- Sampling of the landings should be continued in order to obtain landing data by fishing gear [8].

[35] http://www.greens-efa.org/cms/default/dokbin/190/190528.pdf

14. STAKEHOLDERS

There are three major professional organisations in the fisheries sector:

- the National Confederation of Fishermen Guinea (CONAPEG) which includes representatives of fishing organizations of different components of the fisheries sector;
- National Union of Artisanal Fishermen of Guinea (UNPAG);
- National Union of Guinea fishmongers.

Other stakeholders in relation to research are:

- CERESCOR (Centre for Oceanographic Research Rogbanet) conducts basic research under the supervision of the Ministry of Higher Education and Scientific Research;
- CNSHB (National Centre for Fisheries Science Boussoura) which deals with applied research [29]

Annex 1: PET species found in Guinean waters[36]

Green turtle	*Chelonia mydas*
Loggerhead turtle	*Caretta caretta*
Hawksbill turtle	*Eretmochelys imbricata*
Olive Ridley turtle	*Lepidochelys olivadea*
Leatherback turtle	*Dermochelys coriacea*
Bigeye tuna	*Thunnus obesus*
White grouper	*Epinephelus aeneus*
Whale shark	*Rhincodon typus*
West African Manatee	*Trichechus senegalensis*
Spotted eagle ray	*Aeobatus narinari*
Smoothback Angel shark	*Squatina oculata*
Sawback angel shark	*Squatina aculeate*
Portuguese dogfish	*Centroscymnus coelolepis*
One-finned shark	*Heptranchias perlo*
Oceanic white-tip shark	*Carcharhinus longimanus*
Night shark	*Carcharhinus signatus*
Largetooth sawfish	*Prisits perotteti*
Grey nurse shark	*Carcharias Taurus*
Dusky grouper	*Epinephelus marginatus*
Devil fish	*Manta birostris*
Common guitarfish	*Rhinobatos rhinobatos*
Bottlenose skate	*Rostroraja alba*
Blackchin guitarfish	*Rhinobatos cemiculus*
Atlantic humpbacked dolphin	*Sousa teuszii*
African wedgefish	*Rhynchobatus luebberti*
Common bottlenose dolphin	*Tursiops truncatus*

[36] http://www.earthsendangered.com/search-regions3.asp?search=1&sgroup=allgroups&ID=139

Chapter 7: Guinea Bissau

1. EXECUTIVE SUMMARY

Guinea-Bissau has held Fisheries Agreements with the EU, Senegal, China and Ivory Coast. The EU Fisheries Agreement with Guinea Bissau is one of the oldest and most important for the EU, dating from 1980. Protocols have been in place since then, with the exception of the period from June 1998 to April 1999 when implementation was suspended due to the outbreak of an armed conflict in Guinea Bissau. Since then, two new protocols have been established, the current Protocol permitting the EU fleets of Spain, Italy, Greece, Portugal and France to exploit crustaceans, demersal species and tuna for the annual amount of € 7.5 million. Of this, 35% is ear marked for support of sectoral fisheries policy of Guinea-Bissau.

Incidental capture by gillnets, trawlers, and other fishing gear in Guinea Bissau have been identified as major threat to five endangered species of marine turtles as well as the West African manatee and common bottlenose dolphin, all of which are included in the IUCN Red List. Three marine protected areas have been established which serve to provide some mitigation of the impacts of fishing, however these only restrict the industrial fleet, and even then enforcement is minimal and often ineffective.

Guinea Bissau is not a member of ICCAT and IOTC, so is therefore not able to benefit from the shared research underway in these organisations. The Centro de Investigação Pesqueira Aplicada (CIPA) is the primary research institute and works in collaboration with other international institutes including IPIMAR in Portugal, CNSHB in Conakry, CNROP in Mauritania, CRODT in Senegal and NDP in Cape-Vert. The agreement with Portugal enables joint research to take place and facilitates training of technical staff of CIPA.

Fisheries catch statistics in Guinea-Bissau are generally of poor quality, especially in the case of the coastal artisanal fisheries, here no systematic recording is being implemented. An issue which adds to this problem is the underestimation of catches by the international fleet in the Guinea-Bissau EEZ, due to under-reporting and/or illegal fishing activity.

Information contained in this report is the result of a survey of the literature.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Guinea-Bissau has held Agreements with the EU, Senegal, China and Ivory Coast[1].

[1] http://www.fao.org/fishery/countrysector/FI-CP_GW/en

China -Guinea Bissau Fisheries Agreement

Signed on August 28, 1984, the agreement between China and Guinea Bissau enabled the Chinese international fishing cooperation CONAPEMAC to access the water of Guinea-Bissau through vessels with approved licensing. This was subject to the provisions of equipment, funds and technical personnel by China to help Guinea-Bissau develop industrial fishing fleets and fishing ports. Although diplomatic relations broke off in 1990, the agreement has still been effective due to long-term cooperation at a local level[2].

Guinea Bissau - Senegal Fisheries Agreement

In 2008, Guinea Bissau signed a fisheries agreement allowing Senegalese fishermen to fish in Guinea Bissau waters under license. In addition to providing revenue, the Agreement was intended to increase collaboration between the nations, enabling them to exert more control over the sustainability of their fish stocks [3].

Guinea Bissau - EU Fisheries Agreements

The Fisheries Agreement with Guinea Bissau is one of the oldest and most important for the EU. The initiation of Fisheries Agreements between the EU and Guinea Bissau began in 1980, with a Protocol of Implementation valid from 1993 (Table 1). Agreements continued until June 1998 due to the outbreak of an armed conflict in Guinea Bissau. Implementation of the Protocol was suspended until April 1999 as fishing activities by EU vessels in Guinean waters were not deemed to be safe. The EU withheld the financial compensation corresponding to this period which represented some € 6.5 million, however when peace returned, the EU allocated this amount to Guinea Bissau for the restoration of facilities supporting the national fishing sector.

A new Protocol was established in 2001 for a period of five years from 16 June 2001 with financial compensation amounting to a total of €51 million. Vessels operating under this Agreement came from Spain, France, Italy, Portugal and Greece. According to the 2001 Protocol the two parties expressed their commitment to ensuring sustainable fisheries in the waters of Guinea Bissau in a non-discriminatory manner between the various fleets involved. The two parties agreed to take measures to ensure sustainable management of fish resources on the basis of the best available scientific advice. Where these measures related to a reduction of the fishing possibilities allocated to EU vessels under the Protocol, the amount of financial compensation was reviewed accordingly. A provision was also set regarding the maximum level of by-catches permitted for shrimp vessels, limiting the level of cephalopods and fish allowed on board to 50% of the catches of the vessels[4].

[2] http://www.lib.noaa.gov/retiredsites/china/archi/internation.htm

[3] http://www.illegal-fishing.info/sub_approach.php?country_title=guinea+bissau

[4] http://ec.europa.eu/fisheries/press_corner/press_releases/archives/com01/com01_32_en.htm

Table 1. Fishing agreements between the EU and Guinea Bissau (1993-2006)

Dates	Cost of Agreements (€)		EU Fleets Allowed	Fleet nations
16.06.1993-15.06.1995[5]	Compensation Research contribution Training and scholarships	12 million 450 000 250 000		
16.06.1995-15.06 1997[6]	Total Compensation Other	12 700 10 800 1 500	**Crustaceans and demersal species** Demersal trawlers (finfish cephalopods, shrimp) 12800 GRT per month **Highly migratory species** Tuna seiners: 26 Tuna long liners and pole and line vessels: 16	France Italy Portugal Spain
1998-1999	*Armed conflict in Guinea Bissau*			
16.06.2001-15.06.2006	Total for the period	51 million	**Crustaceans and demersal species** Freezer shrimp trawlers: 4 400GRT Freezer fin-fish and cephalopod trawlers: 4 400 GRT **Highly migratory species** Freezer tuna seiners: 40 vessels Pole-and-line tuna vessels and surface longliners: 30 vessels	Spain, France, Italy, Portugal and Greece

Analyses of past EU relations with Guinea-Bissau indicate that Fisheries Agreements have allowed Guinea Bissau to be taken advantage of, with the EU gaining much and exploiting marine resources with little regard for development or sustainability. EU fisheries license revenues in Guinea Bissau make up only 10.5% of the estimated actual value of the coastal resources exploited by EU vessels and less than 0.5% in the case of the offshore tuna fisheries. There have also been issues resulting from excessive by-catch, underpayment of tuna license fees and denial of timely statistical information for the coastal state[7][8].

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The current fisheries partnership agreement concluded between the Community and Guinea-Bissau covers the period 16 June 2007- 15 June 2011 with a financial contribution of € 7 000 000 out of which 35 % is dedicated to the support of the fisheries policy of Guinea-Bissau. This payment forms an essential contribution to the National Treasury[9]. The fisheries agreement allows community vessels mainly from

[5] FAO,1996. Coastal State requirements for foreign fishing. FAO Legislative Study. http://www.fao.org/docrep/V9982E/v9982e1t.htm

[6] Acheampong, A. 1997. Coherence Between EU Fisheries Agreements and EU Development Cooperation: The Case of West Africa (ECDPM Working Paper No. 52).

[7] Béné, C. (2008), "Global Change in African Fish Trade: Engine of Development or Threat to Local Food Security?", OECD Food, Agriculture and Fisheries Working Papers, No. 10, OECD

[8] Kaczynski, V.M. and D.L. Fluharty, (2002). European policies in West Africa: who benefits from fisheries agreements? Marine Policy 26: 75-93.

[9] FAO. 2006. Contribution of fisheries to national economies in West and Central Africa – Policies to increase the wealth generated by small-scale fisheries. New Directions in Fisheries – A Series of Policy Briefs on Development Issues, No. 03. Rome. 12 pp. http://www.sflp.org/briefs/eng/notesynthese.html

Spain, Portugal, Italy, Greece and France to fish in the Guinea-Bissau waters and is part of the tuna network fisheries agreements in West Africa.

Table 2. Details of the current EU Fisheries Agreement with Guinea Bissau[10]

Dates	Cost of Agreements (€)		EU Fleets Allowed	Fleet nations
16.06.2007 – 15.06.2011	Earmarked for support of sectoral fisheries policy	2 950 000 per year	**Crustaceans and demersal species** Freezer shrimp trawlers: 4 400 GRT per year Freezer, fin-fish and cephalopod trawlers: 4 400 GRT per year **Highly migratory species**	Spain, Italy , Greece, Portugal, France
	Compensation	4 550 000	Freezer tuna seiners and longliners: 23 vessels Pole-and-line tuna vessels: 14	
	Total	7 500 000 per year		

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Does not apply

5. FISHING ADMINISTRATION

The Fisheries Ministry supervises the sector and reports directly to the Prime Minister. A diagram of the main elements in the sector is given below (Figure 1). The ministry budget is obtained from the national Treasury and administrative responsibility resides with the Fisheries Minister.

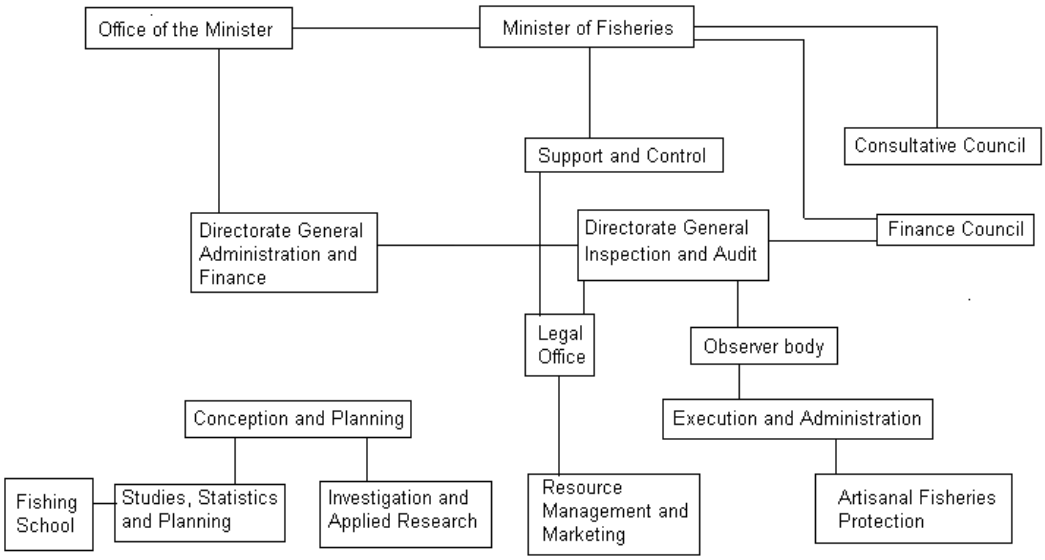

Figure 1. Ministry of Fisheries[11]

[10] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:342:0005:0037:EN:PDF

6. LIST OF IMPORTANT STOCKS

Fisheries in Guinea-Bissau can be divided into three major categories: Industrial, Artisanal and Tuna. The industrial fishery is undertaken exclusively by foreign vessels on a seasonal basis, operating with trawl nets or, to a lesser extent, with purse seines. In general, the catches of the industrial fisheries are dominated by members of the sciaenid community, i.e., *Arius* sp. *Galeoides decadactylus*, *Polydactylus quadrifilis*, *Argyrosoma regius*, *Pseudotolithus* sp. and *Pomadasys* sp., followed by small pelagics, i.e., *Sardinella* sp., *Ethmalosa fimbriata* and *Decapterus* sp. (Table 3).

Cephalopods and shrimps form a smaller proportion of catches. Two main groups of shrimps are commercially important in the region, represented principally by the Southern pink shrimp, *Penaeus notialis*, and the deepwater shrimps, of which deepwater rose shrimp *Parapenaeus longirostris* is the most important. Other less abundant shrimp species are also caught in the area: *Melicertus kerathurus*, *Aristeus antennatus*, *Aristeus varidens*, *Plesionika heterocarpus*, *Plesiopenaeus edwardsianus* and *Aristeomorpha foliacea*[12].

The artisanal fishery operates mainly in coastal areas and the Bissagós Archipelago, with gillnets, longline, handline and beach seine. The catches are dominated by species such as mullets (*Mugil* sp. and *Liza* sp.), sharks and rays (*Carcharhinus* spp., *Sphyrna* sp. and *Rhinobatus* sp.), bonga shad (*Ethmalosa fimbriata),* ilisha *(Ilisha africana*), sardinellas, scads, grunts (*Pomadasys jubelini*), guitarfishes (*Rhinobatus* sp.) and barracudas (*Sphyraena* sp.)[12].

The tuna fishery operates differently, involving foreign vessels using longlines, pole and line with live bait, and purse seines and target *Thunnus albacares* and *Katsuwonus pelamis.*

[11] http://www.fao.org/fi/oldsite/FCP/en/GNQ/body.htm
[12] FAO Fishery Committee for the Eastern Central Atlantic/Comité des pêches pour l'Atlantique Centre-Est. Report of the FAO/CECAF Working Group on the Assessment of Demersal Resources – Subgroup North. Saly, Senegal, 14–23 September 2004.

Table 3. Representative fish species, in terms of biomass and fisheries catch, including the total number of species in each group[13].

Groups	Family	Representative species	No. of spp.
Billfish and marlins	Istiophoridae	*Istiophorus albicans*	4
Tuna	Scombridae	*Katsuwonus pelamis, Thunnus albacares*	4
Pelagic sharks	Carcharinidae	*Carcharhinus signatus, C. limbatus, Galeocerdo cuvieri, Prionace glauca*	10
	Sphyrnidae	*Sphyrna mokarran*	–
Pelagic predators	Trichiuridae	*Trichiurus lepturus*	11
	Zeidae	*Zeus faber*	–
	Sphyraenidae	*Sphyraena afra*	–
	Scombridae	*Scomberomorus tritor*	–
	Carangidae	*Caranx senegallus, Alectis alexandrinus*	–
	Elopidae	*Elops lacerta*	–
Benthic predators	Synodontidae	*Saurida brasiliensis, Trachinocephalus myops*	13
	Ophidiidae	*Brotula barbata*	–
	Aulopidae	*Aulopus cadenati*	–
	Sciaenidae	*Argyrosomus regius*	–
	Muraenidae	*Muraena helena*	–
Demersal sharks	Triakidae	*Mustelus mustelus*	9
	Squalidae	*Squalus blainville, S. megalops*	–
	Carcharinidae	*Rhizoprionodon acutus*	–
	Ginglymostomatidae	*Ginglymostoma cirratum*	–
Groupers/snappers	Serranidae	*Epinephelus aeneus, Mycteroperca rubra, Cephalopholis* spp.	5
	Lutjanidae	*Lutjanus goreensis*	–
Rays	Rajidae	*Raja* spp.	10
	Rhinobatidae	*Rhinobatos rhinobatos*	–
	Dasyatidae	*Dasyatis margarita*	–
Benthos/fish feeders	Acropomatidae	*Synagrops microlepis*	29
	Haemulidae	*Brachydeuterus auritus, Pomadasys perotaei*	–
	Polynemidae	*Galeoides decadactylus, Polydactylus quadrifilis*	–
	Gerreidae	*Eucinostomis melanopterus*	–
Sparids	Sparidae	*Dentex* spp., *Pagellus bellottii, Pagrus caeruleostictus*	8
Flatfish	Paralichthyidae	*Syacium micrurum*	11
	Bothidae	*Bothus podas*	–
	Soleidae	*Dicologlossa cuneata, Microchirus boscanion*	–
Benthic feeders	Chlorophthalmidae	*Chlorophthalmus agassizi*	17
	Ariommatidae	*Ariomma bondi, A. melanum*	–
	Triglidae	*Lepidotrigla cadmani*	–
	Haemulidae	*Pomadasys jubelini*	–
	Drepaneidae	*Drepane africana*	–
Small pelagics	Clupeidae	*Sardinella aurita, S. maderensis*	12
	Carangidae	*Caranx rhonchus, Trachurus trecae*	–
Phytoplanktivores	Clupeidae	*Ethmalosa fimbriata*	2
	Cichlidae	*Sarotherodon melanotheron*	–

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

A list of all PET species found in Guinea-Bissau's waters is found in the Appendix. In terms of target species, the yellowfin tuna are already considered fully utilised, though are listed as 'of least concern' in the IUCN Red List[14]. Bycatches of endangered cetaceans, turtles, and elasmobranchs are of conservation concern. Deaths of manatees

[13] Amorim, P., Duarte, G., Guerra, M. Morato, T., Stobberup, K.A. 2004. Preliminary Ecopath model of the Guinea-Bissau continental shelf ecosystem (NW Africa), p. 95-112. *In*: Palomares, M.L.D., Pauly, D. (eds.) West African marine ecosystems: models and fisheries impacts. Fisheries Centre Research Reports 12(7). Fisheries Centre, UBC, Vancouver.

[14] http://www.iucnredlist.org/

(*Trichechus senegalensis*), listed as 'vulnerable' in the IUCN Red List, have been reported in waters of Guinea-Bissau due to entanglement in fishing nets or direct targeting[12], and populations of the common bottlenose dolphins (*Tursiops truncates),* listed as 'decreasing' in the IUCN Red List has been declining particularly rapidly in Guinea-Bissau[15].

The beaches provide important nesting sites for the green turtle (*Chelonia mydas)*, of which Guinea-Bissau hosts the largest breeding population in Africa. Incidental capture by gillnets, trawlers, and other fishing gear in Guinea-Bissau have been identified as major threats to these marine turtles[16] as well as other species including the loggerhead, hawksbill, olive ridley and leatherback turtles. These are all categorised as endangered or critically endangered on the IUCN Red List.

Guinea-Bissau has been a member of CITES since 1990 and is party to conventions on Biodiversity, Climate Change, Endangered Species, Law of the Sea and Wetlands. The Bijagos Archipelago, located off the coast of Guinea-Bissau, was classified as a Biosphere Reserve in 1996. Two core areas here have been identified as national parks in which commercial fishing operations are completely excluded: Orango Islands National Park in 1999 and João Viera / Poilão national park in 2001. The largest West African nesting beach, and possibly the largest of all Atlantic sites for the green turtle is found there, as are relatively large populations of Atlantic humpbacked dolphins and manatees[17]. This serves to provide some mitigation of the impacts of fishing, however, enforcement is minimal and often ineffective[18].

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Unlike Guinea, Guinea Bissau is not a member of ICCAT and IOTC [19], so is therefore unable to benefit from the shared research underway in these organisations. Important research institutes, collaborations and projects contributing to research are described below.

Research institutes:

- The Centro de Investigação Pesqueira Aplicada (CIPA) has signed several agreements with other international centres or institutes (IPIMAR in Portugal, CNSHB in Conakry, CNROP in Mauritania, CRODT in Senegal and NDP in Cape-Vert). The agreement with Portugal enables joint research to take place and facilitates training of technical staff of CIPA. A proportion of funding from the EU Fisheries Agreement also goes directly to CIPA[1].

[15] Van Waerebeek et al., 2008. Indeterminate stautes of West African populations of inshore common bottlenose dolphins Tursiops truncatue causion agains opportunistic live-capture schemes. http://www.lafiba.org/var/plain/storage/original/application/231a941c95c5a000064d2e0389b231e7.pdf

[16] http://www.panda.org/what_we_do/where_we_work/west_africa_marine/

[17] Campredon and Cuq, 2001. Artisanal fishing and coastal conservation in West Africa. Journal of Coastal Conservation & 91-100.

[18] Agardy, 1997. The Bijagos archipelago biosphere reserve, Marine protected areas and ocean conservation.

[19] http://www.dfo-mpo.gc.ca/international/dip-rfmo-map-eng.htm

Collaborations:

- Sub-regional Fisheries Commission (SRFC)[20]

International and sub-regional conventions and protocols form the basis for sub-regional co-operation in the field of fisheries between the SRFC member states (Cape Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone).

The objectives of the Commission are:
- to harmonise the policies of member states for the preservation, conservation and exploitation of fisheries resources
- Strengthen co-operation for the well-being of their respective populations

- Fishery Committee for the Eastern and Central Atlantic (CECAF)

CEFAC is an advisory body with the main objectives:
-to promote programmes of development for the rational utilisation of fishery resources
-to assist in establishing a basis for regulatory measures
-to encourage training.

Projects:

- **Support for the implementation of the plan of action on the international illegal, unreported and unregulated fishing** (2009-2010). FAO Technical Cooperation Programme (TCP), Budget US$256 000[20].
- **Protection of the Canary Current Large Marine Ecosystem** (CCLME), (2010-2015).FAO Trust Funds, Budget US$6 590 000[20].
- Support for safety at seas for small-scale fisheries in developing countries – global with core activities in West Africa and South Asia (2007-2009). Trust Fund/FAO Government Cooperative Programme, Budget US$ 279 065 000[21].
- **Subregional action plan for the conservation and sustainable management of shark populations** (2008-2012)**.** SRFC, funded by MAVA & Digis. Budget EUR 751 million[22].
- **Support for the management of fishery resources in West Africa.** Strengthening the institutional capacity of the SRFC (2008-2011). Funded by GTZ, Budget EUR2.37 million[22].
- **Towards regional policies for sustainable fishing of small pelagics.** (2007-2009)**.** Funded by the Netherlands, Budget EUR 522 750[22].
- **Strengthening the regional capacity for management and governance of fisheries** (2008-2012). Funded by MAVA & DGIS, Budget EUR11.9 million[22].
- **Support for the development of co-management initiatives in fisheries management** (2008-2013). Funded by AFD, Budget EUR5 million[22].
- **Regional fisheries project in West Africa** (preparatory phase). Increasing sustainable wealth in West Africa. Funded by The World Bank and GEF. Budget US$1.425 million (2008)[22].

[20] http://www.greens-efa.org/cms/default/dokbin/190/190528.pdf

[21] https://extranet.fao.org/fpmis/FPMISReportServlet.jsp?div=&type=countryprofileopen&language=EN&countryId=GW

[22] http://www.csrpsp.org/projets/projets.html

9. DATA COLLECTION

9.1 BIOLOGICAL

Fisheries catch statistics in Guinea-Bissau are of poor quality, especially in the case of the coastal artisanal fisheries, where no systematic recording is being implemented. An issue which adds to this problem is the underestimation of catches by the international fleet in the Guinea-Bissau EEZ, due to under-reporting and/or illegal fishing activity[12]. The foreign fleet operators, who are principally French and Spanish, do not cooperate with local authorities as prescribed in the Agreement and by the Guinea-Bissau's license regulations. As a result no statistical data on foreign fleet activity are supplied and information on catches is routinely denied to the Government[23].

As Guinea-Bissau cannot afford the membership costs ICCAT, the nation is not informed about current trends in the East Central Atlantic tuna fisheries although the information is readily available for the ICCAT member countries[23].

9.2 ENVIRONMENTAL

Little environmental data collection is undertaken in Guinea-Bissau.

9.3 ECOSYSTEM

Published data regarding non-fish groups for the region are scarce, particularly in relation to biomass and production. Most broader ecosystem studies consider only the most characteristic species and are generally descriptive in nature. However, information on species composition and biomass estimates for demersal cephalopods, shrimps and crabs are available from trawl surveys. Future data collection should consider improving the estimation of catches and discards, un-reported shark catches, the creation of separate groups for commercially important species (e.g., Galeoides, Arius, etc.), and compilation of more information, mainly on top predators and benthos groups[12].

9.4 SOCIO-ECONOMIC

No information provided in this section

9.5 FUNDING

The primary sources of funding for data collection come from the EU Agreement which directs funds to CIPA, and the organisations funding projects in the region such as the World Bank, GEF, GTZ, FAO and AFD.

[23] Kaczynski and Fluharty, 2002. European policies in West Africa: who benefits from fisheries agreements? Marine Policy 26: 75–93

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Ecosystem modelling using ECOPATH has been undertaking in collaborative research by the Instituto Nacional de Investigação das Pescas, Portugal (INIP) and CIPA[12]. Other research has focussed on species of conservation interest in the region.

10.2 RESEARCH FUNDING

No information available

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

No information available

10.4 ASSESSMENT FUNDING

No information available

11. DISSEMINATION OF SCIENTIFIC INFORMATION

No information available

12. MANAGEMENT PROCESSES

The fleets

According to Guinea Bissau's government, approximately 107 artisanal vessels operate, of which only 28 are motorised. Half of the artisanal fishermen are foreign (most from Guinea-Conakry), and about 80% are part-time fishermen who also farm.

The industrial fleet had 170 vessels in 2003. Two vessels with cold-storage exist as part of a cooperative venture with China. Information on the total fleet is less certain, as many unlicensed vessels are not recorded in government statistics[24].

Management measures

There are three national parks (Parque Nacional de Tarafe de Cacheu (75 km2); Lagoa de Cufada (75 000 km2) and Orango (158 479 km2)) as well as the Bolama Bijagós Archipelago biosphere reserve which includes an area of 10 274 km2 of aquatic park, however none of these are completely protected areas from artisanal fishing. Industrial fleets are restricted from these waters and are also subject to a number of other restrictions including authorised mesh sizes of 70mm for fish and cephalopod fisheries and 40mm for shrimp fisheries. The length of the fishing season for industrial vessels varies from 3 to 12 months, depending on the licence[25].

[24] http://www.imcsnet.org/imcs/docs/guinea_bissau_fishery_profile_apr08.pdf

[25] http://www.fao.org/fi/oldsite/FCP/en/GNQ/body.htm

Illegal, Unreported and Unregulated fishing

Illegal, Unreported and Unregulated (IUU) fishing is a major problem in Guinea-Bissau. Illegal fishing is extremely high in the eastern central Atlantic region and is increasing[26]. EU fleets do not accept coastal country observers onboard their ships and do not pay agreed fees for tuna harvested in the country's coastal waters. They also do not visit local ports for inspections and do not accept local crew members[27].

In a resolve to combat regional IUU fishing in the sub-region, member states of the SRFC, alone or in combination, have undertaken certain actions. These include[28]:

- Harmonisation of the fisheries legislation;
- The setting up of national registers of fishing vessels as a prelude to the establishment of a sub regional register of fishing vessels;
- Organisation of numerous training programmes for boarding officers at both the national and sub-regional levels
- Introduction of VMS in some states which affords the opportunity to at least track licensed vessels;
- Sub-regional co-operation in cross border combined aero-maritime fisheries surveillance missions.
- Passing of a declaration (Nouakchott Declaration) in 2001, calling for the use of all means at its disposal to fight against IUU fishing activities in the EEZ's of all member states. The Ministers went further to request the international community to assist them in this fight.

13. FUTURE OPPORTUNITIES

Priority areas for future interventions

Future developments for Guinea-Bissau ecosystem research should consider improving the estimation of:

- Catch and effort data for commercially important species
- Discard reporting, including un-reported shark catches
- Information on top predators and benthos groups for ecosystem assessments [12].

Specific recommendations for the shrimp and cephalopod fisheries include:

Shrimp
- Regional compilation of information.
- Update information for *P. longirostris*
- Catch and effort statistics by fishing gear and fleets which are not yet covered
- Sampling of biological parameters

[26] European Technical Centre for Agricultural and Rural Cooperation (CTA)
[27] Kaczynski and Fluharty, 2002. European policies in West Africa: who benefits from fisheries agreements? Marine Policy 26: 75–93

[28] http://www.greens-efa.org/cms/default/dokbin/190/190528.pdf

Cephalopods
- Clarification of discrepancies observed in Spanish statistics obtained by Guinea-Bissau and Spain[29]
- Catch and effort data from all the cuttlefish fisheries
- Biological studies on cuttlefish. Specifically, information is needed on monthly mean weight in catches, biometric relationships (length-weight, mantle length-total length), monthly maturity indices and length at first maturity[29].

14. STAKEHOLDERS

Stakeholders covering research on stock assessments, ecosystem, environment and social and economic aspects include:

- All parties holding Fisheries Agreements with Guinea-Bissau
- Member states of SRFC
- Member states of CECAF
- The Centro de Investigação Pesqueira Aplicada
- Instituto Nacional de Investigação das Pescas

APPENDIX

MARINE PET SPECIES FOUND IN WATERS OF GUINEA BISSAU [30]

Green turtle	*Chelonia mydas*
Loggerhead turtle	*Caretta caretta*
Hawksbill turtle	*Eretmochelys imbricata*
Olive Ridley turtle	*Lepidochelys olivadea*
Leatherback turtle	*Dermochelys coriacea*
African wedgefish	*Rhynchobatus luebberti*
Atlantic humpbacked dolphin	*Sousa teuszii*
Bigeye tuna	*Thunnus obesus*
Common guitarfish	*Rhinobatos rhinobatos*
Common sawfish	*Prisits pristis*
Devil fish	*Manta birostris*
Dusky grouper	*Epinephelus marginatus*
Giant butterfly ray	*Gymnura altavela*
Grey nurse shark	*Carcharias Taurus*
Largetooth sawfish	*Prisits perotteti*
Liver-oil shark	*Galeorhinus galus*
Longfin Mako	*Isurus paucus*
Night shark	*Carcharhinus signatus*
Oceanic white-tip shark	*Carcharhinus longimanus*
One-finned shark	*Heptranchias perlo*
Portuguese dogfish	*Centroscymnus coelolepis*
Queen triggerfish	*Balistes vetula*
Spotted eagle ray	*Aeobatus narinari*
Whale shark	*Rhincodon typus*
West African Manatee	*Trichechus senegalensis*
White grouper	*Epinephelus aeneus*

[29] Report of the fourth session of the Scientific Sub-Committee. Accra, Ghana, 24–26 October, 2005. FAO Fisheries Report No.800. 52 p.
[30] http://www.earthsendangered.com/search-regions3.asp

Chapter 8: Ivory Coast

1. EXECUTIVE SUMMARY

The coastal area of the Ivory Coast is about 32,960 km^2 between latitudes 4° and 5°30' N and longitudes 2°25' and 7°30' W. The principal activities in the coastal area include forestry, plantations, factories, tourism, fishing and various infrastructures (e.g. tourist resorts and hotels). There are approximately 6-8.000,000 people living in the coastal areas (http://www.odinafrica.org/learn-about-odinafrica/65-cote-divore). Fishing is an important activity practised by both national and foreign fleets. It is the main activity and the principal source of income for the population living in the south of the country. The fisheries sector produces 30 percent of locally consumed fish (consumption is estimated at 275,000 tonnes or 16.2 kg/capita/year). The marine fishing sector annually lands about 63,000 tonnes, lagoon and inland fisheries produces about 30,000 tonnes. The deficit of about 182,000 tonnes is imported (FAO 2007). Import and exports of the fisheries sector becomes even more complicated as there are three processing plants which produce annually 121,000 of canned tuna for export. The fisheries sector contributes about 3.2 percent of the agricultural GDP, its contribution to the total GDP is to 0.8 percent and it generates annually 66 billion franc CFA (FAO 2007). There were 3500 dugouts counted along the coast and in the lagoons in 1996 and 14,774 fishermen working at sea and in the lagoons in the year 2000 (Direction des productions halieutiques 2000). Marine artisanal fisheries is practiced by the fishermen using gillnets and hook & line from motorized dugout canoes, and beach seines. The peaks of the fishing seasons are December to February and July to September. Industrial fishing uses about 20-38 ships and takes place on the continental shelf near the ports of Abidjan and San Pédro. The annual catch includes tuna (between 58,000 and 62,000 tonnes), crustaceans (trawling about 6000 tonnes), sardines (between 28,000 and 30,000 tonnes), and shrimp (515 tonnes in 1999 and 1314 tonnes in 2000), although shrimp and sardine fisheries have been reduced in recent years (http://www.odinafrica.org/learn-about-odinafrica/65-cote-divore).

There is a current (1 July 2007 - 30 June 2013) tuna fisheries partnership agreement between the Community and Ivory Coast. The financial contribution for the agreement is €595,000 per year, of which 100 % is dedicated to the support of the fisheries policy of Ivory Coast. The agreement allows community vessels from Spain (15 tuna seiners and 10 surface longliners), Portugal (5 surface longliners) and France (10 tuna seiners) to fish and catch 7,000 t./year in Ivory Coast waters and is part of the tuna network fisheries agreements in West Africa.

The Oceanographic Research Center (CRO) deals with the research of high seas fish resources, especially tuna and swordfish and contribute data for management decisions on these stocks to the International Commission for the Conservation of Atlantic Tunas (ICCAT). Tuna fishing is also practised by artisanal fishermen who land their gillnet catches. Tunas rejected by the processing plants arrive at the local markets and are not monitored. A programme of collection of the statistics for this group "Faux poissons" was started in 2006 to improve the monitoring of this catch category of fish catch (FAO 2007).

Ivory Coast together with 15 other countries has signed the FAO "Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing". Once notice of the 25th country ratification is received by FAO, the Agreement will become active. It will be the first legally binding international treaty focused specifically on the problem of illegal, unreported and unregulated (IUU) fishing.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

There are a number of Chinese fishing vessels operating in Ivory Coast waters that may have some forms of agreements but no information could be found to confirm the details and status of such agreements (http://www.illegal-fishing.info).

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The tuna fisheries agreement concluded between the Community and Ivory Coast covers the period 1 July 2007 - 30 June 2013 with a financial contribution of €595,000 each year, of which 50 % is dedicated to the support of the fisheries policy of Ivory Coast (EU 2008). This fisheries agreement allows community vessels from Spain (15 tuna seiners and 10 surface longliners), Portugal (5 surface longliners) and France (10 tuna seiners) to fish in the Ivory Coast waters and is part of the tuna network fisheries agreements in West Africa. Fee for ship owners is €35 per tonne caught. Advances: Tuna seiners: €3850 per year (ref catches: 110 t.), surface longliners: €1400 per year (ref catches: 40 t.). Reference tonnage: 7,000 t./year. If the overall quantity of catches by Community vessels exceeds 7,000 tonnes per year, the amount of the annual financial contribution will be increased by €65 for each additional tonne caught.

The EC and Ivory Coast signed their first Fisheries Agreement in 1990. The protocol exclusively concerned fishing possibilities on tuna which have been reduced from 9,000 to 7,000 tonnes per year in the latest agreement. Demersal fisheries, available under the previous agreement were not included in the new protocol due to the lack of sufficiently detailed data and EU interest. The licences for tuna vessels were reduced from 34 to 25 for seiners but increased from 11 to 15 for the surface long liners in the current agreement. Given the overall reduction in fishing possibilities, the financial contribution was decreased from the current € 1,065,000 to € 595,000 per year in the current agreement.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable.

5. FISHING ADMINISTRATION

There is limited stock assessment undertaken in Ivory Coast mainly on the tuna species. In general, little current information is available regarding data for management of coastal and marine resources.

The Fishery Committee for the West Central Gulf of Guinea (FCWC) was established in 2006. The aim is to facilitate cooperation in fisheries management between the member countries Liberia, Côte d'Ivoire, Ghana, Togo, Benin, and Nigeria. The

The main institutions involved in fishery data collection are (FAO 2007, http://www.odinafrica.org/learn-about-odinafrica/65-cote-divore):

- Direction des productions halieutiques (DPH) -The DPH deals with data collection of the artisanal fisheries through its Service d'appui à la pêche artisanale et lagunaire.

- Oceanographic Research Center (CRO) – Collects fisheries data through its tuna Conservatory and its research programmes.

- The National Oceanographic Data and Information Management Centre (CNDO-CI) is a national data centre, which is part of CRO. It is charged with carrying out national research on safeguarding and protecting water environments, and implementing sound policies for the management of marine and coastal resources.

- Inspection Services and Animal Sanitary Border control - The SICOSAVF inspects the industrial catches.

6. LIST OF IMPORTANT STOCKS

The three main species of tuna caught by Ivorian fishermen are yellowfin, skipjack, and little tuna. Yellowfin tuna has consistently been the most important species caught.

A specialized trawl shrimp fishery has existed in the Ivory Coast since the mid-1960s: in 1970 there were about 20 vessels, but the number of vessels has since decreased (Menard et al. 2002). The vessels target shrimp, but landed catches of demersal fish are significant and discards very important. Trawlers fish mainly in the 10-75m bathymetric strata. Total landed catches are dominated by 3 families: Sciaenidae, Sparidae and Pomadasyidae (Menard et al. 2002).

Pelagic resources: The majority of the artisanal fishermen target the small pelagic, i.e. the sardinelles, pikes (barracudas), carangues (*Caranx* spp.), bigeye grunt (*Brachydeuterus auritus*). Other pelagic sepcies targeted are marlin, sailfish and Spanish mackerel. The sardine fisheries is based in Abidjan, their catches are composed of the small pelagics (sardinella, mackerels, bigeye grunt, anchovies), which are resources shared with Ghana and to a lesser extent with Togo and Benin. The round sardinella (*Sardinella aurita*) collapsed in 1974, but has since 1984 again become the dominant species in the catches (FAO 2007).

Demersal resources: Most important are shellfish. Fish resources are also exploited but mainly exported. The cephalopods can be considered by-catch as they are not really targeted. The fish are subdivided in species which are found on the trawling fishing grounds (flatfish *Pseudotolithus spp., Galeoides*) and those that live on the rocky bottoms (e.g. *Lutjanus sp.* and *Sparus sp*.). Shrimp are generally found in river mouth areas and are especially targeted by foreign vessels and mainly based on Penaeus shrimps (*Penaeus notialis*), (FAO 2007).

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

There are four species of marine turtles which have been recorded breeding on the West African coastline; the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*) and loggerhead turtle (*Caretta caretta*). There are no records of nesting sites along the coast of Côte d'Ivoire, although there may be suitable habitats in the eastern part of the country. Green and loggerhead turtles are classified as 'Endangered' and Hawksbill and leatherback turtles are listed as 'Critically Endangered' in the IUCN Red List of Threatened Animals (http://iucn-mtsg.org/regions/west-africa-east-atlantic/) and are also listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora as a result of over exploitation for their hides, meat, shells and eggs.

There are about 55 marine mammal species in the west African region of which perhaps 25 can be found in Ivory Coast waters including the west African Manatee (*Trichechus senegalensis*), the Atlantic humpback dolphin (*Sousa teuszii*) and the humpback whale (*Megaptera novaeangliae*), (Collins et al. 2004, Pomilla and Rosenbaum 2006). Five marine mammal species are regarded threatened (listed as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) according to the IUCN Red List) in the region.

The number of animals entangled and killed in net and trawl fisheries (bycatch) of the above mentioned species is not known (Maigret, 1994), but likely represents a threat to local populations.

The development an action plan for the conservation of West African small cetaceans and manatees was launched at the workshop on "Conservation and Management of small cetaceans of the coast of Africa" held in Conakry, Guinea, in May 2000 (http://www.cms.int/species/waam/watch.htm). The meeting had participants from seven Range States (Benin, Equatorial Guinea, Guinea, Ivory Coast, Senegal, The Gambia and Togo), as well as international experts. A first negotiation meeting (Adeje, Tenerife, Spain, October 2007) had considered and further elaborated a Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia, including two separate Action Plans for small cetaceans and the West African manatee respectively. A year after this first WATCH (Western African Talks on Cetaceans and their Habitats) meeting, the WATCH II meeting was held on 2-3 October 2008 in Lomé, Togo, where the final negotiation and signing of the Memorandum of Understanding took place. 15 governmental representatives signed the MoU, as well as three non-governmental collaborating organisations ations (http://www.cms.int/species/waam/watch.htm).

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

As previously stated Ivory Coast is a member of ICCAT and collaborate in ongoing research efforts conducted by ICCAT.

9. DATA COLLECTION

9.1 BIOLOGICAL

The fisheries sector produces 30 percent of locally consumed fish (consumption is estimated at 275,000 tonnes or 16.2 kg/capita/year). The marine fishing sector lands annually about 63,000 tonnes, Lagoon and inland fisheries produce about 30,000 tonnes. The deficit of about 182,000 tonnes is imported. Import and exports of the fisheries sector becomes even more complicated as there are three processing plants which produce annually 121,000 of canned tuna for export (FAO 2007). The total fish catch as reported by DHP to FAO has been about 80,000 tonnes annulayy for the period 1970-2005 (Figure 1).

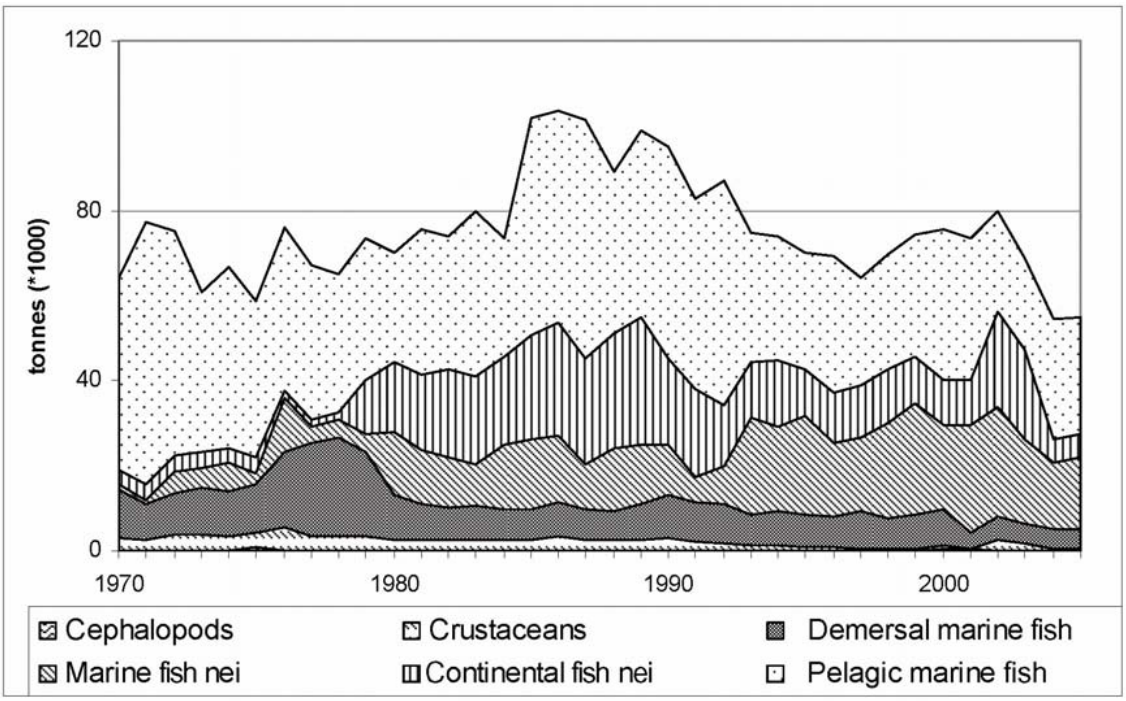

Figure 1. Fisheries statistics for Ivory Cost 1970-2005 reported to FAO (FAO 2007). Fish nei referes to capture production that is not identified to the species level but is instead recorded as marine fishes nei (nei = not elsewhere included).

Monitoring of artisanal fisheries is based on stratified sampling of the artisanal fleet (ARTFISH) and was introduced by FAO through a project in 2000. Since its introduction, DHP could follow and sample artisanal fisheries at the Fishing port of Abidjan until the end of 2006. The DPH carried out this programme in close cooperation with the CRO (FAO 2007). The national industrial fishing vessels land their catch at the fishing port of Abidjan. The fish is auctioned in the port and all marketing is recorded and compiled by SICOSAVF. DPH carries out calculations and prepares the final figures for the directory of the national statistics and FAO (FAO 2007). Monitoring of tuna fisheries is conducted by the Tuna observatory of CRO who are in charge of the data collection of the tuna fisheries following ICCAT specifications. Data collection includes total catch, species composition and size structure of the catch (FAO 2007).

All the dugouts canoes involved in marine fisheries are registered (Repertoir pirogues) and the the national fleet which exploits water of the Côte d'Ivoire is authorized through a licence to fish in territorial waters, but beyond a certain depth not to violate artisanal fisheries (FAO 2007). There are no observers on board foreign vessels (freeze-trawlers or tuna vessels and there is no control on mesh size utilization (FAO 2007). At the market/auction in the fishing port of Abidjan the data are collected for the small pelagics and demersals, including fish prices. The data are collected by staff of SICOSAVF who then sends the collated data to DPH (FAO 2007). The last frame survey took place into 2003/2004. That implies that these figures form the base of calculations of program ARTFISH. After this frame survey/census the CRO and the DPH collaborated until the end of 2006 on the collection of the statistics of fishings (i.e. catch and effort) (FAO 2007).

Several fishery resource surveys have been conducted in the Guinnea Current Large Marine Ecosystem (LME) (Mensah and Quaatey 2002, Zeller et al. 2005). Total reported landings show an increase from 1950 to the early 1990 with a peak at 900,000 tonnes (Figure 2). There is lack of detailed landings statistics per species hence a large proportion of the landings falls in the category "mixed groups". Since the 1960s, high fishing pressure by foreign and local industrial fleets has placed the fisheries in the Guinnea Current LME at risk (Kacynski & Fluharty 2002). Since the mid 1970s, the mean trophic level of the reported landings (Pauly & Watson 2005) has declined an indication of "fishing down" of the local food webs (Pauly et al. 1998).

Although the level of exploitation in the Guinnea Current LME was found to be significant, some fish stocks such as skipjack tuna, small pelagic fish in the northern areas of the northern part of the LME, and offshore demersal fish and cephalopods were believed to be underexploited (Mensah & Quaatey 2002). However, decline in fish stocks and unsustainable fishing has been identified as major transboundary problems and reviews of the status of the LME's fisheries resources indicate that several fish stocks are either overexploited or close to being fully exploited (Mensah & Quaatey 2002). These include small pelagic fish and shrimps in the western and central Gulf of Guinea and coastal demersal resources throughout the LME (Mensah & Quaatey 2002). There is further evidence of depletion of straddling and highly migratory fisheries stocks, with heavy exploitation of yellow-fin and big-eye tunas (Mensah & Quaatey 2002). Overexploitation has resulted in declining stock biomass and catch per unit effort, particularly for inshore demersal species, and this decline has been attributed to trawlers operating in inshore areas (Koranteng 2002).

There are indications that overexploitation has altered the ecosystem with impacts at all levels, including top predators. Species diversity and average size of the most important fish species have declined as a result of overexploitation (Koranteng 2002, FAO 2003). Perhaps the most significant changes in species abundance are reflected in sardinella (*Sardinella aurita*) and triggerfish (*Balistes capriscus*). The sardinella fishery experienced a collapse in 1973, and was followed by a large increase in the abundance of triggerfish between 1973 and 1988. The decline of the triggerfish after 1989 was followed by an increase of the sardinella to unprecedented levels during the 1990s (Cury & Roy 2002).

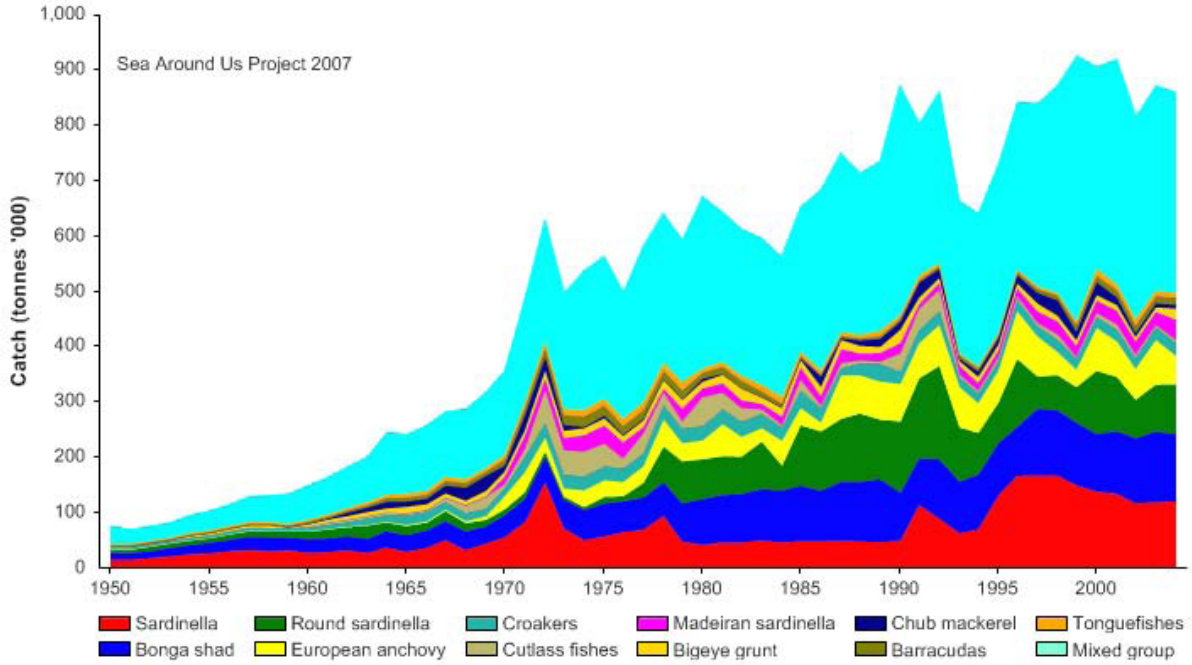

Figure 2. Total reported landings in the Guinea Current LME by species (Figure taken from Sea Around Us 2007).

9.2 ENVIRONMENTAL

Staff of CRO takes part in the Nansen programme for the evaluation of the resources on the continental shelf beyond 30 m depth, by the trawling and hydroacoustic (FAO 2007).

The coastal and marine environments of the Guinea Current are heavily polluted in areas near large cities (Scheren & Ibe 2002). Gordon & Ibe (2006) provided an assessment of the state of the environment with respect to land-based sources of pollution in this region. Pollution from land-based sources is particularly important, and together with sea-based sources, has contributed to a deterioration of water quality in the bordering countries of the Guinea Current LME. Deterioration of water quality from land and sea-based activities has been identified as one of the the broad environmental problems in the LME (NOAA 2003). Despite being mainly localised, pollution has also transboundary impacts in through transport of contaminants by wind and water currents along the coasts. Organic waste from domestic, industrial and agricultural has also resulted in eutrophication and oxygen depletion in some coastal areas (Scheren & Ibe 2002). Chemical pollution is serious in some coastal areas where chemical contaminants enter the aquatic environment through the use of pesticides and persistent organic pollutants (POPs) in agriculture activities. Pollution from oil spills is significant, and originates mainly from spills at production points, loading points and from shipping lanes. Significant point sources of marine pollution have been detected around coastal petroleum mining and processing areas, releasing large quantities of oil, grease and other hydrocarbon compounds into the coastal waters of the LME (Heileman 2008).

9.3 ECOSYSTEM

In terms of habitat loss, mangroves and estuaries have suffered the most significant losses, followed by sandy foreshores and lagoons. The LME has large expanses of mangrove forests (the mangrove system of the Niger Delta is the third largest in the world).

9.4 SOCIO-ECONOMIC

The 16 countries bordering the Guinea Current LME have an estimated total population of about 300 million (Heileman 2008). At the present rate of growth, the population is expected to double in 20-25 years. Almost 50% of the population live within 200km of the coast and many of the region's poor are crowded in the coastal areas for subsistence activities such as fishing, farming, sand and salt mining and production of charcoal (Heileman 2008). The Guinea Current LME and its natural resources represent a source of economic and food security for the bordering countries. Fisheries are of major importance for food security in this region and also provide employment for thousands of people. Therefore a large proportion of the population could potentially be affected by overexploitation of fisheries. Over the past three decades, there has been evidence of reduced economic returns, loss of employment and conflicts between artisanal and large commercial trawlers for access to the fishery resources (Heileman 2008). The overexploitation of transboundary and migratory fish by offshore foreign fleets is having a detrimental effect on artisanal fishermen as well as on those coastal communities that depend on the near-shore fisheries resource for food (Heileman 2008). This is serious in the context of exploding demographics in the coastal areas and the fact that most of the fish catch is exported out of the region.

9.5 FUNDING

No information provided in this section

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

In general, little current information is available regarding research and research funding.

10.2 RESEARCH FUNDING

See above

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

A database (set up in MS Access) of the trawl fisheries were collated for the period 1968-1997 (Menard et al. 2002). This involved extraction of all the effort and catch data from the continental shelf of the Ivory Coast since 1968; fitting of a surplus production model using the group of demersal species; and estimating the trend in the mean trophic levels of landings for the period 1968 to 1997, based on the catches of the main commercial species (Menard et al. 2002).

In general, little current information is available regarding data for management of coastal and marine resources.

10.4 ASSESSMENT FUNDING

No information available

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Again, little current information is available regarding data availability, sharing and dissemination.

12. MANAGEMENT PROCESSES

There are fishing rights conflicts between artisanal and industrial fishermen. The absence of clear and coherent regulations has had an impact on the coastal area. The situation is exacerbated by ambiguous and often unclear laws and the fact that the laws that are in place are not applied. Lack of comprehensive policies and management tools affect the coast and, with exception to policies that are applied in the tourism sector, no specific measures have been taken to protect the coast. A general framework must therefore be put in place in order to address coastal issues in a comprehensive manner (http://www.odinafrica.org/learn-about-odinafrica/65-cote-divore).

The countries bordering the Guinea Current LME participate in several bodies that work on various aspects of coastal degradation and protection of living marine resources. The LME comes under the UNEP Regional Seas Programme for the West and Central Africa Region. They have adopted several international environmental conventions and agreements, among which is the Abidjan Convention and the Dakar Convention. The GEF-supported Guinea Current Large Marine Ecosystem Project (Ibe & Sherman 2002, Ukwe et al. 2006) is an ecosystem-based effort to assist countries adjacent to the Guinea Current LME to achieve environmental and resource sustainability by shifting from short-term sectordriven management objectives to a longer-term perspective and from managing commodities to sustaining the production potential for ecosystem-wide goods and services (www.chez.com/gefgclme/). The second phase of this project 'Combating Living Resource Depletion and Coastal Area Degradation in the Guinea Current LME through Ecosystem-based Regional Actions', extended the pilot phase to include 10 additional countries (Angola, Congo Brazzaville, Congo-Kinshasa, Equatorial Guinea, Gabon, Guinea, Guinea-Bissau, Liberia, São Tomé and Príncipe, and Sierra Leone). This phase included the preparation of a Trans-boundary Diagnostic Analysis (TDA) to identify indicative priorities for ecosystem-wide marine environmental and natural resources protection and management concerns.

The Ministers of Environment of Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea Bissau, Liberia, Nigeria, Sao Tome and Principe, Sierra Leone and Togo, signed the Abuja Declaration on 22 September 2006, establishing the framework for an Interim Guinea Current Commission. The focus of the Interim Commission is on achieving sustainable development through integration of environmental concerns building capacity through multi-sector participation, management of transboundary water bodies

and living resources of land, forests and biodiversity conservation, and development of information and data exchanges (Heileman 2008).

13. FUTURE OPPORTUNITIES

Research needed in basically all areas related to fisheries and marine resources.

14. STAKEHOLDERS

Fisheries related organisations:

- Direction des productions halieutiques (DPH) -The DPH deals with the data collection of the artisanal fisheries through its Service d'appui à la pêche artisanale et lagunaire.
- Oceanographic Research Center (CRO) - Fisheries data through its tuna Conservatory and its research programmes.
- The National Oceanographic Data and Information Management Centre (CNDO-CI) is a national data centre, which is part of CRO in the port area of Abidjan. It is charged with carrying out nationally, all research on safeguarding and protecting water environments, and implementing sound policies for the management of marine and coastal resources.
- Inspection Services and Animal Sanitary Border control - The SICOSAVF inspects the industrial catches.
- The Port Authority (NCCP).

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Chapter 9: Mauritania

1. EXECUTIVE SUMMARY
Not provided

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Fisheries agreements:
Five bilateral agreements -FA-:
01/06/1987 - 30/06/1990: Hake, Shrimps, other demersals, except Cephalopods and lobster;
01/08/1990 - 30/07/1993: Hake, Shrimps, other demersals, except Cephalopods and lobster;
01/07/1993 - 30/08/1996: Hake, Shrimps, other demersals (Cephalopods starting 1995)
01/08/1996 - 31/07/2001: Hake, Shrimps, cephalopods, and other demersals; small pelagics (anchovy, horse mackerel, sardines, mackerel, sabre and others)
01/08/2001 - 31/07/2006: Hake**,** Shrimps, cephalopods, and other demersals; small pelagics (anchovy, horse mackerel, sardines, mackerel, sabre and others)

One fisheries partnership agreement -FPA-:
01/07/2006-30/08/2012: Hake**,** Shrimps, cephalopods, and other demersals; small pelagics (anchovy, horse mackerel, sardines, mackerel, sabre and others)

Private licenses:
Not sufficiently documented.
However, there is a biannual bilateral fishing agreement with Senegal.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

- **Change of targeted species in the agreement**
  Yes, targeting cephalopod species, mainly octopus, since 1995, and small pelagics, since 1996, added to the ones concerned since the 1st FA.
- **Transparency and policy dialogue**
  Few or none, as the EU does not involve third country in any kind of evaluation (neither ex-ante nor ex-post one!) although a Joint Committee was established to this purpose.
- **Contribution towards rational and sustainable exploitation**
  Few, at least from the view point of transparency and communication of data.
- **Financial contribution**
  Increasing: from 38 Millions Euros (1987-90 bilateral FA) to 516 Millions Euros (2006-2012 FPA)

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable

5. FISHING ADMINISTRATION

- **Source of data for management measures**

From fisheries landings / logbooks' declarations: catch/effort, fisheries indicators (abundance indices), biological sampling;
From fisheries independent data: bottom trawl surveys, echo integration, biological sampling;
For some socio-economic considerations;
Compliance with regional and international management measures implemented in the area (RFMOs)

- **Cross checking between observations and declaration in case of observer program?**

Yes, it does exist (provided by the agreements!)

6. LIST OF IMPORTANT STOCKS

Those with interest for the EU:
Hake**,** Shrimps, cephalopods, and other demersals; small pelagics (anchovy, horse mackerel, sardines, mackerel, sabre and others)

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

- **List of PET species in the area of management**

Monk seal; Saw fish; Sea turtles; Sharks (1-2 species); Cetaceans: Delphinidae, Balaenopteridae, Physeteridae, Zyphiidae; Sea birds.

- **Link with Red List species (IUCN) or CITES?**

All of them are in IUCN Red listed.

- **PET species taken as by-catch and mitigation measures taken**

Sea turtles and monk seal.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

- **Areas of research**

Stock assessment and Population dynamics;
Fisheries resource monitoring;
Monitoring of marine environment quality and physico-chemical parameters;
Ecology;
Biology of the main species;
Fisheries socio economics.

- **List of organizations or institutes that collaborate at the national and international level on research projects**

At national level:
Office National de l'Inspection Sanitaire des produits de la Pêche et de l'Aquaculture (ONISPA);
Université de Nouakchott (Facultés des sciences);
Parc National du Banc d'Arguin (PNBA);
Office National de la Statistique;
Parc National du Diawling (PND).

At regional & international level:

FAO/CECAF; ICCAT ; UNESCO/IOC ; INRH (Morocco); CRODT (Senegal); IFREMER (France) ; IEO (Spain); AtlantNiro (Russia); Agrocampus de Rennes (France); Université de Bretagne Occidentale (UBO/UIEM) (France); IMARES (Holland) ; Fondation Internationale du Banc d'Arguin (Mauritania) ; ISTAM & POORFISH (Europe) ; Amphore ; Indiseas.

- **Collaborative projects covering species / stocks / groups of species of interest**

Many projects covering most of species in the EEZ of Mauritania, with the organization cited above.

- **Gaps or overlapping in research being undertaken**

Gaps due to lack of funding and skilful human resource, in the following:
Environment monitoring (Pollution…);
Study of octopus abundance variability and of small pelagic species;
Study of primary production, including toxic phytoplankton.

- **Other coordination projects with output useful to research and management**

There are many; with (i) other national organizations, (ii) organizations of neighboring countries, for shared stocks and others, (iii) other countries with the same interest in fisheries, (iv) RFMOs, etc.

- **Collaboration and reporting at the RFMO level**

ICCAT: Task 1 & Task 2;
CECAF/FAO: Fisheries Statistics;
SCRP (Sub Regional Fisheries Commission): Fisheries Statistics, and other data necessary for joint assessment works.

9. DATA COLLECTION

9.1 BIOLOGICAL

- **Data collection (e.g. type of data, collected by whom):** Biological data (length, weight, sex, maturity, etc), collected by IMROP / DSPCM, at regularly basis: scientific surveys, sampling at landings, observers, log books (including EU vessels).

- **Share of data:** With all RFMOs (ICCAT, CECAF/FAO, SCRP).

- **Biological information:** Spawning & nursery zones and seasons are well identified, as well as life history, for the main species (octopus, shrimps, hake, horse mackerel, small pelagics, most of bottom fish (demersals), lobsters (pink & green), tropical tunas, shellfish (praires, in French!).

- **Issues (e.g. quality, quantity, gaps, issues, needs):** catches declared on log books may be underreported (skippers), thus assessment works may be affected by data quality, quantity, no spatio-temporal coverage in real time, unavailable data time series, inaccessible information, etc., things which may affect the ability to provide necessary advice for management purposes. Needs for regular data collection on real time covering both domestic and foreign fleets.

9.2 ENVIRONMENTAL

- **Data collection (e.g. type of data, collected by whom): routinely, at least twice a year,** data collected are: T°C, sal, O2 dissout, densité , po3, No3,No4, with Mauritanian EEZ.

- **Dedicated programs:** Projects with AtlantNiro, IEO, FAO/Fridjof Nansen, and IMROP regular oceanographic surveys. All dedicated to monitor the seasonal upwelling of this area.

- **Issues (e.g. quality, quantity, gaps, issues, needs):** unfortunately, environment is handled separately from fisheries resources, not taken into account, for instance, in stock assessment, except some attempts to explain the decline of octopus abundance!

9.3 ECOSYSTEM

- **Data collection (e.g. type of data, collected by whom):** no specific approach

- **Dedicated programs (research programs, monitoring programs):** Some projects (PACOBA & Amphore), attempting **(i)** to explain the role of Banc d'Arguin in marine production and (ii) influence of MPA on exploited fish populations

- **Issues (e.g. quality, quantity, gaps, issues, needs):** firstly, it's still considered as not a priority, secondly there is a belief that such approaches require to much data which are being collected. Needs more means to achieve such an objective.

9.4 SOCIO-ECONOMIC

- **Data collection (e.g. type of data, collected by whom):** focus on domestic fisheries, mainly small-scale ones; all the necessary data for socio-economic analyses (catches/effort, investments, operational costs, prices, etc.)

- **Dedicated programs:** Regular IMROP monitoring programs.

- **Issues (e.g. quality, quantity, gaps, issues, needs):** works affected by data quality, quantity, difficult spatio-temporal coverage (many landing sites), unavailable data time series, inaccessible information, etc., things which affect the ability to provide necessary advice for management purposes from socio economic point of view. Needs for more human and funding resources.

9.4 SOCIO-ECONOMIC

Biology

National: State budget -Public Investment Program- to IMROP, stable but limited;
International: Cooperation with France (MAF) and Spain; +/- stable but insufficient.

Environment & Ecosystems

National: only State budget -Public Investment Program- to IMROP, stable but limited,

Socio-economics

National: only State budget -Public Investment Program- to IMROP, stable but limited,

9.5 FUNDING
No information provided

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Biological research:

- Research done: (also see Section 8.1), **(i)** so far the main stocks of interest have been covered in terms of stock assessment, at both national and international levels, where sub-regional research institutes are always involved; **(ii)** biological studies (reproduction, growth, feeding behavior, etc.) are covered only at national level by IMROP
- Gaps: in some cases problems of stock structure, growth, age composition in catches (otolith reading), sampling methodology, and catch data.
- Issues: Needs for more regular data collection: length, growth, stocks' structures and fisheries independent, thru R/V cruises, necessary data for models' calibration where coastal areas must be covered also. All EEZ of Mauritania must be concerned by stock assessment. Capacity building needed.

Environmental research:

- Research done: (also see Section 8.2), **(i)** Project PACOBA for National Golf d'Arguin, involving PNBA, CNRS,UBO,UPVD,MNHN,U Nantes, IRD, and **(ii)** BIOMAC Network, at Sub Regional level (PRCM), involving IMROP/PNBA, **(iii)** Action Plan for Preservation of Eastern Atlantic Monk Seal, CMS Project, involving Morocco, Mauritania, Spain and Portugal

- Gaps: absence of studies on habitats and associated fish communities and primary production (plankton and so on).
- Issues: how to set regular research programs, with necessary means (funds and capacity building), is the challenge. Need for reference points in terms of environment health.

Ecosystem research:

- Research done: **(i)** Impact environmental (National/IMROP) involving also INARES, **(ii)** AMPHORE (International Project), **(iii)** PACOBA (National), **(iv)** INDISEAS (International).
- Ecosystem modeling: e.g. ECOPATH to model some relations resource – environment some behaviors
- Fishery interaction: none.
- Pollutant and contaminants: some analyses on heavy metals and bio toxins (collaboration IMROP/ ONISPA.
- VMEs: the two main areas identified are (PNBA,Baie de l'Etoile, PND).

Socio-economic:

- Research done: mostly at national level (i) focus on artisanal fishery, (ii) attempts to cover other fishing activities.
- Use in analysis and advice: firstly for some economic indicators necessary to provide advice in terms of fisheries management.
- Gaps: **(i)** lack of coherent and systematic data, **(ii)** lack of data on fish sellers (number, incomes, etc., **(iii)** Fish prices.
- Issues: how to come out with sufficient means to solve the gaps.

10.2 RESEARCH FUNDING

The same as Section 8.5

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

- Assessment methods used (primary and other tested) and associate software and evolution over time: VPA, Production models.
- Use of fishery independent data: yes.
- Uncertainty: some.
- Ecosystem assessment: not yet.
- Structure of the advice (e.g. how is advice presented to management?): fragmented.

10.4 ASSESSMENT FUNDING

All inclusive in what is done for research. However, focus on cephalopods, crustaceans, fishes (pelagic & demersal).

11. DISSEMINATION OF SCIENTIFIC INFORMATION

- Sharing / dissemination of research results at both national and international levels: at 2-3 level of the questionnaire (Fair to Good), no confidentiality

- Who is responsible for dissemination?: **(i)** IMROP, thru its "Service de Documentation et d'Informations Scientifiques -SIC-", and **(ii)** FAO concerning the reports of international Working Groups

- Mechanisms in place to review the quality of data monitoring, science and outputs: The IMROP Scientific Counsel examines each year with the researchers both activity plans and reports. There is also an Edition Committee at the IMROP.

12. MANAGEMENT PROCESSES

- (Countries) Institute/organization responsible for management: The Ministry of Fisheries and Maritime Economy.

- Current management measures: thru **(i)** size at first capture, **(ii)** time closures, **(iii)** mesh size, **(iv)** zoning, concerning Octopus, shrimps, some demersal species, hake and small pelagics.

- Enforcement measures: (i) Surveillance at sea carried out by the "Délégation à la Surveillance des Pêches et des l'Economie Maritime » (DSPCM) and (ii) Contrôle of landings.

- Bans on fishing: yes, ban of trawling in the "Parc National du Banc d'Arguin (PNBA)" and in coastal area less than 6 nautical miles for the demersals and les than 12 nm for pelagic fishing.

- Validation of declared catch: no.

- IUU: none.

- VMS: each industrial fishing vessel is supposed to be equipped with a VMS!! No data submitted to be used for any scientific work!

- Management system (decision rules, reference points, discards, by-catch, observers): very few.

- Migration / tagging programs: none.

13. FUTURE OPPORTUNITIES

- Identification of priorities for data collection, specific research required and analysis: (i) Marine Ecosystems and their use, (ii) Marine living resource & environment et (iii) Exploitation systems and Fisheries Management.

- Identification of areas for collaboration, coordination and adoption of best practice: there are many areas, at national, regional and international levels where such collaboration is needed, such as: (i) Stock assessment (fisheries independent data,

14. STAKEHOLDERS

Involvement of stakeholders covering research on stock assessments, ecosystem, environment and social and economic aspects in:

- Data collection
- Data analysis
- Dissemination of information
- Research coordination
- Experimental work
- Decision making

} NONE FOR ALL QUESTIONNAIRES NOT RECEIVED FROM STAKEHOLDERS

Chapter 10: Morocco

1. EXECUTIVE SUMMARY
Not provided

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Fisheries agreements:
Three bilateral agreements -FA-:
1988-1992, Cephalopods, Crustaceans, Demersal fishes, Small pelagics, Tunas, 70 380 000 Euros;
1992-1995, Cephalopods, shrimps, Demersal fishes, Small pelagics, Tunas, 101 000 000 Euros;
1996-1999, Cephalopods, Shrimps, Demersal fishes, Small pelagics, Tunas, FA, 125 000 000 Euros

One fisheries partnership agreement -FPA-:
2007-2011, Small pelagics, Demersal fishes, Tunas, 36 100 000 Euros

Private licenses:
2009, Japan, for tunas
2006/2009, Russia, for small pelagics

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

- **Change of targeted species in the agreement**

Generally, the same, except more specified for shrimps (instead of crustaceans) for the 2nd and 3rd FA, and limited to small pelagics, demersal fishes and tunas during the ongoing PFA (ends 2011). The other were identified as overfished (octopus, shrimps). The Mediterranean is not concerned also.

- **Transparency and policy dialogue**

Considered as confidential, the EU avoids to share the information of any kind of evaluation (neither ex-ante nor ex-post one!) although a Joint Committee was established to this purpose.

- **Contribution towards rational and sustainable exploitation**

The agreements generally consider this issue, thru some measures (vessels' characteristics, quotas, zoning, ban of fishing grounds, etc.).

- **Financial contribution**

Increasing for the bilateral FA: from 70 Millions Euros (1988-1992) to 125 Millions Euros (1995-1999). Then, a sharp decrease occurred to 36 Millions Euros (2007-2011 FPA), consistently with the fishing possibilities offered.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable

5. FISHING ADMINISTRATION

- **Source of data for management measures**

Although data related to EU fishing effort (number of vessels, their GRT, gear specifications, and number of fishermen) are regularly communicated (requirement for any renewal of license), it's not the case with catches which are not or under-reported. These data are therefore not reliable!

Thus, all management measures taken are based upon the plans set by Morocco for its EEZ fisheries resources. These are set from fisheries independent data (bottom trawl surveys and echo integration), biological sampling, some socio-economic considerations, and in compliance with regional and international management measures implemented in the area (RFMOs).

- **Cross checking between observations and declaration in case of observer program?**

Yes, it does exist as it's always provided by the agreements!

6. LIST OF IMPORTANT STOCKS

Those with interest for the EU:
Octopus, along with 2 other cephalopod species (cuttlefish and squid), European and black hakes**,** shrimps, demersal fishes, small pelagics (sardines, anchovies, mackerel, horse mackerel, sabre), crustaceans, and tunas, along with tuna-like species.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

- **List of PET species in the area of management**

Monk seal; Sea turtles; Sea birds; Sharks, banned internationally; Cetaceans: Delphinidae, Balaenopteridae, Physeteridae, Zyphiidae.

- **Link with Red List species (IUCN) or CITES?**

Most of them are in IUCN Red listed.

- **PET species taken as by-catch and mitigation measures taken**

Sea turtles and some dolphins with fishing gears being eliminated (Gillnets)

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

- **Areas of research**

Stock assessment and Population dynamics;
Marine resource exploitation monitoring and fisheries management;
Marine biology of the main species;
Socio-economic studies of fisheries exploitation systems;
Monitoring of the quality of marine environment;
Oceanographic surveys: physic-chemical parameters, nutrients, hydrology, etc.;
Hydrodynamic modeling of both offshore and coastal ecosystems (bays, lagoons, and estuaries);
Some ecological studies.

- **List of organizations or institutes that collaborate at the national and international level on research projects**

At national level:
Ministère de l'Agriculture et de la Pêche Maritime –MAPM-;
Département de la Pêche Maritime –DPM-;
Fédération des Chambres des Pêches Maritimes –FCPM-;
Office National des Pêches –ONP-;
Office National de Surveillance Sanitaire et Sécurité Alimentaire –ONSSA-;
Agence Nationale de l'Aquaculture –ANA-;
Agences Nationales de Développement Social et Economique –ANDSE- des Régions du Maroc;
Marine Royale –MR-;
Gendarmerie Royale –GR-;
Universités (Agadir, Marrakech, Safi, El Jadida, Settat, Casablanca, Tanger/Tétouan, Oujda);
Institut Agronomique et Vétérinaire Hassan II – Rabat –IAVH2-;
Fishery Associations;
ONGs.

At regional & international level:
FAO/CECAF & GFCM; ICCAT ; UNESCO/IOC ; IMROP (Mauritania); CRODT (Senegal); IFREMER & IRD (France), & IEO (Spain) ; IPEMAR (Portugal) : AtlantNiro (Russia).

- **Collaborative projects covering species / stocks / groups of species of interest**

Many projects covering most of species and fisheries, as well as oceanography, in the EEZ of Morocco, with the organizations cited above.

- **Gaps or overlapping in research being undertaken**

For such a huge EEZ, there are gaps due to lack of funding, research vessels and equipments, and sometimes skilful human resource in some particular fields, such as:

Environment monitoring;
Interactions "marine living resources – hydro climate changes", for both explaining and predicting abundance variability;
Multidisciplinary teams, where biologists, oceanographers, mathematicians, socio-economists, etc. would work jointly with some more complex approaches;

- **Other coordination projects with output useful to research and management**

There are many, with **(i)** other national organizations, **(ii)** organizations of neighboring countries, for shared stocks and others, **(iii)** other countries with the same interest in fisheries , **(iv)** RFMOs, **(v)** NGOs, etc.

Collaboration and reporting at the RFMO level
ICCAT: Task 1 & Task 2
GFCM: Task 1, 2, 3, and 4
FAO/CECAF: Fisheries Statistics

9. DATA COLLECTION

9.1 BIOLOGICAL

- **Data collection (e.g. type of data, collected by whom):** Biology (length, weight, sex, maturity, fecundity, etc.), collected by INRH, thru its 5 Regional Centers, at a regularly basis, by mean of scientific surveys (R/V), sampling at landing (ports), observers (in few cases).

- **Share of data:** With all RFMOs (ICCAT, FAO/CECAF, GFCM), and EU (thru Morocco-EC Joint Scientific Committee).

- **Biological information:** for most species, zones and seasons of pawning & nursery are well identified, as well as life history, and other biological parameters (growth, feeding behavior, etc.)

- **Issues (e.g. quality, quantity, gaps, issues, needs):** for domestic activities, landing catches are mostly reliable, and fishing effort well monitored (thru local Fisheries Authorities). For foreign fishing operations, quantities given by log books are generally underreported (what's declared by skippers!), confirmed (sometimes!) by data provided by scientific observers.

  Thus, assessment works may be affected by data quality, quantity, no spatio-temporal coverage in real time, unavailable data time series, inaccessible information, etc., things which may affect the ability to provide necessary advice for management purposes. There is strong need for regular data collection on real time covering both domestic and foreign fleets.

9.2 ENVIRONMENTAL

- **Data collection (e.g. type of data, collected by whom): routinely, at least twice a year,** data collected at different sea water layers are: T°, salinity, dissolved O2, density, chlorophyll, some nutrients, hydrographic data, tides, within Moroccan EEZ.

- **Dedicated programs:** Projects with AtlantNiro, FAO/Fridjof Nansen, IEO R/V, and INRH regular oceanographic surveys. All dedicated to monitor the permanent and seasonal upwellings (part of the Large Canary Marine Ecosystem.

- **Issues (e.g. quality, quantity, gaps, issues, needs):** unfortunately, environment is handled separately from fisheries resources; up today, not taken into account, for instance, in stock assessment, except some attempts to explain the variability of sardine abundance!

9.3 ECOSYSTEM

- **Data collection (e.g. type of data, collected by whom):** no specific approach; still exploring the way to use the existent data base and find the approach to improve aiming at more complex ecosystem modeling

- **Dedicated programs (research programs, monitoring programs):** Few projects: NATFISH, CHALOUPE, ECOPATH, etc. which have been initiated in West-African coast.

- **Issues (e.g. quality, quantity, gaps, issues, needs):** firstly, it's still considered as not yet a priority, secondly there is a belief that such approaches require to much data which are being collected. Needs more means to achieve such an objective.

9.4 SOCIO-ECONOMIC

- **Data collection (e.g. type of data, collected by whom):** focus on domestic fisheries, mainly small-scale and coastal ones; all the necessary data for socio-economic analyses (catches/effort, investments, operational costs, prices, revenues, etc.), going sometimes deeply to "metiers, targeting one or another species" in a given fishing segment.

- **Dedicated programs:** Regular INRH monitoring programs, aiming at covering the whole chain of a given harvesting system, from landings to consumption.

- **Issues (e.g. quality, quantity, gaps, issues, needs):** works affected by data quality, quantity, difficult spatio-temporal coverage (many landing sites, in case of artisanal fishery), unavailable data time series, inaccessible information, etc. For improvement, needs for more human and funding resources.

9.5 FUNDING

Biology

National: **(i)** State budget -Public Investment Program- to INRH, stable but limited;
(ii) Part of the fees paid for fishing licenses, stable but limited as effort is being kept unchanged.
International: An amount from what is paid by EU for a given fishing agreement; not stable and insufficient.

Environment & Ecosystems
The same as for biology section (above).

Socio-economics
The same as for biology & environment/ecosystems (both above).

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Biological research:

- Research done: (also see Section 8.1), **(i)** so far the main stocks of interest have been covered in terms of stock assessment, at both national and international levels, where sub-regional research institutes are always involved (ICCAT, CECAF, GFCM); **(ii)** biological studies (reproduction, growth, feeding behavior, etc.) are covered only at national level by INRH
- Gaps: in some cases problems of stock structure, growth, age composition in catches (otolith reading), sampling methodology, and catch data.
- Issues: Needs for more regular data collection by intensifying work: length, growth, stocks' structures and fisheries independent, thru R/V cruises, necessary data for models' calibration where coastal areas must be covered also. More funds and capacity building are needed.

Environmental research:

- Research done: (also see Section 8.2), **(i)** Projects such as Fridjof Nansen (FAO/Norway), Atlantida (Russia), CarboOcean (EU), etc. **(ii)** Better understanding of coastal hydrodynamics, thru modeling, for aquaculture development purposes **(iii)** Action Plan for Preservation of Eastern Atlantic Monk Seal (CMS Project), involving Morocco, Mauritania, Spain and Portugal
- Gaps: absence of studies on habitats (impacts of fishing activities) and effects on associated fish communities and primary production (plankton and so on).
- Issues: how to set regular research programs, with necessary means (funds and capacity building), is the main challenge. Need for reference points in terms of environment health.

Ecosystem research:

- Research done: **(i)** most of the work already done for some coastal ecosystems (bays, lagoons & estuaries), **(ii)** other local projects do exist, involving universities also.
- Ecosystem modeling: e.g. CHALOUPE, NATFISH: attempts to model some relations resource – environment.
- Fishery interaction: none.
- Pollutant and contaminants: work done thru INRH Network for monitoring marine environment (heavy metals, oil hydrocarbons, biotoxins, microbiology), for both protecting seafood consumers and getting biological and chemical pollution reference points. INRH actively collaborates a lot in this field, at national level (ONSSA), regional and international levels (IEO, IFREMER, etc.)
- VMEs: there are so far four main areas identified which will be ed thru artificial reefs (Cala Iris & Martil in the Mediterranean, and Souiria & Agadir, in the Atlantic). In the southern of Morocco, a whole area is

banned for any kind of fishing activity, to protect the monk seal colony of Cape Blanc.

Socio-economic:

- Research done: mostly at national level: **(i)** focus on artisanal fishery and the ones interacting with it, particularly in the southern Atlantic area, namely trawl fleets (industrial and coastal ones), **(ii)** attempts to cover other fishing activities.
- Use in analysis and advice: firstly for some economic indicators necessary to provide advice in terms of fisheries management
- Gaps: **(i)** lack of coherent and systematic data, **(ii)** lack of data in some particular parts of the chain (fish sellers), etc.,
- Issues: how to come out with sufficient means to solve the gaps

10.2 RESEARCH FUNDING

The same as Section 8.5

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

- Assessment methods used (primary and other tested) and associate software and evolution over time : Quantitative methods (VPA, Statistical Catch Analysis, fitting CCA and CPUEs); FAO/BioDyn models, Usual production models.

- Use of fishery independent data: yes

- Uncertainty: of course, it always exits!

- Ecosystem assessment: not yet!

- Structure of the advice (e.g. how is advice presented to management?): regularly.

10.4 ASSESSMENT FUNDING

All inclusive in what is done for research. However, some priorities given to octopus, sardines, shrimps, hakes, tunas, some shellfish species

11. DISSEMINATION OF SCIENTIFIC INFORMATION

- Sharing / dissemination of research results at both national and international levels: at 1-2 level of the questionnaire (poor-fair), with certain confidentiality as all is mainly used by Fisheries Department for management purposes. Aware of this situation, INRH is aiming at ensuring large dissemination thru its newly established Documentation & Information Service

- Who is responsible for dissemination?: **(i)** at a certain level, INRH, thru its "Service de Documentation et d'Informations Scientifiques -SDIC-", **(ii)** thru RFMOs (ICCAT, FAO) concerning reports of international Working Groups, and (iii) thru reports of joint projects

- Mechanisms in place to review the quality of data monitoring, science and outputs: Normally, thru the INRH Scientific and Reading Committees.

12. MANAGEMENT PROCESSES

- Institute/organization responsible for management: The Department of Marine Fisheries

- Current management measures: **(i)** conventional ones, such as TAC, fishing gear restrictions, size limits, time and are closures, zoning and ban fishing grounds, **(ii)** right-based ones, such as number limit of fishing licenses, and Individual Quotas -IQ- (in terms of catch), transferable or not

- Enforcement measures: (i) Surveillance at sea carried out by the navy patrollers of "Marine Royale", (ii) by the Fisheries Ministry planes, operated by "Gendarmerie Royale", (iii) by observers whenever on board, an d (iv) by control of landings processed in domestic ports by Marine Authority of the Fisheries Ministry

- Bans on fishing: yes they do exist: **(i)** ban of trawling in the "Réserve du phoque moine'' to protect monk seal of Cape Blanc Peninsula, **(ii)** trawling ban in areas less than 3, 6, 8, or 12 nm from the shore (depending on the area where implemented), **(iii)** other cases where need to protect some sensitive spawning/nursery areas, purse seining could be banned. In the Mediterranean, 80m-depth banned trawling is used for the western part, and 3 nm from the coast line for the eastern part.

- Validation of declared catch: sometimes, when it's possible to cross-check with other sources of information. Otherwise, take it as it's declared!

- IUU: none. Process being launched to adopt all Recommendations / Resolutions with regards to IUU issues (FAO, and others)

- VMS: each industrial fishing vessel is supposed to be equipped with a VMS. It's even mandatory. A special Center had been equipped for that at Fisheries Department, with the aim to generalize VMS to all fishing vessels in EEZ of Morocco.

- Management system (decision rules, reference points, discards, by-catch, observers): **(i)** Decision rules: whenever a particular situation has to be addressed; **(ii)** reference points: when to set a TAC (e.g. octopus, sardine), **(iii)** discards / by-catch: thru tolerance level, **(iv)** observers: to be generalized for some foreign fleets authorized to operate in Moroccan EZZ (EU, Russia, Japan)

- Migration / tagging programs: none. A project is under construction with some collaborating countries (e.g. Canada) and RFMOs (ICCAT).

13. FUTURE OPPORTUNITIES

- Identification of priorities for data collection, specific research required and analysis: (i) Marine ecosystems and their use, (ii) Interactions between marine living resource and environment et (iii) Exploitation systems and fisheries management

- Identification of areas for collaboration, coordination and adoption of best practice: there are many areas, at national, regional and international levels where such collaboration is needed, such as: (i) Stock assessment (fisheries independent data, sea surveys, data collection, etc.), (ii) Economics of fisheries management & development (iii) Environment monitoring (hydrodynamics; mapping evolution of physic-chemical parameters, environment quality, pollution), (iv) Studies of marine ecosystems and modeling (dynamics, productivity, fisheries impacts & interactions, etc.)

14. STAKEHOLDERS

Involvement of stakeholders covering research on stock assessments, ecosystem, environment and social and economic aspects in:

- Data collection: unwillingness to collaborate, unless there is an emergent situation where decisions have to be made quickly
- Data analysis: not interest how analyses are undertaken; could be criticized whenever a decision made looks unsuitable
- Dissemination of information: rarely; somehow censored; everything detained by stakeholder is "professional secret"
- Research coordination: sometimes involved, either thru the exchange of points of view "Decision-makers / stakeholders / scientists" or within special Commissions aiming at monitoring given Fishery management Plans. These are the situations where stakeholders seem more motivated!
- Experimental work: in some cases; **(i)** for instance a controversial fishing gear selectivity for which mesh size has to be set for management purposes, **(ii)** in case of exploring new possible fishing grounds (e.g. deep sea species), ...
- Decision making: through lobbying, the stakeholders always seek influencing decisions to be made, very often by anticipating ...

Chapter 11: Sao Tomé and Principe

1. EXECUTIVE SUMMARY

The two islands of São Tomé and Príncipe have a 269 km coastline with a continental shelf area of 744 km^2. The population of São Tomé and Príncipe (about 213,000 people) is the second smallest of any African nation. There are two types of fisheries in São Tomé and Príncipe, the coastal artisinal small-scale fisheries and the large offshore fisheries operated by foreign fleets. Artisanal fishermen provide 90% of Sao Tome & Principe's total fishing capacity. They are based out of 23 ports and use small 5-10m boats and canoes (about 2,400 boats, 1,000 of which are motorized. Typically, long lines and bottom lines are used, but seines and nets are also used seasonally. Artisanal fisheries provide 60-70% of the protein consumed and livelihood for around 2800 fishermen and their families (Costa Alegre 2009, http://www.marapa.org/pages/pt/pesca/pesca.html).

There is a 4 year renewable (1 June 2006 – 31 May 2010) tuna fisheries partnership agreement between the Community and São Tomé and Príncipe. The financial contribution for the agreement is €663,000 per year, out of which 50 % is dedicated to the support of the fisheries policy of São Tomé and Príncipe. This fisheries agreement allows community vessels from Spain (13 tuna seiners and 13 surface longliners), Portugal (5 surface longliners) and France (12 tuna seiners) to fish and catch 8,500 t./year in the São Tomé and Príncipe waters and is part of the tuna network fisheries agreements in West Africa (EU 2007, 2008 http://ec.europa.eu/fisheries/cfp/international/agreements/sao_tome/index_en.htm).

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Some forms of agreements appear to exist with Japan and Taiwan but no information could be found to confirm the details and status of such agreements.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The tuna fisheries agreement between the Community and São Tomé and Príncipe is 4 years renewable and the last covered the period 1 June 2006 – 31 May 2010 (the author has not been able to locate any published information that indicate a renewal past May 2010) with a financial contribution of €663,000 each year, out of which 50 % was dedicated to the support of the fisheries policy of São Tomé and Príncipe (EU 2007). This fisheries agreement allows community vessels from Spain (13 tuna seiners and 13 surface longliners), Portugal (5 surface longliners) and France (12 tuna seiners) to fish in the São Tomé and Príncipe waters and is part of the tuna network fisheries agreements in West Africa. Fee for ship owners is €35 per tonne caught. Advances: Tuna seiners: €5250 per year (ref catches: 150 t.), surface longliners: €1925 per year (ref catches: 55 t.). Reference tonnage: 8,500 t./year. If the overall quantity of catches by Community vessels exceeds 8,500 tonnes per year, the amount of the annual financial contribution shall be increased by €65 for each additional tonne caught. Further, the total annual amount paid by the Community shall not be more than twice

the amount equivalent to the reference tonnage. Where the quantities caught by Community vessels exceed the quantities corresponding to twice the total annual amount (17,000 tonnes), the amount due for the quantity exceeding that limit shall be paid the following year.

In 1984, the EC and São Tomé and Príncipe signed their first Fisheries Agreement. The European Union and Sao Tomé agreed on 14 February 2002 to renew the protocol to their fisheries agreement for a period of three years from 1 June 2002 to 31 May 2005. This agreement offered fishing possibilities to 36 tuna seiners, 25 surface long-liners and 2 pole and line vessels. The previous numbers were 36, 33 and 7, respectively. The financial compensation amounted to €2.2 million over three years, including compensation for an experimental deep-water crab fishery (3 vessels) during the first year and a premium of €50,000 for an evaluation study on the state of these crab stocks. Three countries benefitted from this agreement: Spain (40 vessels), France (18 vessels) and Portugal (8 vessels). 40% of the financial compensation was allocated to measures in favour of the local fisheries sector, scientific research and surveillance of fisheries activities.

The agreement followed on from a very similar agreement (2000) with São Tomé and Príncipe. The purpose of the renewal was to allow continued access to tuna in the Exclusive Economic Zone (EEZ) and to obtain new fishing opportunities for crab. The agreement is an integral part of the network of agreements to fish tuna, which allows the Community fleet to follow migratory and straddling stocks in the Atlantic zone. São Tomé and Príncipe waters are also indispensable to the transit of the EU fleet to fish in the waters of neighbouring countries.

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not applicable.

5. FISHING ADMINISTRATION

In general, little current information is available regarding data for management of coastal and marine resources. São Tomé and Príncipe is a member of the International Commission for the Conservation of Atlantic Tuna (ICCAT).

São Tomé and Príncipe is a member of the Economic Community of Central African States (ECCAS) and an observer to the Economic and Monetary Community of Central Africa (CEMAC). It holds the post of executive secretary of the Gulf of Guinea Commission (GGC) and in May 2009 signed a technical agreement with Cameroon, Equatorial Guinea and Gabon for joint surveillance of maritime security, with the backing of the Council for Peace and Security in Central Africa (COPAX of the ECCAS).
(http://www.eeas.europa.eu/sao_tome_and_principe/index_en.htm)

The Ministry of Natural Resources Energy and Environment is the responsible for questions related to natural resources management, biodiversity, conservation and environment. *The Directorate of Environment* is responsible for implenting

environment issues; conservation, biodiversity and natural resources preservation. Its main functions involves: the execution of the government policy for the environment, including the preparation, submission and updating information concerning carbon dioxide emissions, adaptation for climate change and the National Biodiversity Strategy Action Plan.

The Ministry of Agriculture Rural Development and Fisheries and its *Directorate General of fisheries* (DGP- Direcção Geral das Pescas) deal with issues related to fisheries, management of artisanal fisheries projects, registration of artisanal and industrial fishermen, surveillance and statistic registration of industrial vessels. DGP is also mandated to conduct inspections and monitoring of foreign fishing fleets operating under access agreements.

Fishing and fisheries is regulated in Law no. 9/2001 of 31 December: Fishing and Fisheries Resources Act.

6. LIST OF IMPORTANT STOCKS

Important stocks include; yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus)*, frigate tuna (*Auxis thazard*), Atlantic sailfish (*Istiophorus albicans*), Wahoo (*Acanthocybium solandri*) and several species of sharks, snapper and crab (Alfonso et al. 1999).

Several surveys have been carried out which have resulted in an inventory of the coastal fish of São Tomé island (Alfonso *et al*. 1999). The records of Alfonso *et al.* (1999) confirm presence of 185 fish species from 67 families in coastal waters of São Tomé and Príncipe and are based on captured, photographed or observed fish while diving and those landed by local artisanal fishermen. The best represented families are Carangidae (14 species), Serranidae (11 species), Gobiidae and Scombridae (8 species each). Despite its proximity to the African Continent, it is clear that these islands harbour a particular fish fauna, including several species, which, in the eastern Atlantic, occur only around oceanic islands (e.g., *Epinephelus ascencionis, Paranthias furcifer, Mulloidychtis martinicus, Bodianus pulchellus, Chromis multilineata, Gnatholepis thomsoni, Melychthis niger*). The coastal ichthyodiversity of São Tomé is apparently poorer than that of the adjacent coasts, showing a significant influence of the islands further west, St. Helena and Ascencion (Alfonso *et al.* 1999).

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

Five species of marine turtles have been recorded in São Tomé and Príncipe; green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), Olive Ridley (*Lepidochelys olivacea*) and loggerhead (*Caretta caretta*). Although the latter has only been sighted and not observed nesting (http://www.africas-eden.com/Wildlife-of-Sao-Tome-Principe.asp). Green and loggerhead turtles are classified as 'Endangered' and Hawksbill and leatherback turtles are listed as 'Critically Endangered' in the IUCN Red List of Threatened Animals (http://iucn-mtsg.org/regions/west-africa-east-atlantic/) and are also listed under the Convention on

International Trade in Endangered Species of Wild Fauna and Flora as a result of over exploitation for their meat, shells and eggs.

The archipelago of São Tomé and Príncipe seems to be an important area for cetaceans, probably due to large concentrations of prey, as well as the existence of several small bays and shallow water that constitute preferred rest areas (Picanco *et al.* 2009). Boat-based surveys to record sightings of cetaceans conducted between 2002 and 2005, reported on sightings of humpback whales (*Megaptera novaeangliae*), bottlenose dolphins (*Tursiops truncatus*), pantropical spotted dolphins (*Stenella attenuata*), killer whales (*Orcinus orca*), sperm whales (*Physeter macrocephalus*) and pilot whales (*Globicephala melas*), (Picanco *et al.* 2009). Significant differences were found regarding occurrence of species. Humpback whales showed a preference for shallower waters between 20 and 100 m, bottlenose dolphins occurred most commonly along the continental shelf (20 to 100 m) and pantropical spotted dolphins occurred in deep slope waters (>1000 m), (Picanco *et al.* 2009).

The number of animals entangled and killed in net and trawl fisheries (bycatch) of the above mentioned species is not known but likely represents a threat to local populations in west Africa (Maigret 1994).

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

As mentioned previously São Tomé and Príncipe is a member of ICCAT and collaborate in ongoing research efforts conducted by ICCAT.

9. DATA COLLECTION

9.1 BIOLOGICAL

Several fishery resource surveys have been conducted in the Guinnea Current Large Marine Ecosystem (LME) (Mensah and Quaatey 2002, Zeller et al. 2005). Total reported landings show an increase from 1950 to the early 1990 with a peak at 900,000 tonnes (Figure 1). There is lack of detailed landings statistics per species hence a large proportion of the landings falls in the category “mixed groups”. Since the 1960s, high fishing pressure by foreign and local industrial fleets has placed the fisheries in the Guinnea Current LME at risk (Kacynski & Fluharty 2002). Since the mid 1970s, the mean trophic level of the reported landings (Pauly & Watson 2005) has declined an indication of “fishing down” of the local food webs (Pauly et al. 1998).

Although the level of exploitation in the Guinnea Current LME was found to be significant, some fish stocks such as skipjack tuna, small pelagic fish in the northern areas of the northern part of the LME, and offshore demersal fish and cephalopods were believed to be underexploited (Mensah & Quaatey 2002). However, decline in fish stocks and unsustainable fishing has been identified as major transboundary problems and reviews of the status of the LME’s fisheries resources indicate that several fish stocks are either overexploited or close to being fully exploited (Mensah & Quaatey 2002). These include small pelagic fish and shrimps in the western and central Gulf of Guinea and coastal demersal resources throughout the LME (Mensah & Quaatey 2002). There is further evidence of depletion of straddling and highly migratory fisheries stocks, with heavy exploitation of yellow-fin and big-eye tunas (Mensah & Quaatey

2002). Overexploitation has resulted in declining stock biomass and catch per unit effort, particularly for inshore demersal species, and this decline has been attributed to trawlers operating in inshore areas (Koranteng 2002).

There are indications that overexploitation has altered the ecosystem with impacts at all levels, including top predators. Species diversity and average size of the most important fish species have declined as a result of overexploitation (Koranteng 2002, FAO 2003). Perhaps the most significant changes in species abundance are reflected in sardinella (*Sardinella aurita*) and triggerfish (*Balistes capriscus*). The sardinella fishery experienced a collapse in 1973, and was followed by a large increase in the abundance of triggerfish between 1973 and 1988. The decline of the triggerfish after 1989 was followed by an increase of the sardinella to unprecedented levels during the 1990s (Cury & Roy 2002).

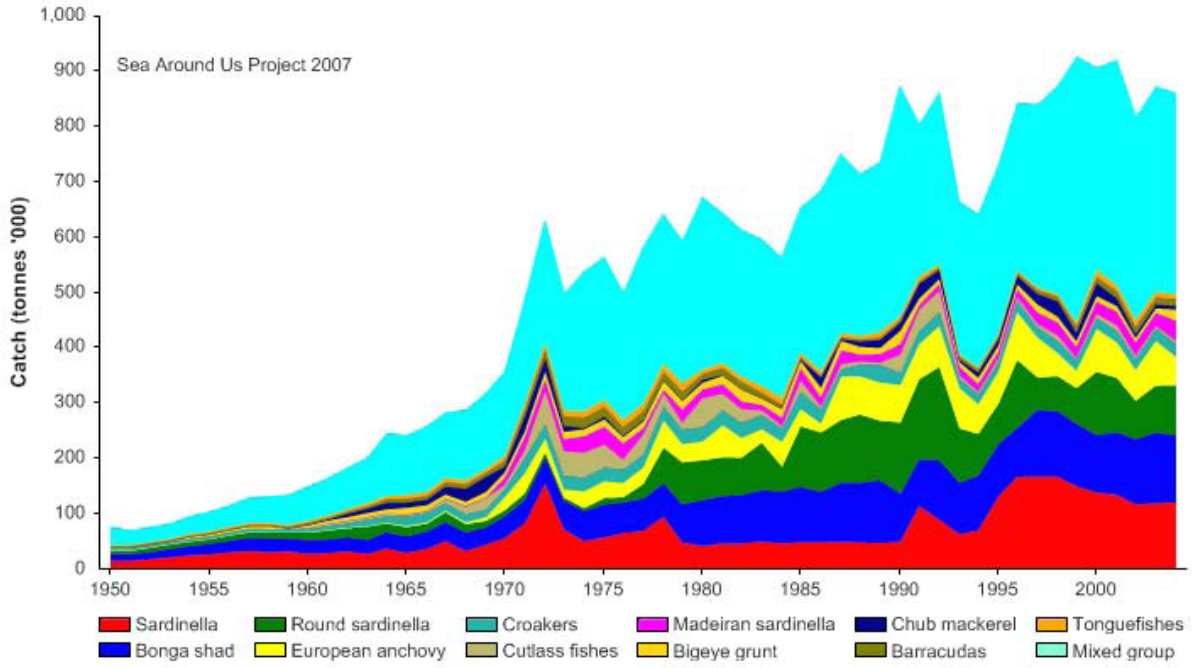

Figure 1. Total reported landings in the Guinea Current LME by species (Figure taken from Sea Around Us 2007).

9.2 ENVIRONMENTAL

The coastal and marine environments of the Guinea Current are heavily polluted in areas near large cities (Scheren & Ibe 2002). Gordon & Ibe (2006) provided an assessment of the state of the environment with respect to land-based sources of pollution in this region. Pollution from land-based sources is particularly important, and together with sea-based sources, has contributed to a deterioration of water quality in the bordering countries of the Guinea Current LME. Deterioration of water quality from land and sea-based activities has been identified as one of the the broad environmental problems in the LME (NOAA 2003). Despite being mainly localised, pollution has also transboundary impacts in through transport of contaminants by wind and water currents along the coasts. Organic waste from domestic, industrial and agricultural has also resulted in eutrophication and oxygen depletion in some coastal areas (Scheren & Ibe 2002). Chemical pollution is serious in some coastal areas where chemical contaminants

enter the aquatic environment through the use of pesticides and persistent organic pollutants (POPs) in agriculture activities. Pollution from oil spills is significant, and originates mainly from spills at production points, loading points and from shipping lanes. Significant point sources of marine pollution have been detected around coastal petroleum mining and processing areas, releasing large quantities of oil, grease and other hydrocarbon compounds into the coastal waters of the LME (Heileman 2008).

9.3 ECOSYSTEM

In terms of habitat loss, mangroves and estuaries have suffered the most significant losses, followed by sandy foreshores and lagoons. The LME has large expanses of mangrove forests (the mangrove system of the Niger Delta is the third largest in the world).

9.4 SOCIO-ECONOMIC

The 16 countries bordering the Guinea Current LME have an estimated total population of about 300 million (Heileman 2008). At the present rate of growth, the population is expected to double in 20-25 years. Almost 50% of the population live within 200km of the coast and many of the region's poor are crowded in the coastal areas for subsistence activities such as fishing, farming, sand and salt mining and production of charcoal (Heileman 2008). The Guinea Current LME and its natural resources represent a source of economic and food security for the bordering countries. Fisheries are of major importance for food security in this region and also provide employment for thousands of people. Therefore a large proportion of the population could potentially be affected by overexploitation of fisheries. Over the past three decades, there has been evidence of reduced economic returns, loss of employment and conflicts between artisanal and large commercial trawlers for access to the fishery resources (Heileman 2008). The overexploitation of transboundary and migratory fish by offshore foreign fleets is having a detrimental effect on artisanal fishermen as well as on those coastal communities that depend on the near-shore fisheries resource for food (Heileman 2008). This is serious in the context of exploding demographics in the coastal areas and the fact that most of the fish catch is exported out of the region.

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

In general, little current information is available regarding research and research funding.

10.2 RESEARCH FUNDING

See above

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

No information provided

10.4 ASSESSMENT FUNDING

The Infrastructure Rehabilitation for Food Security Support Project (PRIASA), which is scheduled to last four years and cost UA 5.26 million, including an ADF grant of UA 5 million, will cover the two islands of Sao Tome and Principe. The main expected outcomes are: (i) upgrading the main artisanal fisheries landing sites (Sao Paolo, Neves, Sto Antonio de Principe, Santana); (ii) rehabilitation, equipping and training of staff of the fishery product quality control laboratory (African Development Bank Group 2010)

There are apparently a number of issues related to the existing fisheries agreements, the funding generated from these and the sustainability of the fisheries (Costa Alegre 2009):

1. Unsustainable fisheries practices used by the developed countries while fishing in developing countries, e.g.overfishing, by-catch and habitat destruction.
2. There is a lack of of qualified human resources to perform observations and inspection of possible illegal practices, e.g. if there is a variable component to the agreement, the additional catch cannot be counted if national authorities are unable to go onboard the vessels.
3. Artisanal fishermen need to go further out to sea to find fish due to the pressure created by foreign fleets. This has safety implications given that the artisanal fishermen are using small boats, with little or no safety, navigational or communication equipment.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Little current information is available regarding data availability, sharing and dissemination.

12. MANAGEMENT PROCESSES

The countries bordering the Guinea Current LME participate in several bodies that work on various aspects of coastal degradation and protection of living marine resources. The LME comes under the UNEP Regional Seas Programme for the West and Central Africa Region. They have adopted several international environmental conventions and agreements, among which is the Abidjan Convention and the Dakar Convention. The GEF-supported Guinea Current Large Marine Ecosystem Project (Ibe & Sherman 2002, Ukwe et al. 2006) is an ecosystem-based effort to assist countries adjacent to the Guinea Current LME to achieve environmental and resource sustainability by shifting from short-term sectordriven management objectives to a longer-term perspective and from managing commodities to sustaining the production potential for ecosystem-wide goods and services (www.chez.com/gefgclme/). The second phase of this project ‘Combating Living Resource Depletion and Coastal Area Degradation in the Guinea Current LME through Ecosystem-based Regional Actions’, extended the pilot phase to include 10 additional countries (Angola, Congo Brazzaville, Congo-Kinshasa, Equatorial Guinea, Gabon, Guinea, Guinea-Bissau, Liberia, São Tomé and Príncipe, and Sierra Leone). This phase included the preparation of a Trans-boundary Diagnostic Analysis (TDA) to identify indicative priorities for ecosystem-wide marine environmental and natural resources protection and management concerns.

The Ministers of Environment of Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea Bissau, Liberia, Nigeria, Sao Tome and Principe, Sierra Leone and Togo, signed the Abuja Declaration on 22 September 2006, establishing the framework for an Interim Guinea Current Commission. The focus of the Interim Commission is on achieving sustainable development through integration of environmental concerns building capacity through multi-sector participation, management of transboundary water bodies and living resources of land, forests and biodiversity conservation, and development of information and data exchanges (Heileman 2008).

13. FUTURE OPPORTUNITIES

Research needed in basically all areas related to fisheries and marine resources.

14. STAKEHOLDERS

The Ministry of Natural Resources Energy and Environment is the responsible for questions related to natural resources management, biodiversity, conservation and environment.

The Directorate of Environment is responsible for implenting environment issues; conservation, biodiversity and natural resources preservation. Its main functions involves: the execution of the government policy for the environment, including the preparation, submission and updating information concerning carbon dioxide emissions, adaptation for climate change and the National Biodiversity Strategy Action Plan.

The Ministry of Agriculture Rural Development and Fisheries and itș Directorate General of fisheries (DGP- Direcção Geral das Pescas) deal with issues related to fisheries, management of artisanal fisheries projects, registration of artisanal and industrial fishermen, surveillance and statistic registration of industrial vessels. DGP is also mandated to conduct inspections and monitoring of foreign fishing fleets operating under access agreements.

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http://www.marapa.org/pages/pt/pesca/pesca.html

Chapter 12: Senegal

1. EXECUTIVE SUMMARY

This report provides a review of the research, management and administrative activities within the fisheries sector of Senegal. With approximately 750 km of coastline, Senegal has a very long tradition of fishery with fishing communities whose knowledge and expertise of the field and practices are clearly established.

Interviews were conducted in November 2009 with scientists, managers and stakeholders, covering the different sectors involved in the data collection, research and management of the national marine resources. The main findings from this third country assessment are summarised as follows

- Senegal has had an access agreement with the EU continuously since 1979. Senegal and the EU have not reached an agreement in 2006 and as a consequence the protocol is not anymore in place and so European vessels are not anymore allowed to come and fish in Senegalese waters. Nevertheless, an agreement has been found between privates European tuna ship owners and the Senegalese government exclusively for the tuna fishery. Senegal also has an agreement with Japan and with "Southern" countries (i.e. neighbour countries).
- Data collection is in place but databases are not up to date, which makes things difficult for research and assessments.
- There seem to be a quite good collaboration between organisations at the national level and the National Research Institute – CRODT – is involved in various international projects.
- Research conducted by CRODT has covered until now the major areas of action: marine environment, species biology and ecology, assessment of the resources, technology of the gears and of the products, the socio-economy of the fisheries and the aquaculture. NGOs mainly focus on MPAs and PETs.
- Assessments are conducted by the FAO and representatives of Senegal take part in them. The frequency is annual for the small pelagic fish but depends on funding for the demersal resources and as a consequence frequency of the assessments is quite random.
- Management is done by the Maritime Fisheries Directorate (DPM) using data provided by the CRODT and assessment for the FAO Working Groups.
- Funding for data collection and research comes from the Ministry of the Fisheries but also from national and international projects.
- A long list of recommendations and areas of improvements has been established by the various people interviewed and is not exhaustive.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

The exploitation system of the marine resources in Senegal includes several national and foreign components. Whereas the national fishing effort is essentially composed of artisanal fishing units and secondarily of some industrial tuna fishing vessels (7 pole-

and-line tuna vessels in 2008) supplying the Senegalese tuna industry, the foreign fleet operating in the Senegalese EEZ is as for it exclusively made up of industrial vessels. The access of the latter to the Senegalese resources is done or was done within the framework of fishing agreements or under other legal formulas of access:

- **Fishing agreement with Japan**, without direct financial counterpart but in exchange of funding for projects and equipment by Japan (for example research vessels, training, development of landing areas). The agreement, still in force despite the suspension of activities of the 2 or 3 Japanese longliners authorised to fish, but not simultaneously, tunas. The agreement is considered as suspended since 2004, probably due to the refusal from Japan to have Senegalese observers on board.

- **The agreement of reciprocity**:

The fishing sector in Senegal suffers moreover from several insufficiencies linked to the access mode of the national fleet to the resources. The national fleet have a free access to the resource which engenders a fishing overcapacity compared with potentials offered by the most important resources. Senegal is then forced to export, in the frame of reciprocity agreements with neighbourly countries members of the CSRP, a part of its fishing effort to the EEZs of these countries (Cape Verde, Mauritania, Guinee-Bissau and Gambia). Insufficiencies at the control level means that a part (not assessed) of Senegalese catches in neighbouring waters are landed in Senegal and counted as catches taken in the Senegalese EEZ. This makes worse the problem of IUU fishery, with risks for Senegal to not being able to face up to the deadline of 1st January 2010 imposed by the EU to limit exportations towards its area to products with certified origin only.

Access conditions vary from a country to another. The fishing agreement between Mauritania and Senegal allows some 300 Senegalese pirogues to fish in Mauritanian waters, mainly small pelagic, provided that 15% of catches are landed in Mauritania. It is a seasonal fishery that seems to work only in one way and for which Senegalese use 100% of quotas that are allocated to them.

The fishing agreement with Guinee-Bissau covers two types of fishery: artisanal and industrial fishery. In the case of the first one, the state of Guinee-Bissau has agreed on allowing 300 boats with a power smaller than or equal to 40 HP per year, 50 boats with a power larger than 40 HP and smaller than or equal to 60 HP per year. With regard to industrial fishery, 10 vessels per year for the tuna fishery (seiner and pole-and-line) are allowed as well as shrimp trawlers (1200 GRT per year), cephalopod trawlers (1200 GRT per year) and trawlers for pelagic fish (1000 GRT per year) for which numbers of vessels are not specified. Furthermore, any industrial vessel, except tuna vessels, is forced to land 2.5 tonnes of fish per trimester for the benefit of the Ministry of Fishery of Guinee-Bissau.

The fishing agreement with Gambia only relates to industrial fishery and the two States have agreed to allocate the following fishing possibilities reciprocally: 1000 GRT per year for the shrimp trawlers, 1500 GRT per year for the fish and cephalopod trawlers, 850 GRT per year for the tuna fishery (seiners, pole-and-line and longliners) and 750 GRT per year for the sardine vessels. With the difference of the agreement with the Guinea-Bissau and Mauritania, vessels are not compelled with the landing of catches carried out nor with their trans-shipment in water under jurisdiction of one or the other State.

The last agreement, between Senegal and Cap Verde, does not detail the fishing possibilities but specifies that a Joint Committee meets each year to fix the fishing possibilities that the two parts are allocated mutually. Similarly to the fishing agreement with Gambia, vessels are not compelled with the landing of catches carried out nor with their trans-shipment in water under jurisdiction of one or the other State.

Within the framework of these four agreements, the Senegalese vessels have as an obligation to have an observer onboard, to fill the logbook and to report fishing statistics.

- **Private agreement**: A policy of attribution of Senegalese flags to foreign vessels (essentially European and Asian) is also in force. This access mode seems to cause a certain form of reserve from the representatives of the fishermen and some NGOs due to the risks of over capacity and conflicts with the other national fleets.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

- **Fishing partnership agreement with the EU**.

A fisheries agreement is in place since 1980. It is a mixed agreement with fishing opportunities for crustaceans, small pelagic, demersal species and tunas. The protocol of application of this agreement has been suspended and has not been renewed at the expiry of the latest in date and which covered the period from 01.07.2002 until 30.06.2006. This protocol fixed the maximum capacity of the European fleet in the area:

- To 1500 GRT per trimester for trawlers (inshore demersal fishing for fish and cephalopods) landing and selling part of their catch in Senegal.
- To 3000 GRT per month averaged over the year for ocean-going fish trawlers (deep-water demersal species) and bottom longliners not landing their catch in Senegal.
- To 3500 GRT per month averaged over the year for ocean-going freezer trawlers (deep-water demersal fishing for crustaceans, except lobster) not landing their catch in Senegal.
- With regard to the tuna fishery, the protocol ensures the presence of 16 pole-and-line tuna vessels, 39 freezer tuna seiners and 23 surface longliners.

The financial contribution was fixed at EUR 16 000 000 a year (of which EUR 13 000 000 as financial compensation and EUR 3 000 000 for the following measures:

- Resource monitoring/evaluation of stocks (research, participation in exchange and regional coordination networks, etc.): EUR 500 000
- Fisheries inspection and monitoring (including VMS, etc.): EUR 700 000
- Improving the safety of small-scale fishing: EUR 500 000
- Institutional support for establishing sustainable fishing: EUR 500 000
- Improving skills: EUR 700 000
- Evaluation and audit of partnership schemes: EUR 100 000

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

The non renewal of the protocol is mainly due to financial issues but also due to the fuzziness for the partnership agreement system.

Even if the protocol has not been renewed, 11 European pole-and-line tuna vessels are still allowed to come and fish in the Senegalese EEZ. There is an agreement in place between French and Spanish ship-owners and the Senegalese Ministry of fisheries because the Senegalese tuna industry is supplied by these vessels as all catches are landed in Senegal.

5. FISHING ADMINISTRATION

The Ministry of Maritime Economy, Fisheries and Maritime Transports contains several Directorates including the Maritime Fisheries Directorate (Direction des Pêches Maritimes – DPM thereafter). The Directorate, and thanks to a network of various partners, implements the policy of the State in terms of maritime fishing. As such, it is in charge of:

- elaborating and implementing the maritime fishery planning scheme, in collaboration with the public structures and the private professional organisations concerned,
- ensuring the management of the exploited maritime fisheries in accordance with the planning schemes,
- promoting the cooperation in terms of maritime fisheries at the sub-regional and regional scale and worldwide,
- looking after the application of the rules relative to the practice of the maritime fishery,
- processing the fishing licences applications,
- looking after the development and the execution of the fishery development projects and programmes,
- ensuring the collection, processing and the exploitation of catch statistics for the maritime fishery,
- controlling the salubrity and the quality of the maritime fishery products,
- assisting the professional fishery organisations,
- looking after the improvement of the artisanal fishery professionals,
- ensuring the testing and dispersion of the equipments, techniques and results of the research in the field of marine fishery,
- ensuring a permanent dialogue with the stakeholders and partners for development,
- carrying out with a multidisciplinary approach projects and programmes in particular under artisanal and industrial fisheries sectors.

For this, the DPM rely on a strategy based on the rational management of the fishing resources and the safeguarding of balances between the fishing effort and the exploitable resources in the various fishing areas while consolidating the protection measures of the resources through a better organisation of the fishing activities and a considered evolution of the fleets. Its team is in charge of the management, and in particular through the co-administration and the plans of installation, thus empowering the populations and of the stakeholders.

The data used to determine management measures are the one collected by CRODT (Centre de Recherches Océanographiques Dakar-Thiaroye – Oceanographic Research Centre Dakar-Thiaroye – National research institute) and the assessment are provided

by the FAO working groups (Working Group on the assessment of demersal resources and Working Group on the assessment of small pelagic fish off northwest Africa).

6. LIST OF IMPORTANT STOCKS

For the purposes of this work we have considered the following species important:

Species / stocks / species groups	**Gear type or fleet sector**	**Reason for inclusion**
Sardine (*Sardina pilchardus*)	Costal purse seiners, pelagic trawlers and pelagic freezer trawlers.	Stock under-exploited.
Bonga (*Ethmalosa fimbriata*)	Surrounding gillnets.	Socio-economic reason. Feed the fishmeal factories.
Black hake (*Merluccius senegalensis*)	Demersal trawlers.	Target of the Spanish hake trawlers for fresh fishery until 2001.
Deepwater rose shrimp (*Parapeneus longirostris*)	Demersal freezer trawlers.	Target of the Spanish shrimp freezer trawlers and national industrial fishery.
Octopus (*Octopus vulgaris*)	Demersal trawlers.	Target of the Spanish trawlers and national industrial and artisanal fisheries.
Cuttlefish (*Sepia spp.*)	Demersal trawlers.	Mainly target of national industrial and artisanal fisheries but also Spanish ice trawlers.
Squid (*Loligo vulgaris*)	Demersal trawlers.	Target of Spanish trawlers.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

In order to preserve and protect the endangered and threatened species, Senegal has established seven marine protected areas (MPA):

MPA Site Name	**Designation**	**Designation Status**	**Date Designated**	**Total Area (km^2)**
Basse-Casamance	National Park	Designated	1970	50
Delta du Saloum	National Park	Designated	1976	599.30
Delta du Saloum	Wetland of International Importance Ramsar Convention	Designated	1984	730
Delta du Saloum	Biosphere Reserve UNESCO-MAB	Designated	1980	1800

Gueumbeul Special	Faunal Reserve	Designated	1983	7500
Iles de la Madeleine	National Park	Designated	1976	0.45
Kalissaye	Special Reserve	Designated	1978	0.16
Langue de Barbarie	National Park	Designated	1976	20
Poponguine	Nature Reserve	Designated	1986	

Many species encountered in the Senegalese waters are listed on the IUCN Red list but the critically endangered ones are the following:

Scientific name	**Common name**	**Status**	**Pop. trend**
Dermochelys coriacea	Leatherback	Critically Endangered	Decreasing
Epinephelus itajara	Goliath grouper	Critically Endangered	Unknown
Monachus monachus	Mediterranean monk seal	Critically Endangered	Decreasing
Pristis pectinata	Wide sawfish	Critically Endangered	Decreasing
Pristis perotteti	Largetooth sawfish	Critically Endangered	Decreasing
Pristis pristis	Common sawfish	Critically Endangered	Decreasing
Squatina aculeata	Sawback angel shark	Critically Endangered	Decreasing
Squatina oculata	Smoothback angel shark	Critically Endangered	Decreasing

Some species of sharks and rays are caught as bycatch. Exploitation of rays and sharks concerns almost all types of artisanal fleets. According to the CRODT, major metiers used in the exploitation of Sharks (Sharks [with capital S] = sharks + rays) are drifting gillnets (34% of total bycatch of Sharks), purse seine, set nets for demersal fish and sole nets. The Member States of the SRFC (Sub Regional Fisheries Commission), conscious of the risks of fast collapse of stocks of rays and sharks and their consequences on biological biodiversity, have engaged, through the PSRA-Requins (Shark Sub Regional Action Plan), to develop a strategy of conservation and sustainable management of Sharks in the sub-region. This engagement initially resulted in the support of the FAO International Action Plan for Sharks in 1999. The Sub-regional Action Plan for the conservation and management of sharks (PSRA-Requins), adopted in 2001 by the SRFC started in 2002. It is declined under various aspects related to research, to field work studies and investigations, to the establishment of management measures, to the facilitation of their application and to the harmonisation of the management actions and rules at the sub-regional scale. The specific objective of the project is to preserve Shark populations in the West African sub-region, through the reduction of the fishing effort and the improvement of the means of existence of the communities living from this fishery.

Furthermore, the stock of white grouper (*Epinephelus aeneus*) is considered as depleted in 2007 following the assessment made by the FAO Working group on the assessment of demersal resources with a biomass corresponding to 5% of $B_{0.1}$. It is targeted by the artisanal and industrial fleets.

The list of species listed on the IUCN Red list is provided at the end of the questionnaire.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

CRODT has three research programmes:

- "Resources and environment"
- "Exploitation system dynamics"
- "Management and planning of fisheries and their environments"

The objectives of the programme "resources and environment" focus on:

- the knowledge of the aquatic environment and its influence on fisheries resources
- the knowledge of the population bio-ecology
- a reliable assessment of the maritime and continental potentialities and control of their spatiotemporal variability according to the hydro climatic environment

The objectives of the programme "exploitation system dynamics" aim to determine:

- the interactions (sociological, technological, economical, political...) in fisheries systems
- the strategies and tactics developed by stakeholders (institutions, fishers, aquaculture, tradesmen, consumers...)
- the technologies implemented by stakeholders, en terms of innovations, evolutions and transfers

The objectives of the programme "Management and planning of fisheries and their environments" consist of:

- studying the conditions for a better adjustment of the existing intervention policies
- assessing then to propose elements of strategic choice for a sustainable development of the sector
- contributing to the sustainable exploitation of the fragile ecosystems of the coastal and continental environments

CRODT collaborates at the national and international scale. At the national scale, it collaborates on the three research programmes listed above with the DPM, NGOs and IRD. In addition of these programmes, CRODT works with the DPM on a participative research, monitoring and assessment to support local initiatives of co-management of artisanal fisheries. The aim of the project is the management and sustainable planning of fisheries in the pilot sites of the GIRMaC programme (integrated management of marine and coastal resources).

At the international level, CRODT collaborates with institutions at the regional or sub-regional scale but also at a larger scale (mainly European partners):

Name of collaborating institute	**Name of project**
IRD / Montpellier University / IFREMER / CEMAGREF / Agrocampus Rennes / UBO / Nice University	Marine Protected Areas: biodiversity conservation and sustainable management of marine resources tool.
DPM / IUCN Mauritania	Support to the trans-border management of mullet, meagre

	and bluefish fisheries between Mauritania and Senegal – PARTAGE.
Management and Cooperation Agency (AGC Senegal) / Spanish Institute of Oceanography (IEO) / Applied Fishing Research Center (CIPA Guinea-Bissau)	Fishing resources assessment in the common zone between Senegal and Guinee Bissau.
Cabinet BRLi / Como Pêche DPM / World bank	Study of the shrimp (*Penaeus notialis*) and the C*ymbium spp* in the Senegalese waters.
EU	Fishing gear selectivity in the frame of the development of working plans of the fisheries.
Flanders government / 23 African countries	Phase IV of the project ODINAFRICA.
SRFC / WWF / IUCN / UE / Dutch cooperation / French cooperation / FAO / North West African countries and other partners	Project on regional policies for a small pelagic sustainable fishery in North West Africa.
Countries member of the SRFC and the FAO	Project PRAO (Regional Project of Fisheries in West Africa).

CRODT also collaborates with FAO/CECAF for the assessment of small pelagic fish and demersal resources. Data are provided yearly for the small pelagic fish and on demand for the demersal resources. Data contain stock identity, fisheries, abundance indices, sampling and biological data.

9. DATA COLLECTION

9.1 BIOLOGICAL

Data of the artisanal fishery have been collected since 1974 for some coastal harbours but underwent throughout the years many transformations in the collection and data processing.

The statistics of the artisanal fishery rely on three types of data collected on the field: “recruitment”, “effort” and “catch and prices”. They are yearly with a tabular presentation of the efforts by harbour, by fortnight and by region as well as exportations by country. Efforts on harmonisation of the data collection system and the data processing have been made by the DPM and CRODT for a better readability of the fishing data in Senegal.

With regard to the industrial fishery, data relate to the fleet composition based in Dakar, the repartition of catches by bottom trawlers, the monthly repartition and by tidal zone and the trawlers fishing effort; the repartition of the catch (tonnes) by fishing days, by tide, by fishing gear and by type of trawler. Data are also provided by the observers of the Protection and Surveillance of Fisheries Directorate on board foreign vessels.

Most of these data are used in the assessments conducted by the FAO Working Groups. As catches and CPUE of Spanish fleets are used in the assessment of the black hake, deepwater rose shrimp, octopus and cuttlefish stocks, these data are made available to the Senegalese organisations, and particularly to CRODT.

Some biological information – temporal and spatial distribution of spawning – are available for the black hake stock and then used by CRODT.

Gaps are present in the biological data collection. For the bonga stock, there are no fisheries independent data available and the sampling scheme is insufficient. For the black hake stock, the series of fishery statistics of the trawlers is not up to date. And finally, there is no sampling scheme for catch and effort for the deepwater rose shrimp.

The outstanding issues for the selected stocks are the following:
Sardine:

- Improve sampling of the different fisheries covering all quarters of the year, especially in Mauritania and Senegal.
- Sardine length should be measured to the ½ cm below for all fisheries.
- Continue the programme of age reading exchanges.

Bonga:

- Continuation of the biological sampling.
- Investigation of obtention of separate effort data for gillnets.

Deepwater rose shrimp:

- Implement a biological sampling at landing for all fleets in harbours.

9.2 ENVIRONMENTAL

Several types of environmental data are collected in Senegal and several databases have been created by the Senegalese National Oceanographic Data Center. Each database contains different data, from different sources and covering different periods. Sources of data are either national (marine stations, oceanographic surveys by national or foreign vessels) or international (data compiled from international databases such as World Ocean Database 2005 or Aqua-MODIS). Data collected are temperature, salinity, chlorophyll, dissolved oxygen, nitrogen, phosphorus and nitrite.

9.3 ECOSYSTEM

No information has been on this topic. But it does not mean nothing is done as research is conducted in that field.

9.4 SOCIO-ECONOMIC

No information has been on this topic. But it does not mean nothing is done as research is conducted in that field.

9.5 FUNDING

No information has been on this topic. But it is assumed that funding for data collection come from the Ministry and national and international projects.

10. RESEARCH, FUNDING AND ASSESSMENT

Biological Research

It was only found that length-weight relationship studies are carried out by CRODT. Biological research on the selected species is usually conducted by neighbouring countries (mainly Mauritania and Morocco).

In 2007, the FAO working group on the assessment of small pelagic fish off Northwest Africa wanted to conduct a length frequency analysis with a view to assessment by structural models but it was not carried out.

Several recommendations have been expressed:

Recommendations for the sardine:
- Continue the estimation of abundance indices for the whole region in October–December.
- Organize a Working Group to analyse the length frequency data.

Recommendation for the bonga:
- Encouragement of studies at higher level on distribution and biology of the bonga.

Recommendation for the deepwater rose shrimp:
- Improve knowledge of the biology of this species.
- Carry out selectivity studies to reduce bycatches.

Recommendation for the octopus:
- Analyse observer data to evaluate bycatches for the octopus in other demersal fleets.
- Prepare seasonal or monthly data for the meeting of the next Working Group.
- Carry on the studies on the unity of cephalopod stocks.

Recommendations for the cuttlefish:
- Prepare seasonal or monthly data for the meeting of the next Working Group.
- Analyse survey data to have abundance indices for the cuttlefish species.
- Carry on a biological study programme on cuttlefish (reproduction, growth, mortality).
- Conduct a bibliographic synthesis on the biology of cuttlefish.
- Carry on the studies on the unity of cephalopod stocks.

Environmental Research

The national research programme “resources and environment” covers the environmental research. Its objectives focus on:
- the knowledge of the aquatic environment and its influence on fisheries resources
- the knowledge of the population bio-ecology
- a reliable assessment of the maritime and continental potentialities and control of their spatiotemporal variability according to the hydro climatic environment

A recommendation has been put forward by the FAO Working Group on the assessment of the demersal resources for the octopus: “Analyse environmental data to have a better knowledge about natural factors of the abundance.”

Ecosystem effects Research

CRODT is involved in monitoring vulnerable species and participates in the implementation and management of marine protected areas. The major issue is that aspects are planned but not really developed due to lack of funding.

Socio-Economic Research

Through two national research programmes, CRODT is involved in socio and economic research:
The programme “exploitation system dynamics” aims to determine:

- the interactions (sociological, technological, economical, political...) in fisheries systems,
- the strategies and tactics developed by stakeholders (institutions, fishers, aquaculture, tradesmen, consumers...),
- the technologies implemented by stakeholders, en terms of innovations, evolutions and transfers.

The programme “Management and planning of fisheries and their environments” consists of:

- studying the conditions for a better adjustment of the existing intervention policies,
- assessing then to propose elements of strategic choice for a sustainable development of the sector,
- contributing to the sustainable exploitation of the fragile ecosystems of the coastal and continental environments.

A regional project called PRAO (Regional Project of Fisheries in West Africa) which is mainly interested in demersal stocks as they are the most threatened is conducted by the Member States of the SRFC and by the FAO, and Senegal is one of them.

10.2 RESEARCH FUNDING

Research is funded by national and international funders. At the national level, funding come from the DPM. It is assumed to be renewed each year but the amount might vary. At the international level, funding comes from various sources but always as part of a project: NGOs such as WWF and IUCN, IRD, French National Research Agency (ANR), Spanish International Cooperation Agency (AECI), World Bank, consultants and the EU. The funding is set for the length of the project.

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

Assessments are conducted by the FAO Working Groups on the assessment of small pelagic fish off Northwest Africa and the Working Group on the assessment of the demersal resources. The first one meets each year and conducts assessment for several species, including sardine and bonga.

As data consistency for catch-at-age has been somewhat improved in the area, it was decided in 2007 to apply the XSA analytical model to the 1990-2007 data series for the sardine stock. Two separate abundance indices were used, the Russian CPUE and the acoustic survey biomass indices. Catch of sardine in the Senegalese waters in relatively low in comparison to the natural mortality of the stock. This situation generally hinders virtual population analyses. Therefore the results of the analysis were not taken into consideration by the Working Group. The Schaefer logistic production model was used to assess the stock. The fit of the model was judged to be satisfactory for the zone. The Working Group proceeded with a projection of catch and abundance over the next five years following only one scenario: maintaining effort at current level. The Working Group recommended considering the projections with a great deal of precaution taking into account the impact of the environment of abundance and stock dynamics. Large variations in abundance could in fact be unrelated to the fishery.

The same logistic production model has been used to assess the bonga stock. A time series of total catch data as well as stock abundance is required to run this model. For the 2007 assessment, total catches og bonga were obtained by summing the catches of the fleet in Mauritania, Senegal and Gambia. The abundance indices were obtained using the effort of the Senegalese artisanal fisheries catches. Although the Working Group had expressed concern on the representativeness of the Senegalese effort data on the bonga fishery in the region, it was however decided to apply to the catches with precaution and urged countries in the region to carry out necessary parameter sampling for future analysis. An attempt was made to make an assessment of the bonga stock using available data but the model did not provide reliable results. As a consequence, the Working Group was not in position to make projections for bonga.

For the black hake, the deepwater rose shrimp, octopus and cuttlefish stock the Working Group meets on demand and the frequency of the meetings mainly depend on funding available. For all these stocks, the same model as for the small pelagic stocks has been applied. For all of them, except the deepwater rose shrimp, the model provided conclusive results. The current statuses of the stocks have been assessed as well as the current level of exploitation. The issue with the deepwater rose shrimp stock is the lack of contrast in the data and probably erratic fluctuations in the abundance of this stock.

The last stock of this study (squid), no information has been provided in the reports of the Working Group.

10.4 ASSESSMENT FUNDING

No information provided

11. DISSEMINATION OF SCIENTIFIC INFORMATION

There is an active collaboration between the different organisations at the national level and CRODT is also involved in international projects. Publications, reports, leaflets are produced and seminar organised.
FAO is responsible for publication and dissemination of assessment results. Other information are published and disseminated under the responsibility of the research institute and other project partners (IUCN, WWF etc).
One of the major issues for CRODT is its absence of website for the research institute.

Also, a lot of the information available on Internet is out of data. It is actually difficult to know if nothing has been done on specific subjects such as oceanographic data collection since or it is just a question of updating the websites.

12. MANAGEMENT PROCESSES

The DPM is in charge of the management procedures, using the data collected by CRODT and assessment provided by the FAO Working Groups. The fishing effort is the management measure used for all the stocks considered in this study except the sardine for which a TAC is set annually. Four reference points are used in the management: $B_{0\text{-}1}$, $F_{0\text{-}1}$, $F_{0\text{-}1}$ and F_{MSY} for the four stocks for which an assessment has been conducted and for which reliable results have been obtained. Furthermore, the Senegalese law imposes to all fishing vessels to be equipped with VMS. It is not clear what the level of compliance is and if the data are used. Finally, the DPM imposes foreign vessels to have Senegalese observers on board. The compliance seems to be extremely high. Due to this compulsory measure, Japanese tuna vessels have stopped fishing in the Senegalese EEZ.

13. FUTURE OPPORTUNITIES

Several future opportunities have been put forward.
With regard to the data collection:

- Increase of the number of individuals in each sample covering all size ranges. Covering of all fleet segments and all quarters of the year.
- Improve the data collection and reporting system through amongst others improved species identification.
- Carry out regular national and/or regional scientific surveys with the aim to obtain reliable abundance indices for the demersal stocks.

With regard to the biological research:

- A thorough analysis of the properties and reliability of time series collected by research vessels should be carried out.
- Improvement of the reliability of length and age data in the frame of data relative to catch and biological data.

With regard to the environmental research:

- More research on hydrographical and/or ecological variability in the region and its effects on stock dynamics.
- Implementation of a more objective procedure with the application of a series of environmental data for the identification of the years with particularly favourable and unfavourable condition.
- Study the effect of environment on the abundance of demersal species.

With regard to the assessment methods:

- With the exception of bonga, assessments could be greatly improved if more and better data were available.
- Run age based stock assessment models in order to analyse the effect of changes in relative exploitation patterns on the stock.
- Preparation of the data required for the assessments at least one month in advance of the next Working Group meeting.

With regard to the development of assessment methods:

- Consideration of alternative assessment models for demersal resources.

With regard to the dissemination of results:

- The scientists should ensure awareness amongst managers about the serious state of the demersal stocks in the various countries in order to ensure application of the recommendations made by the FAO/CECAF working groups.
- CRODT should implement a website to disseminate their research and their results.
- Sources of information, and more particularly Internet, should be updated in order to improve the dissemination of the results of the present researches conducted in the country.

With regard to the management process:

- Establishment of a framework for joint management in the case of stocks shared in the region.

14. STAKEHOLDERS

Several stakeholders have been interviewed: IUCN, WWF, CONIPAS (fishers representatives) and Mr Alliou SALL who is the regional manager for West African Region for ACPFish II research program and a fisheries socio anthropologist.

None of them are is involved in the process of stock assessment, resource allocation or data collection except CONIPAS as they provide data to the DPM and CRODT.

Apart Mr SALL, all of them are implicated in ecosystem effect research:

- IUCN is implied in the safeguard of maritime and coastal areas through programs such as PRCM (Regional Program for the Conservation of the Coastal and Marine Zone in West Africa) (http://www.prcmarine.org/). In this frame, IUCN is implied in the following projects:
- Support with the strengthening of the institutions of the regional network of MPAs in West Africa (RAMPAO) and with the implementation of its scheme of work.
- Participative management of natural sites and resources in West Africa – GP SIRENES.
- CONIPAS had created two bodies:
- National inter-professional council for the artisanal fishery with the AMPs at the centre of the debates (support on the local knowledge). Creation of a forum to take part in the fisheries decisions.
- Federation of the ecologists.
- WWF is also partner in the PRCM, as well as IUCN, and takes part in the following projects:
- Conservation:
    - Improvement of the state of conservation of marine turtles in West Africa.
- Integrated management:
    - Integrated area and marine biodiversity management project in the Gambia.

WWF also works on:

- The establishment of situations of reference (from a capitalization of existing data and local knowledge) for some sensitive sites. Collaboration between 2002 and 2004 for the identification of biodiversity sites (species, ecosystem and priority sites).
- The reflexion on and implementation of a monitoring system which allows data collection relative to state indicators for the sites and their components in a perennial way. Use of a local convention and training at the local scale.

In terms of environmental research implication, WWF is involved in:

- Political action in favour of the respect of the environment
- Fisheries management in the frame of the PRCM program:
    - Reinforcement of the capacities of NGOs and active professional organisations in fisheries and environment in the West African Marine "Ecoregion".

With regard to the socio and economic aspects, all stakeholders are involved either by doing research or by being strongly implicated in the process (CONIPAS).

- IUCN is interested in the migration of fishermen and organises seminars for the benefit of the stakeholders (sub-region scale) aiming at increasing the technical capacity of the States in the negotiations of the fisheries agreements.

In the frame of the PRCM program, IUCN is taking part in the following projects:

- Fisheries management:
    - Reinforcement of the regional capacities of fisheries management and governorship.
    - Project of support to trans-border artisanal fishery management – PARTAGE.
- Integrated management:
    - Program of support to the network of the Members of the Parliament and environmentalist local elected official in the countries for the PRCM-IUCN.
    - Regional Program of Education to the coastal and marine Environment of the West African littoral – PREE.
- WWF is involved in various ways:
- Political action in favour of more equity and respect of the environment during fisheries agreements negotiations.
- In the frame of the PRCM program, WWF takes part in the fisheries management project by focusing on the:
    - Reinforcement of the regional capacities of fisheries management and governorship.
    - Reinforcement program of international capacities of the network on fisheries policies in West Africa (REPAO).
- Support for the creation and development of MPAs from identification of areas to their implementation.
- Promotion of a participative approach in MPAs management.

- Support for training for observers.
- Participation to awareness programs toward MSC certification of octopus stocks.

Mr SALL participates in several studies / projects on social aspects in fisheries:
- Study on the ecological knowledge of artisanal fishers on small pelagic in North West African in the frame of a project on Sustainable fisheries of small pelagic in North West Africa.
- Project ECOST (Ecosystems, Societies, Consilience, Precautionary principle: Development of an assessment method of the societal cost for best fishing practices and efficient public policies).
- Study on West African migrants: artisanal fishery and emigration of young African through the pirogue route.
- Study on the integration of fishers abroad.
- Study on the economic and social dimension left by migration.
- Participation to a book untitled "Conservations - A Trialogue on Organization, Power and Intervention in Fisheries" and more particularly an "An Essay on the Fishworkers' Organization in Senegal".
- Study on the role of women in fisheries social movements ("Women as leaders").

All stakeholders interview have listed lacks and problems:
- Lack of fisheries management plan.
- No registration of pirogues (free access).
- Bad governorship of the fisheries policies.
- No positive impact of fisheries agreements.
- Problem in finance management dedicated to fisheries.
- State support laccking for research - many researchers have left, no follow up by the State.
- Problems with catch declarations because important quantities of fish are caught outside Senegalese waters in the frame of an agreement with a Southern country but counted in the national statistics as taken in the Senegalese waters -> declarations distorted and impact on stock assessments.
- Necessity for leading to equitable agreements.
- Agreements necessary for species fished in Senegal but not consumed.
- Limit the shell companies.
- Improvement of the companies inland to reduce unemployment -> necessary for the development.
- Problem of source of data scattering.
- Problem of guardianship for the MPAs to know who is in charge of them.
- Problem of communication on what is done but there is nevertheless a better share of existing information and tasks.
- Important lacks on data and research on factors and socio and economic aspects.
- Negative image of researched by fishers.
- No consideration of local knowledge.
- Problem of approach: incompatibility between the actual situation of things and research themes. Good approach: subsidiary approach, thematic research, closer to the fisheries world. Ask ourselves the question: what do fishers need?
- Necessity for a study on needs of communities in terms of research.

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http://www.univ-brest.fr/gdr-amure/index2.php?affich=select_projrech&id=3

http://www.isra.sn/descriptioncentre.php?codecentre=CRODT

Regional Programme of Conservation of the coastal and marine zone in West Africa: http://www.prcmarine.mr

Management and Cooperation Agency between Senegal and Guinea-Bissau (AGC) http://www.agc.sn/fr/index.php

Paper on the project of assessment of the marine resources in the common zone http://fr.allafrica.com/stories/200902060096.html

Presentation of the integrated management programme of the marine and coastal resources– GIRMaC http://www.environnement.gouv.sn/IMG/pdf/girmac-presentation.pdf

Network ODINAFRICA : http://www.odinafrica.net/

DPM: http://www.ecomaritime.gouv.sn/spip.php?article17

Fishing statistics:
http://www.nodc-senegal.org/PRODUITS/CATALOGUE_V1.0/M%E9ta_donn%E9es/statistiques.htm

Senegalese Oceanographic Data National Centre: http://www.nodc-senegal.org/dpmanis.htm

Interviews:

IUCN	• Renaud Bailleux
CONIPAS	• Mamadou Diop Thioune
WWF	• Alassane Dieng: Project leader • Arona Soumare: Director of Conservation
ACPFish II	• Aliou Sall: Regional manager for West African Region for ACPFish II research program / fisheries socio anthropologist

Chapter 13: Kenya

1. EXECUTIVE SUMMARY

Kenya has a land area of 580,000 km^2 and lies astride the equator. It has a 580 km long coastline bordering the Indian Ocean with different, marine and coastal wetlands rich in biodiversity. The total Kenyan population is 39.4 million (based on preliminary results of the 2009 population census), with a yearly growth rate of about 2.6%. The coastal population is estimated to 3.4 million (2009 population census). The coastal economy is heavily dependent on fisheries, commerce and tourism. It has been calculated that the fisheries sector makes up almost 5% of the GDP (Fondo, 2004). Under the Fisheries Act, the Director is empowered to appoint officers for the purposes of licensing fishing activities and registering fishing vessels, enforcement of fisheries laws and inspection of fishing activities. The management of fisheries resources is guided by the National Fisheries Policy and Strategy Statement. PET species includes coelacanth, sea turtles, dolphins, dugong and whales as listed by the IUCN and/ CITES. There are currently no comprehensive data for stock assessments for deep sea resources. However, over-fishing, illegal, unreported and unregulated (IUU) fishing practices are major concerns facing Kenya. Some of the challenges facing the fishery sector in Kenya include; limited knowledge on the status of stocks, inadequate fisheries infrastructure (e.g. inadequate fish landing sites and fishing ports, lack of quality assurance laboratories and piracy). Kenya does not have any fisheries partnership agreement with EU or with Distant Water Fishing Nations (DWFN), instead fishing access for DWFN in Kenya territorial waters is by license. Due to lack of infrastructure to handle deep sea vessels, licensed vessels are allowed to fish and land the fish at the destinations of their own choice where they can get markets. The sea turtle conservation programme was initiated in February 1997 by WWF involving local communities, visitors, government departments and international institutions, following continued extraction of turtles by the local communities (Church and Palin 2003). The programme is a member of the Kenya Sea Turtle Conservation Committee (KESCOM) and its focus is on conservation of the critically endangered turtles and community education. A carefully selected youth team is responsible for monitoring and patrols. However, the initiative is faced with many challenges such as inadequate funding and lack of an enabling institutional and policy framework for youth patrols and monitoring. The green turtle and the Hawksbill Turtle are both categorized as endangered species. The dugong and turtle species are under threat not only from being strangled in fishing nets, but also from the destruction of the seagrass meadows by the trawling activities. Further, dead turtles have been sighted in the Ungwana Bay and the deaths have been attributed to incidental catches by trawlers (Wamukoya *et al.* 1996). Whales and dolphins are also taken as bycatch in gillnet fisheries and likely represent a threat to local populations.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Fishing access arrangement in distant waters is facilitated by annual licensing. License fees from this earned the Government around KShs 30 million per year in 2006 (approximately US$ 400,000). The fees charged are US$ 20,000 for purse seiners (Anon. 2006, http://www.fisheries.go.ke).

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)
Nor applicable

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Currently Kenya has no Fisheries Agreement with EU.

5. FISHING ADMINISTRATION

The Ministry of Fisheries Development is the main custodian of many issues related to coastal marine resources. The Fisheries Department administers the fisheries sector, formulate policies and overall coordination. It advises the government and the regional/district administration on fisheries development including formulation and implementation of fisheries management plans, fisheries statistics and legislation. The Director of fisheries is the statutory officer in charge of fisheries management. The Director is empowered under the Fisheries Act, 1989 revised in 1991 to appoint officers for the purposes of licensing fishing activities and registering fishing vessels, enforcement of fisheries laws and inspection of fishing activities. The Kenya Marine and Fisheries Research Institute (KMFRI) has the mandate to do research on aquatic resources and give appropriate information and advice to the Department.

6. LIST OF IMPORTANT STOCKS

Marine fishing is conducted at five levels; artisanal, sport fishing, shallow water shrimp trawling, long liners and purse seiners. Artisanal fishing activities were undertaken by 10,276 fishers, of which 9,601 are boat fishers and 675 foot fishers (Anon. 2006, Marine waters fisheries Frame Survey 2006 report). The number of fishing crafts which were used during the period under review was 2,368, of which 194 were motorized, 991 using paddles while 1,179 use sails as a means of propulsion. The most common fishing gears used were gillnets, traditional traps, seine nets (which include beach, prawn and reef seines), long line hooks, hand lines and traps among others. Fishing in the territorial waters was carried out by eights trawlers mainly trawling for shrimps. These trawlers operated for eight months (January to August) before a ban was imposed on them due to conflicts between them and the artisanal fishers (Anon. 2006). In the EEZ waters, 33 purse seiners and around 30 long liners that are foreign vessels under Kenyan licenses are operating (Anon. 2006). A wide variety of major fish stocks of commercial importance are caught by the artisanal fishers and industrial fishing within the territorial (inshore) waters. The prawn fishery from which approximately 400mt are landed each year are fished by commercial trawlers from the two fishing grounds with brackish waters.

The offshore waters of the Kenyan zone yield catches of large tunas, billfishes and pelagic sharks to foreign fishers. The offshore fisheries zone is exploited by vessels from Distant Water Fishing Nations (DWFNs). The main species sought are the highly migratory tunas including skipjack, yellow fin and bigeye tuna. Some of the fish landed in Kenya and transhipped overseas. Other large pelagic fishes such as kingfish, tuna, sailfish and marlin are caught by surface gill nets and trolling lines. There are no available studies on these stocks carried out in the deep sea. Thus, information on marine fish stocks in the deep sea is not well known because of lack of capacity to collect data.

Shark fishing using set gill net (*jarife*) has been in practice for many decades. Shark catch rates have declined dramatically over the last 40 years, in the order of 85%. The trade in shark fins dates back to the 1960s. Kenya is renowned for its lobster, but the fishery is generally perceived to be over-exploited (Samoilys and Kanyange 2008). A study conducted by the Oceanographic Research Institute (ORI) in 1999 in KMNR stated that the fishery was probably fully exploited though mean densities of lobster were similar to those for other exploited tropical lobster fisheries around the world (Fielding and Everett 2000).

Deep sea fish species found in Kenya

Kenya offers some of the finest deep sea fishing in the world with a huge variety of different fish species such billfish including black, blue and triped marlin, sailfish, broadbill swordfish and shortbill spearfish. Striped Marlin can reach a size of 120 kg and blue marlin of up to 270 kg and these species are usually caught between August and October. The broadbill (*Xiphias gladius*) is usually caught in December before the shift in the monsoon winds to the north east during December and January. Shortbill spearfish is caught mid November to end of March with December being the best month. From August a large number of migrating yellow fin tuna are present in Kenya coastal waters. Tiger and mako sharks are also caught. Traditionally when the Kaskazi (north east monsoon) blows, the billfish arrive in large numbers. There are two defined fishing seasons around the coast of Kenya. These are the yellow fin tuna season, which runs from August to the end of October, and the marlin season, which runs from December to mid March.

In previous years, illegal commercial trawlers fishing off Somalia's coast used to catch a large part of the migrating species and thereby reducing the available resources for Kenya. However, now fishermen on the northern coast of neighbouring Kenya say that deep sea fish have increased due to a reduction in poaching as a result of fear for pirates.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

In Kenya the protected, endangered and threatened species are turtles, dolphins, dugong, and whales as listed by the IUCN convention. There are five species of turtles in Kenya. Hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*), both categorised as Critically Endangered. Green (*Chelonia mydas*), Olive Ridley (*Lepidochelys olivacea*) and loggerhead (*Caretta caretta*), all listed as Endangered by the IUCN. The sea turtle conservation programme was initiated in February 1997 by WWF involving local communities, visitors, government departments and international institutions, following continued extraction of turtles by the local communities (Church and Palin 2003). The programme is a member of the Kenya Sea Turtle Conservation Committee (KESCOM) and its focus is on conservation of the critically endangered turtles and community education. A carefully selected youth team is responsible for monitoring and patrols. However, the initiative is faced with many challenges such as inadequate funding and lack of an enabling institutional and policy framework for youth patrols and monitoring.

The dugong (*Dugong dugon*) and the turtle species are under threat not only from being caught in fishing nets, but also from the destruction of the seagrass meadows by trawling activities. Indeed, dead turtles have been sighted in the Ungwana Bay and the

deaths have been attributed to incidental catch by trawlers (Wamukoya *et al.* 1996). Humpback whales (*Megaptera novaeangliae*) are present in Kenya waters between July and October, several dolphin species occur year round (e.g. Indo-Pacific bottlenose (*Tursiops aduncus*) and Indo-Pacific humpback dolphins (*Sousa chinensis*)) whereas others are occasionally sighted (Berggren 2009). Both dolphins and humpback whales are caught and drown in set nets along the Kenya coast (Cockcroft *et al* 1994, Kiszka et al. 2008).

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Areas of research within the waters of Kenya includes; fisheries biology (growth, fish maturity, food and feeding, reproduction, ecology), catch assessment surveys (gear/vessel type, length, weight, effort), prawn monitoring and sea turtles (species assemblage, abundance, stomach contents, by catch), socio-economics (employment, income generation, socio-livelihood, revenue), environmental research (beach erosion, temperature, waves and tides, pollution etc), and trawl surveys (weight, length, effort, catch, discards) etc. The research is sometimes short term donor funded projects which are not sustainable due to limited sources of funding to support data collection tied to specific projects. When the projects end, there is no continuity in data collection. Currently, there are no comprehensive data for stock assessments of the deep sea resources. Most of the present data are from Artisanal fishermen and industrial fishing. There are several organizations and institutions at National level collaborating mainly in Artisanal fisheries research. These include Kenya Marine and fisheries Institute, Kenya wildlife services and NGOs (such as WWF, Wildlife Conservation Society). Regional joint research plans are organized by funded projects such as The Aghulas and Somali Current Large Marine Ecosystem (ASCLME), The South West Indian Ocean Fisheries Project (SWIOFP), etc. At international level, the FAO is the major collaborative organization on Fisheries research with a lot of fisheries information on taxonomy. Also the EU, JICA, DAAD, WORLD BANK, the Western Indian Ocean Marine Science Association (WIOMSA) supports a number of marine research projects. There are outstanding issues and major gaps in data collection which includes lack of equipment and capacity. Biological information on the different fishes in Kenya is lacking. Few studies on some species have been conducted e.g. Kulmiye *et al*. (2002) studied some aspects of the reproductive biology of the thumbprint emperor (*Lethrinus harak)* from the South coast of Kenya in Gazi and Msambweni areas, and McClanahan and Kaunda-Arara (1996) estimated that the densities of fishers in Kenyan reefs are between 7-13 fishers/km^2 and the rates of resource extraction from Kenya are estimated atapproximately 1.3 tons/km^2/yr.

9. DATA COLLECTION

9.1 BIOLOGICAL
No information for this section

9.2 ENVIRONMENTAL
No information for this section

9.3 ECOSYSTEM
No information for this section

9.4 SOCIO-ECONOMIC

No information for this section

9.5 FUNDING

In Kenya funding is mainly through donor support e.g. the Fish Spawning Aggregation management project was initiated by IUCN's Eastern Africa Regional Office (EARO), through funding from the Norwegian Agency for Development Cooperation (NORAD) (Samoilys *et al.,* 2006). Other funding agencies are the National Oceanic and Atmospheric Administration (NOAA) and the WIOMSA's MASMA grant scheme. Marine resource mapping for Kenya was done for example under the sponsorship of UNEP Regional Seas Program, EAF/14 project which lasted from 1995 to 1998 and produced a GIS database and a hardcopy atlas for use in Integrated Coatal Zone Management

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

No information for this section

10.2 RESEARCH FUNDING

Currently, research funding for EEZ at National level for biological, environmental, ecosystem effect and socio-economic data are not available except at international level. The data available on the above mentioned aspects are from inshore waters projects which operate under donor support. The true status of Kenya's marine resources is not known and the last resource assessments were done in the 1980s. Therefore, there is a need for updated assessments (Fondo, 2004).

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

As mention previously no comprehensive research activities have been conducted in the EEZ. Thus, most of the assessment methods, assessment models and software used, have been conducted within the inshore waters aimed at obtaining information (data) necessary for solving outstanding issues. For example, in fish stock assessment, various research methods, models and analytical software have been used (swept area method, Fox production models, FISAT package) to accomplish the goals of the research. The outcomes (results) of the research can be used in implementing some management measures for conservation and sustainable utilization of the marine resources.

10.4 ASSESSMENT FUNDING

The major sources of funding in assessments at national level are mainly based on the inshore waters research. Sources of funds include government support, World Bank, universities, NGOs (such as WWF and WIOMSA), conservation organizations (such as IUCN), FAO, UNDP, NORDIC etc. Similarly, at international level major sources of funding for inshore waters research includes World Bank, FAO and others. Most of these funds are severely limited to assessment that can be undertaken and not consistent from year to year.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Information is circulated through websites, mailing, post and the media. Partner organizations/institutes/universities are responsible for sharing and dissemination of scientific information from research programmes at national to international levels. At national levels sharing and dissemination involves; between institutions, universities, research organizations, NGOs and between individual scientists, whereas at international level it involves regional sharing. Mechanisms in place to review the quality of data, monitoring, science outputs are through peer review arrangements by the partner institution/organization/university. Such institutions have the duty to appoint a peer review committee for reviewing scientific information for publication. Dissemination of information is through publication of scientific papers in journals where peer reviewed papers are submitted.

12. MANAGEMENT PROCESSES

The management of fisheries resources in Kenya is guided by the National Fisheries Policy and Strategy Statement. The Government policy is to promote the development of fisheries, fish culture, and fisheries related industry to maximize food welfare and employment benefits for Kenya citizens whilst ensuring that resources are utilised in a sustainable manner. Basic fisheries legislation is set out in six Parts and 26 Sections of the Fisheries Act 1989 (Act No. 5 of 1989; revised 1991). The Act applies to both marine and inland fisheries, and broadly empowers the Director of Fisheries, with the approval of the Minister, to issue regulations to promote the development of fisheries and aquaculture and to ensure the proper management of specific fisheries, including the possibility of declaring closed seasons and/or areas, access limitations, and restrictions on fishing methods, gear, and the characteristics of fish that may be caught. The Act further establishes bases for: Registration of fishing vessels (obligation of registration of fishing vessels and definitions of governing conditions). Licensing provisions which requires that one needs to be in possession of a valid license to fish in Kenya waters.

Since control of fisheries exploitation through restriction of access to fishing is sensitive, the government has been involving the fishing community in the licensing process, where only those who adhere to the rules are cleared by the Beach Management Units (BMUs) to be licensed. This process not only restricts if not prevents new entrants into the fishery, but it also helps to reduce the use of illegal gear and methods, as those with illegal gear would not be licensed. Rights-based approaches

to fisheries management has not been practised in Kenya. Stock assessment is basically carried out by KMFRI, although traditional knowledge and catch records remain quite useful to management.

In case of turtle management ***Kenya*** Sea Turtle Conservation Committee; KESCOM is involved in management. Management measures used involve TAC, fish size limit, area closures and fishing gear selectivity which is based on scientific advice. Further, Rights based management is also practiced (number of fishing licenses, individual quota). Other measures are

13. FUTURE OPPORTUNITIES

In the Western Indian Ocean (WIO) region, considerable efforts have been made to promote regional collaboration and to address regional issues relating to conservation.

Further regional research collaboration, coordination and adoption of best practice are needed in the following areas; (1) Biological research – Mariculture, management planning, covering stock assessment, genetics, species diversity, and reproduction biology (2) Environmental research focusing on modeling, interaction with policy making bodies and regulations, general environmental issues such as pollution (3) Ecosystem effect research with more emphasis on indigenous species, unspoiled biodiversity centers (4) Socio-economic research – focusing on policy analysis linkages, monitoring of developments in economic arena, markets and linkage with decision makers(5) Staff training in data collection from the EEZ with the establishment of data base, validation of data and non conventional data sets collection. (6) Assessment methods with more emphasis on baseline surveys and acoustic surveys (7) Development of assessment software through involvement of tertiary institutions (8) Dissemination of results with further expansion on data sharing, publication of the results, development of websites use of media and scientific publications (9) Management process – objectives and broad policies of the research, capacity building for low level managers, quality and quantity of production and (9) Funding –getting research priorities right, export creation, sustainable institutional, regional and international collaboration.

14. STAKEHOLDERS

Stakeholders (such as fishing industries, NGOs, universities, government organizations etc) are the key partners in conducting research on stock assessment, ecosystem, environment and socio-economic aspects. They are fully involved as sources of information and can contribute valuable advices on what should be done to solve the existing problem. In Kenya, stakeholders are considered as complete shareholders and part of decision makers during implementation of most management processes/practices.

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Chapter 14: Mozambique

1. EXECUTIVE SUMMARY

Mozambique's economy has been devastated by decades of conflict. Post conflict challenges with governance, corruption, legislation and revenue collection in particular, have also inhibited economic development. The government has initiated widespread reforms to alleviate this, but Mozambique is still ranked among the poorest countries in the world. It is therefore reasonable to claim that investment into fisheries management and specifically science may not be a prime priority within the national budget even though the marine fishery resources are important for economic and social reasons. Management of the fishery sector is consequently suffering from lack of resources, funds and limited human resource capacity. Therefore the ability of Ministry of Fisheries to implement management decisions, including the collection of data and to conduct research is extremely limited.

There have been three fisheries agreements between Mozambique and the EU since 1987. The principle difference between the three agreements (and their protocols) is in the fishing opportunities made available to EU fishers and the financial contribution: although previous agreements included shrimp the most recent, the 2007 Fisheries Partnership Agreement only covers tuna. Tuna fishing opportunities are allocated to 89 vessels (44 seiners + 45 longliners) with a financial contribution of 0.9m€/yr (0.65m€ compensation, 0.25m€ targeted actions). This is an increase by 25% for seiners and tripled for longliners.

Mozambique is not a member of IOTC and therefore is not able to benefit from the shared research underway in this organisation. For tuna, the species is not landed in Mozambique so very little data is collected and no research or stock assessment is undertaken routinely by the MoF. Sometime the opportunity to gain information from 'research ships of opportunity' may occur or possibly input from one of the many regional projects that Mozambique participates in. However, this information is not utilised in any systematic manner.

For shrimp catch data is collected routinely from landing points including, length, weight, sex and maturity information. This has been used to produce Virtual Population Analysis (VPA) estimates of stock size but this is not done routinely and current break downs in the computer system are making data compilation and modelling difficult. Vessel logbook data is collected by the MoF irregularly and the quality of this data is questionable. An annual survey is conducted together with the industry once a year as the main data gathering exercise in research.

The MoF has over the last few years shown a remarkable will to improve the fisheries management regime through better decisions, regional cooperation and improved implementation of management measures. Their main priorities in terms of research are related to a research vessel, IT equipment and software for data storage and processing, development of research facilities and human resource development through scholarships and technical training. The TXOTX network with appropriate funding

backing the concept could contribute towards this within the scientific disciplines of fisheries management.

The summary contained in this report is compiled from the work of two field trips to Mozambique to interview the senior management of the MoF and scientific staff as well as a range of stakeholders.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

In relation to non European Union (EU) fisheries agreements it was reported by the Ministry of Fisheries (MoF) that none were active in 2009. However, it is understood that they do have bilateral fisheries agreements with neighbouring countries (e.g. Namibia and South Africa) as well as with other nations (e.g. Vietnam and Brazil) but that these are intended for development of fisheries and exchange of information and experience and do not include direct access to the fisheries[1].

Private Licenses

There is limited information in relation to private license agreements or joint ventures (JV) in the **tuna sector**. The fishery was described as less attractive for private sector agreements due to a highly mobile fleet that spends a relatively small part of the season in Mozambican waters and the fact that Mozambique can offer very limited facilities in terms of marketing, maintenance and bunkering.

However, the following data were given for the EU fleet:

Name of country and company	Years of licences	Target species groups, stocks or species	Gear type / fleet sector	Annual Private Sector catch (tonnes) within your EEZ	Proportion of the Private Sector catch landed at ports in your coastal state
Spain ANABAC	2000-2009	Tuna	Purse Seiner	8744 t	0
Spain AGAC	2000-2009	Tuna	Purse Seiner	1234t	0
France ORTHONGEL	2000-2009	Tuna	Purse Seiner	1172t	0

[1] Pers Comms: Angelica Dengo, MoF

And the following data were provided for non EU companies:

Name of country and company	Years of current agreement / licences	Target species groups, stocks or species	Gear type / fleet sector	Annual non-EU DWF catch (tonnes) within your EEZ	Proportion of the non-EU DWF catch landed at ports in your coastal state
Japan Transea Shipping	2000-2009	Tuna	Purse Seine	23575t	0
Japan Japan Tuna	2000-2009	Tuna	Purse Seine	18153t	0
Taiwan Great Wall	2005	Tuna	Purse Seine	29280t	0

For **shrimp**, private license agreements have not been established in recent years but it is worth noting the presence of Pescamar in Mozambique and the establishment of the joint venture between Mozambique and Pescanova that was a result of the 1987 fisheries agreement[1] and a previous bilateral agreement with Spain. There are a number of direct licensing schemes and joint venture companies with Japanese, Spanish, Portuguese and South African fishing firms but names and numbers were not provided by MoF. However, from other sources it is know that 70% of the production is coming from two major commercial companies, PESCAMAR and EFRIPEL. The catch is frozen directly on board before being exported to Japan and the European Union. Well equipped foreign shrimp fleets are still very active in Mozambique's waters. About 187 industrial vessels including 72 foreign vessels for tuna fisheries are operating in the industrial fisheries[2].

The Mozambican side is represented in the joint venture companies by the holding company Emopesca. The value of Emopesca has been estimated to be in the range of 100 mill US$ based on data from the early 90'ies. Recently Emopesca has reduced its holding of shares in the largest operator, Pescamar, from 49% to less than 30%. It has however been difficult to find information on how this reduction came about and to what price the shares were transferred to the other shareholder, Pescanova. A similar transaction may take place in the other major joint venture company, Efripel, assuming this to reflect a new Mozambican policy in the joint venture cooperation[3]. Key figures (in USD) of the largest Mozambican fishing companies are given in Annex 7.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

There have been three fisheries agreements between Mozambique and the EU, the first of which entered into force on 1 January 1987. This was subsequently renewed twice, but each time with a different protocol, changing some of the technical conditions, including the fishing opportunities made available. The second renewal expired at the end of September 1993. There was then a space of 10 years with no agreement, the

[1] MRAG: Comparative Study of the Impact of Fisheries Partnership Agreements, Technical Report. 2007
[2] INFOSA 2007 - http://www.infosa.org.na/dloads/restrict/country%20profile/Mozambique.pdf
[3] Arne Eide 2004: An Economic Analysis of Natural Resources Sustainability in Mozambique Fisheries http://archive.povertyenvironment.net/?q=filestore2/download/2043/Moz%20fisheries.pdf

second agreement only coming into force on 1 January 2004 and lasting three years. The third, a FPA, entered into force in January 2007. The principle difference between the three agreements (and their protocols) is in the fishing opportunities that each made available to EU fishers and the financial contribution:

- The **1987 Agreement on Fisheries Relations** and its first protocol (1987-9) allowed for 40 tuna vessels (with no differentiation between longliners and purse seiners), an annual average of 3700 GRT/month of capacity (equivalent to about 15-18 vessels) in the shallow water shrimp fishery and 1100 GRT/month of capacity (equivalent to 3-4 vessels) in the deepwater shrimp fishery. Financial contribution: 2.5m€/yr (2.3m€ compensation, 0.2m€ targeted actions)
- The **second protocol (1990-1)** increased the opportunities for tuna vessels to 44, without change to the opportunities for shrimp vessels. Financial contribution: 3.425m€/yr (2.15m€ compensation, 1.275m€ targeted actions)
- The **third protocol (1992-3)** reduced the opportunities for tuna vessels to 42 and withdrew all shrimp opportunities for both shallow and deep water. Financial contribution: 0.275m€/yr15 (0.172m€ compensation, 0.103m€ targeted actions)
- The **2004 Fisheries Agreement** established opportunities for 49 tuna vessels (35 seines + 14 longliners) and 10 deepwater shrimp vessels. Financial contribution: 4.09m€/yr (4.09m€ targeted actions)
- The **2007 Fisheries Partnership Agreement** reverted again to only tuna, but increasing the number of opportunities to 89 vessels (44 seiners + 45 longliners). Financial contribution: 0.9m€/yr (0.65m€ compensation, 0.25m€ targeted actions)

The most fundamental change in the evolution of the protocols was the withdrawal in 1992 protocol of shallow water shrimp opportunities, after Mozambique passed a new fisheries law (3/90) which set aside the shallow water shrimp fishery for exploitation by national individuals or companies.

The details of the opportunities and compensations are set out in Annex III.

Execution of agreements[4]

Very few details are available regarding the execution of the first agreement and protocols (1987-93), although it can reasonably be assumed that the uptake of shallow water shrimp opportunities (1987-91) would have been high. The execution of the agreement would have been influenced by the establishment of joint venture companies in the shallow water shrimp sector (notably Pescamar, a JV between Mozambique and Pescanova of Spain and Efripel, a JV with Taiwo of Japan). Pescamar has existed in Mozambique since 1980 and it would have been in the interest of both the company and the State to strengthen the position of Pescmar and other JVs in the sector rather than rely on a fisheries agreement for full exploitation of the resource. By 1990 Mozambique had tabled a new fisheries law (3/90) which included a specific clause setting aside the shallow water shrimp fishery for national exploitation only. As a result of this the third protocol to the agreement included no shallow water opportunities and Mozambique proposed that national companies should charter EU vessels in order to carry on fishing, but the EU did not agree. The agreement was then terminated in 1992[5], before it had run its course. Following the withdrawal of shallow water shrimp opportunities, it became

[4] Source: Economic and Social Impacts of the Mozambique / EU Fisheries Agreements, 2008, Kusi Limitada - Consultores

[5] MRAG: Comparative Study of the Impact of FPAs, Technical Report. 2007

important to establish national capacity to exploit the resource and the Fisheries Law now allowed the leasing (*afreitamento*) of vessels, which become common amongst smaller quota holders in the fishery. Meanwhile the larger companies continued to invest to maintain and expand capacity. Of note is the 6m€ loan for the renewal of Pescamar's fleet made by the European Investment Bank in 1994, sponsored by the Government of Mozambique[6].

The second and third agreements with the EU were quite different in nature not only from the first agreement (set out more than 15 years earlier) but also from each other. The 2004 agreement followed the pattern of the later Fisheries Agreements, whereas the 2007 agreement is a FPA. In addition to the change in the typology of the agreements, the 2004 agreement created fishing opportunities in the tuna and deepwater shrimp sectors, whereas the 2007 agreement only allows for tuna fishing.

For the 2007/11 agreement, the opportunities in the tuna segment were increased by 25% for seiners and tripled for longliners. This appears to be a direct consequence of the inclusion of an exclusivity clause in FPA, forbidding EU vessels intending to fish in the waters of a third country with an FPA with the European Community to enter into direct agreements outside of the FPA. Mozambique has long standing contracts with the European Tuna Associations (Anabac and Opagac) and issued private licenses in addition to those under the 2004 FA[7].

Financial contribution & licensing

The revenues from the financial contribution and licensing are important to the Mozambican Fisheries Agreements as they are the only economic benefits that the country gains through the agreement. The financial contribution under the 2004 agreement was unusual in that the total payment was allocated against targeted actions. Under these conditions, the agreement pre-defined how the base contribution was to be spent and any variations had to be previously agreed with the Commission. In the 2007 partnership agreement, the Government of Mozambique has gained much greater autonomy in the application of the financial contribution. Part of the payment (72%) is set against access and not subject to control via the agreement, whilst the balance is for "objectives identified by common accord in the context of the sectoral fisheries policy".

The level of compensation in the 2004 agreement is extraordinarily high in the context of the value of reference catches (especially in the deepwater shrimp sector), and even higher still considering that there was no uptake of opportunities in the deepwater shrimp sector.[8]

For the 2004/6 protocol, the level of rent in the deepwater shrimp sector was extremely high, and marginally exceeded of the value of the reference catch. High tuna catches in 2004 kept the overall rent at 47%, a little above the overall rent foreseen in the protocol. However in 2005 low declared tuna catches and no uptake of deepwater shrimp opportunities implied that Mozambique received a rent almost 2 ½ the value of the catch. The conditions set out in the 2007/11 protocol imply a rent of about 14% of value based on the reference catches which is considered reasonable.

[6] European Investment Bank Projects http://www.eib.org/projects/loans/sectors/agriculture/loan.htm?id=3301216
[7] MRAG: Comparative Study of the Impact of FPAs, Technical Report. 2007), a practise that is now not permissible
[8] Economic and Social Impacts of the Mozambique / EU Fisheries Agreements, 2008, Kusi Limitada - Consultores

Reporting
Reporting is a key aspect of compliance within the fisheries agreement and has a direct implication for resource management, compensation payments and transparency. Reporting obligations in the 2004 and 2007 agreements as well as the present FPA cover entry and exit, catch and position information. According to the MoF there has been very limited compliance with any of the reporting obligations from the EU fleet. Catch reports should have been communicated directly to the Ministry, but appear to have been communicated to member states, then the Commission / Delegation and finally to the Ministry. It is interesting to note that this constitute infractions under the terms of the agreement and could have resulted in license suspension. The Ministry has however not taken such measures to ensure compliance with the agreement.

An ex-ante evaluation was conducted prior to the current FPA with Mozambique and representatives of MoF participated in the evaluation. MoF has not made this evaluation public (not due to any confidentiality issues), nor could it be found on the EU website http://ec.europa.eu. It is unknown if the evaluation was made available to EU Member States who operate vessels within the Mozambican EEZ. The MoF was satisfied with the the availability and transparency of information provided by the Commission during the negotiation phase of the FPA.

A Joint Committee (JC) responsible for monitoring the FPA exists and meets annually to monitor the implementation of the agreement, reassess fishing opportunities and to monitor the implementation of partnership actions. The MoF represents Mozambique on the Joint Committee[9]. The last meeting was in 2009 and was attended by both the EU and Mozambique. Both the performance and the effectiveness of the JC were rated as satisfactory by the MoF[10].

Resource management aspects[11]
The 2004 agreement is clear that although the level of fishing opportunities made available under the protocol may be reassessed by the Joint Committee[12], the protocol makes it clear that the review will be the competence of Mozambican authorities[13]. It is therefore not considered that the agreement takes away any dominion of Mozambique over its own resources.

Deepwater shrimp resources in Mozambique are estimated to have a potential yield of 3,500t/yr whilst current levels of exploitation are around 1,000-1,800t/yr. The attribution of a reference catch of 1000t to the EU via the 2004 agreement is therefore in keeping with UNCLOS Article 62.

Resource management in the *tuna* sector does not effectively fall under the dominion of Mozambique per se, although there are principles which should be followed in order to avoid contributing to unsustainable fishing practices. The highly migratory nature of the target species of seiners and longliners (tuna, swordfish and sharks) makes it in practise impossible for anyone State to effectively manage the resource, both in terms of scientific research and catch or effort management.

[9] Angelica Dengo, Chief Department of International Cooperation, adengo@mozpesca.gov.mz
[10] Pers Comms: Lizete de Sousa and Claudia Thomas, MoF
[11] Pers Comms: Joaquim Tenreiro de Almeida, Fisheries consultant (previously PS of the MoF)
[12] Article 11, §4 of the Agreement
[13] Article 4 of the Protocol

In the case of the Indian Ocean this responsibility falls to the Indian Ocean Tuna Commission (IOTC) which coordinates scientific research, publishes stock analysis & recommendations and retains a list of vessels authorised to fish in the area. This list is the basis for regional effort management. The EU is a member of the IOTC and thus any vessel fishing under an agreement will have to be already on the IOTC's list of authorised vessels and therefore within the current allowance for regional effort.

It is important to note that unlike all of its immediate neighbours, Mozambique is neither a member of the IOTC nor cooperating party and is therefore not obliged only to license IOTC authorised vessels. In this respect the agreement has indirectly improved tuna resource management, especially since 2007 whereby it became impossible for Mozambique to license EU vessels by private agreement (outside of the FPA). Whilst the country remains outside of IOTC membership, Mozambique continues to have the ability to licence vessels in excess of the IOTC's approved list (thus undermining regional resource management) as well as license vessels considered illegal by IOTC[14], although they have committed not to do this through the SADC Statement of Commitment on IUU fishing.[15]

Observers are a key tool for biological monitoring of catches as well as to ensure compliance. The 2007 agreement introduces a new clause that observers taken on board shall be appointed by the IOTC[16]. This is somewhat strange considering that Mozambique is not bound by any IOTC resolution and that IOTC observers would not have any legal powers over the vessel whilst in Mozambican waters, unless the IOTC appoints observers from the Ministry of Fisheries. The agreement therefore opens up the possibility that there will only be biological observation, and no onboard compliance monitoring. The ex-post evaluation of the 2004 agreement concluded that the continued absence of an effective observer programme contributed to the "limited" impact of the agreement on improved Monitoring, Control and Surveillance (MCS)[17].

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Does not apply

5. FISHING ADMINISTRATION

Mozambique

Mozambique's economy has been devastated by decades of conflict. Its high growth rate over the last decade has been from a very low base, and has been greatly dependent on capital-intensive investment by the private sector, and on the strong South African economy. Neither of these influences has favoured smaller businesses, or the central and northern regions, raising concerns about the distribution of wealth. Problems with governance – corruption, legislation and revenue collection in particular – have also inhibited economic development. The government has initiated widespread reforms to

[14] Source: Economic and Social Impacts of the Mozambique / EU Fisheries Agreements, 2008, Kusi Limitada - Consultores
[15] Source: Stop Illegal Fishing website – www.stopillegalfishing.com
[16] Annex to the Protocol, Chapter 7, §1
[17] MRAG: Comparative Study of the Impact of Fisheries Partnership Agreements, Technical Report. 2007

alleviate this, particularly in banking, the management of public finance and the collection of customs dues[18].

National Fisheries Administration

The administration of Mozambican fishing is a system ordered in political, economic, scientific, social and technical terms, expressed in legislation and other regulatory instruments, made operational by a series of institutions formed by the MoF and the respective local (provincial and district) fisheries bodies, and also the central institutions it supervises and their respective local delegations.

The system includes the following integrated sub-systems, namely, *policy making*, *fisheries management*, *promotion of development*, and *production and services* exercised by the state or with state participation.
The main responsibilities of the MoF, as a *political body,* concern the establishment of fisheries development policies and strategies, implementing them through development plans, as well as coordinating implementation through guidance and control of the performance of the various sub-systems and the creation of a business environment favourable to the operators and to new investors.

The *fisheries management* sub-system consists of the following institutions:

- *National Institute of Fisheries Research* (IIP), whose task is to look after the sustainability of resources;
- *National Directorate of Fisheries Administration* (DNAP) which is still an integral part of the MF and whose objective is to monitor, licence and supervise fishing activity,
- *National Institute of Fish Inspection* (INIP), the objective of which is to ensure that the quality of fisheries produce, exported or imported for domestic consumption, is in accordance with the health conditions stipulated in Mozambican legislation and in international provisions.

For its part, the *fisheries development promotion sub-system* consists of the following institutions:

- *National Institute for the Development of Small Scale Fisheries* (IDPPE), which seeks to promote the development of small scale fishing, with particular attention to reducing levels of poverty and promoting the well-being of communities of artisanal fishermen;
- *National Institute for the Development of Aquaculture* (INAQUA), which has the objective of promoting aquaculture;
- *Fisheries Promotion Fund* (FFP), the objective of which is to manage the financial resources intended for public investment in the sector and to grant loans intended for development; and
- *Fisheries School* (EP), which provides basic and mid-level specialist training required for the development of the sector, as well short duration training courses.

Finally, the *production and services sub-system* is gradually disappearing. In the past it consisted of state and mixed companies. Practically all that remains is state holdings in mixed shrimp fishing companies, notably Pescamar.

[18] FCO, UK - http://www.fco.gov.uk/en/travel-and-living-abroad/travel-advice-by-country/country-profile/sub-saharan-africa/mozambique/?profile=economy

Local Fisheries Administration
The Fisheries administration has a local presence, in the provinces and districts. The administration of artisanal fishing, as regards issuing and charging for fishing licences, supervision, and collecting fines, has been in the power of the district administrator since 1 October 2006. At levels lower than the district (administrative post and locality) any powers in terms of fisheries administration are exercised by delegation of powers by the district administrator.

The administration of semi-industrial and industrial fishing is exercised by the provincial fisheries administration body, currently integrated into the Provincial Fisheries Directorate (DPP).

By attribution of the MoF, and in coordination with the administration of the respective districts, the community fishing councils (CCPs) may exercise some of the attributes that flow from the powers granted to the district administrator.

The central fisheries administration institutions, such as the IDPPE, FFP and IIP, possess provincial delegations and the first named is also represented in some districts and even down to a series of some localities.

Data source for establishment of management measures
Source of data for management measures is scarce and mostly based upon advice from internal research (which is limited and hampered by lack of resources), advice from RFMO's and FMO's such as IOTC and SWIOFC, advice from NGO's when justified, feedback from MCS organisation and consultation with the fishing industry etc[19].

There is no observer programme presently running in Mozambique[20].

6. LIST OF IMPORTANT STOCKS

The most important industrial and semi industrial stocks are listed below with catch volumes (tonnes) and landed value ('000 USD) for 2005 and 2006[21].

	Tonnes		USD '000	
	2005	**2006**	**2005**	**2006**
Lobster	1	8	11	88
Crab	158	107	474	321
Deep water shrimp	1,774	1,803	8,870	9,015
Fish	660	665	1,650	1,663
Shallow water Shrimp	8,520	7,393	68,160	59,144
Nephrops	149	94	1,490	940
Cephalopods	165	114	413	285
Kapenta	12,991	16,017	15,589	19,220
Bycatch	1,830	1,725	915	863
Total	**26,248**	**27,926**	**97,572**	**91,539**
Tuna	5,396	6,691	10,792	13,382

The important stocks in terms of EU interests and this study will be limited to tuna, deep water shrimp and shallow water shrimp. Tuna is presently the targeted species under the present FPA. Deep water shrimp and shallow water shrimp is mainly

[19] Pers Comms: Lizete de Sousa and Claudia Thomas, MoF
[20] Pers Comms: Lizete de Sousa and Claudia Thomas, MoF
[21] MoF, Relatório do Balanço do PES 2006

exported[22] to the European market and several EU operators are active in the fishery as partners in a JV.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

There was very little focus on PET species in the MoF. There is awareness in terms of bycatch of turtles as well as certain red list shark species possibly being targeted as well as being caught as by-catch. This is not presently a priority in terms of either research or fisheries management in Mozambique. There are however indications that bycatch of turtles in the shallow water prawn fishery could be as large as 3-4,000 tonnes per year[23]. Particularly interesting species present in Mozambique waters listed on the Red[24] [25] species list or CITES[26] are:

- **Whale Shark** - These species are mainly entangled in the nets of artisanal fishermen.
- **Dugong** - The main contemporary threat is entanglement in inshore artisanal gill and shark nets. Other fishing gears such as seine nets and fence traps pose a lesser threat.
- **Green and loggerhead sea turtles** - These species include the green, hawksbill, loggerhead, olive ridley and leatherback turtles.

A full list of PET species in Mozambican waters is listed in Annex 1.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

The knowledge of research collaboration in Mozambique is fragmented. There are however several initiatives that are contributing to research. The total value of these *projects under way* is about 83.5 million USD, distributed among artisanal fisheries (five, representing about 71% of that sum), aquaculture (three, almost 1%), inspection and quality control of fisheries produce (three, almost 3%), port infrastructures (two, 24%) and public fisheries administration (two, almost 2%)[27].

The following collaborations and projects are important in this context:

- The ***Sofala Bank Artisanal Fishing Project*** (PPABAS), with a value of almost 18 million USD, co-financed by IFAD, Norway, BSF and the Government, which took place over six years in the period 2002-08 and which has an extension to 2011. It covers actions of fishing development (research, fishing gear, processing), development of markets and access route, strengthening of financial services, community development (education, health, water, associations, co-management), and institutional support, policy formulation and legislation;
- The ***Cabo Delgado and Northern Nampula Artisanal Fishing Project*** (PPCDNN), with a value of 23.3 million USD, co-financed by the ADB and the Government, running in the six year period 2003-09. It covers provision of credit, development of community infrastructures and institutional support;

[22] See annex 5 for details of export commodities
[23] Pers Comms: Lizete de Sousa and Claudia Thomas, MoF
[24] www.redlist.org
[25] http://www.greenpeace.org/international/seafood/red-list-of-species
[26] http://eame.wiomsa.org/keyspecies.html and http://www.opwall.com
[27] Assistance to the Fisheries Sector of Mozambique, Ministry of Fisheries, September 2009

- The ***Inhambane and Gaza Coastal Fishing Development Project,*** with a value of 4.4 million USD, co-financed by Italy and the Government, running for the three year period 2008-10. It covers the improvement of infrastructures and access to support services, processing and marketing, training and strengthening of community organisations;
- The project for ***Poverty Reduction through Fisheries in Mocímboa da Praia***, with a value of almost 600,000 USD, co-financed by Canada and the Government, running for the five year period 2005-10. It covers the strengthening of local capacity, institutional support, the introduction of sustainable fishing practices, processing, environmental protection and gender equity;
- The *IDPPE* ***Support and Institutional Capacity Building Project,*** with a value of almost 600,000 USD, co-financed by Ireland and the Government, running in the period 2007-10;
- The ***Marine Sciences Human Resources Development Projects***, with a value of 114,000 USD, co-financed by Canada (CIDA) and the Government, taking place between 2007 and 2012. It covers training in MSc. and institutional and community capacity building;
- The project to ***Support the Fisheries Produce Inspection System in Mozambique***, with the value of 2 million USD, co-financed by the United Kingdom (DFID) and the Government, which is taking place between 2007 and 2010. It covers improvements to laboratories, the building of residences for inspectors in the provinces and training;
- The project on ***Institutional Capacity Building and Acquisition of Laboratory Equipment***, with the value of 137,000 USD, co-financed by UNDP, USAID, EC and the Government, is taking place in 2008 and 2009. It covers the supply of laboratory equipment and equipment for monitoring heavy metals;
- The project on ***Strengthening Capacities for Improved Quality Control of Fisheries Produce*** *(traceability of products of small scale fishing)*, with the value of 210,000 USD, co-financed by Spain, EC and the Government, is taking place in 2008 and 2009. It covers technical assistance for the diagnosis and validation of control procedures, training of inspectors, technical staff and extensionists, and training of semi-industrial and artisanal operators;
- The ***Beira Fishing Port Rehabilitation Project,*** with the value of 19.7 million USD, co-financed by BADEA, BID and the Government, which is being undertaken over the four and a half year period between 2004 and 2009. It cover the rehabilitation of quay number 1 and the processing room, repair of the cold stores, construction of support infrastructures, dredging and the supply of equipment;
- The project to ***Rehabilitate the Workshops of the Maputo Fishing Port***, with the value of 196,000 USD, co-financed by Japan (OFCF) and the Government, which is taking place in 2008 and 2009. It covers maintenance, the supply of spare parts and technical assistance;
- The ***Cahora Bassa Research, Monitoring and Fisheries Development Project***, with the value of 485,000 USD, co-financed by Iceland (ICEIDA) and the Government, which is taking place over the four year period between 2007 and 2010. It covers building the IIP delegation, training (MSc and PhD), research and monitoring of the semi-industrial and artisanal fisheries, and the development of fisheries strategies and management plans;

- The ***Fisheries of the South-West Indian Ocean*** *(Mozambique)*, with the value of 826,000 USD, co-financed by the GEF (under the Fisheries in the Southwest Indian Ocean project, which has a total value of 22.7 million USD, covering eight beneficiary countries: the Comoros, Kenya, Madagascar, Mauritius, Mozambique, South Africa and Tanzania) and the Government, which is being undertaken over the five years between 2008 and 2012. It covers information surveys, data conservation and information technology, assessment and sustainable use of crustaceans, assessment and sustainable use of demersal fish, assessment and sustainable use of pelagic fish, inclusion of biodiversity in national and regional fisheries management, and the strengthening of national and regional fisheries management.

In addition to these projects, the following projects are awaiting the *approval or signing* of the respective agreements (September 2009):

- The project on the ***Development of Maputo Coastal Resources Fishing***, with the value of 1.9 million USD, co-financed by Japan (JSDF) and the Government. It covers community and institutional capacity building, formulation of resource management plans and adaptation to climate change;
- The project on ***Strengthening the Health Conditions of Fisheries Produce in the ACP Countries***, co-financed by the EC and the Government, yet to be approved.

The table in Annex 2 lists projects under negotiation that may contribute towards research in the future.

9. DATA COLLECTION

9.1 BIOLOGICAL

The data on the catch of the industrial and semi-industrial fisheries are collected using a logbook system while a systematic and functional landings monitoring system is used for artisanal fisheries.

Information within the industrial shrimp fishery is generally well documented and port-based. There are concerns about the level of precision. Basic catch statistics is hard to access in comprehensive data bases and the uncertainty regarding statistical information is read from the discrepancies between catch values provided by different sources and public offices.[28]

The artisanal fisheries monitoring system is based on stratified random sampling with landing sites having similar features grouped into strata. Catch recorders are residents of the fishing community that are trained for the purpose and act in teams of one sampler and one assistant. The system now covers almost the entire coastline (all coastal districts) as well as some inland areas. Catch, effort, CPUE, species composition and length frequencies of the most important species are collected. The analysed results are provided to public as well as private entities, and used for stock assessment and advice for management measures.

[28] Arne Eide 2004: An Economic Analysis of Natural Resources Sustainability in Mozambique Fisheries http://archive.povertyenvironment.net/?q=filestore2/download/2043/Moz%20fisheries.pdf

While fisheries data is fairly reliable it does not adequately include some fisheries (such as the crab fishery). However, currently all coastal provinces are being covered by sampling at port. Mozambique has significant fisheries for short-lived, abundant species (eg small pelagic) that have very variable and sometimes large catches. These present particular technical difficulties to the level of enumerator coverage in a stratified sampling scheme. Enumerators are residents of coastal villages that are identified, trained and paid allowances by IIP. The monitoring system is costly and ways are being examined to ensure continued funding.

Catch statistics exist in several mutually contradictory versions. This applies to most of the key fisheries even though some improvements have been achieved when it comes to collecting catch information from the artisanal sub-sector. There is a strong need to systematise and standardise catch statistics in all sub-sectors[29].

The main constraints of data collection and research are related to expense, limited financial resources, difficulty in covering all the required landing sites, and limited stock assessment experience. There is an urgent need of improving the quality and accessibility of essential data on fisheries and related activities. There is also a need identified for observer programmes to validate the data that was provided by fishing companies. There is also a need to standardize the species, gears, and vessels regionally according to FAO accepted codes and criteria to enhance regional participation and cooperation within research.

Data collected by the MoF[30]:

Tuna:

- No landing data is collected as catches are landed outside of Mozambique;
- Catch, position and date information is provided by a limited number of vessels to the MoF. This information comes from the EC delegation in Mozambique or via the vessel or company agent, it is however not reported in a systematic manner;
- The MoF reported that they shared 'some' data with the IOTC – but this was both limited and it was not clear what information was shared; and
- Many issues are related to the tuna fishery – e.g. lack of data, Mozambique is not a member of IOTC which further limits access to data, lack of research capacity, no observer programme etc.

Shrimp:

- Catch data at landing points such as length, weight, sex and maturity is collected routinely every month by provincial fishery personnel;
- Vessel logbook data is collected by the MoF more irregularly and quality of data questionable both in terms of catch and particularly bycatch;
- Annual survey conducted by IIP together with the industry once a year (normally beginning of the year);
- No data is shared with other countries as this is a national fishery; and

[29] SWIOFC 2007-First Working Party on Fisheries Data and Statistics ftp://ftp.fao.org/docrep/fao/010/a1511e/a1511e00.pdf

[30] Pers Comms: Lizete de Sousa and Claudia Thomas, MoF

- Issues are many – mostly related to limited access to resources and funds which limits routine data collection.

9.2 ENVIRONMENTAL

No environmental data is collected by the MoF. There are intentions to establish an environmental section within IIP in the near future but lack of resources and funds has delayed this development. The issues are again related to procurement of equipment (e.g. a small vessel purpose made to collect basic environmental data).

9.3 ECOSYSTEM

No ecosystem research is done by the MoF. Certain programmes such as the Large Marine Ecosystem[31] (LME) under GEF[32] are doing research on ecosystems but very limited knowledge of these programmes were present within the Ministry of Fisheries. The issues related to ecosystem research are therefore huge as it is a discipline to be developed from the beginning.

9.4 SOCIO-ECONOMIC

IDPPE is responsible for socio-economic data collection and research within the fishing communities in Mozambique. They mainly focus on the artisanal fisheries. Data is collected regularly on fishing technology (equipment), fisheries resources (catch/environment), and postharvest technology and marketing. Again issues are related to HR capacity, resources and funds available to conduct surveys as well as regular data collection.

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Biological Research
The main research related to fisheries undertaken so far include:

- shallow and deep water shrimp (*penaeidae*) and its bycatch
- estuarine and coastal fisheries
- line and recreational fishing
- freshwater fisheries (Kapenta)
- shrimp culture

Specifically in relation to tuna and shrimp the following information was provided:

Tuna
No biological research. Mozambique is not a member of IOTC which further limits the potential cooperation and collaboration the country could have benefitted from in terms of research conducted on the tuna stocks of the Western Indian Ocean. The tuna fishery in the Mozambique Channel is a seasonal operation and has to be considered in the frame of the Indian Ocean fishery.

[31] LME - http://www.undp.org/gef/portfolio
[32] GEF - http://www.gefweb.org

Shrimp
Most biological research is related to length/frequency analysis which is used 'sometimes' for virtual population analysis.

Gaps are large and include HR development, limited resources and funds to conduct research as well as poor laboratory conditions.

Environmental Research
No environmental research is presently being conducted by the MoF. Other departments (such as the department of oceanography under the Ministry of Environment) do some limited research but there is no collaboration with MoF. Main issues and gaps in relation to environmental research are HR development, resources and dedicated facilities to conduct research. Individual researchers participate in certain international forum and regional projects but most of this participation and collaboration was described as discussion groups more than actual research initiatives.

Ecosystem Research
No ecosystem research is presently being conducted by the MoF. Gaps and issues are therefore the same as for environmental research. Individual researchers participate in certain international forum and regional projects but most of this participation and collaboration was described as discussion groups more than actual research initiatives.

Socio-Economic Research
The MoF are conducting socio-economic research through IDPPE. This research is limited to the artisanal fisheries sector and focuses on improvement of living standards for the poorest segment of the fishing sector. It relates to improvement of fishing practises, improved post harvest production, fish consumption and cross cutting issues such as gender, HIV/AIDS within the fishing communities. Gaps and issues within socio-economic research are related to limited resources and funds to conduct this type of research more extensively.

10.2 RESEARCH FUNDING
See above

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

Most biological research is related to length/frequency analysis and some of this data is used for virtual population analysis in relation to the Shrimp. But no stock assessment takes place for the tuna within Mozambique.

The previously used database to store and process data is out of order and there is a need to implement a new and modern system that can assist with running assessment models.

10.4 ASSESSMENT FUNDING

General knowledge about which funding is used for what purpose was very limited within the consulted people within MoF.

The largest external funding to the fisheries sector is coming from the Norway and ICEIDA Fisheries Sector Assistance Programme. In short, the components the programme addresses are: policy, fisheries management, promotion of the development of the production of fisheries produced for consumption and cross-cutting issues such as gender, HIV/AIDS, governance and environment. The total resources envisaged for this programme phase II (2009-2014) are estimated at 26.5 million USD of which 22.5 million USD is financed by Norway and 4.0 million USD by ICEIDA. The resources to be funded by the Mozambican government have still to be determined. However, it is expected that the value identified before the present Programme was formulated (around 1.2 million USD) will be increased[33].

Other important funding sources are EU (FPA) contributing 900,000 Euro per year. Partnership for African Fisheries (www.africanfisheries.org) through the Stop Illegal Fishing Programme (www.stopillegalfishing.com) will contribute more than 200,000 USD in 2010 towards issues of Illegal, Unreported and Unregulated (IUU) fishing[34].

The EU ACP FISH II project has a regional base in Mozambique but it is uncertain how much Mozambique will benefit from this project[35].

Mozambique has also just been approved for a WB/GEF Regional Strategic Partnership for a Sustainable Fisheries Investment Fund (http://www.gefonline.org/projectDetails.cfm?projID=2093) in the LMEs of Sub-Saharan Africa project via the African Union (AU). This programme represent about US$75 Million over ten years although it is uncertain what this funding will contribute towards within Mozambique at the time of writing. The project objectives are to: promote governance reforms and sector adjustments for sustainable management of fisheries; assist individual coastal countries to build the capacity to implement management measures for sustainable fisheries; promote information exchange and capacity building at the regional level; and encourage direct financial support to the fisheries sector to meet the sustainable development objectives in fisheries that would contribute to reduction in poverty[36].

A range of other projects and initiatives with a certain funding attached to them are described in section 7.

PROJECTS

Other initiatives addressing issues of marine biological, environmental, eco-system and socioeconomic data collection and research are listed below, but during consultations in Mozambique it appeared that few people had good knowledge of these projects:
The South West Indian Ocean Fisheries Project, (http://www.swiofp.net/) the SWIOFP is an ambitious multinational research project with an overall goal that will see the West Indian Ocean's marine resources ecologically managed for sustainable use and benefit by the region's riparian countries. The project forms part of the Large Marine Ecosystem Programme approach (LME) and is supported by the Global Environment Facility (GEF) as a contribution to its international waters programme. The aim is to facilitate that the Western Indian Ocean countries will work together to

[33] Pers Comms: Britt Fisknes, NORAD
[34] Pers Comms: Sandy Davies, SIF
[35] Pers Comms: Philippe Cacaud, EU ACP Fish II Project
[36] Pers Comms: Peter Flewwelling, Adviser MoF

understand and management better their fisheries through an LME and Ecosystem Based Approach

The WIOFish database, (http://www.wiofish.org) which is designed to increase the understanding of the small-scale traditional fisheries of the western Indian Ocean by providing holistic descriptions of the fisheries including attributes such as catch composition, vessels and gear used, habitats within which the fisheries operates, management strategies and socio-economics. The main objective of the WIO Fisheries Database is to provide a better understanding of biological and socio-economic aspects of fisheries in the WIO region, including lesser known "non-traditional" species.

The AMESD programme, (http://www.amesd.org) is developed to provide operational services using earth observation data (satellite imagery) for the management of fishery resources, the monitoring of fishing activities and the ocean observation (to assess climate change). It will improve the regional access to satellite Earth and Ocean Observation data through the installation of AMESD satellite thematic receiving stations and the dissemination of products and services. It aims to strengthen the capacities of MOI and regional technical partners in the processing and analysis of spatial observation data coming from earth observation satellites. These activities will be undertaken by the Mauritius Oceanography Institute (MOI) in collaboration with several regional partners: fisheries Ministries and "Fisheries Monitoring centres" of Madagascar, Mauritius and Comoros; fisheries research institutes from Seychelles, Mozambique, Kenya, Tanzania, etc.

The Ocean Data and Information Network for Africa, (ODINAFRICA-IV) (http://www.odinafrica.net/), which will be implemented in the period 2009 – 2013 commenced in August 2009. ODINAFRICA-IV will promote the sustainable management of marine and coastal resources, as well as reducing the risks of ocean related hazards, based on sound scientific knowledge. The primary objectives are: expanding and strengthening the network of marine scientists and institutions in the region to foster the sharing of data and information; developing high quality products and tools to support decision-making, management and conservation of the marine and coastal environment; promoting the use of products and services developed by the project to all stakeholders; and fostering active south-south, intra-Africa, north-south and Africa-Flemish collaboration for marine training, research and technology transfer.

ASCLME Project, (http://www.asclme.org) is a five-year project covering the Agulhas and Somali Current Large Marine Ecosystems (ASCLME). It is centred on the two large marine ecosystems (LMEs) of the western Indian Ocean region. These are the Somali Current LME – which extends from the Comoros Islands and the northern tip of Madagascar up to the horn of Africa – and the Agulhas Current LME which stretches from the northern end of the Mozambique Channel to Cape Agulhas.
The ASCLME project is funded by the Global Environment Facility (GEF) and implemented by the United Nations Development Programme (UNDP). The goal of the ASCLME project is to ensure the long-term sustainability of the living resources of the ASCLME region by introducing an ecosystem-based approach to management. The overall project objectives are: to acquire sufficient baseline data to support an ecosystem-based approach to the management of the Agulhas and Somali Current LMEs; and to produce a Transboundary Diagnostic Analysis (TDA) and Strategic Action Plan for both the Agulhas Current and Somali Current LMEs.

The EAF-Nansen Project, (http://www.eaf-nansen.org/nansen) "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries" is an initiative to support the implementation of the ecosystem approach in the management of marine fisheries. The aim is to promote sustainable utilization of marine living resources and improved protection of the marine environment. Notionally, the project started in December 2006 but substantively from early 2008 and has a five-year time frame. The project is executed by FAO in close collaboration with the Institute of Marine Research (IMR) of Bergen, Norway and funded by the Norwegian Agency for Development Cooperation (Norad). The EAF-Nansen Project is set to strengthen regional and country specific efforts to reduce poverty and create conditions to assist in the achievement of food security through development of sustainable fisheries management regimes and specifically through the application of the ecosystem approach to fisheries in a number of developing countries. The initial focus of the project is on Sub-Saharan Africa.

The project is a means to achieve the Millennium Development Goal (MDG) related to eradication of poverty and hunger while simultaneously ensuring environmental sustainability.

Eyes on the Horizon, (http://www.eoth.org) is an initiative of the EU-SADC MCS project and Mozambique Ministry of Fisheries, developed in collaboration with the tourism industry to help combat IUU fishing, operationally set up in 2003. EOTH operates in full collaboration with the Inhaca Association, ANAII. Also, as part of the programme, ANAII/EOTH promotes education and awareness within local communities regarding the importance of conservation and sustainable fishing methods to secure the wellbeing of present and future generations. The organisation also collects data on turtles, sharks, rays and potato cod captured along the Mozambican coast line.

Ocean Research, (http://www.oceans-research.com) through their Ponta Mamoli brogramme is recording observations on bull shark, whale shark and humpback whale ecology, as well as, conducting long-term reef monitoring surveys.

Chennels Volunteer Projects, (http://www.chennellsvolunteerprojects.com/pages/813/mozambique), Monitor whale shark numbers and behaviour, loggerhead turtle nesting activity and coral reef condition in order to make recommendations for improving the conservation of marine biodiversity.

African Impact, (www.africanimpact.com), volunteer in Mozambique on the Whale Shark Marine Conservation Project and help with hands-on whale shark research, coral reef monitoring, humpbacked whale monitoring and turtle nest surveys, as well as, explore one of Africa's best scuba diving destinations

WWF Mozambique, (www.wwf.org.mz), WWF MCO: Marine Program: The overall objective of this program will ensure the conservation of biodiversity and biological processes in the major coastal marine systems in Mozambique, whilst also ensuring that the management and equitable use of local marine resources

Dolphin Care, (www.dolphincare.org), they perform long term studies on the resident dolphins, by mammal monitoring, photographic fin identification, providing education and a research center, as well as turtle monitoring and whale shark data collection.

Frontier, www.frontier.ac.uk, the key aim of this project is to monitor whale shark numbers and behaviour, along with loggerhead turtle nesting activity and coral reef condition, with the long term view of developing a strategy for the future coastal zone management.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

The dissemination of research results are mostly done through local research documents, seminars and consultative meetings. Certain results and findings may occasionally be published in regional and international scientific publications. The research centre also distributes a small newsletter to the fishing industry as well as the government 2-4 times per year[37].

12. MANAGEMENT PROCESSES

The MoF is responsible for the management of the fisheries with most tasks allocated to DNAP and decisions made by the Senior Management of the Ministry[38].

Management measures

Shrimp: The fishery has been closed to new entrants and fishing effort of the current owners should not be exceeded (Ministerial Diploma No. 40/2001, published in the Bulletin of the Republic No 9, 3rd series, February 28, 2001). In addition to this measure, the fishery is subject to a seasonal closure of a variable period of three to three and a half months, usually defined between November and mid March of the following year (but with a tendency to increase to a maximum of six months). During the closed season any fishing activities from trawling for deep shrimp and other crustaceans is prohibited on the continental slope of Sofala Bank between the parallels between 16 º and 19 º North (Ministerial Diploma No. 40/2001, published in the Bulletin of the Republic No 9, 3rd series, February 28, 2001). Trawling is prohibited on all of Sofala Bank during this period.

Deep Sea Shrimp: The proposed annual TAC (not achieved) was 3,100 tons for the deep water prawns and 500 tons for each by-catch species, e,g., lobster and crab. Given the state of overfishing for lobster during the last years of the 90's, their capture has been banned in this fishery. Although there are no restrictions for the fishing of gamba and other crustaceans (with the exception of lobster) throughout the year as a result of closing up the shrimp fishery on Sofala Bank, there is restrictions on fishing at this closed time between the parallels of 16° and 21° South.

[37] Pers Comms: Laurentina Kossa, MoF
[38] Pers Comms : Manuel Castiano, MoF

Tuna: There is no established TAC, and the full potential of the fishery is not known. Following a pre-cautionary approach, the total quota allocated in 2004 for tuna and related species reached 24,600 tons, corresponding to 125 vessels, of which 80 were longliners and 45 seiners, but they do not permanently fish in EEZ of Mozambique.

Enforcement measures[39]
The MoF have approximately 45 provincial fisheries inspectors available to conduct inspections at port or landing site. In addition, a new patrol vessel went into operational service in 2008 to enable at sea inspections. VMS was implemented through funding from the EU as part of an earlier FA but the system has never worked or provided any useful information. A recent MoU with the Seychelles has initiated cooperation on VMS and it is expected that Mozambique will enjoy a VMS picture in the near future. No observer programme is presently in use.

The MCS system is weak and struggles with governance as well as political support but a significant improvement has been noticed over the last five years.

Validation of declared catch
Tuna: No validation of declared catch as no landing point in Mozambique.
Mozambique is reliant on catch reporting from the individual vessels and organisations such as the EU and RFMOs.
Shrimp: Unreliable validation of declared catches due to limited resources such as weights, governance issues as well as limited capacity to inspect vessels when landing.

IUU
Tuna: Unlicensed intrusion into the Mozambican EEZ, underreported catches, illegal and unreported transhipments, illegal by-catch and target species being sharks instead of tuna.
Shrimp: Illegal fishing gear, underreported catches, underreported by-catch, illegal by-catch and violation of closed areas and zones.

13. FUTURE OPPORTUNITIES

Risks:
The main problems threatening the sustainability of marine resources are:

- **Man made:** Potential overfishing and bycatch (including discard) of fishery resources of high commercial or social value, destruction of coastal environment, lack of coherence between projects.
- **Natural:** Natural disasters, such as drought, floods, storms, El Niño phenomenon, erosion (due to floods, waves, winds, along shore drift) and natural fluctuations that impact on the stocks.
- **Socio-economic:** Consequences related to marine and coastal problems are immense considering that a significant percentage of the population, about 60 percent, live in the coastal zone, depending on the resources available. Indeed the economy of the country as a whole depends largely on marine and coastal resources.
- **Political:** The decision to not be a member of the IOTC reduces Mozambique's ability to participate in regional cooperation, research and data analysis within

[39] Pers Comms: Avelino Munwane, MoF

the tuna fishery, inadequate transparency and governance jeopardise implementation of management measures.

Opportunities:

Shrimp

- The most important fishery along the Mozambican coast is the shallow water fishery at the Sofala Bank. It is well known that abundance of this shrimp is heavily influenced by the environment, especially the Zambezi River flow, which is regulated.
- Data from the relevant national institutes combined with observations of river discharge could be used in this kind of study. Simple statistical models could be tested to investigate the impact of the environment on the shrimp catch. Experiments with a physical model to study how variations in river flow influence the circulation in the area could be performed. Field observations of the shrimp might be undertaken to map behaviour during the various stages of the one-year life-cycle.

Tuna

- Large resource which may contribute significantly to the national economy if managed better
- Potential value adding in Mozambique has a potential if infrastructure and easy of doing business improves.

Human Resource

There is a lack of skilled personnel and diversity in training specialties. The level of expertise is also an issue of major concern; there are few MSc and PhD educated staff compared to the challenges. In addition, an effective small observer programmes could be beneficial.

Research vessel[40]

Research done so far in coastal waters and in the open seas has been conducted by ships of opportunity, i.e., according to the availability of occasional research vessels in the region. Often these research vessels were attached to research plans of their host institutions/countries, not always compatible to the local needs. This method has made planning and systematic monitoring rather difficult. For these reasons there is a strong and urgent need for a medium-sized research vessel that would be suitable to operate safely in the shallow seas (about 10m deep) as well as in the open sea.

14. STAKEHOLDERS

Stakeholders in the fishing industry in Mozambique are limited to a handful although the sector would benefit from including a wider range of aquatic user groups and NGO's within their decision making process. The commercial fishing industry has influence through their financial importance as well as through powerful individuals lobbying decisions which influence their operations. This reduces the impact of other

[40] Pers Comms: Laurentina Kossa, MoF

stake holders which does not have the same importance resources to influence or consult within the management institutions[41].

Other stakeholders in relation to research are:

Eduardo Mondlane University
Eduardo Mondlane University (http://www.uem.mz) is the only higher education offering courses with substantial training in marine sciences. The university also conduct some basic research on shrimp within Maputo Bay although not classified as particularly important for the MoF.

The Pedagogic University
The Pedagogic University (http://www.up.ac.mz) graduates students in general biology, who may go on to employment in fisheries or environmental sectors.

Center for Coastal Zone Management
A Center for Coastal Zone Management (subordinated to the Ministry of Coordination for the Environment Affairs) (http://www.mozambique.mz) is established in Xai-Xai, in southern Mozambique. This institution carry the tasks is undertaking research and training in coastal zone management.

[41] Pers Comms: Peter Flewwelling, Claudia Thomas and Laurentina Kossa, MoF

ANNEX 1: PET SPECIES FOUND IN MOZAMBICAN WATERS

- Whale Shark
- Dugong
- Green and loggerhead sea turtles
- Large brindle bass
- Brown-spotted Rockcod
- Smalleye stingray
- Mozambique Numbfish or Slender Electric Ray
- Manta Rays
- Devil rays
- Ornate Eagle Ray
- Pelagic Thresher
- Common Thresher Shark
- Pygmy Blue Whale,
- Fin Whale
- Bumphead Parrotfish
- Dusky Shark
- Sandbar Shark
- Gulper Shark
- Brindle Bass
- Natal Electric Ray
- Honeycomb Izak,
- Whitespotted Izak
- Shortfin Mako
- Tawny Nurse Shark
- Sperm Whale
- Bowmouth Guitarfish,
- Giant Guitarfish
- Leopard Shark
- Black-blotched Stingray

(www.redlist.org), (http://eame.wiomsa.org/keyspecies.html), (http://www.opwall.com)

ANNEX 2: PROJECTS UNDER NEGOTIATION THAT MAY CONTRIBUTE TOWARDS RESEARCH IN THE FUTURE.

Identification of project		Main details of project			
No	**Item**	**Partners**	**Duration**	**Coordination**	**Observations**
1	Assistance to the Fisheries Sector in Mozambique	Norway, ICEIDA	2009-12 3 years	Office of Minister	Under formulation Finance guaranteed
2	Support for coastal fishing in southern Mozambique (Maputo, Gaza, I'bane)	WB, Japan	2009-10 1 year	IDPPE	Approved Finance guaranteed
3	Building of artisanal fishing market and support infrastructures in Maputo	JICA		IDPPE	Under discussion
4	Building of artisanal fishing infrastructures in C. Delgado, Nampula and Sofala	China		IDPPE	Finance not guaranteed
5	Establishment of assistance units in Gaza (Massingir) and Maputo (Mutanhana)	ICEIDA		IDPPE/FFP	Finance not guaranteed
6	Improved availability of ice for artisanal fishing in inland waters / *Concept Note*	TCP-FAO Junta Galicia		IDPPE	Finance not guaranteed. Submitted 11.07
7	Development of fresh water aquaculture in southern Mozambique/*Concept Note*	TCP-FAO Junta Galicia		IIP	Finance not guaranteed. Submitted 11.07
8	Establishment of ecology and water quality laboratory in IIP (Concept Note)	TCP-FAO Junta Galicia		IIP	Finance not guaranteed. Submitted 11.07
9	Genetic study on marine shrimps in Mozambique (Concept note)	TCP-FAO Junta Galicia		IIP	Finance not guaranteed. Submitted 11.07
10	Improved production from small scale fish farming	NEPAF		INAQUA	Finance not guaranteed
11	Technical assistance for establishing regional network for aquatic bio-security in Africa	FAO-TCP		INIP	Finance not guaranteed
12	Strengthened food security through improved quality of fisheries and aquaculture produce	DFID & UNDP	2008-2011	INIP	Under discussion
13	Training, selection and hiring of sailors at origin – FORPEX Project	Spain		EP	Under discussion
14	Rehabilitation of the industrial quay at the Maputo Fishing Port (Phase III)	JICA		DNAP & PPM	Finance not guaranteed. Submitted in 2003
15	Reduction of the shrimp by-catch and changes in management of shrimp fisheries in tropical countries (regional project)	GEF, UNEP & FAO		IIP	Approved. Under way (?)
16	Strengthening fisheries management capacity in ACP countries (Regional project)	EU/FFED		DNAP	Approved in 12/07
17	Development of fishing and aquaculture on Lake Niassa (regional project)	WB/GEF			Under discussion
18	Safety at sea for small scale fishermen (regional project/SWIOFC)	SISA/ Sweden		FAO	Under discussion
19	Institutional capacity building and training in rural develop. and aquaculture in Africa, through South-South cooperation	FAO, Japan		INAQUA	Finance not guaranteed. Submitted 04/07
20	Coordination and implementation of agricultural research and training in the SADC region	EU/FFED		INAQUA	Finance not guaranteed. Submitted 03/06
21	PROFISH – artisanal fisheries – MCS	WB			No information

Source: Ministry of Fisheries September 2009

ANNEX 3: DETAILS OF THE OPPORTUNITIES AND COMPENSATIONS OF EU AGREEMENTS AND PROTOCOLS IN MOZAMBIQUE

Agreement/Protocol	1(i)	1(ii)	1(iii)	2	3
Period					
From	1/1/87	1/1/90	1/1/92	1/1/04	1/1/07
To	31/12/89	31/12/91	30/9/93	31/12/06	31/12/11
Opportunities					
Seiners	40 vessels	44 vessels	42 vessels	35 vessels	44 vessels
Longliners	Incl	Incl	Incl	14 vessels	45 vessels
Shallow water shrimp	3700 GRT/mth	3700 GRT/mth	0 vessels	0 vessels	0 vessels
Deepwater shrimp	1100 GRT/mth	1100 GRT/mth	0 vessels	10 vessels	0 vessels
Reference Catches (t)					
Seiners + Longliners	18000 total pd	6000 total pd	6000 total pd	8000 /yr	10000 /yr
Incremental compensation	50 €/t	50 €/t	50 €/t	75 €/t	65 €/t
Shallow water shrimp	1500 /yr	1000 /yr			
Deepwater shrimp	1000 /yr	1200 /yr		1000 /yr	
Bycatch		200 crab		535 /yr	
Licenses (€)					
Seiners	1000 /yr	1000 /yr	1000 /yr	3000 /yr	4200 /yr
increment	20 /t >50t	20 /t >50t	20 /t >50t	25 /t >120	35 /t >120
Longliners	1000 /yr	1000 /yr	1000 /yr	1500 /yr	3500 (>250GT)
increment	20 /t >50t	20 /t >50t	20 /t >50t	25 /t >60	35 /t >100
					1680 (<250GT)
					35 /t >48
Shallow water shrimp	266 /GRT/yr	266 /GRT/yr	-	-	-
Deepwater shrimp	151 /GRT/yr	151 /GRT/yr		600 /t	
Compensation (€)					
Seiners	nd	nd	300,000 total pd	600,000 /yr	650,000 /yr
Longliners	nd	nd	Incl	Incl	Incl
Shallow water shrimp	nd	nd	-	-	-
Deepwater shrimp -	nd	nd	-	3,490,000 /yr	-
Total Compensation/yr	2,300,000 /yr	2,150,000 /yr	300,000 total pd	4,090,000 /yr	650,000 /yr
Targeted actions (€)					
Policy support					250,000 /yr
Conferences	20,000 /yr	60,000 total pd	50,000 total pd	60,000 /yr	
Quality control				100,000 /yr	
Training				430,000 /yr	
Research	180,000 /yr			1,000,000 /yr	
Institutional development				1,000,000 /yr	
MCS				1,500,000 /yr	
Scientific & tech		1,890,000 total pd	130,000 total pd		
programmes		600,000 total pd			
Trawl survey	200,000 /yr	1,950,000 total pd	180,000 total pd	all of above	250,000 /yr
Total Targeted Actions					
Total per year	2,500,000 /yr	3,425,000 /yr	274,608 /yr	4,090,000 /yr	900,000 /yr
Total for period	7,500,000	6,850,000	480,000	12,270,000	4,500,000
Expected License Fees (100% uptake)					
Seiners	40,000 /yr	44,000 /yr	42,000 /yr	105,000 /yr	184,800 /yr
Longliners	Incl	Incl	Incl	21,000	116,550 /yr
Shallow water shrimp	984,200 /yr	984,200 /yr	-	-	-
Deepwater shrimp -	166,100 /yr	166,100 /yr	-	600,000 /yr	-
Total per year	1,190,300 /yr	1,194,300 /yr	42,000 /yr	726,000 /yr	301,350 /yr
Total expected revenue	3,690,300 /yr	4,619,300 /yr	316,608 /yr	4,816,000 /yr	1,201,350 /yr

Source: Economic and Social Impacts of the Mozambique / EU Fisheries Agreements, 2008, Kusi Limitada - Consultores

ANNEX 4: TXOTX – PEOPLE CONSULTED WITHIN MOZAMBIQUE

Name	Position	Email
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Joaquim Tenreiro de Almeida	Fisheries Consultant (previously PS of the MoF)	yangula@tdm.co.mz

ANNEX 5: MAIN EXPORT COMMODITIES, MOZAMBIQUE

Main Exports (fob; USD million)					
	1995	**1996**	**1997**	**1998**	**1999**
Prawns	73.1	70.3	85.1	72.6	65.5
Electricity	0.0	0.0	0.0	36.2	62.9
Cashew nuts (raw)	5.6	29.3	15.1	21.6	25.1
Cotton	19.8	26.8	25.2	22.3	19.9
Manufactured products	5.1	8.3	19.9	14.3	13.9
Timber	9.6	9.8	13.8	11.0	8.8
Cashew nuts (processed)	6.9	17.2	0.0	19.1	7.8
Citrus fruit	1.3	1.0	0.8	0.4	5.8
Sugar	7.3	12.8	12.8	8.4	5.5
Fuel (bunkering)	4.5	2.6	2.4	1.3	4.4
Copra	6.1	3.7	4.6	5.0	3.5
Tyres and inner tubes	2.7	2.4	3.3	3.4	1.0
Tea	0.0	0.0	0.6	0.5	0.2
Coal	0.5	0.4	0.3	0.2	0.0
Total including others	**167.6**	**218.6**	**216.4**	**248.2**	**268.9**
Sources: Banco de Moçambique; Ministério da Indústria, Comércio and Turismo, IMF.					

ANNEX 6: TXOTX –MAJOR FISHING COMPANIES OPERATING IN MOZAMBIQUE

NAME OF COMPANY	CHAIRPERSON	PHONE/FAX/ MOBILE	E-MAIL/ WEBSITE	ADDRESS	PRODUCT
Amapic	Joao Marcos Nangave,S.	+258 1 308464 +258 1 308465 +258 82 3159920	amapic@teledata.mz	Av. 25 de Setembro 123,11^{o} Andar, Maputo	Shrimp
Amojal MOM	Rua Mateus Sansao	+258 1 494576 +258 82 8985000		Jose Abel Jonaze Muthemba 171, 3^{o} Andar, Polana, Maputo,	Shrimp,Frogslegs, Surimi
Angopesca Lda		+25801401470 +25801401560	qzupolh@esrail.wm	POB: 10995 Av.OUA, n) 1095 Maputo	Shrimps
Agro Indico	Jorge Goncalves	+258827211207 +258 1413209	agroindico@teledata.mz	POB: Maputo	Frozen fish, lobster, Shrimp
Campanhia De Ampamhia DE Pescas DA Zambezia-C.P.Z	Dr Cesar Bento	+2580131 14 92 +25803 3114 93	cpz@tvcabo.co.mz	Av. 25 de Setembro 1509 C.P.510 Maputo	Shrimp
Copic Lda	Dr. Gabriel Boa	+258 1418214 + 258 1418218	emopesca@tvcabo.co.mz	Maputo	Shrimp
Efripel Entreposto	Dr R Megessane	+ 258 01415500 +25801 41 5631	efr.mpm@tvcabo.co.mz	Rua Joao Noguira n 35 Maputo	Shrimps
Gambeira Lda.	Lurdes da C.M.Cossa	+2581321965 +2581 323524 +258823116880	gambeira.lurdes@sortmoz.com	Rua Tavares de Almeida, 30, Maputo,	Shrimps
Gabrier Xavier Barca		+258 03-353535 +258 03-327946		Rua Base Ntchinga, No. 2447 C.P: 2169 Beira-Sofala	Shrimp
Kapenta DE Mozambique Lda		+258 05 22 811 +258 052 22 813		Av. Da Liberdade Tete	Fish
Krustamoz Lda	Edgar Julio Soares	+258 1 493247 /8 +258 1 493249 +258 82 3061510	edgars@panitra.com	Av. Armando Tivane 850 R/C, Maputo, Mozambique	Shrimp

NAME OF COMPANY	CHAIRPERSON	PHONE/FAX/ MOBILE	E-MAIL/ WEBSITE	ADDRESS	PRODUCT
Mavimbi Lda	M. R. Massinga	+258 1 304504 +258 1 326425 +258 82 3016670	mavimbi@tvcabo.co.mz	Av. 25 de Setembro 11711,1º andar, Maputo,	Shrimp
Mavimbi Lda	Virginia Salita Chrindja	+258 83624900 +258 01426425	salita@tvcabo.co.mz	Travessa do Banco de Mozambique No. 63 Maputo	Shrimp
Mawipi Pescas , Lda		+258-82-302484 +2582581426425		Sede Provisoria: Av. 25 de setembro no. 1171,2 andar Maputo	Shrimp
Pescas Do Sul, Lda	Carlos Silva	+ 258 01 420255 + 258 01426537	polymar@teledata.mz	POB: 4342 Av. Karl Max N. 1747C. P 4342 Maputo, Mozambique	Shrimps
Scangulf. Lda		+258 84551141 + 258 1485829	m-shik@teledata.mz	Rua Marques de Pombal No. 313 Maputo C.P. 226	Shrimp
Sip- Sociedade Indutrial Pesca	Antonio Schwalback	+2581429074/6 +258 1321142	sip-ida@teledata.mz	Rua Zerlequias Manganhela 520 601, maputo	Shrimp
Sociedade De Fomento Pesqueiro		+258 01493365 + 25801422308		POB: 541 Av. Armando Tivane, n 373 Maputo	Shrimps
Sociedade Industrial de Pesca Lda		+258 01429074 +258 01421142		POB: 2646 Av. Zadeguias Manganhele, No. 520, Maputo	Shrimps
Sociedade industrial de pesca		+258 03 325034 +25803326883		POB: 514 Cais 1-Port da Beira Beira	Shrimps

Source: INFOSA 2007 - http://www.infosa.org.na/dloads/restrict/country%20profile/Mozambique.pdf

ANNEX 7: KEY FIGURES (IN USD) OF THE LARGEST MOZAMBICAN FISHING COMPANIES.

Company	Revenues	Net Profits	Net Assets	Shareholders' Fund	Operating Costs	No. of Employees
Pescamar (Sociedade de Pesca de Mariscos) Lda.	18,031,672	981,865	17,130,790	8,196,803	13,360,911	603
SIP (Sociedade Industrial de Pesca), Lda	5,279,810	298,399	592,514	503,264	4,875,934	109
Gambeira, Lda	2,623,426	228,081	514,373	240,795	2,374,077	30
Indicopesca, Lda	1,789,962	27,480	629,412	92,751	1,708,298	47
Mavimbi, Lda	1,615,073	6,730	1,454,765	- 25,323	1,608,041	20
EMOPESCA (Empresa Mocambicana de Pescas) EE.	1,038,119	36,453	3,313,751	2,399,659	926,128	27
Equipesca, SARL	557,886	4,012	672,465	278,209	300,254	41
Pesca do Alto (Pescalto), Lda	465,868	22,045	113,027	61,733	430,709	15
Companhia de Pescas da Zambézia, Lda	156,598	-123,553	775,699	52,113	280,151	130
EFRIPEL (Entreposto Frigorifico de Pesca de Moambique) Lda.	14,528,465	4,175,544	na	na	na	na

Source : KPMG, Mozambique 2003

Chapter 15: Tanzania Mainland

PRAWNS/SHRIMPS AND TUNA FISHERY IN TANZANIA MAINLAND

EXECUTIVE SUMMARY

Tanzania claims 12 nautical miles territorial sea and 200 nautical miles EEZ, which covers 223,000 km². The marine fisheries are conducted mainly on the coastal continental shelf, which measures 30,000 km². The coastal continental shelf is narrow and characterized by a steep drop-off. The Fisheries Division has the largest share of authority compared to other government institutions over many issues related to coastal marine resources in mainland Tanzania. Under the Fisheries Act, 2003, the Director is empowered to appoint officers for the purposes of licensing fishing activities and registering fishing vessels, enforcement of fisheries laws and inspection of fishing activities. The management of fisheries resources in Tanzania is guided by the National Fisheries Policy and Strategy Statement (1997), the Fisheries Act No 22. of 1970 as amended in 2003, the Deep Sea Fisheries Authority Act of 1998 as amended in 2008 and the Deep Sea Fishing Authority Regulations of 2009. Others are the Fisheries Regulations of 2005, amended in 2009, Marine Parks and Reserves Act 1994, EEZ Act of 1989, TAFIRI Act of 1980. To date, industrial fishing has been limited to coastal prawn trawling (inshore waters). Fishing access arrangement in distant waters is facilitated by annual licensing of foreign vessels, thus making it difficult to acquire data from registered foreign vessels fishing in the deep sea. The tuna fishery data available are received electronically by the Fisheries Department from the fishing vessels which sometimes not reliable. Inshore prawn/shrimp fishing activities are generally concentrated by a mix of artisanal fishers and industrial trawlers. Tuna and prawn fishery stocks are of commercial importance caught by the marine fisheries are discussed in this report.

The marine prawns fishery in Tanzania is still largely artisanal. Artisanal fishermen catch the bulk of the marine fishes, including tunas using traditional fishing craft and gear. The EEZ has not been exploited significantly and there is a potential to increase landings of tuna, prawns and similar fish species such as sharks and rays, sardines, Indian mackerels, and bill fishes. In 1989 the number of artisanal fishermen was 15,491; it increased to a peak of 16,361 in 1991, and then leveled off to 15,027 in 1993. However, in 2007, the number of licensed tuna fishing vessels using longline was 52 and 38 purse seine vessels. Out of these, only 6 longline vessels host the Tanzania flag. Currently, there are 31 licensed tuna fishing vessels after formulation of Deep Sea Fishing Authority which has the mandate to manage the fishing activities within the Tanzanian EEZ. Prawns landings from commercial trawlers have been declining from 1970s to 2007, leading to the suspension of commercial trawlers operation from 2008 todate. Some of the challenges facing the fishery sector in Tanzania include; limited knowledge on the status of stocks, IUU fishing, and inadequate fisheries infrastructure (e.g. improved fish landing sites, quality assurance laboratories and fishing ports or fishing harbor). However, the recent EU regulation on catch certification are most likely would improve on compliance with data requirement and submission to Tanzania Government in this respect.

INTRODUCTION

Fisheries management is the institutional framework under which the fishing industry operates. This framework may be set by social customs, the government (fisheries authority), and fisher groups or by other means such as environmental pressure groups. Irrespective of the fisheries management regime, the fisheries management process consists of human socio-economic interactions involving the biological resource. It follows that fisheries management process must been seen in this right rather than just looking at the resource only. This process should therefore involve participation of all stakeholders (resource users, resource managers and researchers) to minimize conflicts and maximize its acceptance (Kailis, 1996). The alternative; remote management by commands backed up by force is both extremely costly and probably not very effective. Conflicts and users refusing to abide by regulations tend to lead to unsuitable resource use. More effective management relies on co-management property rights (Cream and Symes, 1994). Fisheries policy or management regimes developed with sufficient involment and participation of all stakeholders often creates a level of self compliance among the people.

Tanzania claims 12 nautical miles territorial sea and 200 nautical miles EEZ, which covers 223,000 km². The marine fisheries are conducted mainly on the coastal continental shelf, which measures 30,000 km². The coastal continental shelf is narrow and characterized by a steep drop-off. The offshore tuna fishery is dominated by commercial purse seine and longline vessels that target three main species of tropical tunas: skipjack, yellowfin and bigeye, while inshore tuna fishery carried out by artisanal fishermen mainly by handlining, trolling, longlining and gillnetting.

Prawns/shrimps of Tanzania fall under the three families of Hippolytidae (Hunter shrimps), Palaemonidae (River prawns or spider prawns) and Penaeidae (Shrimps, prawns). The commercially important Penaeidae prawn species are *Penaeus indicus, P. semisulcatus P. monodon, Metapenaeus monoceros* and *M.stebbingi.* Others of less economic importance because of their low catches in the fishery are *P. japonicus, P.latisulcatus* and *P.canaliculatus*. The Hippolitydae are represented by *Exhippolysmata ensirostris* and the Palaemonidae represented by *Macrobrachium rude* and *Nematopalaemon* tenuipes. Haule (1985) reported that the white prawns *Penaeus indicus* made up to 66% of the catch, 18% were the giant prawns *Penaeus monodon* and the tiger prawns *Penaeus semisulcatus,* 15% were brown shrimp *Metapenaeus monoceros* and the flower shrimp *Penaens japonicus* made up 1%.

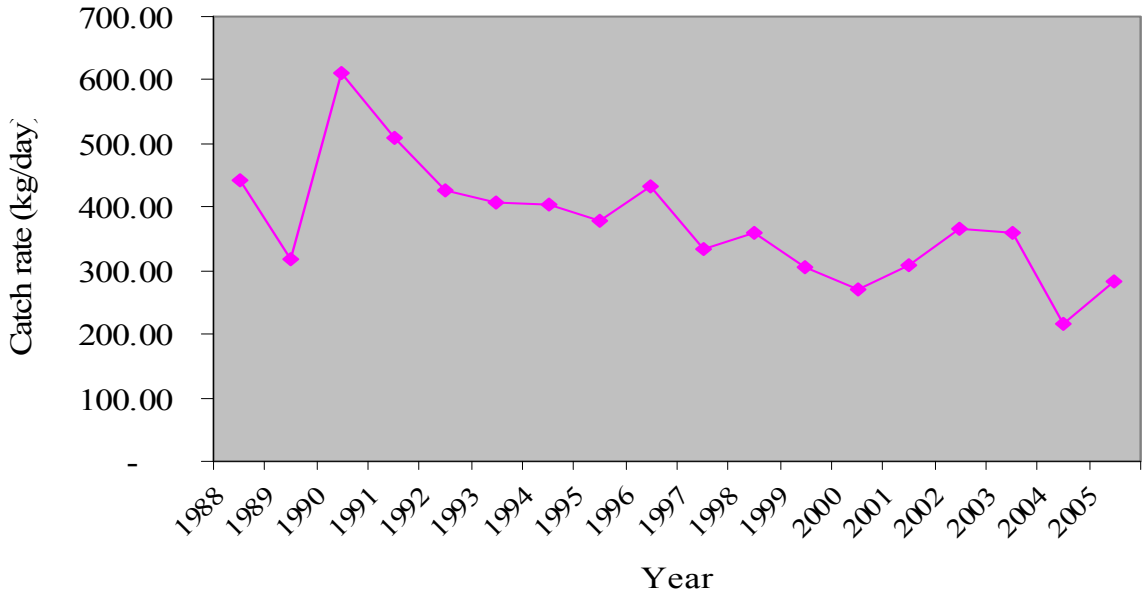
COMMERCIAL LANDINGS FOR PRAWNS/SHRIMPS

The landings from the commercial trawlers reached about 500 tons (whole weight) in 1970, and then declined to abut 200 tons when the joint venture company (New Mwananchi Ocean Products) was disbanded (Bwathondi and Mwaya, 1984). According to Brownell (1982), a new company (Tanzanian Fisheries Corporation) was subsequently established but as a consequence of operational difficulties the annual landings from trawling had remained at substantially below 200 tons (tail weight). However, available records on prawns catch from trawlers during the years 1988 to 2007 are as shown in Table 1.

Table 1. Trend of shrimp fishery from 1988 to 2007

YEAR	NO.OF VESSELS DEPLOYED	NO. OF FISHING DAYS	PRAWN CATCHES (Kg)	PRAWNS CATCH RATE (Kg/day)
1988	13	1476	650,929	441.01
1989	13	2166	688,837	318.02
1990	9	1574	960,686	610.35
1991	13	1315	669,016	508.76
1992	15	1560	663,852	425.55
1993	10	1462	597,211	408.49
1994	16	2513	1,014,087	403.54
1995	18	2108	795,436	377.34
1996	12	1779	769,651	432.63
1997	16	2091	699,059	34.32
1998	17	2778	995,564	358.37
1999	17	2252	688,006	305.51
2000	20	3352	909,715	271.39
2001	21	3882	1,193,685	307.49
2002	23	2521	926,079	367.35
2003	25	3664	1,320,056	360.28
2004	25	3037	661,062	217.67
2005	17	1528	467,037	305.65
2006	13	1082	312,076	288.43
2007	10	666	202,455	304.00

Source Annual statistics from Department of Fisheries Tanzania Mainland



Graph 1. Trend of prawns catch rates from 1988 to 2005

Source: *Fisheries Division, Ministry of Livestock Development and Fisheries, Dar es Salaam.*

FISHING SEASONS FOR PRAWNS/SHRIMPS

Before the beginning of a fishing season of every year, the Fisheries Division holds a stakeholders meeting whereby a review of status of stocks in the previous season is discussed and new management tools, if any, are agreed upon. In the early 1990s the fishing season lasted for 9 months (from March to November) and then changed to March – October in the late 1990s due to declining catches. In the year 2003, season months were reduced to April – October. Two consecutive stakeholders meetings were held on 9th January 2008 and 4th April 2008. Based on the information that revealed declining prawn catches, the stakeholders meeting unanimously agreed to close prawn trawling as from 2008 pending research findings on the health of the resource. Tanzania Fisheries Research Institute has since then been instructed to carry out research on the health of the prawn resource, whose findings shall be the basis for decision on the future exploitation of prawns. The research is still going on. However artisanal fishers continue catching the prawns by methods other than trawling.

ARTISANAL PRAWNS/SHRIMPS LANDINGS

The annual landings from the artisanal fishery are reported at between about 250 and 500 tons during the years 1965 through 1972 (FAO/IOP, 1979). Bwathondi and Mwaya (1984) refer to them being at least equal to the landings from the trawlers. The principal fishing methods included stationary traps, cast nets and seines. However, from 1970s to 2007, most of the available data on prawn landings are from the industrial sector of the prawn fishery leaving out substantial quantities exploited by the small-scale operators in the fishery; underestimating the true catches and making management decisions more difficult.

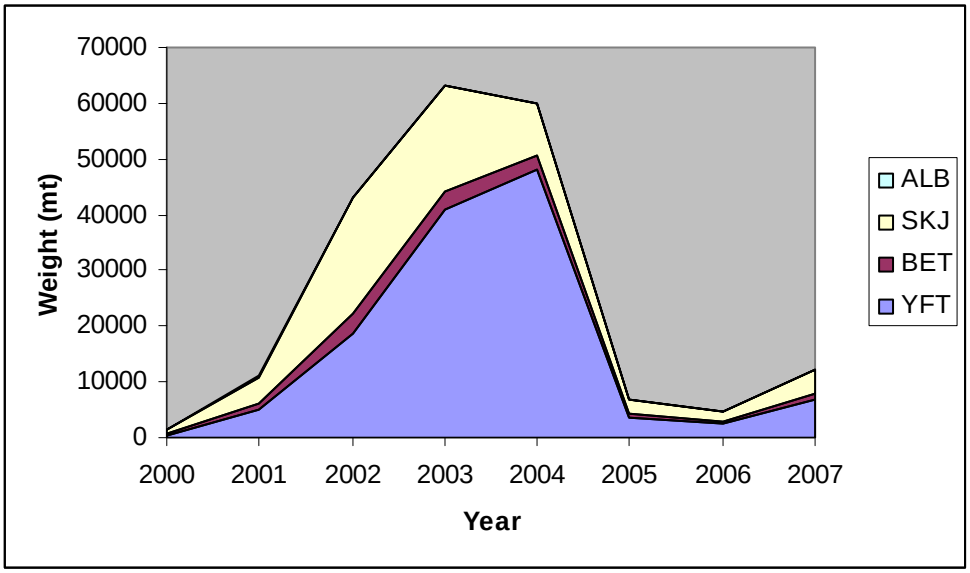
PRAWNS/SHRIMP STOCK ASSESSMENTS

Prawn stock assessments have been undertaken in subsequent periods using various techniques; Haule (1981) studied some biological aspects of Penaeid prawns of Kunduchi mangrove creek in Dar es Salaam. Sanders made preliminary assessment for the shallow water shrimp trawl fishery of Tanzania based on catch and effort data (Sanders, 1989). FAO estimated maximum sustainable yield (MSY) at 2 000 tones in 1997; South West Indian Ocean Project (SWIOP) in 1990 estimated the potential as 1 050 tones and in 2001 the Tanzania Fisheries Research Institute (TAFIRI) estimated MSY at 497 tones.

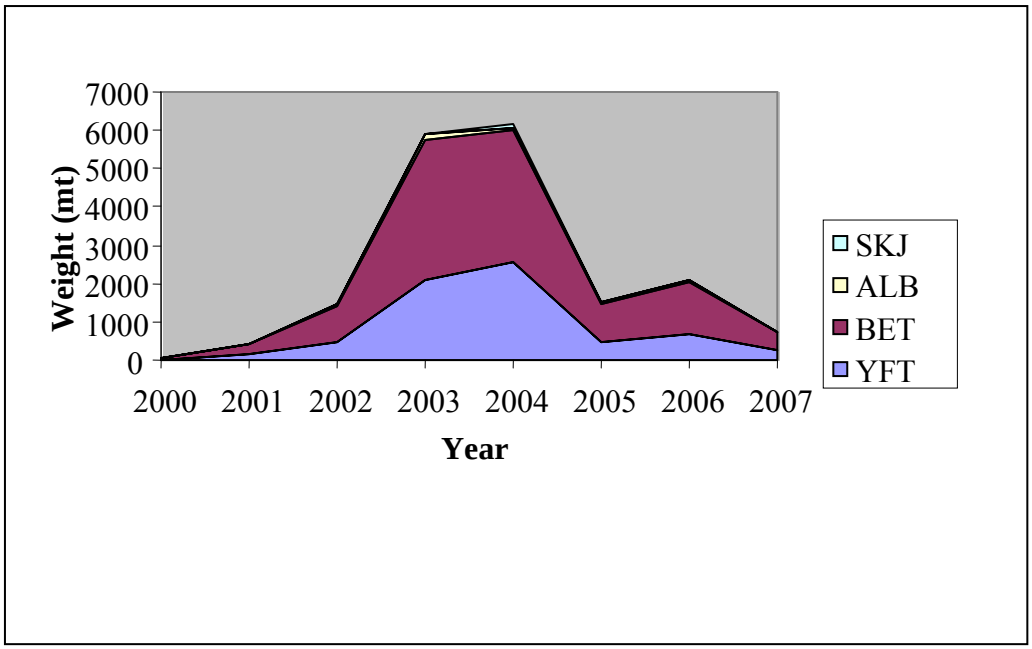
Mahika (1992) investigated on the possibility of minimizing juvenile prawns and finfish in the catches of trawlers at Bagamoyo/Wami area by incorporating rigid separator grids in the commercial trawls. In a parallel study Nkondokaya (1992) made an assessment on the by-catch composition of finfish in the shrimp fishery whereby he identified the by-catch species and suggest means of reducing them as well as alternative utilization of by-catch. Some preliminary work on the abundance and reproductive biology of the Penaeid prawns of Bagamoyo coastal waters was also done by Teikwa and Mgaya (2003). In 2003 Mwakosya made assessment of the resource (Mwakosya, 2004) Under TAFIRI, two main surveys were conducted, the first survey was conducted in 1992 which made an assessment of crustacean resources in the Rufiji – Mafia channel (Nhwani, *et al*. (1993). The second study was conducted in 2001 to investigate the species composition, distribution and abundance in Bagamoyo and Rufiji delta (Bwathondi *et al.* 2002). In both surveys there was evidence of declining catches.

TUNA FISHERY IN TANZANIA MAINLAND

Currently the coastal fisheries are dominated by artisanal or small-scale fisheries which contribute more than 96% of the total marine fish catches. Artisanal fishery is concentrated in inshore shallow waters because of the limited range of the fishing vessels and crafts. Most of the fishermen use simple gear and vessels of limited operational range. There are no available studies on these stocks which have been carried out in the deep sea. Therefore, fishing access arrangement in distant waters is facilitated by annual licensing and the data available are received electronically from foreign fishing vessels, which sometimes are not reliable. For example, fisheries statistics report from 2001-2008 shows a total of 90,042.46 Mt were reported to Fisheries Division offices from deep sea tuna fishing vessels which had been caught from Tanzanian waters. The EU is an important market destination for Tanzania tuna exports. However there is limited knowledge on the supply chain for the tuna fishery since transshipment is at Sea and the country does not have porting facilities. This makes it difficult to track the volume and value of the tuna fishery from the Tanzania EEZ. It is our hope that the recent EU regulation on catch certification most likely would improve on compliance with data requirement and submission to Tanzania Government in this respect. In addition, the readiness and co-operation of neighboring countries in curbing IUU in their respective EEZ presents a good opportunity for a regional framework to improve tuna governance in the SWIO coastal states. Approximately 8 species of tuna are recorded in long line and purse seine logbooks as being captured. The majority of non-target species are caught, and retained or discarded in low numbers this include marlin, shark and other species which were recorded into species level.



Catches of Tuna within the EEZ of Tanzania from 2000 to 2007 by Purse seine



Catches of Tuna within the EEZ of Tanzania from 2000 to 2007 by Logline

CURRECT RESEARCH PROGRAMME ON TUNA

Sustainable management of tuna and associated resources is of critical importance to Tanzania which has a very limited scientific knowledge in all areas of tuna biology and

fisheries. Apart from Regional Tuna Tagging Programme Indian Ocean (RTTP-IO) there is no scientific research project done concerning tuna stock in Tanzania, although at the moment there are terms of reference prepared to undertake research on three main tuna species available in Tanzania water. The research together with FAD development and assessment will be funded by Marine Coastal Environment Project (MACEMP).

Tuna Tagging Publicity & Tag Recovery in Tanzania Mainland & Mafia Island
The Regional Tuna Tagging Project indicated that among 88,616 tagged tunas in the region 59,130 tunas were tagged from Tanzania but with large majority of *Thunnus albacares* and *Thunnus obesus* (67%) while *Katsuwonus pelamis* is by far the main species tagged in the other covered areas (Seychelles and Madagascar). A Total of 50 tags were recovered for a period of July 2007 to June 2008, all were yellow tags 48 tags recovered from Ferry Fish Market at Dar es Salaam, 1 from Kilwa Kivinje and 1 from Tanga. A tag from Tanga lacked the information of type of gear and fishing vessel used because were collected from Fish Trader from Tanga. The 60% of the tags come from Yellow fin Tuna while 30% Skipjack Tuna and 20% were Bigeye Tuna Length and weight measurements were not done in accurate due to the lack of enough information from the person who delivers the tags.

Publicity Plan was prepared for all Tanzanian coasts which aimed to cover all coastal districts but unfortunately only Tanga Region districts were funded while other regions were not funded. The publicity in Tanga Region started from 12/09/2007 to 17/09/2007 which included four coastal administrative districts namely; Pangani, Tanga, Muheza and Mkinga. Fishermen and other fisheries workers in Tanga region were informed about the Regional Tuna Tagging Project–Indian Ocean (RTTP-IO) and the need to return all tagged tunas.

MANAGEMENT PROCESSES

The management of fisheries resources in Tanzania is guided by the National Fisheries Policy and Strategy Statement (1997), the Fisheries Act No 22 of 1970 as amended in 2003, the Deep Sea Fishing Authority Act of 1998 as amended in 2008 and the Deep Sea Fishing Authority Regulations of 2009. Others are the Fisheries Regulations of 2005, amended in 2009, Marine Parks and Reserves Act of 1994, EEZ Act of 1989, TAFIRI Act of 1980. Management measures in Tanzania includes establishment of observers programmes, Marine Protected and Reserve Units (MPRU), involvement of a broad range of stakeholders in Tanzanian and international experts, local communities, national and local management agencies as well as non-governmental organizations. For example, following the appearance of Coelacanth in Tanzania, the National Committee for African Coelacanth Ecosystem Programme (ACEP) decided to organise a three day Stakeholders workshop to initiate the planning process of creating a successful Marine Protected Area to conserve the coelacanths and other marine resources of Tanga region, in Mainland Tanzania. In addition, the Government has established the National Integrated Coastal Environment Management Strategy. The goal is to implement the National Environment Policy and other related policies in conserving, protecting and developing the resources of Tanzania's coast for use by present and future generations. The Integrated Coastal Management (ICM) strategy will be implemented through activities of the Marine Parks & Reserves Unit (MPRU), National Environment Management Council (NEMC) and the Tanzania Coastal Management Partnership (TCMP). WWF has been involved in marine conservation in Tanzania since 1990. In

recent years, WWF has developed a new conservation approach and defined 238 "eco-regions" worldwide, based on their outstanding biological features. The Eastern Africa Marine Eco-region (EAME), which extends along the coast from southern Somalia to northern South Africa, is one of these eco-regions. Within EAME, the Rufiji – Mafia – Kilwa Seascape is one of the 8 sites identified as globally important and covers an area of approximately 9,500km_ which includes one of perhaps only two remaining dugong populations in Tanzania. The government has been involved in protection, awareness raising and research. **S**ince January 2003 the Wildlife Conservation Society (WCS) has focused attention on the plight of dugongs in Tanzania. Plans are underway to initiate more detailed research, based on the preliminary findings, such as quantitative population, and seagrass, surveys. Other management strategies for dugongs, sea turtles and dolphins include; establish dugong sanctuaries or community-managed areas in one or both of the key areas. Management of these sanctuaries will need to focus on regulating the use of gillnets, and possibly also prawn trawling and halting dynamite fishing. Success is likely to depend particularly on an effective programme raising awareness and providing incentives and alternatives to gillnet fishers. Development of National conservation body such as a "national dugong task force", along similar lines to the recently convened Tanzania Turtle Committee would greatly assist in the development of a national dugong conservation strategy, including the establishment of one or more sanctuaries and national awareness campaigns. The Vessel Monitoring System (VMS) has been established in Tanzania to monitor movements and activities of foreign vessels in the EEZ, but is still not much effective.

The International Monitoring, Control and Surveillance (MCS) network (for fisheries-related activities) is an arrangement of national organisations in charge of fisheries-related MCS activities, which have been authorised by their countries to coordinate and cooperate in order to prevent, deter and eliminate IUU fishing management system (decision rules, reference points, discards, by-catch, observers). Currently, the Tanzanian government has embarked on a special countrywide operation against use of illegal fishing gears and illegal export of fish and fishery products. This includes establishing more patrol and management centres in various districts (coastal guard). It was reported by the Minister that the Government has set up 12 patrol centres in the country; four of them are in the marine waters. It was reported by an officer from the Fisheries Division that patrols are carried out in collaboration with Marine Police Navy, Judiciary with mobile courts. According to the Minister for Livestock Development and Fisheries (2008), the Tanzania People's Defence Forces (TPDF) would step up patrol on the country's Exclusive Economic Zone (EEZ) on the Indian Ocean to curb theft of resources.

CONCLUSION

According to the data collection system in Tanzania, most data on catch statistics of prawn/shrimp landings from 1970s to 2007 were from the commercial trawlers, leaving out substantial quantities of prawns/shrimps exploited by the small-scale operators (artisanal fishers) in the fishery industry. This leads to underestimating the true catches and making management decisions more difficult. For the tuna fishery, due to lack of infrastructure and fishing and services to handle deep sea vessels, licensed vessels are allowed to fish and land the fish at the destinations of their own choices where they can get markets. This imposes some difficulties in acquiring reliable statistics of tuna

catches. As a consequence, we are not even in a position to supervise and manage the deep sea tuna fishery as the operators find it hard to steam long distances so as to come to collect observers or inspectors. Most of the data on tuna statistics comes from artisanal fishery using observers on board. However, since the year 2005, when the SADC Monitoring Control and Surveillance (MCS) programme came into place, a mechanism was put in place requiring tuna fishing vessels to transmit electronically the catch statistics to the fisheries division. This enables our country to have in place at least some basic data, although it may not be reliable.

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Chapter 16: Zanzibar

1. EXECUTIVE SUMMARY

Zanzibar is an island state with a growing coastal population and increasing in both localand foreign interests in marine resources. The fisheries of Tanzania is mostly artisanal,using traditional vessels and gears, However deep sea industrial fisheries started to pick up in the 1990s. Licenses are provided by the Zanzibar Department of Fisheries and Natural Resources (DFNR) as well as the Mainland Department of fisheries. However in 2009 the Tanzania Deep Sea fisheries Authority was established and now Licenses will be issued by both parties together. Zanzibar, Tanzania does not have any fisheries partnership agreement with Distant Water Fishing Nations (DWFN).

Fishing access in deep sea is by licensing the fleets. National Fisheries Policy was formulated in 1985 and subsequently revised in 1995 to accommodate the changing socio-economic environment. The main thrust of the fishing policy is to promote sustainable development of the fishing sector for economic, social and environmental benefits of its people. In 1974, the Revolutionary Government of Zanzibar formed the Department of Fisheries natural resources (DFNR), under the Ministry of Agriculture, Livestock and Environment. Besides other functions, the key responsibility of the department was directed to supervise and modernize fishery activities. The type of fish caught in the deep sea currently in large numbers are Sharks, Yellow fin tuna, Big eye tuna, Albacore, Swordfish, Sailfish, Marlins and Skip jack. The major fisheries fleets are from foreign countries. Mostly long liners, gillnet, hand line, pole and line. purse seine. Trawler. Traps and trolling lines In Zanzibar there is no moratorium for fishing against any stocks.

All species mentioned by CITES are considered as endangered. Turtles, Coelacanth, dolphins, dugong and whales as well as some shark species are protected. The common ones which are several times caught accidentally in gill nets are dolphins and turtles. Several research are taking place in Zanzibar in collaboration with various institutions There are some coordination projects such as ASCLME and MACEMP which are useful in research and management. Most of the data collected in Zanzibar is related to inshore fisheries. There is hardly any research in the offshore fisheries.

Research results are disseminated in various ways such as in International journals, meetings, workshops, reports, local media and TV. There is a need to revise prevailing fishing laws which are currently not adequate and the penalties and fines are too light to deter offenders on fishing activities Other areas which my require attention include establishment of deepsea marine reserves. Also more collaboration is required in combating IUU in the region. Various stakeholders such as the community, private sectors, NGOs, Universities, and various Government Institutions are the key partners in managing the fisheries sector as well as in conducting research and decision making issues. Most are engaged actively in various issues related to fisheries such as in data collection, dissemination of information, research coordination and experimental work

Zanzibar is an island state with a growing coastal population and increasing in both local and foreign interests in marine resources. Agriculture is the second dominant sector in Zanzibar accounting for an average of 23.3% out of which the fisheries sub-sector contributed about 4.5% of GDP (BoT, 2006). The fisheries of Tanzania is mostly artisanal, using traditional vessels and gears (Jiddawi, 2000, Jiddawi and Marcus 2000). However Deep sea industrial fisheries started to pick up in the 1990s. Licenses are provided by the Zanzibar Department of Fisheries and Natural Resources (DFNR) as well as the Mainland Department of fisheries. However in 2009 the Tanzania Deep Sea fisheries Authority was established and now Licenses will be issued by both parties together.

The local fisheries sector is an important economic activity in Zanzibar. It employs 34,268 people in actual fishing activities (Jiddawi and Khatib, 2007). Also, it forms a major source of household and national income, employing about 25% of the population as fishers and supporting service provider in fisheries oriented activities such as fish auctioneers, fish fryers, fish mongers, boat builders, net repairers, marine engine repairers and fishing gear and equipment traders.

Estimated size of fishing grounds for Zanzibar artisanal fishermen is about 6,720 km2 of which 4,000 km2 (59.5%) for Unguja and 2,720 km2 (40.5%) for Pemba (BoT, 2006). Fishing activities in Zanzibar are small-scale concentrating in the inshore waters. The sector contributes more than 96% of total marine fish production estimated at average of 23,000 metric tons per annum (DFMR, 2006).

Most of the fishing activities are currently taking place within internal and territorial waters (12 nautical miles). The Deep Sea or the Exclusive Economic Zone (EEZ) is not yet fully exploited (Jiddawi N. S and Ohman,.2002). Zanzibar territorial waters consist of foreshore having seashores and in some areas there are mangroves, beaches, sand, mud flats and sea-grasses. These are the spawning/breeding, nursery, feeding and protecting and entertainment areas for various marine animals Total annual average fish catch from the area is about 23,000 metric tons which is equivalent to 96% of total fish catch in Zanzibar (Fisheries statistics, 2007. The deep sea fisheries reports catches of up to 1800 tones (DFNR, 2009) Fig 1.

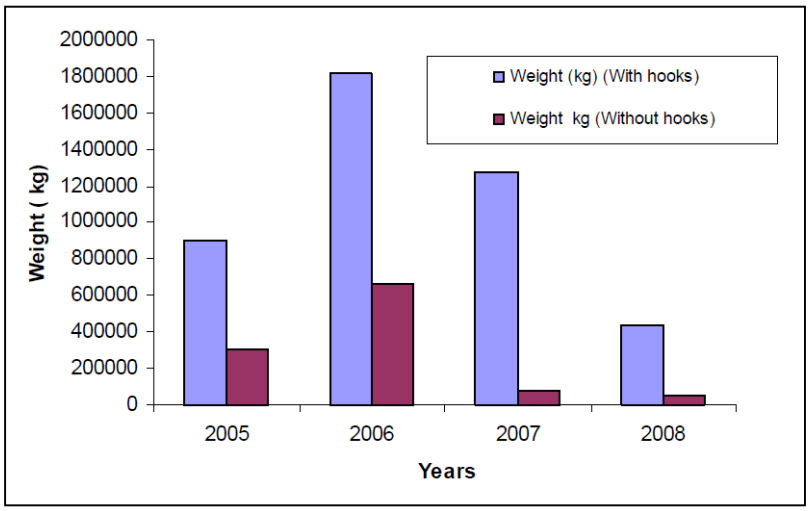


Fig. 1 Total catch of Deep sea fisheries fleet between 2005 to 2008 reported in Zanzibar

In Zanzibar, most of the animal fishery products are locally consumed and a little (1 – 3%) such as sea cucumbers, shells, octopus and lobsters is exported. Zanzibar exports fish, averages 1,806 metric tons per year, which contributes a small percentage of revenue compared to seaweed of which export average is 7,128 metric tons per year (DFMR, 2006).

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Zanzibar, Tanzania does not have any fisheries partnership agreement with Distant Water Fishing Nations (DWFN). Fishing access in deep sea is by licensing the fleets. Licences are provided to Fishing vessels fishing in the deep sea fisheries by the Deep Sea Fishing Authority. Previously the Fisheries Department in the mainland and the fisheries Department in Zanzibar were issuing licences separately. Currently this year a deep sea authority has been formed and this will be responsible for issuing licences for the whole of Tanzania. The exact number of vessels is not known but is less than 100 for Zanzibar.

Below is a list of some 31 fishing vessels which reports landed fish catch to Zanzibar. Table 1. Usually the Licences are renewed annually. On some instances some boats have been caught without licences. For such cases licences may not be provided as these were considered to be poaching. However, landing of fish is done in various countries according to preference of the fleet.

The Fisheries Policies (the Fisheries Policy of Tanzania Mainland, 1997 and the Fisheries Policy of Zanzibar, 1995), and the fisheries Acts (the Zanzibar Fisheries Act, 1998 and the Tanzania Mainland Fisheries Act, 2003) regulate the Tanzania fisheries and other aquatic resources. As fisheries is not a union matter, there are two separate Departments, one on each side of the Union, that deal with fisheries issues; i.e. the Fisheries Division in the Ministry of Natural Resources and Tourism (Tanzania Mainland) and the Department of Fisheries and Marine Resources in the Ministry of Agriculture, Livestock and Environment (Zanzibar).

There are two Acts (the Territorial Sea and Exclusive Economic Zone Act, 1989 and the Deep Sea Fishing Authority Act, 1998), which are union Acts both for Tanzania Mainland and Zanzibar, dealing with the exploitation of fisheries and other aquatic resources. Each partner in the Union licences fisheries investors, particularly the industrial trawlers and deep sea fishers (investors) on her own. Recently it was agreed that the share in the EEZ resources should be 40% and 60% for Zanzibar and Mainland respectively National Fisheries Policy was formulated in 1985 and subsequently revised in 1995 to accommodate the changing socio-economic environment. The main thrust of the fishing policy is to promote sustainable development of the fishing sector for economic, social and environmental benefits of its people. The fisheries policy has the broad objective of “managing fisheries sustainably in order to obtain the maximum yield while protecting the environment and securing benefits for future generations”. In more recent policy statements, the overall goal is achievement of “optimum sustainable yield”.

Some of the e development objectives of fisheries management include: to enhance protection and conservation of natural resources fisheries stocks, coastal and marine

environment through participation and involvement of local communities, to promote exploitation of offshore fish resource and aquaculture,to develop exploitable market of marine products in order to earn foreign exchange, to maximization of export and foreign exchange earnings capacity and to strengthening mechanisms for the enforcement of rules and regulations because enforcement of laws, control and monitoring are big problems facing Zanzibar fisheries.

Table 1 names of Deep se fishing vessels fishing in Tanzania waters,

Vessel Name	Vessel Name
BLUE STAR-05	SHYE SIN NO.1
CHEN FA NO.1	SI HONG NO.128
CHIEN CHANG NO .36	SI TAI NO 326
CHIEN HANG NO.6	TIA XIANG NO.8
CHIEN WEI NO.3	WAKASHIO MARU NO.81
CHUN I NO. 326	XIN SHI JI NO.10
DAH YIH NO.222	XIN SHI JI NO.17
F/V SAKOBA	XIN SHI JI NO.70
FENG RONG SHENG	XIN SHI JI NO.73
HSIEH CHAN NO.101	XIN SHI JI NO.78
INDIA STAR	XIN SHI JI NO.79
KOSHIN MARU	XIN SHI JI NO.81
KWANG HARNG NO.7	XIN SHI JI NO.85
NO.1 KYUNG YANG	XIN SHI JI NO.86
SHING CHI YU NO.11	YUSHO MARU NO.7 and No 8

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)
See above

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU
See above

5. FISHING ADMINISTRATION

In 1974, the Revolutionary Government of Zanzibar formed the Department of Fisheries
natural resources (DFNR), under the Ministry of Agriculture, Livestock and Environment. Besides other functions, the key responsibility of the department was directed to supervise and modernize fishery activities. Fishing licences are issued by the DFNR for Zanzibar. The fishing is administered separately between Tanzania mainland and Zanzibar. Zanzibar has its own fisheries regulations, policy and Act. The Department is responsible for providing advise to the government and the country on fisheries development including formulation and implementation of fisheries management plans, fisheries statistics and legislation. Also the Departments role is to manage and conserve marine resources for sustainable fisheries development.. There are beach recorders on each landing site and these report to the District fisheries office in Zanzibar who then reports to the main head office. There is no observer programme in

Zanzibar. The ship themselves bring data to the Department and Natural Resources Office.

The Government also earns revenue through collection of licenses from Artisanal fishermen and those from outside Zanzibar who conduct deep-sea fishing. Between 2000 and 2005, collection through deep-sea licenses amounted to average revenue of USD 152,052.2 per annum, each deep sea fishing license cost USD 200, renewed yearly (BoT,2006).

During 2003 a total of USD 460,852 was collected, having the highest revenue from deep sea compared to other periods. The highest earnings in 2003 were attributed to having issues the highest number of licenses issued, totalling 104. Consequently, total fish catch from deep-sea increased significantly from 32,090.6 tons in 2002 tons to 460, 952 tons during 2003 (BoT. 2006). Data from revenue collection of artisanal fishing activities indicates that revenue from Unguja amounted to an average of TZS 6.8 million between 2001 and 2005 (BoT, 2006).

6. LIST OF IMPORTANT STOCKS

The type of fish caught in the deep sea currently in large numbers are Sharks, Yellowfin tuna, Bigeye tuna, Albacore, Swordfish, Sailfish, Marlins and Skip jack Fig 2a and Fig. 2b. The major fisheries fleets are from foreign countries. Mostly long liners, gillnet, hand line, pole and line. purse seine. Trawler. Traps and trolling lines. Tuna are mostly caught by long line, purse seine and gill nets. Crustaceans such as lobsters. shrimps are also caught with trawlers and traps. Other species found are pelagic species such as marlin, sailfish, swordfish, sharks and kingfish. Most of these fish are also shared stocks with Kenya to the North and Mozambique to the South as well as Seychelles and the Comoros Islands, The fish are caught by the fleets and usually sold out of the country.

There are no available studies on these stocks which have been carried out in the deep sea. Thus, information on marine fish stocks in the deep sea is not well known because of lack of capacity to collect data.

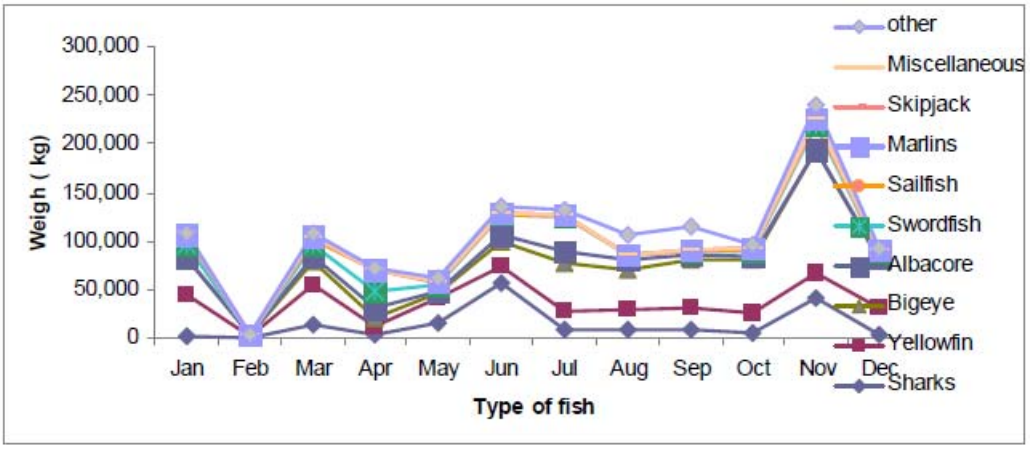


Fig 2aMonthly catch of different fish from the Deep sea, Zanzibar

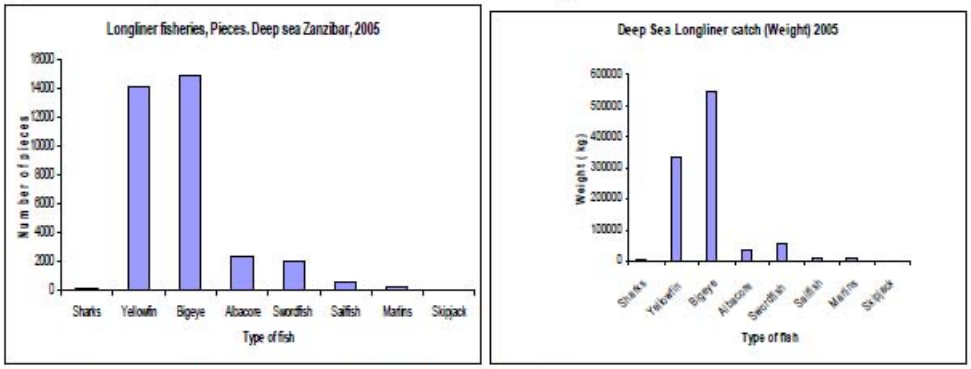


Fig 2b Deep sea long line catch for 2005 and 2006

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

In Zanzibar there is no moratorium for fishing against any stocks. All species mentioned by CITES are considered as endangered. Turtles, Coelacanth, dolphins, dugong and whales as well as some shark species are protected. The common ones which are several times caught accidentally in gill nets are dolphins and turtles. Currently in Zanzibar there is a marine mammal project which is trying to test the use of pinger to exlude dolphins in gill nets at Kizimkazi, South of Zanzibar which is an area where dolphin tourism takes place (Amir et al, 2005). The existence of the threatened population of dugongs has been reported in Zanzibar in 2007 and the three coelacanth have been reported in Nungwi, the northern part of the island since 2006.

Dolphin species that are encountered around Zanzibar coastal water of (Unguja and Pemba Islands) are the Indo-Pacific bottlenose (*Tursiops aduncus*), Indo-Pacific humpback *(Sousa chinensis*), common bottlenose dolphins (*Tursiops truncatus*), spinner dolphin (*Stenella longirostris*), Risso's dolphins (*Grampus griseus*), rough toothed dolphins (*Steno bredanensis*) and Pan-tropical spotted dolphins (*Stenella attenuata*) (Ortland, 1997; Todesco, 1997; Berggren, 2000; Amir et al. 2002, 2005a).

There are five species of turtles found in Zanzibar waters. However, only the green and hawksbill turtle nest along the beaches of Zanzibar. Turtle with tags from as far south as Durban in South Africa and the Seychelles have been reported in Zanzibar.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Several research are taking place in Zanzibar in collaboration with various institutions. For example SWIPPF, MACEMP, West Indian Ocean Tuna Commission. The Institute of Marine Sciences is the only Institute which is conducting research related to Fisheries in Zanzibar. However, the research work is conducted in collaboration with the Department of Fisheries and Natural resources.. Other International institutions which fund various local institutions are the GEF, NORAD through NUFU, SIDA SAREC, , UNDP. UNESCO etc. However most of the research that is being done is inshore coastal waters. The deep sea has not been studied yet. The collaboration between scientists in the region and outside is very good but mostly related to inshore work. .

The quality of networking depend where the scientist work. For example more opportunities go to Government institutions. The Government institutions are responsible for regional cooperation. However in the West Indian Ocean region there is an NGO called WIOMSA which is responsible for regional cooperation as far as research is concerned.

Areas of research within the territorial waters of Tanzania includes; Fisheries biology (growth, maturity index, feeding habits, reproduction, ecology), Catch Assessment Survey (gear/vessel type, length, weight, effort) have also been conducted.
There are some coordination projects such as ASCLME and MACEMP which are useful in research and management. They supports research institutions in various ways For example MACEMP has supported the stock assessment of inshore fisheries in Tanzania waters in 2008 and the catch assessment surveys as well of artisanal fisheries. Some example of some research work which has been conducted by the IMS are: Western Indian Ocean Climate and Sedimentation (WINOCS) With RV Meteor. In collaboration with German scientists utilizing the RV Meteor which was in the Tanzanian waters in 2008 to investigate the past climate as recorded in the sediment of the Western Indian Ocean continental margins. Research on Phytoplankton and Primary

Production Studies in the Agulhas-Somali Current Large Marine Ecosystem ahs been done in collaboration with e Marine and Coastal Management (MCM), Cape Town, South Africa. Transboundary networks of marine protected areas for integrated conservation and sustainable development: biophysical, socio economic a nd governance assessment in East Africa with an aim of to developing scientific knowledge for the creation of transboundary networks of MPAs in the East African region in collaboration n with the University of Portugal and other European institutions. Study of environmental changes in Tanzania coastal waters for sustainable utilization of marine resources and conservation of coastal ecosystem. Funded by Third World Academy of Science (TWAS).

9. DATA COLLECTION

9.1 BIOLOGICAL

Most of the data collected in Zanzibar is related to inshore fisheries. There is hardly any research in the offshore fisheries. Some example of research conducted within the Department of Marine Biology and Resources management at IMS but relates to the inshore habitats within the disciplines of Biological, Environmental, Ecosystem,and

Socio-economic are: Assessment of Mangrove Deforestation on Phytoplankton Community Structure and Biomass in Kisakasaka, Zanzibar, Measurement of seawater temperature using StowAway Tidbit Temperature Logger tied on a staghorn coral branch at 3-4m deep at Chumbe and Bawe in Zanzibar. Review of coral reef remediation and restoration in the Western Indian Ocean, Fish monitoring in selected landing sites in Zanzibar under the Coral reef Targeted Project. The study site was Matemwe on the east coast near Mnemba which has good coral reefs. Others are Mkokotoni on the North west of Zanzibar near coral reefs, and Pongwe/Uroa along the coast. And the the effects of coral bleaching on coral reef fish, fisheries and ecosystem services in the Western Indian Ocean.

Several types of data are available. Fishery related data can be obtained at IMS and TAFIRI. This is for specific fish where research work has been done. Environmental data can be obtained from the Meteorology department Zanzibar. Also some specific related data can be obtained from IMS which is the centre of oceanographic data centre. Information on waves, currents, salinity of the water can be obtained for specific work inshore. Major gaps in data collection is funds and lack of capacity.

9.2 ENVIRONMENTAL

Within the environmental sciences studies conducted related to environmental changes in Tanzania coastal waters for sustainable utilization of marine resources and Quaternary Sedimentary Record of Monsoon Winds, Variability and Associated Carbon and Nitrogen Burial Rates on the East African Continental Margin.

9.3 ECOSYSTEM

See 9.1

9.4 SOCIO-ECONOMIC

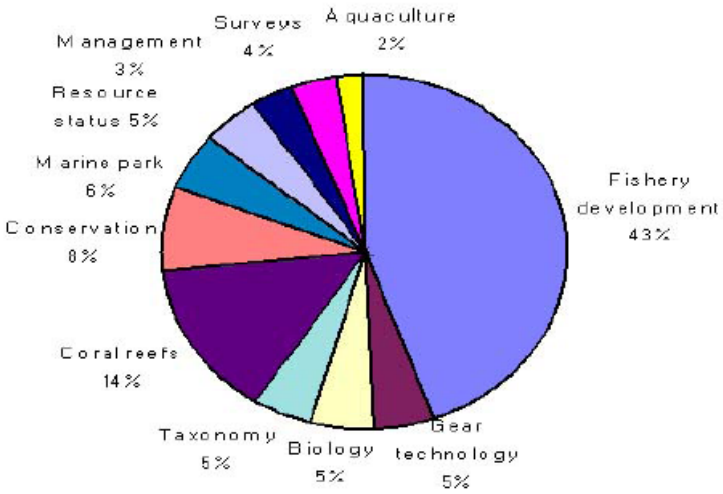
Within the socioeconomic aspects studies includes include investigation of the indigenous knowledge on coral reefs management in Tanzania

9.5 FUNDING

See 9.1

10. RESEARCH, FUNDING AND ASSESSMENT

The funding usually comes from Donor agencies and some little money from the central government. A lot of data is available but for inshore fisheries. For example population structure of inshore fisheries, habitat preference, abundance etc. On research subject coverage, the majority of the work (43%) deals with fisheries development followed by coral reef and reef-associated fisheries. Other areas covered include conservation, protected areas, fish taxonomy, biology, resource status, and aquaculture. Research on fishery development contributes 43% (Fig 3).



.Fig 3 Research conducted in Tanzania related to Fisheries (Jiddawi 2000)

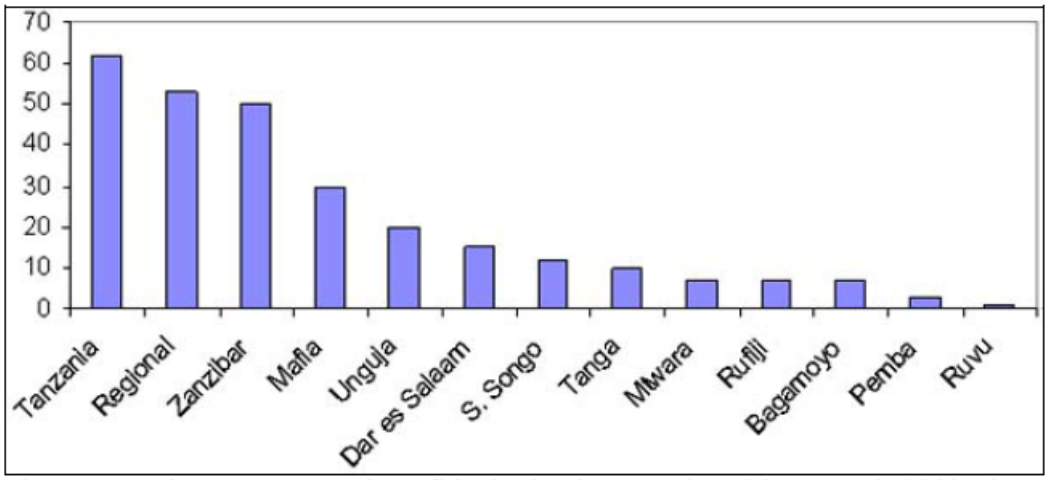


Fig 4 Areas where most research on fisheries has been conducted in Tanzania.(Jiddawi 2000)

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Research results are disseminated in various ways. Some scientific reports are published in International and regional Journals for example WIOMSA journal of Marine sciences or Journal of Coastal and Shelf sciences etc and can be accessed through the internet or through the journals as hard copies. Information is also relayed through videos and TV. Some information is relayed through meetings and workshops. These meetings can be local meetings, regional meetings or international meetings.

In Tanzania several institutions deal with fishery related activities. These are the University of Dar es Salaam, Department of Fisheries and Aquatic sciences and the IMS. Each individual institution is responsible in the dissemination of their individual reports. The Institute of Marine Sciences is library was the only library with many fisheries publications. This is because the institute inherited all the books, reports and 10reprints owned by the defunct East African Community. On top of the inherited materialsIMS has continued to receive fisheries technical reports from FAO and ICLARM/WorldFish Center (Nyika and Jiddawi 2007). IMS library holdings general collections, periodicals, theses and dissertations. Science and Biology Abstracts in CD-

ROM are also kept in the IMS library, FAO technical reports, undergraduate students project reports, postgraduate dissertations, theses and ASFA (Aquatic Sciences and Fisheries Abstracts) CDs. The IMS also maintains all reports from consultancy works undertaken by staff of the IMS and other University Departments. With assistance from FAO and ODINAFRICA the IMS has access to ASFA and other fisheries related databases on Internet (Nyika and Jiddawi, 2007). Other areas where fisheries research is taking place is Mbegani Fisheries Development Centre, Mbegani was a partner in stock assessment surveys conducted in the early 1980s by Bergen University, Norway. Reports from this assessment however still remain in the Norwegian university.

The Fisheries Division, Ministry of Natural Resources and Tourism The Division of Fisheries in the Ministry of Natural Resources and Tourism (MNRT) is responsible for the formulation of fisheries policies, the development of management plans and strategies, and the enforcement and monitoring of fisheries legislation. The division generates lots of information on the country's fisheries, particularly information on fish catches. For this purpose, the division uses TANFIS (Tanzania Fisheries Information System), a software developed through FAO assistance. TAFIR Ihas information through TAFIRI quarterly and annual reports; TAFIRI bulletin and research reports; Some donations are received from outside, including various journals and technical reports; Programme/project reports, covering specific topics, CD-ROMs including ASFA, FishBase and FAO FISHSTAT.(Nyika and Jiddawi, 2007)

12. MANAGEMENT PROCESSES

The management of fisheries resources in Zanzibar is guided by the National Agriculture Policy of which the Fisheries Policy is included, the Fisheries Act and the Deep Sea Fishing Authority Act and the Deep Sea Fishing Authority Regulations of 2009 further guides the management of fisheries. Management measures in Zanzibar includes establishment of Marine Protected Area, Establishment of Beach Management Units in various fishing villages. The role of these units is to oversee proper management of the fisheries specialty check those fisher who go against the law.The Zanzibar Navy also is involved in paroling on the country's Exclusive Economic Zone (EEZ) on the Indian Ocean..Some Patrol are also done by special planes.
The management measures conducted in Zanzibar are mostly related to inshore fisheries for example, gear restrictions in specified sites, mesh size, time closures for prawns, capacity limit also for prawns.

13. FUTURE OPPORTUNITIES

Future opportunities where collaboration between Zanzibar and other Institutions can take place are in fisheries biological research such as stock assessment for deep sea fisheries, species diversity and reproductive biology. Issues of climate change and impact to fish productivity, ecosystem modelling, and in socioeconomic issues such as marketing, migration conflicts etc. can also be studies. Zanzibar lacks adequate surveillance capacity to monitor, arrest and prosecute illegal fishermen due to lack of adequate patrol boats. This is something which is required in futre. Also There is a need to revise prevailing fishing laws which are currently not adequate and the penalties and fines are too light to deter offenders on fishing activities Other areas include establishment of deep-sea marine reserves. Also more collaboration is required in combating IUU in the region.

14. STAKEHOLDERS

Various stakeholders such as the community, private sectors, NGOs, Universities, and various Government Institutions are the key partners in managing the fisheries sector as well as in conducting research and decision making issues. Most are engaged actively in various issues related to fisheries such as in data collection, dissemination of information, research coordination and experimental work.

CONCLUSION

Also the although deep fishing is recommended, the challenge is to ensure that policies are in place to mitigate over fishing. Various studies have confirmed that Zanzibar has high potentiality of fishing in terms of stock and quality of fish inshore but this could possibly be the same for offshore. Immediate stock assessment is thus required to determine the size of stocks before determining the number of licenses to be given to fleets.

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Table 2. The people who were given questionnaires and contacted in various ways in relation to the project

No.	Name	Institution/ Specialty
1	Narriman Jiddawi	Aquaculture and fisheries management, IMS
2	Omar Amir	Marine. Mammal, IMS
3	Saleh Yayha	Fisheries ecology. IMS
4	Hamad Khatib	Department of Fisheries and Natural Resources
5	Anas masoud	Manager Menai Bay conservation area
6	Zahor el Kharousy	Department of Fisheries and Natural Resources
7	Zainab Ngazy	State University of Zanzibar
8	Mwanahija Shalli	Socio economic . IMS
9	Bwire Kahitira	TAFIRI
10	Salum hamed	Aquaculture and fisheries management, IMS
11	Muumin Hamadi	Aquaculture and fisheries management, IMS
12	Ameir Himid	ZAFFIDE
13	Bishara Juma	Department of Fisheries and Natural Resources
14	Asha Khatib	Doe
15	Issa Ameir	ZAFFIDE
16	Sihaba Juma	Doe
17	Makame Nassor	Codecoz
18	Christopher Muhando	Coral reef ecology and management, IMS

Chapter 17: Comoros

1. EXECUTIVE SUMMARY

Members of the TXOTX project team for Seychelles were unable to visit to the Union of Comoros to conduct interviews. Questionnaires (French versions) were provided to Mr. A. Mohammed and Mr. Motremed, both of whom stated that they would attempt to complete them but felt that most of the information requested was not valid due to the situation in Comoros. The report for Comoros is therefore based on a number of information sources. Firstly, we obtained available online information which mainly concerned the FPA with the EC. Secondly, we requested staff of the Indian Ocean Tuna Commission (IOTC) to collect data for us during an IOTC fact-finding mission to the archipelago in December 2009. Thirdly, we obtained information from Comoros reports to other meetings (i.e. Southwest Indian Ocean Fisheries Commission: Scientific Committee and Working Party on Fisheries Data and Statistics reports; Southwest Indian Ocean Fisheries Project reports).

In Comoros, there are no fisheries monitoring systems and research programmes being implemented. Given the socio-economic circumstances of the country, it is perhaps unsurprising that monitoring and research are afforded low priority and efforts to promote sectoral development often only last for the duration of the intervention. Comoros is a member of both the Indian Ocean Tuna Commission (IOTC) and the Southwest Indian Ocean Fisheries Commission but is unable to participate fully, or contribute to a great extent, due to the lack of data collected and the absence of biological sampling programmes.

The legal and regulatory framework in Comoros is outdated. To assist address fishery concerns, the Fishery Resource Administration with support of FAO developed an "Operational strategy for management and fishery development" and "A code of fishery regulation in the Comoros" in 2004 so as to provide an updated legal and regulatory framework adapted to the requirements of responsible fisheries. Comoros has not ratified the UNFSA or FAO Compliance Agreement.

The level of information sought by TXOTX through the questionnaire survey was not really relevant to Comoros, which is one of the Least Developed Countries (LDC) and lacking adequate (or even basic) infrastructure and capacity for fisheries monitoring, assessment and research. Across the spectrum of countries being assessed as part of TXOTX, Comoros probably represents the most data poor situation.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

With the exception of the FPA with the EC, we have been unable to source any details on fishing agreements and private licenses. Discussions on the sidelines of other meetings indicated that Comoros does not have any current agreements or licences for foreign vessels in addition to those with the EC. Also, internet research did not provide any evidence of non-EU agreements.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The first agreement between the EC and Comoros was in 1988. In structure, the current FPA between Comoros and the EC is typical of current tuna fishery agreements in the Indian Ocean. The duration of the agreement is 7 years (Jan 2005 to Dec 2011). The financial contribution if EURO 390 000/year of which 60% is earmarked for sectoral fisheries policy. The fees for ship-owners is EURO 35 per tonne caught, while the advances are EURO 3,375/year for purse seiners (ref catches: 96 t) and EURO 2,095/year for longliners (ref catch: 59 t). The overall reference tonnage is 6,000 t/year.

The FPA caters for up to 40 purse seiners (21 Spain, 18 France, 1 Italy) and 17 longliners (12 Spain, 5 Portugal).

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not relevant

5. FISHING ADMINISTRATION

Within the Ministère du Développement Rural de la Pêche, de l'Artisanat et de l'Environnement, the Direction National des Ressources Halieutiques (DNRH) is in charge of fisheries, including data collection, research and assessment. Data from the EU vessels are provided to the responsible Ministry through the DNRH. Currently, there is no capacity MCS centre or capacity to process VMS data.

6. LIST OF IMPORTANT STOCKS

The Agreement and Protocol makes provision for tuna without specifying the individual species and stocks. Nevertheless, reporting under the protocol covers the usual species of tuna for the Indian Ocean, yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*) and for billfish.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

Comoros is an important site for many PET species including green turtles (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*), which are locally protected although still consumed. Cetaceans are also relatively common around Comoros (13 species reported). Both turtles and dolphins are targeted and caught as by-catch in artisanal fisheries.

CONCLUSION

There is little or no information available to complete the following sections, which have been removed. Comoros does not have fisheries monitoring and information system and research is lacking. A statistical system for monitoring landings was established in 1994 by the Association Thonier of the Commission de l'océan Indien, which defined 12 strata sampled randomly across 3 islands with five primary sites monitored in Grande Comoros, four in Anjouan and three in Moheli. The fisheries information system continued until 1996 when the project ended and fisheries landings

have not been monitored since that time. In 2007, the Ministry attempted, unsuccessfully, to reinstate the system. Problems cited in the failure to maintain such a system in Comoros include lack of funds, large numbers of landing sites (104), insufficient recorders, a lack of computer support for processing and analysis, and reluctance of some fishers to have their catch monitored or handled (SWIOFC WPFS 2007).

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FAO South West Indian Ocean Fisheries Commission. Report of the Second Working Party on Fisheries Data and Statistics. Mombasa, Kenya, 28-30 April 2008. FAO Fisheries Report.

FAO South West Indian Ocean Fisheries Commission. Report of the Third Session of the Scientific Committee. Maputo, Mozambique, 16-19 September 2008. FAO Fisheries and Aquaculture Report. No. 899. Rome, FAO. 2009. 85p.

Interviewees: (Informally interviewed on the sidelines of meetings**)**
Mr Abdouchakour Mohamed: Direction Nationale des Ressources Halieutiques
Mr Ahmed Said Soilihi: Direction Nationale des Ressources Halieutiques
Mr. Ben Massoundi Rachid: Director of the National Fisheries Research Institute
Mr. Youssouf Ali Motremed: Deputy Director of the National Fisheries Research Institute
Mr. Miguel Herrera: Indian Ocean Tuna Commission

Chapter 18: Mauritius

1. EXECUTIVE SUMMARY

This report provides a review of the research, management and administrative activities within the fisheries sector of Mauritius. The information provided within this report was compiled from the work of interviewing key scientists, managers and other stakeholders.

Mauritius has an extremely large EEZ to which it has provided licences to the European Community, the Government of Seychelles and the Japan Tuna Fisheries Co-operative Association (JTFCA) since 1991. Foreign fishing vessels were also licensed to fish on the 'banks' fishing ground and in 2007 all licence fees amounted to a total of USD 608,500.
The EU is a major trading partner with Mauritius and in 2002 signed the Country Strategy Paper and the National Indicative Programme. This allowed for the fifth protocol of the EU Fisheries Partnership Agreement and an EU Food and Veterinary Office Inspection.

The large EEZ also provides for a large range of scientific and industrial challenges and opportunities. The Ministry of Agro Industry, Food Production and Security (MAFS) is the institution responsible for all aspects of fisheries policy, management, development and implementation of the fisheries law including aquaculture.

The most important fishery is the tuna fishery and tuna like species which are caught and landed in Mauritius (Port Louis) for onshore processing and service industry. This activity alone, provides benefits to Mauritius accruing to the amount of 200-250 million EUR annually. A significant proportion of biological research goes into the tuna fishery, where the Albion Fisheries Research Centre (AFRC) and the Indian Ocean Tuna Commission (IOTC) are collaborating to improve the management of the tuna stocks in the Indian Ocean.

Another important collaborative effort coordinated by MAFS is the South West Indian Ocean Fisheries Project (SWIOFP) which aims to assess and sustainably use the region's common key fisheries resources according to an ecosystem approach.

Lastly, a number of stakeholders are involved in research in Mauritius. These include The Ministry of Agro Industry, Food Production and Security, NGO's, national institutes as well as international organisations. The most important research they conduct is on the tuna fishery where it is likely that more collaboration will develop in the future.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Licensing for foreign fishing vessels to fish within the Mauritian EEZ was first introduced in 1991[116]. Today, licences are issued to foreign longliners, purse seiners and trawlers against payment of the appropriate fees. In 2007 there were fishing agreements between Mauritius and the European Community, the Government of Seychelles and the Japan Tuna Fisheries Co-operative Association (JTFCA), with access rights and fishing licences are issued under these Agreements.

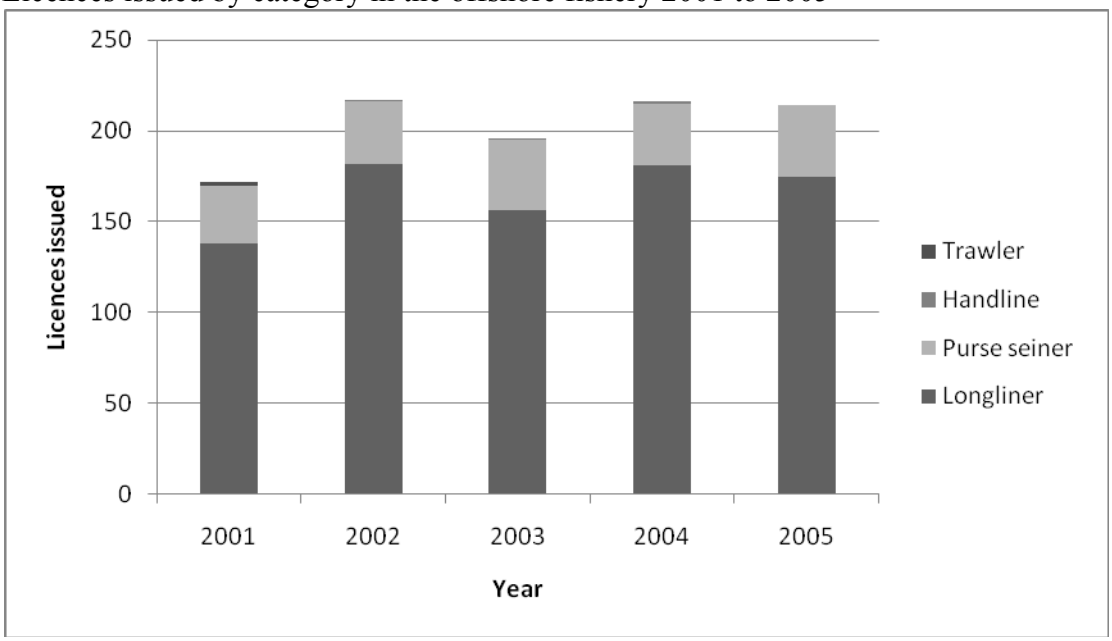
Licence fees obtained under the fishing agreements with the EC, JTFCA and Seychelles amounted to Euros 114,850, USD 382,000 and USD 100,000, respectively. Eighty-five longline licences were also issued to vessels of various nationalities outside these fishing agreements (direct licensing) with 36 extensions of licences being granted to some of these vessels. Also, three licences were issued to foreign fishing vessels to fish on the 'banks' fishing grounds for demersal species. Licence fees for longliners and banks fishing vessels amounted to a total of USD 608,500 in 2007.

Thirty-five Mauritian fishing vessels/boats were licensed to carry out different types of fishing operations for the production of chilled and frozen fish mostly for the domestic market.

Category	Nationality	Number issued
Mauritius longliners	Mauritius	2
EU longliners	France	17
	Spain	14
	Portugal	3
EU Purse seiners	Spain	20
	France	16
	Italy	1
Other nationalities	Cambodia	1
	China	1
	Indonesia	3
	Japan	6
	Seychelles	1
	Philippines	1
	Taiwan	108
Longliners licensed under Fishing Agreement with JTFCA	Japan	18
Purse seiners licensed under Fishing Agreement with Seychelles	Seychelles	2

[116] Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

Licences issued by category in the offshore fishery 2001 to 2005



Stop Illegal Fishing Programme 2007: Concept paper for the management of offshore fisheries in Mauritius

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)
Not applicable

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

The EU is a major trading partner with Mauritius. On the 21 February 2002, the EU and the Government of Mauritius signed the Country Strategy Paper and the National Indicative Programme for the period 2002 to 2007. This cleared the way for the financial instruments of the 9th EDF. The main areas of assistance were focused on Environment and on the Technical cooperation facility and poverty alleviation[1].

EU Fisheries Partnership Agreement
The latest fisheries protocol between the EU and Mauritius covers the period 3 December 2003 to December 2007 and was adopted by Council Regulation No 2003/2004 with a financial contribution of € 487,500 out of which € 195,000 for targeted actions for the development of the fisheries sector. This was the fifth protocol since the 1990 framework agreement between the EU and Mauritius. As from 2.12.2007, there is no protocol in force[2].

The 2003-2007 protocol limited the EU Fleet to 41 seiners and 49 surface longliners. Liners were limited to a ceiling of 25 GRT/month averaged yearly. The total EU

[1] http://ec.europa.eu/development/Geographical/RegionsCountries/Countries/Mauritius.htm
[2] http://ec.europa.eu/fisheries/cfp/external_relations/bilateral_agreements/mauritius_en.htm

financial commitment for this protocol was € 1,950,000 of which € 780,000 were for targeted actions[3].

EU Food and Veterinary Office Inspection

The Food and Veterinary Office (FVO) of the Director General of Health and Consumer Protection undertook an inspection in January 2006 in order to assess the public health controls and conditions of production of fishery products. It is commonly believed that this inspection was related to increase the pressure on Mauritius to sign a new protocol with Mauritius[4].

5. FISHING ADMINISTRATION

Mauritius forms part of the Mascarene Islands of the Indian Ocean and is situated ca. 700 km to the east of Madagascar at latitude 20° S and longitude 57.5° E. Mauritius has jurisdiction over a proclaimed Exclusive Economic Zone that stretches over 1,900 000,km². This extensive area holds an immense potential for exploration and presents a wide range of scientific and industrial challenges and opportunities.

At present, ocean-related activities are undertaken by various governmental and parastatal institutions as well as non-governmental organizations. The Ministry of Agro Industry, Food Production and Security (MAFS) is the institution responsible for all aspects of fisheries policy, management, development and implementation of the fisheries law including aquaculture.

The Fisheries Division of the Ministry is responsible for fishery related research including the collection of data and compilation of statistics, fishery management and policy advice, as well as the development of near-shore and offshore fisheries and aquaculture.

The Fisheries Division is arranged into three Technical Services and a Fisheries Protection Service:

1. **The Technical Service of Fisheries Management** – this Service includes the tuna fishery, monitoring of foreign fishing vessels, licensing of fishing vessels, and monitoring control and surveillance (MCS) – these are all highly important aspects of the management of the offshore fishery and they fall specifically within the duties of the Divisional Scientific Officer for Fisheries under this Service.
2. **The Technical Service of Fisheries Research** – this is an important aspect of the work of the Fisheries Division and since 1982, the research work has been coordinated from the Albion Fisheries Research Centre (ARC), this includes limited research on the offshore fishery.
3. **The Technical Service of Fisheries Training services** – in 2004, a Fisheries Training and Extension Centre (FiTEC) was constructed at Pointe aux Sables to provide training to fishers. FiTEC has as its primary objective to enhance the knowledge and skills of fishers to operate in the outer lagoon fishery, ensure safety at sea and create awareness of fisheries management and marine conservation.

[3] http://ec.europa.eu/fisheries/cfp/external_relations/bilateral_agreements/mauritius_en.htm
[4] Pers Comms: David Ardill, Fisheries Consultant Mauritius - ardilldn@gmail.com

4. **Fisheries Protection Service –** 264 officers' fall into this Service of the Ministry, with seven posted on the offshore fishery. The Protection Service is responsible for the enforcement of all fisheries law and regulations. The current law governing fisheries is the Fisheries and Marine Resources Act 1998, however, this is currently under review to update it to assist the country in meeting the new challenges and situations that the sector is facing. The Protection Service does not have any patrol vessels or airplanes available for surveillance of the EEZ, they do however have a vessel monitoring system (VMS) that tracks the position of all licensed vessels within the EEZ and on occasions they cooperate with the National Coastguard for surveillance of the EEZ.

The emphasis of the Ministry has been to focus on the needs of the Mauritian fishing industry. The Ministry has generally given priority to fishery research and protection of the near shore resources and training of fishers to sustainably utilise these resources. When personnel and funds are limited, priorities have to be set, and not all activities can be covered as fully as would be desirable. The offshore fishery, as one of the more recent fisheries, and with limited direct relevance to Mauritian fishers, has therefore not been the top priority in the allocation of resources within the Fisheries Division[5].

The National Coastguard

The National Coastguard (NCG) is a specialized agency within the Police Force, and it provides limited additional assistance for enforcement of national fisheries laws and regulations through patrols in the EEZ. The NCG reports to the Prime Minister's Office (PMO), as the Office with responsibility for the EEZ. The NCG has one large seagoing vessel, two smaller seagoing vessels and several small near-coastal patrol and inception vessels. They also operate two Dornier surveillance airplanes. The NCG operates from a central command station at Port Louis with 19 field stations, including Rodrigues and the outer islands[6].

6. LIST OF IMPORTANT STOCKS

For the purposes of this work we have considered the following species important:

Species / stocks / species groups	Gear type or fleet sector	Reason for inclusion
Skipjack tuna	Purse seine	Targeted by EU vessels and caught and landed in Mauritius
Yellowfin tuna	Purse seine	Targeted by EU vessels and caught and landed in Mauritius
Bigeye tuna	Purse seine	Targeted by EU vessels and caught and landed in Mauritius
Albacore tuna	longline	Targeted by EU vessels and caught and landed in Mauritius
Swordfish	Longline (surface)	This is caught by EU fleet

Stop Illegal Fishing Programme 2007: Concept paper for the management of offshore fisheries in Mauritius

[5] Stop Illegal Fishing Programme (www.stopillegalfishing.com) 2007: Concept paper for the management of offshore fisheries in Mauritius

[6] Pers Comms: Commander K nagi, NCG

The offshore fishery is that of the tuna and tuna like species that are widely distributed in the EEZ of Mauritius and the adjoining waters of the Indian Ocean Tuna Commission. The value of the fishery to the islands lies in two main areas - firstly, the licensing of foreign vessels to fish in the EEZ and secondly, in the use of Port Louis, as a centre for offshore vessels and the associated onshore processing and service industry. A recent economic study into the benefits accruing to Mauritius from the offshore fishery indicated that earnings from services and, to a lesser extent, licences, amount to 200-250 million EUR annually[7].

Currently the offshore fishing is managed in a fragmented manner by various Divisions of the MAFS with no defined central administrative body. This has opened the door for non-systematic procedures. The results of this weak management system has been an economic loss for the government and also the creation of a worrying international image that does not reflect the governments' true commitment to managing the fishery by international standards. This in turn has reduced investment into the sector[8].

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

In order to preserve and protect the endangered and threatened species, Mauritius has established two marine parks and a number of marine protected areas (MPA). However numerous Sharks, rays, turtles and marine mammal populations suffer from the fishing activities of artisanal and industrial fisheries. A summary obtained from IUCN's red list[9] as well as Greenpeace red list[10] outlines those species which are vulnerable, endangered, and critically endangered:

- **Pygmy Blue Whale,** endangered - These species are mainly entangled in the nets of artisanal fishermen.
- **Bumphead Parrotfish,** vulnerable – Are overexploited and suffer from destructive fishing techniques by artisanal fishermen
- **Sandbar Shark,** vulnerable – overfishing from artisanal fishermen
- **Dugong,** vulnerable - The main contemporary threat is entanglement in inshore artisanal gill and shark nets. Other fishing gears such as seine nets and fence traps pose a lesser threat.
- **Brindle Bass,** vulnerable – overfishing from artisanal fishermen
- **Hawksbill Turtle,** Critically endangered - entangled by commercial fishing gears (gillnets, longlines, pound nets, and trawls).
- **Shortfin Mako,** vulnerable - is the major bycatch component of tuna and swordfish fisheries and is also the specifically targeted by commercial fishermen.
- **Tawny Nurse Shark,** vulnerable - overfishing from artisanal fishermen
- **Sperm Whale,** vulnerable - These species are mainly entangled in the nets of artisanal fishermen.

[7] Pers Comms: S Seenevassen, Adviser to the Minister
[8] Stop Illegal Fishing Programme (www.stopillegalfishing.com) 2007: Concept paper for the management of offshore fisheries in Mauritius
[9] www.redlist.org
[10] http://www.greenpeace.org/international/seafood/red-list-of-species

- **Black-blotched Stingray,** vulnerable – caught by linegear and trawl as bycatch and or could be targeted.
- **Yellowfin**, lower risk – overfishing by industrial fishermen
- **Bigeye**, vulnerable - overfishing by industrial fishermen
- **Albacore**, data deficient - overfishing by industrial fishermen

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

Mauritius has a variety of research initiatives in place which are mainly coordinated by the Ministry of Agro Industry, Food Production and Security. The largest collaboration in place is the South West Indian Ocean Fisheries Project (SWIOFP)[11]. The SWIOFP is a regional and multinational project with nine participating countries; namely Comoros, France (Reunion), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa and Tanzania. The SWIOFP was set up to enable the participating countries to collectively assess and sustainably use the region's common key fisheries resources according to an ecosystem approach. The project to be funded by the World Bank/GEF[12], Norway and France has a five-year scientific phase and costs around US$ 25 million. Member countries would contribute in kind.

A series of workshops and meetings were held from 2003 to 2007 for the preparation of the project. SWIOFP implementation would take place in 3 stages. An initial 12 -18 months focused on collection and analysis of relevant existing data and setting up of a regional database. The second phase of 18 – 30 months would involve intensive onboard sampling to collect data identified in the gap analysis. While the third period of 18 – 24 months would focus on data analysis and preparation of a strategic action plan.

Mauritius will participate in six components namely,(i) data atlas and information technology, (ii) assessment and sustainable use of demersal fishes, (iii) assessment and sustainable use of pelagic fishes, (iv) monitoring of fishing effort and catch, existing values and exploitation conflicts, (v) fisheries impact on non consumptive resources and (vi) strengthening regional and national fisheries management. Mauritius has also been entrusted with the responsibility to coordinate activities of the component "fisheries impact on non consumptive resources"[13].

9. DATA COLLECTION

9.1 BIOLOGICAL

Tuna fisheries are monitored through the collection, processing and analysis of fishing and biological data obtained from local and foreign licensed vessels.

The most recent sampling data indicates that the tuna catch is composed of 74% skipjack, 21% yellowfin, 4% bigeye and 1% miscellaneous fish. The species composition of the purse seine catch unloaded in Mauritius 2003-2007 is presented in the table below

[11] http://www.swiofp.net
[12] http://www.gefweb.org
[13] Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

Data collection for offshore fishery

Species/stocks/ species groups	Type of data	Method of data collection
Tuna – purse seine	Length frequency	Port sampling from transhipped vessels
Tuna – purse seine	Catch composition	Port sampling from transhipped vessels
skipjack tuna	Gonad and liver samples	From the local cannery
Tuna – licenced vessels	Catch data	Logbooks licensed vessels
Imports (mainly tuna and swordfish)	bacteriological analysis	Random samples were collected from imported fish and fish products at the ports of entry

Species composition of purse seiners catch (%)

Year	Species			
	Skipjack	Yellowfin	Bigeye	Miscellaneous
2003	68	25	6.0	1.0
2004	60	31	8.0	1.0
2005	55	38	5.0	2.0
2006	63	33	3.5	0.5
2007	74	21	4.0	1.0

Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

Other investigations made during the sampling of a total of 2,912 tuna comprising 1,950 skipjack, 635 yellowfin and 327 bigeye include data on length frequency and reproductive biology[14].

9.2 ENVIRONMENTAL

At the Ministry of Agro Industry, Food Production and Security, in the Marine Conservation Division (MCD), services are provided for the long-term protection and conservation of marine biodiversity and the sustainable use of the coastal zone. Management of marine parks is also within their mandate. Ecological surveys have been conducted in the lagoon at Poudre d'Or in connection with pollution caused around the discharge point of the textile industry at Ile d'Ambre. The four ex-sand mining sites, namely Grand Gaube, Poudre d'Or, Mahebourg and GRSE are sometimes monitored in relation to the regeneration of the marine ecosystem.

Data collection is outlined in the table below gathered from a range of sources.

Environmental data collection

Species/stock/species group	Type of data	Geographic scale
General	Harmful marine microalgae	Sampling of harmful marine microalgae at the established sites, Albion, Blue Bay, Le Morne and Trou aux Biches.
General (not tuna)	Toxicity tests for the presence of ciguatoxin	Specimens received from the Fisheries Protection Service, Health Offices and fishing vessels

[14] Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

General	Coastal water Quality Chemical parameters The sea state, weather conditions, conductivity, pH values and water temperature	Monitoring of water quality at the 65 established stations of the 14 sites around the island
General	The levels of the trace metals copper, zinc and lead and the levels of three pesticides, atrazin, diuron and hexazinone to assess the water quality	At the eight established sites namely: Pointe Roches Noires, Grand River South East, Mahebourg, l'Escalier, Baie du Cap, Tamarin, Grand River North West and Rivière Lataniers
General	Water quality analyses	At the ex-sand mining sites Grand Gaube, Poudre d'Or, Grand River South East and at the aquaculture farm at Pointe aux Feuilles.
General	Sea Surface temperature	At 13 fishery posts

9.3 ECOSYSTEM

Coastal Ecosystem research is undertaken in Mauritius. A large component of this is the long-term monitoring of coral reefs which is continued at the following established sites: Albion, Le Goulet, Anse la Raie, Bel Ombre, Belle Mare, Trou d'Eau Douce, Ile aux Benitiers, Trou aux Biches, Bambous Virieux and Baie du Tombeau. Data on substrate cover was collected using the Line Intercept Transect (LIT) method. Data on coral cover was recorded up to the species level. Other ecological surveys include[15]:

- **Underwater survey of boat passage at the Fisheries Training and Extension Centre (FiTEC),** after the passage of cyclone "Gamede", an underwater survey of the boat passage was carried out. Observations showed that the passage was filled with sand and rubble;
- **Survey on sea cucumbers,** surveys on sea cucumbers were carried out in the lagoons of Mauritius and Rodrigues to gather information on the status of the stock for management purposes;
- **Deployment of a temperature data logger,** a temperature data logger was deployed in the back reef of Albion lagoon. During 2007, the sea-surface temperature ranged between 21oC and 29oC; and
- **Development of an action plan for stranded marine mammals/turtles,** an action plan for stranded marine mammals/turtles was prepared after consultations with other Ministries and NGOs. The responsibilities of the various organisations in the implementation process have been defined and a Standing Protocol has been worked out.

Investigations into coastal water quality have also been made. Data from research in 2007 is outlined below:

- **Monitoring of chemical parameters,** Water quality was monitored in the lagoon at 76 established stations of the nineteen sites around the island. Over 300 samples were analysed in duplicates for chemical oxygen demand (COD), nitrate-nitrogen (NO_3-N) and phosphate (PO_4^{3-}). Temperature, sea state, weather conditions, conductivity and pH were also recorded. Data in relation to certain sites were submitted to the Ministry of Environment and National Development Unit as part of the contribution to the Western Indian Ocean Land-based Project (WIOLaB);

[15] Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

- **Analysis for trace metals,** Water samples from the high seas in the North-West of the island were analysed in the context of export of fish and fishery products to the European Union. No detectable levels of cadmium, lead and mercury were recorded;
- **Water analysis and fish mortality at other sites**, Samples of seawater and of freshwater were collected for analysis in relation to cases of alleged pollution and fish mortality. Results showed that nutrient levels were within the norms;
- **Independent Environmental Audit on wastewater projects,** The monitoring of seawater quality at the three major outfalls namely; Pointe Moyenne, Montagne Jacquot and Baie du Tombeau were continued. Results of analyses of water samples were within the norms set under *the Regulation for Effluent Discharge into the Ocean as per GN No 45 of 2003 of the Environment Protection Act 2002;*
- **Monitoring of mercury level,** The 2007 fisheries annual report reveals The level of mercury in estuaries was monitored at eight sites namely, Rivière Lataniers, GrandRiver North West, Tamarin, Baie du Cap, l'Escalier, Mahebourg, Grand River South East and Pte Roches Noires. Results of analyses indicated that levels of mercury in the water samples were below the detection limit. Data were submitted twice yearly to the technical committee set up by the Ministry of Environment and National Development Unit for the UNEP Global Mercury Assessment Programme;
- **Monitoring of coliform bacteria at public beaches,** Monitoring of the levels of total coliform (TC) and faecal coliform (FC) in seawater at selected public beaches was continued at the 10 sites namely, Flic en Flac, Albion, Pointe aux Sables, Trou aux Biches, Mon Choisy, Le Goulet, Grand Baie/La Cuvette, Blue Bay, Péreybere and Belle Mare. The Blue Bay and Balaclava Marine Parks were also sampled once during 2007. Results of water analyses showed that the levels of TC and FC at the selected beaches and the two marine parks were within the CWQG limits for primary contact (TC<1000 colonies/100ml and FC<200 colonies/100ml);
- **Environment Information System (EIS),** The National Environment Action Plan 2 (NEAP2) has made provision for the setting up of an EIS for the management of information on the environment. It consists of developing a core set of indicators and a computer-based EIS for strategic management of the environment. In order to implement the EIS, the Ministry of Environment & NDU has developed a Memorandum of Understanding (MoU) to be endorsed by the relevant stakeholders for the provision of environmental indicators. The Fisheries Division would provide data on the marine fish biodiversity in the two marine parks, status of corals and mangroves, state of fish stocks and coastal water quality; and
- **Accreditation of Laboratories,** Under the component "Assistance and support to the quality control of laboratories in Mauritius" of the "Strengthening Fishery Production Programme" of the EU, a consultant carried out an audit of the laboratories at the centre in 2007. Based on his recommendations, a proposed action plan was prepared for the accreditation of the fish toxicity, marine chemistry and marine bacteriology laboratories. Laboratory personnel were given basic training for accreditation of laboratories against ISO 17025 standard.

9.4 SOCIO-ECONOMIC

The Ministry of Economic Development, Financial Services & Corporate Affairs is responsible for the collection of all socio-economic statistics of Mauritius. Data is collected via administrative records, censuses and surveys and disseminated mainly

[16].

9.5 FUNDING
See sections 9.1-9.3

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

Biological Research
Research performed is mainly undertaken for fisheries in:

- Estuarine and coastal fisheries
- Tuna fisheries
- Snapper/grouper fisheries
- Crab and shrimp fisheries
- Sea cucumber fishery
- Aquaculture

The Albion Fisheries research centre (AFRC), is involved in research for quite a few fisheries;[17]

- Collaborative research/studies with regional, international organisation (e.g. the Indian Ocean Tuna Commission (IOTC) for the management of tuna stocks in the Indian Ocean, the Indian Ocean Commission (COI) in fisheries and marine ecosystem monitoring studies and other foreign institutions). The AFRC has been conducting research on tuna since 1985 with emphasis on the collection of catch/effort data and length frequency data.
- Development and improvement of aquaculture production techniques. Seed production of marine shrimps and sea breams are being improved for stock enhancement. Red tilapia and seabream fingerlings are produced for distribution to fish farmers.

Environmental Research
The environmental research performed in Mauritius includes:

- The CORDIO, (Coral Reef Degradation in the Indian Ocean), project, allocated a sum of US$ 18 000 for studies on coral bleaching in Mauritius. Temperature data loggers were set at both sites. Project ended in November 2006;
- Mauritius has made an analysis of chemical oxygen demand (COD), nitrate-nitrogen (NO_3^--N) and phosphate (PO_4^{3-}) in coastal water quality;
- WIO-Lab Project aiming at intensifying the fight against marine pollution caused by land based activities and to determine the extent and magnitude of pollution of coastal waters in order to develop systems that will counter any damage.
- Coastal Zone Management research covering – Assessment of Environmental Impact Assessment (EIA) applications and Preliminary and Environmental Reports (PER)

[16] http://www.gov.mu/portal/site/cso
[17] http://www.gov.mu/portal/site/fisheries/menuitem.1b4d752328b132be7f7a98ada0208a0c/#Main%20activities%20of%20Albion%20Fisheries%20Research%20Centre

- Post EIA monitoring
- Ecological surveys for the delimitation of swimming zones, for widening of sea passes and dredging of channels
- Assessment of coastal development projects and tourism related activities
- Mapping of the bathymetry of the lagoons of Mauritius and Rodrigues
- Monitoring of mangrove propagated areas
- Public awareness campaigns on coastal zone development.

Socio-Economic Research

The Mauritius Research Council[18] is the driving force behind research for national development and to promote and pioneer research for sustainable development to enhance the quality of life of the people of Mauritius. The Institute has a dedicated project area related to "Ocean Technology and Marine Resources". The Institute has responsibility for socio-economic research and encompasses activities such as:

- foster, promote and co-ordinate research and development in all spheres of scientific, technological, social and economic activities;
- advise the government on all matters concerning scientific and technological policies;
  lay guidelines for, and initiate the formulation of research and development policies on a national basis;
- encourage commercial utilisation of research and development results in the national interest.

In addition, the Ministry of Economic Development, Financial Services & Corporate Affairs is responsible for the collection, compilation, analysis and dissemination of all socio-economic statistics of Mauritius. Data is collected via administrative records, censuses and surveys and disseminated mainly through three types of publication: economic indicators, digests and census and survey reports[19].

10.2 RESEARCH FUNDING

The current state of funding has mainly come from multi-lateral and bi-lateral donors. A summation of which is presented below:

- **Government of Japan** (Ministry website 2002), financing the construction of a Fisheries Training and Extension Centre and associated facilities at Pointe Aux Sables. Building and civil works started in March 2003 and The Fisheries Training and Extension Centre has been operational since October 2004. Japan has contributed to a large extent to the development of fisheries (fishing port facilities) and advancement of fisheries and aquaculture research (research infrastructure and technical assistance) in Mauritius. The Albion Fisheries Research Centre which carries out the research, development and management functions of the Ministry of Agro Industry, Food Production and Security (Fisheries Division) has almost entirely been constructed and equipped with Japanese assistance. The facilities at the Albion Fisheries Research Centre cover

[18] http://www.mrc.org.mu
[19] http://www.gov.mu/portal/site/cso

a total surface area of 3,410m² which include an office/administration block, biological, chemical, bacteriological and marine ecological laboratories and hatcheries. In addition, a set of out-door rearing ponds of a total surface of 12,000m² is available for experimental culture work[20].

- **Indian Ocean Tuna Tagging,** the objective of this project is to improve the scientific knowledge on the migration pattern of tuna in the Indian Ocean and to have a better apprehension of basic biological data. It is expected that this research project will reinforce the capacities of the countries of the region and of the Indian Ocean Tuna Commission (IOTC) to step up scientific advice and to develop a sustainable management scheme for tuna. Budget: 2004-2008, 14 million €.
- **Norway,** a cooperation program between Mauritius and Norway within fisheries management has been planned for a 3 year period, from 2008. Main components of the program will be Fisheries resource mapping including:
  - Competence strengthening within fisheries research and management
  - Develop a national plan of action to combat IUU-fishing
  - Regulations for certification of fishing vessels
- **The Kuwait Fund,** Approved the grant of 100 000 Kuwait Dinars for a feasibility study for the development of a long line fishery. In 2005
- "**l'Institut Français de Recherche pour l'Exploitation de la Mer" (IFREMER),** for the implementation of a regional scientific project to study the genetic structure and characteristics of the swordfish stocks in the Indian Ocean
- **ODINAFRICA project,** the goal of the current phase of ODINAFRICA is to improve the management of coastal and marine resources and the marine environment in participating countries by enhancing data flows into the National Oceanographic Data and Information Centres (NODCs) and strengthening the capacity of these centres to analyse and interpret the data so as to develop products and increase the delivery of services to end users.

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

A large proportion of the assessment is focused on obtaining data related to length/frequency analysis of the skipjack tuna, yellowfin tuna, the albacore tuna and the Swordfish.

10.4 ASSESSMENT FUNDING

No information in this section

11. DISSEMINATION OF SCIENTIFIC INFORMATION

Mauritius has a Documentation Unit/Marine Information Centre, which provides information and access to reference materials on fisheries, and the marine environment to students, stakeholders and the public in general. The library is also continually stocked with new publications and CD-ROMs. The website of the Fisheries Division is also regularly updated.[21]

[20] http://www.gov.mu/portal/sites/nsp/research/institution_al.htm
[21] Ministry of Agro Industry, Food Production and Security, Fisheries Division: Annual Report 2007

12. MANAGEMENT PROCESSES

The Ministry of Agro Industry, Food Production and Security is responsible for fisheries management. For example, with regard to illegal foreign fishing vessels which call at the port for different purposes such as loading/unloading/export of fish and fish products, transshipment, bunkering, change of crew, provisions and repairs are monitored. Enforcement is effected through patrols at sea and on land and contraventions are followed by legal proceedings. It appears that Mauritius has little ability to monitor the offshore resources for illegal fishing.

A Vessel Monitoring System (VMS) was set up in February 2005. The VMS monitors the location, speed and direction of licensed fishing vessels by means of the Inmarsat and Argos satellite-based tracking systems. The satellites send data at regular intervals to the Land Earth Station (LES), which after processing are transmitted to a database at the Fisheries Monitoring Centre (FMC) at the Albion Fisheries Research Centre. The VMS network includes five workstations, three located at the FMC, one at the National Coast Guard (NCG) Headquarters, Port Louis and one at the NCG Maritime Air Squadron (Plaisance). Twenty local fishing vessels were fitted with mini-C transponders. All fishing vessels that are licensed to fish in Mauritius waters are required to transmit data to the FMC while operating in the waters of Mauritius. Regulations in this regard were promulgated on 1 June 2005. Sixty-six vessels thus reported to the FMC during the year starting from March 2005

Tuna fisheries are monitored through the collection, processing and analysis of fishing and biological data obtained from local and foreign licensed vessels. An example of this came from a recent article in the newspaper L'Express.[22] In October 2009, a vessel carrying important quantities of tuna was banned from unloading its shipment in Port Louis. The reason was that the tuna originated from three boats blacklisted by the Indian Ocean Tuna Commission (IOTC). The shipment was thus considered as coming from illegal fishing.

Since the beginning of the year, two other cases were discovered, and the boats involved were also prohibited from unloading their shipment in Port-Louis. The Mauritian government intends to submit to the Parliament a new text of law, the Fisheries and Marine Resources Bill, which amends and consolidates the laws relating to the import and the export of fish and other sea products, and reinforces measures to combat illegal fishing. The prohibition of unloading illegally caught fish shows the determination of Mauritian authorities to fight illegal fishing, in order to protect the access of Mauritian fish products to the European market.

Tagging is considered an excellent tool for estimating the importance of interactions and competition between fisheries as well as to study tuna stocks and migrations. The Regional Tuna Project of the Indian Ocean Commission (IOC) conducted five tagging cruises in the western Indian Ocean, during which 955 fishes were tagged. Out of the total number tagged 15 were recaptured. Tuna tagging in the Indian Ocean was also undertaken by the Indo- Pacific Tuna Programme and by the Japanese National Research Institute of Far Seas Fisheries. 39 tuna marked by these organisations were

[22] http://www.lexpress.mu/display_article.php?news_id=95898

recovered in Mauritius. Analysis of data collected from the tag recoveries provide some preliminary estimates of growth rate and migration of tuna. Tagging is the most direct method to estimate growth, stock structure, schooling behaviour and migrations; it also provides essential information for estimating mortality (natural and fishing) and fisheries interactions and thus is pertinent for defining proper management of a stock.

Lastly, a recent project has been undertaken which attempted to improve the scientific knowledge on the migration pattern of tuna in the Indian Ocean and to have a better apprehension of basic biological data. It is expected that this research project will reinforce the capacities of the countries of the region and of the IOTC to step up scientific advice and to develop a sustainable management scheme for tuna. The project had a budget of 14 million €, which lasted from 2004-2008[23].

13. FUTURE OPPORTUNITIES

Limited information is available on future research opportunities in Mauritius, but it would appear that they would welcome further collaboration with other IO countries to manage the tuna and to work within the framework of IOTC.

14. STAKEHOLDERS

There are a variety of stakeholders involved in research within Mauritius. The Ministry of Agro Industry, food production and Security are mainly involved in the industrial longline fishery for tunas and swordfish.

NGO's are also active in the sector in order to gain further insight on the status of fisheries in Mauritius.

The Mauritius Oceanography Institute (http://moi.gov.mu), the MOI undertakes scientific research in collaboration with local and international institutions to contribute to the regional and global matrix of oceanographic science.

[23] Analysis of Tag Recoveries in Mauritius (1988-1993) and Presentation of Codification Procedure in Use 1995 http://iodeweb1.vliz.be/odin/handle/1834/519

Annex 1

Signing of the AMESD Grant Contract (1.231 M€) to the Mauritius Oceanography Institute

Wednesday, 09 September 2009 - http://www.amesd.org/en/ioc-marine-and-coastal-areas/description-of-the-thema-and-objectives/76-moi-grant-signing.html

The European Union, the African Union and the Mauritius Oceanography Institute (MOI) have signed this Monday, September 7, on the MOI premises (Quatre-Bonnes - Mauritius) with an IOC representative, the AMESD-THEMA grant contract.

This 1,231 000 € grant from the European Union will allow the MOI, which acts as the AMESD regional implementation centre for the IOC region (including: Madagascar, Seychelles, Comoros, Mauritius, Kenya, Tanzania, Mozambique), to implement the AMESD regional activities for the 3 next years.

The corresponding forthcoming activities will aim to:

- develop new products and operational services using earth observation data (satellite imagery) for the management of fishery resources, the monitoring of fishing activities and the ocean observation (to assess climate change...)
- improve the regional access to satellite Earth and Ocean Observation data through the installation of AMESD satellite thematic receiving stations and the dissemination of products and services.
- strengthen the capacities of MOI and regional technical partners in the processing and analysis of spatial observation data coming from earth observation satellites

These activities will be undertaken by the Mauritius Oceanography Institute (MOI) in collaboration with several regional partners: fisheries Ministries and "Fisheries Monitoring centres" of Madagascar, Mauritius and Comoros; fisheries research institutes from Seychelles, Mozambique, Kenya, Tanzania, etc.

Chapter 19: Seychelles

1. EXECUTIVE SUMMARY

A review of the research, management and administrative activities pertaining to fisheries accessed by EU fleets in Seychelles was conducted in November and December 2009. Interviews were conducted with key scientists and managers. The main findings from this third country assessment are summarised as follows:

- Seychelles has a long history of access agreements with EU and Asian fishing nations, with the fishing sector having developed into a major economic pillar over the last 3 decades
- A strong relationship between the EU and third countries in the region will be needed to provide a good foundation for research and management as the target stocks approach or exceed limits to sustainability
- Academic institutions are absent in Seychelles and fisheries research is concentrated entirely within the Seychelles Fishing Authority (SFA), the executive arm of the Government for fisheries
- SFA has well developed fisheries information systems and generally collects reliable data on industrial and artisanal fisheries. In terms of industrial purse-seine fishery which is centred in Seychelles, SFA undertakes an important role for data provision to IOTC
- Applied biological, environmental, ecosystem and socio-economic research related to pelagic resources has typically been conducted in collaboration with EU partner institutions, notably IRD which has maintained a long-term presence at SFA
- Financial resources are not generally limiting to research in Seychelles which is principally constrained by human capacity (few high level scientists, e.g. MSc/PhDs)
- For Seychelles, collaboration with partners will continue to be important for conducting research in the short to medium term. The recently opened Seychelles University may improve national research capacity in the longer-term.
- Research gaps identified in this review are obviously of regional importance. Developing networks of researchers, both between the EU and third countries and within third countries, is seen as vital to improved management of pelagic ecosystems.

2. FOR ALL COUNTRIES: FISHERIES AGREEMENTS / PRIVATE LICENCES

Seychelles has a current Fisheries Partnership Agreement with the EU (2005-2011) providing for access to the EEZ by EU purse-seine fleets targeting tuna and tuna-like species. The average annual value of the agreement (license fees and financial compensation) was US$ 5.27 million (averages: 2006-2008). There is also a fleet of Seychelles-flagged Spanish owned purse-seiners, with which Seychelles arranges private licenses with vessel owners. A few purse-seine vessels flagged by Iran, Mayotte and Thailand also have current or recent access through private licenses.

Seychelles also has current access agreements with Japan and Taiwan, for freezer longline fleets. The Japanese agreement comprises two parts, the principal agreement concerning terms and conditions of access, and the second providing Goods and Services to Seychelles. In terms of Taiwan, the agreement is between the Government of Seychelles (GoS) and the Taiwan Deep Sea Tuna Boat-owners and Exporters Association, and the latest version came into force in 2008. It provides for licensing arrangements for a maximum of 120 longline vessels.

3. FOR COUNTRIES WITH A CURRENT EUROPEAN AGREEMENT (FA / FPA)

The FPA has not changed in terms of focus on tuna and tuna-like species. A clause relating to deep water species was inserted in the current FPA, should interest and fisheries develop. An ex-ante evaluation was conducted prior to the current FPA, for which the GoS authorities (SFA, MENRT) were interviewed. However, the results were confidential and were not made available to GoS prior to or during the negotiations. Finally, a copy was made available several years after the negotiations upon request by the GoS. As far as GoS are aware, the results were available to EU member states. EU member states are present during negotiations as observers only, while EU and GoS negotiate. Within the GoS, there is apparent dissatisfaction with the availability and transparency of information provided by the Commission as the draft FPA was not available prior to the opening session of the negotiations.

There is a Joint Committee (JC) between the parties, covering the main responsibilities and functions, which meets annually and on request. The last meeting was held in June 2009, with Seychelles delegation represented by SFA, the fisheries ministry (Principal Secretary) and the Ministry of Foreign Affairs. Delegates for the EU include the EU, fishing member states and a representative of the EU presidency. The GoS are apparently fairly satisfied with the performance and effectiveness of the JC.

There are no restrictions on catch and effort under the FPA but all such data for EU vessels fishing inside the EEZ are provided (position information by hourly VMS and logbook sets, catch by set and effort calculated from logbooks). Data are used for national statistics, research and monitoring, control and surveillance. Seychelles has raised concerns with the EU regarding the reliability of the data provided. Recently, there have been technical meetings and meetings of the JC to address the issue.

Few technical measures are applied under the FPA with no gear restrictions, by-catch limits or recovery periods. Seychelles has restricted zones (shallow banks, less than 200 m depth) from which purse-seine vessels are excluded in the agreement. The FPA does allow for reduction or increases in fishing possibilities but this has not occurred. Some technical information (e.g. catch and effort) is provided to the EU through the JC.

Financial contributions through the FPA are controlled by the Ministry of Finance in Seychelles but use of the funds for fisheries-related interventions is based on requests by the competent authority (SFA), following approval by the SFA Board of Directors and the minister of the parent ministry. The agreement stipulates that 54% of total financial contributions should be spent on fisheries-related interventions. The funds do not go through the JC. Financial contributions of the current agreement have mainly been used for infrastructure development (c. 40%), monitoring and control (c. 20%), artisanal fisheries (c. 20%), research (c. 10%) and training (c. 10%).

4. FOR COUNTRIES WITHOUT CURRENT FA OR FPA WITH THE EU

Not relevant to Seychelles.

5. FISHING ADMINISTRATION

Seychelles Fishing Authority (SFA) is the executive arm of the GoS for all fisheries-related matters, including administration and management. SFA also collects and manages all fisheries data relevant to the FPA and other agreements. Data for the purse-seine fisheries are collected through logbooks, vessel monitoring systems, port sampling and research programmes. A Seychelles observer programme was approved by GoS in late 2008 but has not been implemented due to piracy issues. The fisheries and biological data derived from these programmes are provided to the Indian Ocean Tuna Commission (IOTC), which has the mandate for management of the stocks targeted by the EU in Seychelles EEZ.

6. LIST OF IMPORTANT STOCKS

The FPA does not specify the stocks to be covered by the agreement, which refers to tuna and tuna-like species, including billfish. The main stocks actually targeted in the EEZ by EU vessels are yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*), which this review focuses on. EU longline vessels are also covered under the agreement (12 vessels), for which swordfish (*Xiphias gladius*) is a relatively important species, but these have limited presence in the Seychelles EEZ.

7. PROTECTED, ENDANGERED AND THREATENED SPECIES (PET)

In Seychelles, all cetaceans, turtles (incl. green, hawksbill, leatherback and loggerhead) and the whale shark are protected according to law. Numerous shark species are considered threatened in Seychelles in accordance with IUCN criteria but this status has not been translated into national legislation. However, Seychelles is implementing a Shark-NPOA, which constitutes national policy on sharks and will consider management requirements.

PET numerous species of turtles and sharks (including rays) are taken as by-catch in purse-seine and longline fisheries. The IOTC resolution concerning mitigation of sea bird by-catch applies to Seychelles-flagged vessels fishing in areas of concern but by-catch does not occur in the EEZ. IOTC mitigation measures regarding sea turtles are recommendations and Seychelles has adopted a policy to promote uptake by the industry (i.e. use of circle hooks). SFA has also adopted IOTC guidelines regarding reporting of data on shark by-catch.

8. RESEARCH COLLABORATION AND RESEARCH COORDINATION

At the national level, fisheries research in Seychelles is conducted almost entirely by the Research & Development Section of SFA. Seychelles lacks academic institutions - although the Seychelles University started in 2009. Most Non-Governmental Organisations (NGOs) focus on conservation issues (endemic species, threatened

species, habitat restoration etc) and few have addressed direct fisheries issues. A few NGOs and the Seychelles Centre for Marine Research & Technology (SCMRT) conduct research on coral reefs and/or manage marine protected areas (MPAs), all of which are inshore and coastal. While SFA collaborates with numerous national institutions on research, most are generally related to inshore, demersal fisheries.

The main areas of research conducted by SFA are:

- Stock assessments (subset of demersal line and trap fishery species)
- Fisheries development research (e.g. assessment of deep water shrimp resources, deep water snapper stocks)
- Biological and behavioural studies (demersal species, pelagic species in collaboration with partners)
- Ecological research (e.g. effects of coral bleaching on reef fisheries, MPA effects)
- Oceanography (e.g. studies of larval dispersal)
- Climate research (e.g. effects on climate variability on tuna fisheries)
- Socio-economic research (e.g. cost-benefit analyses, climate change adaptability, use of fisher knowledge).

National organisations/institutions collaborating on research projects

- Seychelles Centre for Marine Research and Technology
- Departments for environment and natural resources
- Marine Conservation Society, Seychelles
- Islands Conservation Society
- Nature Seychelles

International research projects and collaborating organisations/institutions for non-relevant species/ecosystems

- WIOMSA MASMA projects: The importance of spatial behaviour of fish and fishers for inshore fisheries management and design of MPAs. Coastal Oceans Research and Development-Indian Ocean, Institute of Marine Sciences (Zanzibar), Kenya Marine and Fisheries Research Institute, Wildlife Conservation Society, University of East Anglia, Rhodes University. Grants = US$ 400,000, shared among partners.

Research projects and collaboration (current) concerning relevant species/ecosystems

- **SWIOFP**: A regional GEF funded/World Bank implemented project focusing on fisheries research for offshore, shared, transboundary and migratory stocks with a focus on resources other than tunas (2008-2013). However, collaboration with IOTC on artisanal fisheries monitoring systems, by-catch mitigation research and biological studies for data poor IOTC species are planned. The project budget is around US$ 18 million. Collaborating institutions are: Marine and Coastal Management (South Africa), Tanzania Fisheries Research Institute, Kenya Marine and Fisheries Research Institute Albion Fisheries Research Centre/Ministry of Fisheries (Mauritius), Direction de la Pêche et des Ressources Halieutiques (Madagascar), Fisheries Research Institute (Mozambique), National Directorate of Natural Resources (Comoros), IRD, IFREMER.

- **MADE**: An EU funded project focusing on mitigation of ecological impacts from open ocean pelagic fisheries (2008-2012). The project budget (EU contribution) is around EURO 3 million. Collaborating institutions are IRD, IFREMER, SFA, Universite Libre de Bruxelles, AZTI-TECNALIA (Spain), AQUASTUDIO AQUA (Italy), Hellenic Centre for Marine Research (Greece), University of Patras (Greece), Universidade Federal Rural de Pernambuco (Brazil), Universite de la Reunion (France), University of Montpellier, The Genoa Aquarium Foundation (Italy), University of Azores (Portugal)

- **IOSSS:** Indian Ocean Swordfish Stock Structure project, involving SFA, IFREMER and collaborating institutes in Australia (CSIRO).

Due to the fact that the pelagic fisheries component of SWIOFP has been developed by the same research team involved in MADE, the two projects have been designed to be complementary. Links between the pelagic components of SWIOFP and IOTC have become stronger in recent years, which will reduce the potential for overlap – identification of research gaps under SWIOFP was based on recognised IOTC needs. Sampling of swordfish will also be shared between SWIOFP and IOSSS.

A major gap in the Indian Ocean is information on neritic tunas and other scombrids (e.g. king mackerel) that are regionally important to small-scale fisheries. Moreover, shark stock status is poorly known. It is planned for SWIOFP to address some of these species.

The IOTC secretariat is based in Seychelles and there has always been strong collaboration with SFA. Notably in recent years, strong support was given to the RTTP-IO (regional tuna tagging project). SFA reports to IOTC according to guidelines and meets most reporting requirements for working parties. As a member, data are also reported to the Southwest Indian Ocean Fisheries Commission (SWIOFC), but the focus in on non-tuna species and fisheries.

9. DATA COLLECTION

9.1 BIOLOGICAL

SFA routinely collect logbook catch and effort data from the EU purse-seine vessels – data are corrected based on port sampling; landings and transhipment data. SFA routinely collect length frequency data for YFT, BET and SKJ through port sampling. Data for ALB are collected less regularly due to lower landings at Port Victoria. Sex and maturity data are collected on an ad-hoc basis.

Spatially disaggregated catch, effort and length data are shared with IOTC. SFA also collaborates with IRD and IEO for the collection, management and sharing of length data for the French and Spanish fleets, respectively. SFA has not conducted independent studies on the spatio-temporal distribution of spawning, location of nursery grounds, recruitment relationships, life histories etc, but has collaborated on projects addressing a few of these parameters.

- Quality of the logbook data (in terms or reliability) for estimation of stock (e.g. CPUE) and performance (catch against reference tonnage) indicators has been an issue in recent years

- Seychelles have not conducted independent stock assessments, and biological sampling programmes have been conducted in collaboration with partners (e.g. IRD) – human resource (technical) constraints are a barrier to development of independent studies
- Outstanding issues include (1) need to increase length frequency sample sizes, particularly for swordfish, need to improve sampling of swordfish for reproductive studies (3) need to improve identification and sampling of shark by-catch.
- Logbook submissions are usually on time, enabling timely advice for managers

9.2 ENVIRONMENTAL

Capacity for environmental data collection and use is undeveloped in Seychelles. SFA have nominally provided oceanographic data services for government, with the Meteorological services also providing basic functions. SFA have attempted to develop this capacity to better understand environmental impacts on fisheries, and now have a full-time physical oceanographer.

Environmental datasets (in-situ and remotely sensed data) are being developed. Remotely sensed data available from SFA for the EEZ and region include SST, altimetry and currents. Recently, these have been used to support research (e.g. studies on climate variability effects on tuna fisheries under the Seychelles Second National Communication to the UNFCCC). Environmental analyses of by-catch patterns as part of the EU project MADE are also being supported by SFA. Collection and management of remotely sensed oceanographic data are being addressed under the ongoing project African Monitoring of the Environment for Sustainable Development (AMESD). In the Indian Ocean, the focus of this project is Management of Marine and Coastal Zones, and SFA will be provided with hardware and software for the collection of ocean colour, SST, altimetry data etc, data which will be used for research and services. The LME programme (ASCLME) is also providing in-situ datasets to participating countries, which will be managed through the Seychelles Centre for Marine Research and Technology.

- The major gap is the lack of a coordinated approach to oceanographic research in Seychelles. A dedicated oceanographic institute is lacking and capacity is low, with very few Seychellois trained in this field.
- The vulnerability of Seychelles to climate change warrants capacity development in oceanography.

9.3 ECOSYSTEM

SFA collects ecosystem information required by IOTC but only at present from declarations, as the observer programme has not been implemented. By-catch and discard data are considered unreliable from purse-seine and longline logbook declarations, although they are thought to be low for purse-seine fisheries. Stomach content data have been collected on an ad-hoc basis as part of collaborative research programmes (e.g. UR TETHIS). VME data are not collected.

- The major issue is the lack of implementation of an observer programme for the Seychelles-flagged purse seine fleet, leading to gaps in critical ecosystem information such as by-catch of PET species. At the moment, piracy is a major impediment to observer programmes.

- Declaration on by-catch and discard of PET species are required but data are considered unreliable.
- Catch statistics are unreliable without reliable estimation of tuna discards, leading to uncertainty in stock assessments.

9.4 SOCIO-ECONOMIC

SFA collects data on purse seine vessel expenditures in Port Victoria, with routine data compilation for every port call, facilitated by vessel agents. Data on imports and exports of tuna and tuna products are also collected by SFA. Other socio-economic data such as household, demographic and sexual equality information, have not been collected for persons in the industry. The available data is used routinely (annually) by SFA to estimate the contribution of the tuna industry to the national economy, and were analysed for a study on the effects of climate variability (see below). Otherwise, socio-economic data collection and studies are not well developed in Seychelles.

- The major issue identified is the lack of capacity. SFA maintain a section for economic and market support but it has been difficult to retain and attract economists due to low salaries.
- Economic databases have been poorly managed. There is a need to introduce new data collection procedures to access demographic, household information and other key parameters.

9.5 FUNDING

Collection of data for the EU, Seychelles-flagged fleets, and Asian longline fleets is funded under the SFA budget. As a parastatal organisation, SFA receives a recurrent budget, which approximates to around EURO 1 million annually. This is supplemented for targeted interventions from the EU financial contribution. The SFA budget and accounting procedures are not disaggregated into data collection, research etc, making estimation by these categories uncertain. However, based on the number of staff involved in each type of data collection and an estimation of operational costs, a preliminary estimate was calculated.

Biological (tuna fisheries only): 17 staff = EURO 68,000
Environmental: 1 staff = EURO 6,400
Ecosystem: 4 staff = EURO 19,200
Operational costs = EURO 25,000
Total: c. EURO 120,000/year

10. RESEARCH, FUNDING AND ASSESSMENT

10.1 RESEARCH

In this section, we focus on research projects and programmes that have been completed within the last 10 years and which focused on pelagic species or ecosystems. Ongoing programmes of relevance were detailed earlier in the report.

- **FADIO**: This project, '*Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems*', was funded by the EU between 2003 and 2006. It aimed at studying the behaviour of tuna and other pelagic species around FADs in order to better understand the effects of the tuna purse seine FAD fishery, with

most of the studies conducted in and around Seychelles in collaboration with SFA.
FADIO addressed *biological and ecosystem Research*

- **THETIS**: The research programme, '*Thons Tropicaux: Environment, Strategies d'Exploitation et Interactions Biotiques dans les Ecosystemes Haturiers'*, was implemented by IRD in collaboration with SFA, amongst other partners, between 2001 and 2004. The aim of the programme was to understand the meso-scale bio-physical processes controlling the dynamics of pelagic ecosystems, with an emphasis on trophic dynamics. SFA played a principal role in stomach contents analysis and the programme led to numerous publications which were co-authored by local scientists.
  THETIS addressed *biological and environment research*

- **RTTP-IO**: The *Regional Tuna Tagging Programme – Indian Ocean*, was supported by SFA throughout its duration (2004-2009), with landings and transhipment in Port Victoria providing the principal platform for tag recoveries.
  RTTP-IO addressed *biological research*

- **CAPPES**: This project, '*CAPturabilite des grands PElagiques exploites a la palangre derivante dans la EEZ des Seychelles'*, was funded by SFA in collaboration with IRD between 2004 and 2006. The aim was to improve knowledge of the habitat of longline target species (swordfish, bigeye and yellowfin tuna) in Seychelles in order to promote better targeting strategies, reduce by-catch and adopt an ecosystem approach to the fishery.
  CAPPES addressed *biological and ecosystem research*

- **Depredation Studies:** Over the last 3 years, SFA have conducted a series of experimental trials of mitigation devices to reduce depredation in longline fisheries.
  These studies addressed *biological and ecosystem research*

- **Climate Change Research:** SFA recently completed a research project (2007-2009) on the socio-economic effects of climate variability on Seychelles tuna economy, as part of the Second National Communication to the United Nations Framework Convention on Climate Change. This was conducted in collaboration with scientists from IRD and the University of Huelva, Spain
  These studies addressed *socio-economic research*

10.2 RESEARCH FUNDING

A large proportion of funding is currently project based and derived from grants. Under the recurrent budget, SFA supplements the research projects (providing in-kind contributions to grants etc) in terms of office, IT, staff and research vessels costs. Small-scale research projects deemed a priority can usually be funded out of the recurrent budget, but grants or exterior financial support (e.g. FAO) may be sought for more costly research. The value of current project grants for research relevant to tunas and billfish are given in earlier sections of the report.

10.3 ASSESSMENT METHODS, ASSESSMENT MODELS AND SOFTWARE

For tunas and billfish, SFA scientists have not conducted independent stock assessments, instead relying on stock status advice from IOTC working party assessments. Stock assessments conducted at the national level are focused on demersal species.

10.4 ASSESSMENT FUNDING

Not relevant – see section 10.3.

11. DISSEMINATION OF SCIENTIFIC INFORMATION

The Senior Statistician of the Research and Development (R&D) Section of SFA is responsible for data submissions to IOTC and sharing through active collaborations. The Documentation Centre of SFA is responsible for dissemination of statistical bulletins, after compilation of statistics by the Statisticians in the R&D section.

Biological and ecosystem data are mainly shared through active collaboration with project partners IRD and IEO, and with the relevant RFMO (IOTC). Results are disseminated in SFA statistical bulletins (quarterly, annually), summarised in the SFA Annual Reports and occasionally through seminars. The level of environmental data collected, shared and disseminated is low as a dedicated programme for this is relatively recent. Data are shared with national and international institutes, or research programmes, upon request. SFA currently manages the collection and management of ocean temperature datasets in Seychelles, which are shared with partners through a website. As noted earlier, SFA are developing capacity and services for oceanographic data under the AMESD project.

Socio-economic data are shared mainly with national institutions, notably the National Statistics Bureau and the Ministry of Finance, in reports on the performance of the industrial fisheries sector. Results are also summarised in SFA Annual Reports.

Scientists at SFA have contributed to numerous peer-reviewed publications relevant to tunas and billfish, based on collaborative research, but typically not as lead authors. Lead authorship on peer-reviewed papers by SFA scientists has mainly related to demersal fisheries and coastal habitats.

12. MANAGEMENT PROCESSES

Seychelles Fishing Authority (SFA) is responsible for fisheries management. There are no fisheries management measures for the tuna and billfish fisheries in Seychelles, with the exception of closures for shallow water (<200m) to industrial fisheries. In terms of enforcement measures, SFA is also responsible for monitoring, control and surveillance activities, which are applied in port, at sea and by air. There are no bans on fishing in the EEZ directly related to tuna and billfish. However, many gears that are destructive to bottom habitats, e.g. trawls, are banned.

Declared catches are validated by inspections of landings and transhipment. IUU fishing is identified and monitored through a range of MCS activities, including control of registration of vessels and issuing licenses, port inspection of logbooks and wells, VMS, catch validation for export.

Seychelles interacts with other countries on IUU through:

- (Indian Ocean Commission) Regional Surveillance Project,
- Data exchange, through regional projects and bilateral relationships
- Harmonisation of Port State Measures under the IOC project
- Control of transhipment at sea, combined with IOTC observer programme

A VMS system is mplemented for all foreign and Seychelles-flagged fleets targeting tunas and billfish, as specified in the various agreements. In terms of compliance, it is mandatory for foreign vessels and compliance is 100%. For the local vessels, it is voluntary until new Fisheries Act is passed, when it will become mandatory. However, 80% of local vessels with autonomous power supply have been installed with VMS on a voluntary agreement.

VMS data are available for scientific purposes and there are mechanisms to link those data with logbook data. Also, VMS is used to enforce the restricted zones that apply to the industrial fleets. For the fisheries and species in question, there are no decision rules or reference points in use.

13. FUTURE OPPORTUNITIES

The main threat to future opportunities for research in the Seychelles EEZ and surrounding areas is piracy. This is currently impacting on several research programmes related to pelagic open ocean fisheries, notably MADE and SWIOFP, and is impacting on observer programmes. However, programmes based on port sampling can be carried out and opportunities involving research at sea are also suggested in lieu of a reduction in the piracy threat.

- Develop and implement national programme for improved collection of fisheries statistics and biological studies of sharks (pelagic and demersal species) (opportunity under NPOA-Sharks; high priority)
- Improve swordfish biological sampling and implement reproductive studies of swordfish (opportunities also being developed under IOSSS)
- Implement data collection for sport fisheries to provide alternative data sets for billfish (opportunity under the new Fisheries Act, which gives SFA regulatory control of these fisheries)
- Support IOTC plans for a regional level programme of research on fisheries catching marlins and sailfish, including biological studies.

14. STAKEHOLDERS

Stakeholder involvement in research occurs in Seychelles. In the (local) semi-industrial longline fishery for tunas and swordfish, the industry has assisted in research on the following topics:

- Testing devices for mitigation of depredation by marine mammals and sharks on longline catches

- Sampling catches for gonads and retaining undressed specimens for genetic and reproductive studies
- Involvement in the CAPPES project which researched optimal longline configurations for different target species
- Voluntary uptake of circle hooks and sharing of data on their effects for target species and by-catch
- Given constraints on bait for longline fisheries in Seychelles, the industry has also assisted in trials of small purse-seine gear for catching bait, including conversion of a longline vessel for this purpose

The purse-seine vessels have also assisted in research on FADs (FADIO Project), sharing of marine mammal and whale shark observation data,

Most involvement has therefore been limited to assistance in data collection and experimental work. Stakeholders have not been involved in data analysis although there is typically regular feedback within collaborative research programmes. In terms of decision-making, research and management processes are participatory.

Interviewees:

Mr. Vincent Lucas – Manager of Research and Development, SFA
Mr. Jude Talma – Manager of Fisheries Management Section, SFA
Ms. Juliette Dorizo – Senior Statistician, SFA
Mr. Rondolph Payet – SWIOFP Executive Secretary (formerly CEO of SFA)
Mr. Andre Gabriel – Senior Accountant, SF

Chapter 20: The Faroe Islands

Background

The Faroes is a self-governing territory with its own democratically elected government, under the external sovereignty of the Kingdom of Denmark. 20% of Faroe Islands' national budget comes as economic aid from Denmark. The Faroes retains a degree of autonomy in line with their treaty with Denmark, i.e. the Act on the Concluding of Agreements under International Law by the Government of the Faroes; and the Faroes is not a member of the EU having determined that the EU Common Fisheries Policy would not support the best interests of the Faroes as a fisheries dependent nation. In accordance with the Home Rule Act of 1948 the Faroe Islands legislate and govern a wide range of areas, including the conservation and management of living marine resources within the 200-mile fisheries zone, environmental policies and research.

The Faroes negotiate their own trade and fisheries agreements with the EU and other countries, in consultation and cooperation with the Danish foreign ministry, and participate either independently or together with Greenland (Denmark in respect of the Faroe Islands and Greenland) in a range of regional fisheries management bodies. The EU considers the Faroes to be a third country with which it has established a Bilateral Fisheries Agreement.

The Faroe Islands participate actively in the multilateral Nordic Cooperation established by the Helsinki Treaty. This treaty has inter alia established close cultural cooperation among the Nordic Countries. As a coastal state they also participate in multilateral negotiations on the management of shared fish stocks in the Northeast Atlantic such as Atlanto-Scandic herring, mackerel, blue whiting and redfish.

The Faroes and Greenland have refused to abide by quotas set by the North Atlantic Fisheries Organization (NAFO), which sets catch limits for each member.

Earlier this year Canada barred Danish-flagged fishing ships from East Coast ports as punishment for the alleged overfishing of the 334-tonne shrimp quota set by NAFO. This is seen by some as targeting the Faroe Islands fleet, and the dispute flags an ongoing and potentially strengthening issue if and when retreating sea ice expands arctic fishing activity.

Whaling, practised in the Faroe Islands since 1584, is regulated by Faroese authorities and does not fall under the International Whaling Commission, with whom there is disagreement vis-à-vis the Commission's legal authority to regulate small cetacean hunts. Long-finned pilot whales (*Globicephala melaena*) are killed in hunts, called "grindadráp" in Faroese; these are non-commercial and are organized on a community level and anyone may participate.

In November 2007 the Faroe Islands were granted associate membership of UN’s Food and Agriculture Organization, FAO. NB Only independent nation states can get full membership in FAO. Associate membership grants full access to sessions, conferences and meetings, without voting rights.

Section 1: Fisheries Administration

1.1 All Types of Agreements

The Faroes have negotiated a fisheries agreement and a free trade agreement with the EU.

Faroes have also entered into fisheries agreements with Greenland, Iceland, Norway and the Russian Federation.

Agreements and management can be complex, for example the Faroese Pelagic Organization's North-East Atlantic Mackerel fishery in the NE Atlantic (including Western & North Sea components), falls under the following arrangements:

- a tripartite agreement between Norway, EU and the Faroe Islands for the area west of the British Isles, Ireland, and Norway,
- a bilateral cooperation between Norway and the EU for the North Sea component of the stock,
- NEAFC for international waters
- a southern component of the stock is managed by EC alone,
- a northern component is managed by Norway and the Faroe Islands

1.2 Membership of RFMOs

The Faroes are a full member of the North Atlantic Marine Mammal Commission (NAMMCO). Through Denmark the Faroes (with Greenland) are represented in NAFO, NASCO and NEAFC. Denmark in turn is represented in these RFMO's by the EU.

1.3 Management

Ministry of Fisheries and Natural Resources is the government authority responsible for the conservation and exploitation of the Faroe Islands fish resources.

The fishing industry is closely consulted on decisions regarding conservation of fish stocks and the management of fisheries, including fisheries legislation, regulations and international negotiations. This is facilitated through formal standing advisory committees and specific issue focused consultative meetings. The Parliamentary Committee on Industry also consults with relevant stakeholders.

In the Faroe Islands fishing licenses are awarded by The Ministry of Fisheries and Natural Resources (www.fisk.fo) and are renewed on a yearly basis providing the license requirements continue to be met. Effort can be controlled by either number of fishing days or quotas and the licenses are transferable and can be merged (within sectors). The Ministry conducts all monitoring, control and surveillance.

Regulations of all fisheries in the Faroese fisheries zone (FFZ), and Faroese fishing vessels outside the Faroese fisheries zone is based on the Commercial Fishery Act, 1994, which states that: …the living marine resources in the FFZ and Faroese allocations in waters outside the Faroese fisheries zone are the property of the Faroese

people and that these fisheries should be sustainable in both biological and economic terms. Socio-economic factors should also be taken into account...

The 'Fishing Days' system

A management system of individual transferable quotas was introduced in 1996, with restrictions on transferability. The quotas are for fishing days for 5 different groupings of fishing vessels in the Faroese fisheries zone, based on an assessment of the fishing capacity of each vessel group based on the data series from 1985-1994. For each fishing year (September-August), each group of vessels is awarded a number of fishing days, which are further divided between individual licensees in each group.

Fisheries in the EEZ are further regulated by area closures (especially for bottom trawl fisheries) to protect stocks, especially juvenile fish and spawning stocks. There is apparently no scientific estimate of the effect of these closed areas on the overall fishing mortality.

A vessel may transfer fishing days to another vessel in the same vessel group only if it has utilized at least 60% of its fishing days the preceding fishing year. Transfers between vessel groups are restricted with the aim of preventing increases in fishing efficiency in any one vessel group.

This management system is intended to provide a flexible and responsive management tool, allowing vessels to adapt activities within a broad framework of management strategies. This is well suited to fishing for a mixed catch of ground-fish species in Faroese waters, and is conducive to a multi-species ecosystem management approach. The system reduces incentives to discard non-target species and/or misreport catches. It is unnecessary to set annual quotas on single stocks as the basis for the fisheries regulation, but allows flexibility of effort between main stocks over a number of years, driven by catches and market prices.

The current 'day' regulatory system may not be as responsive as a catch quota system, given that it may be easier to give a value to a catch rather than a potential catch. Another challenge of the system is to ensure that the fishing efficiency/capacity can increase within the various vessel groups; and it is noted that since 1996/1997 the number of fishing days has been reduced by 16-17% for the largest vessel groups,

The overall allocation of fishing days is reviewed on an annual basis through a process of consultation in which the fishing industry actively participates. The level of fishing effort (days) for the next fishing year (1 September to 31 August), must be adopted by Parliament, based on a proposal from the Minister, by August 18th each year. The Minister bases his proposal on assessments and recommendations from both the Faroese Fisheries Laboratory and the Fishing Days Committee.

Scientific advice on the sustainability of fishing effort is based on regular monitoring of stock sizes and fishing mortality, which have been conducted for the past 50 years by ICES and the Faroese Fisheries Laboratory.

The Fishing Days Committee is comprised of representatives from the fisheries sector and must, as does the Fisheries Laboratory, provide the Fisheries Minister with

recommendations for what level of fishing days for each vessel group will best ensure that the stocks can be fished sustainably.

Since the introduction of the fishing day system in 1996, the total number of days has been gradually reduced by over 20%, in order to adjust for likely increases in fishing efficiency. Continuous evaluation of fishing efficiency ensures a sustainable balance between resource productivity and the capacity of the fishing fleet.

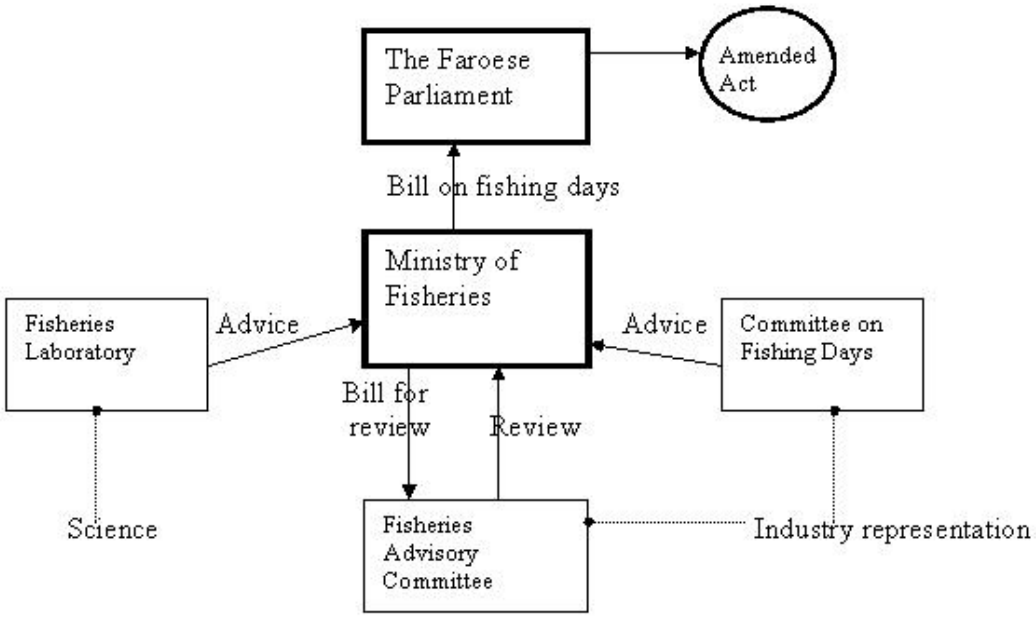


Figure 1: Process for day allocation. Source: http://www.fishin.fo/Default.aspx?ID=8669

Relevant rules are implemented through Faeroese National Law. The Fisheries Act requires sustainable exploitation of resources – both economically and biologically, with due regard to biodiversity and socioeconomic considerations. The Faroese have a specific objective to keep fishing effort at a constant level.

Within the 12 nm zone all mobile fishing gear is permanently banned with the sole exceptions of scallop dredging (one license) plus a single derogation for a limited amount of trawling (a small scale summer trawl vessel for 10m or smaller vessels fishing in restricted areas for plaice, lemon sole and monkfish). Jigging and long lining for finfish are allowed, however, as is potting for e.g. lobsters and whelks. Legislation gives priority to static gear over mobile gear within this 12nm zone.

From 12 to 200 nautical miles there are a number of areas closed to all mobile bottom gear, some permanent e.g. Faroes bank and some seasonal (e.g. a cod spawning zone in the north, where/when it would also be illegal to fish by any method including scallop dredges). There is a general presumption in Faroese waters against fishing during spawning seasons.

Landings

Discarding is not permitted in any fishery within Faroese waters - all catch must be landed. All commercial fish by-catch must be logged and landed at an authorised weight control landing slip office (almost always at the quayside fish market in the capital Tórshavn). These landings are easily and frequently verified by Ministry officials. After landing commercial by-catch may be sold in the local market and details are recorded both at landing and market. The data is available for local fisheries management.

Non-commercial catch, referred to as "rusk", must also be landed, there is apparently no detailed information on the invertebrates in this component of the catch.

1.4 MCS

The Faroese Fisheries Inspection (FVE) operates under the authority of the Ministry of Fisheries and Maritime Affairs; the FVE in cooperation with the Danish navy is responsible for monitoring and inspecting catches and landings of individual vessels and the weighing-in of catches, including onboard inspection, monitoring of transhipments and inspection of landings in port.

FVE has two guard vessels, a patrol boat and two helicopters at its disposal (Bell 412 and Bell 212). The vessels are on duty all year round in the Faroese fishery waters. Occasionally, in support of a multilateral agreement, a vessel is dispatched for fishery inspection duties in NAFO (Northwest Atlantic Fisheries Organization) and NEAFC (North East Atlantic Fisheries Commission) regulatory area.

The harvesting licence is an operating licence issued to an individual vessel, and it specifies the details of fishing activities (catch & area limitations and gear requirements) In which the vessel is permitted to participate. It also outlines requirements for reporting of catch data and information on landings or transhipments.

A daily log of their fishing activities must be recorded in an authorised catch logbook issued for this purpose, regardless of whether or not fishing takes place on that day. Data recorded should include catch and bycatch. Note, as stated elsewhere all caught material must be landed.

Fisheries inspectors may inspect any fishing vessel operating within the national fisheries jurisdiction, and any fishing vessels flying the Faroese flag operating in waters outside the national jurisdiction. Inspectors have the authority to board vessels, check fishing activities, gear used, logbook data, catch composition etc. The Faroese Fisheries Inspection compares fisheries landing and sales data, where a Faroese vessel accidentally exceeds its allocated quota, it may be possible to transfer/buy unused quota from another vessel, or accept a reduction of quota for the following year.

All vessels larger than 15 GT must have satellite vessel monitoring system in both national and international waters.

To minimize the risk of undeclared landings, Faroese vessels are not allowed to land fish in any harbour before the skipper has informed the Faroese and the local inspection

authorities. Landings to non-Faroese port are under bilateral and international agreements. The monitoring procedures follow coastal and international agreements

Section 2: Fisheries Research

The Faroese Fisheries Laboratory provides the Ministry of Fisheries and Natural Resources with scientific assessments and advice on the status and management of fish stocks and marine ecosystems around the Faroe Islands. Fish stock assessment is based on a variety of surveys including bottom trawl, acoustic and 0-group surveys conducted by the Faroese research vessel, Magnus Heinason, this data is used in combination with commercial catch and effort data from logbooks and the sampling of commercial catches for length and age analysis. The resultant data is available for assessments by ICES working groups, which in turn support the Fisheries Laboratory's advice to the Minister.

The Faroe Marine Research Institute (FAMRI) conducts marine research and provides science based advice on marine resources and environment to the Government of the Faroe Islands. The most important fish stocks are assessed based on fishery independent surveys conducted on the research vessel, Magnus Heinason, surveys include 0-group surveys, bottom trawls surveys and acoustic surveys, and assessments include fishery dependent data such as catch and effort.

Faroese Pelagic Organisation (FPO) - Felagið Nótaskip, cooperates with the Faroese Research Institute. FPO vessels may be chartered or in some cases they have hosted scientists on board allowing research during commercial operations. In July 2009, research projects initiated by the Faroese Ministry of Fisheries in cooperation with Faroese Research Institute, involved the participation of 3 FPO vessels.

2.1 Stocks of interest to the EU

The Faroes top 15 species caught in 2008 (in 1,000 tonnes)[1]

Species	1,000 tonnes
Blue Whiting	230
Herring	78
Saithe	64
Cod	27
Horse Mackerel	24
Argentines	16
Mackerel	15
Haddock	11
Capelin	10
Prawn	9
Redfishes	6
Ling	5
Tusk	4
Greenland Halibut	3
Queen Scallop	3

[1] Source: Statistical Bureau of the Faroes

Blue whiting is mainly used in animal feed but is also processed into surimi and frozen whole for human consumption. Capelin is used for fishmeal and fish oil. The other species caught are sold whole or value added onboard Faroese vessels or in processing plants in the Faroes.

2.2 Assessment of Fish Stocks

Assessments are undertaken by the Faroese Fisheries Laboratory, with a subsequent review in ICES working groups and are considered to be of a good standard. But it is noted that the Committee on Fishing Days scrutinises sometimes does not follow the scientific advice, where that advice is based on a single year assessment.

2.3 Endangered, Threatened and Protected species (ETPs)

ETP species found within the area include seals and a variety of cetaceans and birds. It is noted that Faroese are not members of the IWC. They are members of NAMMCO and conduct cetacean hunts as detailed above in the background section.

Lophelia and sponge reefs are considered sensitive habitats that are abundant in some areas of the Faroese EEZ.

2.4 Environmental and ecosystem data collection

Areas of the Faroes seabed have been mapped; mainly by the BIOFAR project (www.biofar.fo) though there appears to be little detailed information. Academic studies have been supplemented by fishermen's own knowledge and experience.

2.5 Vulnerable Marine Ecosystem (VMEs)

Faroe Islands managers are involved in international consideration of VMEs through its [Danish] representation in RFMOs such as NAFO and NEAFC.

2.6 Data collection on the socio-economic aspects of fisheries management

The fishing industry is fully represented and involved in fisheries management in the Faroes Islands.

3. Research funding and coordination

3.1 Funding

The Fisheries Research Fund is a dedicated research fund established by the Ministry of Fisheries & Natural Resources aimed at stimulating scientific and industrial Research and Development (R&D) projects in the areas of Marine Biotechnology, Fish Harvesting Technology, and Fish Processing Technology.

There is an emphasis on collaborative research and development projects between the fisheries and fish production sectors and Faroese research and development institutes.

4. Dissemination of Scientific Information

Scientific information is disseminated through papers, scientific meetings, symposia and through websites.

5. **Sources of Information:**

http://www.fishin.fo/Default.aspx?ID=8661

FAROE ISLANDS FISHERIES & AQUACULTURE
RESPONSIBLE MANAGEMENT FOR A SUSTAINABLE FUTURE
By FISKI- OG TILFEINGISMÁLARÁÐIÐ
(Ministry of Fisheries and Natural Resources)
Downloaded from www.fishin.fo

http://www.frs.fo/get.asp?gid=f960D1B31-292C-49E3-B21B-FFD0B4341D97
Faroes Marine Research Institute

Chapter 21: Greenland

Background

Greenland is an autonomous constituent country within the Kingdom of Denmark, gaining Home rule on 1st May 1979 and Self rule on 21st June 2009. The Danish royal government is responsible for foreign affairs, security and financial policy, and provides a subsidy of DKK 3.4 billion ($633m), or approximately US$11,300 per Greenlander, annually.

Greenland joined the European Community (now the EU) with Denmark in 1973, but withdrew in 1985 over a dispute centred on stringent fishing quotas; thereafter basing its relations with the EU on a special agreement. It is the only Danish territory that is included in the list of OCTs (Overseas Countries and Territories) associated to the Community.

Until 31 December 2006, all Community financial assistance to Greenland (EUR 42.8 Million per year) was channelled through the Fisheries Agreement between the Community and Greenland. Financial assistance to Greenland is financed from the General Budget of the EU (and not the EDF), hence Financing Agreements have to be concluded annually.

Greenland is an independent member of the Nordic Council. Special cooperation with Iceland and the Faroe Islands is organised through the Nordic Atlantic Cooperation and the West Nordic Foundation. N.A. Cooperation and the West Nordic Foundation provide the basis for specific cooperation with Iceland and the Faeroe Islands.

Greenland (Denmark) is one of eight countries in the Arctic, the others being Russia, Canada, USA, Iceland, Sweden, Norway and Finland, that founded the Arctic Council in 1996.

Greenland cooperates with the Inuit peoples of Canada, Alaska and Russia through its membership of the Inuit Circumpolar Conference (ICC). The ICC has official status as an NGO (Non Governmental Organisation) within the UN system. The ICC is a permanent member of the Arctic Council. Denmark and Greenland are also working, within the UN Human Rights Commission, to establish a Permanent Forum for Inuit Peoples within the UN.

Section 1: Fisheries Administration

1.1 All Types of Agreements

The current bilateral fisheries partnership agreement between the EC and Greenland is for 6 years from 1st January 2007 to 31st December 2012, it is a mixed FPA contributing 15,847,244 € per annum [1]. This is the only non-ACP state which has an

[1] Including a financial reserve of 1 540 000 € for additional capelin and/or cod quotas and 3 261 449 € for defining and implementing a sectoral fisheries policy in Greenland.

FPA with the EU. Although it is a mixed FPA the allocation of quotas is subject to the TAC and quota regulations.

EU vessels currently operating in Greenland waters come from Germany, Denmark, the UK, Sweden, Spain and Portugal.

Greenland has negotiated independent agreements with adjacent countries including Norway where they have had a quota for cod, haddock and Pollack etc. in the Barents Sea, and the Directorate for Fishing, Hunting and Agriculture has entered into similar agreements with Russia, a relationship that started in 1992. Russia has had a quota to take redfish in Greenland waters.

1.2 Membership of RFMOs

Memberships include (noting that Denmark may take a lead where there are international considerations): NEAFC, NAFO, NASCO, IWC (Denmark) and NAMMCO.

1.3 Management

Ministry of Fisheries, Hunting and Agriculture is responsible for the management of living resources in Greenland, including:

- Administration of legislation on national and international fisheries, including conservation and exploitation
- General assistance for national and international fisheries policy
- Setting total allowable catch (TAC) and quotas including issuance of licenses and permits
- General tasks relating to control and observation of fisheries
- Realisation of development initiatives in fisheries
- Administration of onshore installations and settlement production, including service contracts with Arctic Green Food (AGF)
- Assistance and performance of tasks in support of councils, boards, work groups, committees and conferences
- Preparation, participation and follow-up of regional, bilateral and international conventions, agreements

The Ministry supports the Home Rule Government in matters relating to Parliament, preparing legislation on business subsidies, the fisheries financing pool, and re-establishment support for fisheries, hunting and agriculture, including structural adjustments of coastal fisheries as well as consultancy services for fishermen and hunters, including service contracts with the Association of Fishers and Hunters in Greenland, KNAPK.[2]

The Greenland Institute of Natural Resources falls under the Ministry of Infrastructure, Climate and the Environment under the Greenland Home Rule, and is tasked under the Landsting Act No. 6 of 8 June 1994, to provide the scientific basis for the sustainable exploitation of natural resources in and around Greenland, and for protecting the environment and the biological diversity.

[2] Kalaallit Nunaanni Aalisartut Piniartullu Kattuffiat (Danish: Association of Fishermen and Hunters in Greenland)

The Institute has three departments:

- Department of Fish and Shrimps,
- Department of Mammals and Birds,
- Administrative Department,

- Plus a Centre of Marine Ecology and Climate Impacts.

An information office is attached to the management as a staff function, while a cross-departmental logistics unit belongs under the Administrative Department and a cross-departmental IT/data unit resides in the Department of Fish and Shrimps.

The shipmasters of the Institute's two research ships report to the head of the Administrative Department.

Another ministry, that of Domestic Affairs, Nature and Environment, is more directly responsible for the Environment and Ecosystems. Its areas of responsibility relevant to fisheries include:

- Coastal marine environmental protection
- Supervision of the marine environment area
- Nature protection
- Nature conservation
- Management of conservation areas
- Supervision of the nature area
- CITES, including issuing licences

It is also responsible for administration of international agreements on nature and the environment.

1.4 MCS

All foreign vessels fishing in Greenland waters are required to carry an observer.

Inspections are managed in tandem by the naval inspection fleet stationed at Grønnedal, South Greenland, plus their aircraft based in Narsarsuaq, and the Fisheries License Control, the Home Rule government's designated fishing licensing and monitoring authority. Operations include practical inspection of fishing vessels' catch and fishing gear exclusively when they are at sea with onboard patrols. A second MCS process I s through the management of fish processing plants, largely through controlling time periods of purchase.

Section 2: Fisheries Research

The Greenland Institute of Natural Resources[3] is responsible for national marine and fisheries science [see section 2.4]. They also participate in international scientific research activities related to advising on the species with which the department is concerned.

[3] http://www.natur.gl/index.php?id=19&L=3

2.1 Stocks of interest to the EU

Fishing opportunity as indicated in the protocol (tonnes)

	2007	2008-2012	License Fee €/per ton
Cod[4]	1 000	3 500	90
Redfish	10 838[5]	8 000	53
Greenland halibut	10 000	10 000	129
Shrimp	11 000	11 000	80
Atlantic halibut	1 400	1 400	217
Capelin	55 000	55 000	5
Snowcrab	500	500	120
By-catches	2 600	2 300	
Total	**92 338**	**91 700**	

2.2 Assessment methods, assessment models and software

Assessment methods and models are expected to be consistent with those used within ICES, given that they are [under Denmark] members of ICES.

2.3 Endangered, Threatened and Protected species (ETPs)

Greenland, along with Norway, Iceland and the Faroes is a member of NAMMCO, which its website describes as an "..international body for cooperation on the conservation, management and study of marine mammals in the North Atlantic... The agreement focuses on modern approaches to the study of the marine ecosystem as a whole, and to understanding better the role of marine mammals in this system. NAMMCO provides a mechanism for cooperation on conservation and management for all species of cetaceans (whales and dolphins) and pinnipeds (seals and walruses) in the region, many of which have not before been covered by such an international agreement."

Greenland through Denmark is represented in the IWC.

The blue whale is protected both in Greenland and the rest of the North Atlantic Ocean, and the numbers is expected to increase. However, the status of blue whale in Greenland is not known, since observations of this species are so rare. Blue whales were taken up to the 1960's. More recently (1980s onwards) blue whales have been sighted mainly off the coast, and on at least one occasion in Disko Bay. In the latter case the whale was satellite tagged in early spring and monitored until July. It remained in Greenland waters throughout that period, apparently in association with an abundance of capelin.

2.4 Data collection and analysis

The Greenland Institute of Natural Resources is responsible for fisheries data collection and analysis.

[4] Cod and Capelin quotas may be modified dependent upon scientific advice.
[5] Reduced to 9 750 t for 2007 in line with a NEAFC management measure.

The Department of Fish and Shrimps
The department is responsible for preparing the advisory material relating to exploitation and protection of the species that are most important to the community in terms of fisheries. Past work has focused on research, monitoring and advice with respect to shrimp, Greenland halibut, cod, crab, and rose fish; and to a lesser extent lumpfish, scallop, and salmon.

Information from fisheries and in-house investigations
Direct and indirect fisheries data is supports management advice. Results are presented in international scientific bodies and following comparison and assessments of shared data, appropriate advice is provided by Pinngortitaleriffik to the Greenland Home Rule.

Routine assignments, reports, and scientific papers
Routine assignments include analysis of log book information, age determination of fish by otolith examination, collection and analysis of samplings from fisheries, investigation of crab egg maturation stages, analyses of fisheries statistics, and planning and completion of annually recurring population studies of shrimp, crab, Greenland halibut, cod, and salmon. In an ongoing process the department plans and carries out new research projects and prepares reports, meeting documents, scientific papers, advisory material, and participates in international scientific meetings.

2.5.1. Biological data collection

TOGTER / SURVEYS 2010

Vessel	Date		Days	Project/programme	Areas covered
PAAMIUT					
	09-Jun	24-Jun	16	Trawlsurvey Westgreenland 50 - 600 m	Nuuk-Ilulissat
	26-Jun	15-Jul	20	Trawlsurvey Westgreenland 50 - 600 m	Ilulissat- Upernavik - Nuuk.
	17-Jul	02-Aug	17	Trawlsurvey Westgreenland 50 - 600 m	Nuuk-Cape Farewell.
	04-Aug	22-Aug	19	Trawlsurvey Eastgreenland 1 - 1500 m	Cape Farewell - Eastcoast -Tasiilaq
	24-Aug	09-Sep	17	Trawlsurvey Eastgreenland 1 – 1500 m	Tasiilaq - Eastcoast
	11-Sep	23-Sep	13	Trawlsurvey Davis Strait 400 – 1500 m	Nuuk-Davis Strait - Aasiaat
	25-Sep	13-Oct	19	Trawlsurvey Baffin Bay 1 - 1500 m	Aasiaat - Baffin Bay
ADOLF JENSEN					
	27-May	09-Jun	14	Crabpot survey Disko Bay	Disko Bay
	12-Jun	26-Jun	15	Crabpot survey inshore Sisimiut	Inshore Sisimiut
	26-Jun	01-Jul	6	Gillnet survey COD inshore Sisimiut	Inshore Sisimiut
	04-Jul	14-Jul	11	Gillnet / Longline survey GHL Disko Bay	Disko Bay
	17-Jul	31-Jul	15	Gillnet / Longline survey GHL Upernavik	Inshore Upernavik
	03-Aug	20-Aug	18	Crabpot survey offshore Nuuk - Paamiut	Offshore Nuuk - Paamiut
SMALL BOATS					
	1 week in May			Gillnet / Pilk Inshore Qaqaortoq	Inshore Qaqaortoq
	31-May	04-Jun	5	Gillnet survey COD Inshore Nuuk	Inshore Nuuk
	June/July		7	Gillnet survey COD Inshore Qaqortoq	Inshore Qaqortoq

2.5.2. Environmental and ecosystem data collection

The Greenland Institute of Natural Resources collects hydrographical data in support of climate research and contributes to relevant international databases. The department has a wide network for data collection and information dissemination, including fishermen, biologists, fisheries inspectors, hunting and fisheries officers, and interest groups.

As indicated in section 1.3, another ministry, that of Domestic Affairs, Nature and Environment, is more directly responsible for the Environment and Ecosystems, and the administration of international agreements on nature and the environment.

One large project proposal worth mentioning is ECOGREEN[6] (to establish the scientific basis for a long-term ecosystem-based management of marine resources in West Greenland). This ambitious international project would include:

- Current state of the environment
- Changes in the polar region
- Exploring new frontiers
- The polar regions as vantage points
- The human dimension in the polar region

In relation to fisheries it is interesting to note that the Home Rule Government designated a "Redfish protection area", banning all bottom trawl fisheries; and from 2001, the Ministry has required the mandatory use of sorting-grids in shrimp fishing to protect particularly juvenile redfish and halibut.

2.5.3 Vulnerable Marine Ecosystem (VMEs)

Greenland is involved in international consideration of VMEs through its [Danish] representation in RFMOs such as NAFO and NEAFC.

2.5.4. Data collection on socio-economic aspects

Greenland cooperates with the Inuit peoples of Canada, Alaska and Russia through its membership of the Inuit Circumpolar Conference (ICC). The ICC has official status as an NGO (Non Governmental Organisation) within the UN system. The ICC is a permanent member of the Arctic Council. Denmark and Greenland are also working, within the UN Human Rights Commission, to establish a Permanent Forum for Inuit Peoples within the UN.

In relation to fishing/hunting, clearly there must be fully transparent justification and documentation of permitted takes of cetaceans by indigenous groups.

Greenland Institute of Natural Resources staff interact with fishermen to gain resource user information & insights; and to present and discuss study methods, results, advice and biological issues. Staff also engage in fisheries seminars and teaching.

3. Research funding and coordination

3.1 Funding

Funding processes have not been confirmed, but it is assumed that core funding is provided from public sources. It is worth noting that Greenland is dependent on exports of shrimp and fish [reports of >90% of export revenue] and on a substantial subsidy -

[6] http://classic.ipy.org/development/eoi/proposal-details.php?id=122

about $650 million in 2009 - from the Danish Government, which supplies nearly 60% of government revenues.

The institute also receives funding from a variety of sources in support of specific themes or research, examples include:

Funding for the Greenland Climate Research Centre is from governments, research councils, private funds, and industry – both national and international.

Proposed funding strategy for ECOGREEN (see section was to apply for a substantial fund to cover all or most of ECOGREEN activities supplemented with small funds. Danish and Greenland partners would apply for financial support from the Danish Research Councils. International partners would be offered logistic support from the facilities provided by the outlined project. The project consortium would also apply, if possible, for EU or other international funds.

3.2 Research collaboration and coordination

Research collaboration may be bilateral or with larger groups perhaps through regional organisations, an example of the latter, international cooperative research, is the marine survey aspect of the NASCO SALSEA programme, developed to concentrate sampling upon areas where salmon stocks from many rivers co-occur, since the declines in marine survival are experienced by large groups of stocks. Considering that both Southern European and North American stocks co-occur at West Greenland as non-maturing 1SW fish, it was suggested that an additional survey programme be developed for the West Greenland area. This enhanced sampling programme of salmon harvested off the west coast of Greenland in 2008, 2009 and 2010 and combine these data with data collected on these same cohorts of salmon sampled during concurrent oceanic surveys and subsequent in-river sampling programmes in home waters to make inferences related to the causal mechanisms behind stock-specific performance in the ocean (i.e. marine survival).

Investigator and Collaborators

- NOAA Fisheries Service (USA) – Project Coordinator
- United States Geological Survey (USA)
- Greenland Nature Institute (Greenland)
- Greenland Home Rule Government (Greenland)
- Department of Fisheries and Oceans (Canada)
- The Marine Institute (Ireland)
- Fisheries Research Services (UK (Scotland))
- Centre for Environment, Fisheries and Aquaculture Science (UK (England & Wales))
- North Atlantic Salmon Fund and the Atlantic Salmon Federation (Iceland, Canada, USA)
- NASCO's International Atlantic Salmon Research Board

4. Dissemination of Scientific Information

Scientific information is disseminated through papers, scientific meetings and symposia, through websites, and data is provided to international databases in relation to climate change. Information on shared and/or international stocks is generally managed and disseminated by the appropriate agency and/or in many cases that includes feedback for dissemination at the national level.

5. **Sources of Information:**

Greenland Government Website
http://uk.nanoq.gl/

Greenland Ministry of Fisheries, Hunting and Agriculture
http://uk.nanoq.gl/sitecore/content/Websites/uk,-d-,nanoq/Emner/Government/Departments/ministry_of_fisheries.aspx

https://www.cia.gov/library/publications/the-world-factbook/geos/gl.html

Current Legal Framework:
FPA:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:172:0004:0008:EN:PDF

Protocol:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:172:0009:0025:EN:PDF

Chapter 22: Iceland

Background

Iceland is a member of the European Free Trade Association (EFTA). EFTA countries can participate in the European single market without having to join the EU. An application to join the EU is in process and the decision to start the pre-accession procedures rests with the EC. It is noted that current polls apparently suggest that in a referendum, must Icelanders would be opposed to joining the EU.

Iceland is a full member of the FAO. European countries have been allocated 10 seats on the Council. One of the European seats is occupied by the five Nordic Countries, Denmark, Finland, Iceland, Norway and Sweden according to a three-year rotation scheme. The Nordic countries have close cooperation and policy coordination regarding FAO. Iceland is supportive of COFI and is committed to participating in committees and meetings within the FAO. Notable focus areas in FAO include international co-operation to combat Illegal Unreported and Unregulated Fishing and the development of guidelines for deep-sea fisheries were formulated which will contribute greatly to the protection of vulnerable marine ecosystems.

Iceland is also a member of the Arctic and Nordic Councils.

Section 1: Fisheries Administration

1.1 All Types of Agreements

International Agreements

Fishing for the Atlanto-Scandian herring stock in the northeast Atlantic is controlled by an international agreement. Iceland, Faroe Islands, Norway, the Russian Federation and the European Union all fish this stock. The annual TAC is decided by the Northeast Atlantic Fisheries Commission (NEAFC) and Iceland's share is allocated to individual vessels.

Fishing of the oceanic redfish stock in the international area of the Irminger Sea is also controlled internationally by NEAFC. This stock is fished by Iceland, Russia, Faroe Islands, Greenland and some EU countries. The Icelandic share is allocated to individual vessels.

The capelin stock is also trans-boundary by nature but most of it is found within the Icelandic EEZ. It is fished mainly by Iceland but a proportion of the TAC is fished by other nations in accordance with an agreement between Iceland, Norway and Greenland.

The northern shrimp fisheries in the international area of the northwest Atlantic, usually called the Flemish Cap, are subject to management by the Northwest Atlantic Fisheries Organization (NAFO). The fisheries are subject to management by effort restriction but Iceland has objected to this system of management and allocated individual vessel

quotas on the basis of this being more effective. Icelandic observers are placed on-board all Icelandic fishing vessels for various assessment including shrimp size, maturity and by-catch.

1.2 Membership of RFMOs

- North East Atlantic Fisheries Commission (NEAFC)
- North Atlantic Salmon Conservation Organization (NASCO)
- North Atlantic Marine Mammal Commission (NAMMCO)

Iceland is not a member of the Northwest Atlantic Fisheries Organization (NAFO), but does apparently cooperate with that organisation.

It is noted that The International Council for the Exploration of the Sea (ICES) is important for co-operation in marine science, an essential basis for responsible management.

1.3 Management

The Fisheries Management Act No. 116, 10 August 2006 (see Appendix 1) consolidates previous fisheries legislation, of which one of the most notable was the 1990 Fisheries Management Act that enabled the establishment of an Individual Transferable Quota (ITQ) system for the majority of commercial fisheries. All of these vessels had existing vessel catch quotas and there was no effort option for trawlers and the larger boats. The quotas are permanent, perfectly divisible, transferable, and represent shares in the total allowable catch.

The Ministry of Fisheries is responsible for management of the Icelandic fisheries and implementation of the legislation. The Ministry issues regulations for commercial fishing for each fishing year, including an allocation of the TAC from each of the stocks subject to such limitations. The allocation of quota shares for each vessel is based on its share in the catch of each stock in the three years leading up to the establishment of individual vessel quotas for fishing from that stock. For the major ground-fish stocks, this was the period 1981-83.

A vessel can transfer some of its quota between fishing years but its quota is lost if it catches less than 50% of its total quota, measured in "cod equivalents", in two subsequent years. There is also a requirement that within the year, the net transfer of quota from any vessel must not exceed 50%.

In order to prevent undue consolidation of fishing rights by a few fishing companies certain upper limits have been set for the holding of quota shares in major fishable stocks by a fishing company or a group of companies closely linked by ownership. The upper limit is 12% of the quota share for cod, 20% for haddock, saithe and Greenland halibut, 35% for redfish, 20% for herring and capelin and 20% for offshore shrimp. A further measure stipulates that each fishing company or a group of companies is not permitted to hold more than 12% of the value of the combined quota shares for the stocks utilized by TAC allocations.

A separate small boat quota system (krókaaflamarkskerfi) is available for boats less than 15 GT. These are only allowed to fish with handlines or longlines. These boats get quotas for all the major demersal species and can freely transfer the quota within this system. To prevent consolidation of fishing rights these quotas cannot be transferred to the common quota system. About 700 boats are fishing within the small boat system.

The current management policy of the Icelandic government strongly advocates responsible fisheries through ecologically and economically sustainable management of the living marine resources.

The Althing, Iceland's national parliament, adopted a management system of individual transferable quotas (ITQs) for individual vessels based on each vessel's catch performance from 1981–1983.The first year of allocating ITQs was 1984. Until 1990 there was an effort option in the system that made it difficult to limit total catches. The present comprehensive fisheries management system is still based on ITQs. The aim is to ensure the sustainability of the fisheries while emphasising the economic benefits of the fisheries sector.

Each vessel is allocated a certain share of the total allowable catch (TAC) of the relevant species. The catch limit of each vessel during the fishing year is based on the TAC of the relevant species and the vessel's share in the total catch. According to Icelandic law the total allowable catch (TAC) is set by the Minister of Fisheries and Agriculture and this decision should be based on scientific advice from the Icelandic Marine Research Institute.

Icelandic fisheries management uses a variety of other measures including, area restrictions, fishing gear restrictions, and the use of closed areas to conserve important vulnerable habitats. There are also provisions for temporary closures of fishing areas to protect spawning fish from all fishing. Extensive nursery areas permanently closed for fishing. Spawning areas of cod are closed for a few weeks in late winter during the spawning period and the Marine Research Institute has the right of immediate, temporary closure of areas with excess juveniles. There is a 12 mile limit for large trawlers in most areas and there are several selectivity measures, such as a mesh size of 135 mm or equivalent. A sorting grid is mandatory to avoid by-catch of juvenile fish in the shrimp fisheries and devices for excluding juveniles in the ground-fish fisheries are also mandatory in certain areas.

The catch rule for cod is also a very important landmark in the precautionary approach to cod stock management. This rule, based on scientific recommendations, was adopted by a government decision and became effective in 1995. It states that the annual TAC for cod is to be set at 25% of the fishable biomass. This implies that the TAC is automatically set after the annual stock assessment. Following the recommendations of the Marine Research Institute, the government decided in July 2007 that the TAC for cod in the fishing year 2007/08 should be set at 20% of the fishable biomass.

There are requirements that small fish, i.e. cod and saithe less than 50 cm and redfish shorter than 33 cm must be kept separate in the catch and must not exceed 10% of the cod, saithe, haddock and redfish catch, the equivalent numbers for haddock are 41 cm and 25%. In compensation, and since this fish has rather low value, it does not count fully in calculations of the vessels' used quota.

There are also strict requirements for the keeping of logbooks on-board all fishing vessels and they must be made available for fishery inspectors. The logbooks are important for scientific assessment purposes.

Inshore and offshore shrimp are assessed and managed separately. Local stocks of inshore shrimp differ in abundance temporally and spatially. Each fishing area is a distinct management unit and TAC's are allocated in accordance with scientific recommendations by area.

Commercial whaling

Commercial whaling was reinstated by Iceland October 2006, when the Ministry of Fisheries and Agriculture allowed a limited catch of common minke and fin whales.

1.4 MCS

The Icelandic Coast Guard, responsible to the Minister of Justice, monitors fishing activities in Icelandic waters, including surveillance of areas closed for fishing and inspection of mesh sizes and other gear related practices.

The Directorate of Fisheries is responsible for routine administration and enforcement of the Fisheries Act and related legislation. They monitor Icelandic fisheries closely, and the enforcement regime has strict port control, requiring the weighing of all catches. Discards are prohibited and everything must be landed.

The Department of quota allocations within the Directorate issues commercial fishing permits, it also allocates catch quotas to Icelandic fishing vessels and maintains records of those rights. It records quota transfers between vessels and checks that vessels do not fish in excess of their quotas. The department collects data on fishing and the catches landed by the Icelandic fleet and monitors compliance with rules on the weighing and recording of catches.

Port authorities are responsible for the correct weighing and recording of the catch. All landed catch is weighed on certified scales by licensed operators who are employed by the local port authorities or sometimes by a plant that is approved for this purpose. A computer system links all the ports of landings to the Directorate and catch data is entered directly to a database located at the headquarters. Fishing by on-board processing vessels is monitored by weighing the landed products in a similar way and by conversion to catch weight by means of yield indices, estimated several times per day by sampling the catch and processed products on board. Some Icelandic fishing vessels sell their catch directly in European fish markets. Those catches are monitored by records of sales transmitted from the importing country to the Directorate of Fisheries. To ensure standards are maintained, the Directorate employs a team of inspectors to supervise correct practices in the fisheries.

The inspectors have access to the log books that record fishing details, including location, dates, gear and catch quantity. Vessels that process the catch at sea are required to enter data in the log books electronically and transmit the information directly to the Directorate of Fisheries and hence the Directorate has real time

information on the major fisheries in Icelandic waters. Information on catches, quota share, quota status and transfer of quota between vessels is available in near real time to the public on the Directorate web site.

Buyers (usually processors) of the catch must register and send to the Directorate information on the value and amounts bought and the disposition of the catch. This may be used to verify catch and landing data.

Under a bilateral agreement between Iceland and the European Union (EU), Icelandic inspectors are required on board all EU fishing vessels in Icelandic waters. In co-operation and under the auspices of the Northwest Atlantic Fisheries Organization (NAFO) Icelandic inspectors supervise catches on board 25% of Icelandic vessels in other fisheries supervised by NAFO.

VMS

There are two tracking systems in Iceland[1]. One is mandatory for all vessels and required for safety. The second is for fisheries control, in which certain vessels must participate according to their fishery and fishing area. Fisheries control authorities have full access to all data in both systems. The shipboard costs for VMS equipment are the responsibility of the vessel owner/operator. Communications from the VMS, as well as running and maintaining the VMS/FMC, are paid for by the authorities. VMS is used to monitor compliance with fisheries regulations of Iceland, international regulations such as NEAFC and NAFO, and in waters of other states where bilateral tracking agreements are in force (i.e. Greenland, Faroe Islands, Norway and Russia). The control centre has strict security rules for access, based on NEAFC and NAFO rules.

[1] http://www.fao.org/fishery/vmsprogramme/VMS_Iceland/en

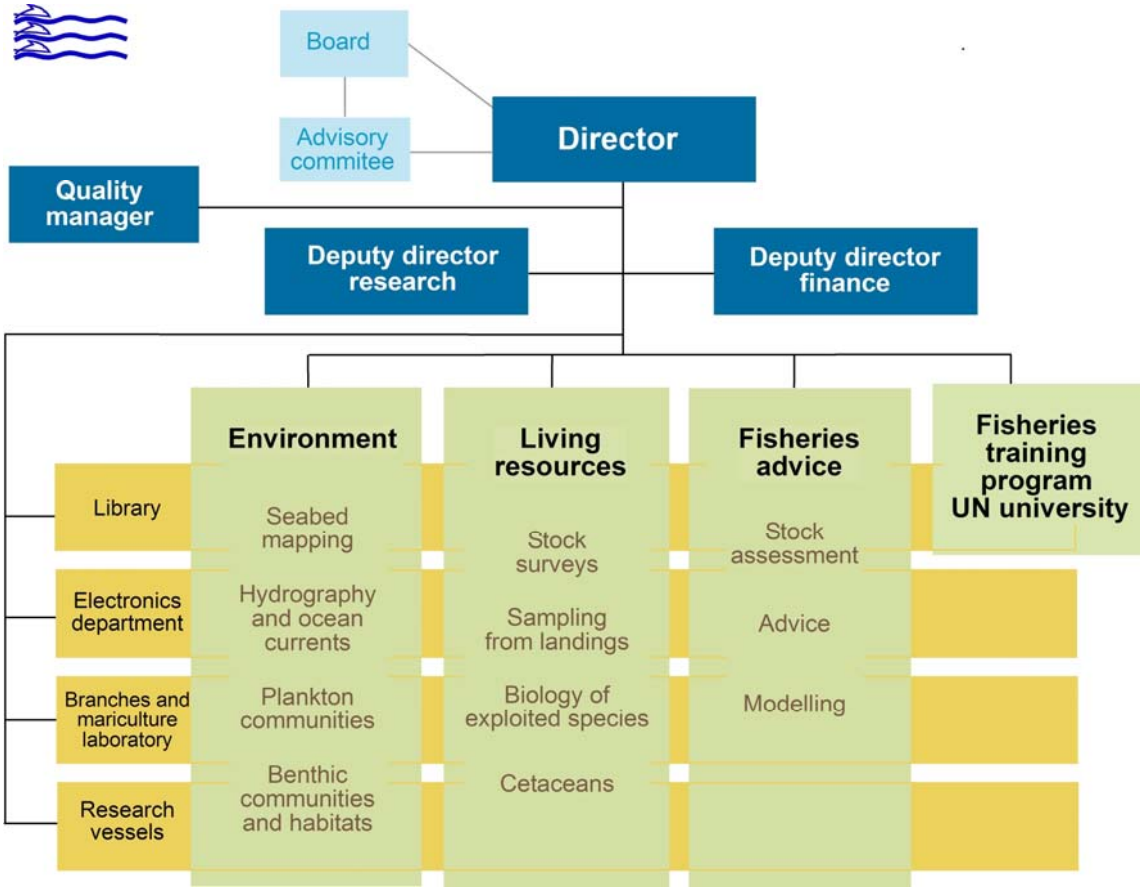
Section 2: Fisheries Research

Background

Icelandic Marine Research Institute.

The Marine Research Institute conducts extensive research on the status and productivity of the commercial stocks, and long-term research on the marine environment and the ecosystem around Iceland. The results of this research are the foundations of the advice on sustainable catch level of the fish stocks.

The institute has 170 employees, 2 research vessels, 5 branches in Iceland and a mariculture laboratory.



MRI focuses on the following activities:

- Conducting research on the marine environment and living resources in Icelandic waters.
- Provision of advice to the government on catch levels and conservation measures
- Informing the government, the fishery sector and the public about the sea and its living resources

The three main sections, Marine Environment, Marine Resources and Fisheries Advisory are supported by a Modelling Department, Electronic Department and the Fisheries Library.

The **Marine Resources Section** researches exploited stocks of fish, crustaceans, molluscs and marine mammals. The major part of the work involves estimating stock sizes and the total allowable catch (TAC) for each stock. Major projects include, annual ground fish surveys covering the shelf area around Iceland and surveys for assessing inshore and deep-water shrimp, lobster, and scallop stocks. Pelagic stocks, such as capelin and herring are monitored annually by acoustic surveys. There is an increased focus on multi-species interactions of exploited stocks in Icelandic waters

A scientific advisory board reviews the assessments for all the species, and provides recommendations on TAC's. MRI advice for some of the major Icelandic stocks is also reviewed by ACOM (ICES).

2.1 Stocks of interest to the EU

The EU has an interest in marine resources in Icelandic waters, but all indications are that Iceland does not wish to open up its fisheries to the EU. Clearly current negotiations for Iceland to join the EU leave the situation in a state of flux.

2.2 Assessment methods, assessment models and software

Fishery dependent data is sampled from the landings (age, length, weight, maturity, sex etc.). There are fishery independent ground-fish surveys, acoustic surveys for herring, capelin and oceanic redfish; CPUE is assessed by fleet category from logbook data. Fish is aged by means of otoliths and scale analysis.

Using total landings and the age composition of those landings, the numbers of fish caught from each year class can be estimated. Proportional decline in the numbers landed from year to year for a certain year class is an estimator of the total annual mortality of that year class. By subtracting the natural mortality from the total mortality the fishing mortality can be estimated and hence the stock size can be back-calculated by means of different models as LTVPA, ADAPT or TSA.

Assessment of the stock size of demersal fishes, and invertebrates is conducted at various times of the year and the results are the basis for the annual TAC recommendations. Acoustic methods are used to assess the herring, capelin and oceanic redfish stocks for the same purpose.

Catch per unit effort (CPUE) has been recorded systematically in the ground-fish surveys since 1985 and by fishing trawlers since 1986. Catch and mean length of the catch is now recorded separately for each species. Trends in average fish size and CPUE serve as indicators of stock condition and abundance.

Using cod and redfish as an example of the stock assessment process:

Scientific data from 3 main sources:

- Systematic collection of data on the landed catch in Iceland
- Data collected by the MRI research vessels
- The ground-fish survey

The ground-fish survey started over 20 years ago. Four trawlers are hired in spring and autumn for a systematic survey of the fishing grounds, targeting cod and haddock. A total of approx. 15,000 cod are analyzed each year for length, weight and age distribution of the catch.

The most accurate analysis of each year class is done just at the end of its life, when almost all the fish from that year class have been caught or died from natural causes, e.g. by age 12 for cod, and in Iceland the cod stock has an estimated natural mortality of 20% p.a.

Shrimp stock assessment is based on CPUE and shrimp abundance in surveys but also on shrimp size distribution in the catch, shrimp growth, stock recruitment and male/female ratio in relation to shrimp size. Abundance of young cod is taken into consideration in TAC recommendations for offshore shrimp, given that shrimp is an important component in the cod diet.

Stock projections
Stock size and catch projections for the upcoming 2-3 years is based upon:

- Information on recruitment from pre-recruit surveys
- Expected growth
- Expected landings
- Assumed natural mortality (predation)

2.3 Endangered, Threatened and Protected species (ETPs)

Iceland actively participates in the cooperation of the parties to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and currently holds a seat on the CITES Standing Committee.

Iceland along with Greenland, Norway, and the Faroes is a member of NAMMCO, which is described on its website as an "..international body for cooperation on the conservation, management and study of marine mammals in the North Atlantic...". "The agreement focuses on modern approaches to the study of the marine ecosystem as a whole, and to understanding better the role of marine mammals in this system. NAMMCO provides a mechanism for cooperation on conservation and management for all species of cetaceans (whales and dolphins) and pinnipeds (seals and walruses) in the region, many of which have not before been covered by such an international agreement."

Iceland is a member if the International Whaling Commission (IWC).

Cetacean research in Iceland has involved the following:

- Sightings surveys: to monitor population size and trends for management.
- Photo-identification, satellite telemetry and skin biopsy sampling to support research on population structures and behaviour.
- Feeding ecology and multi-species modelling.
- Monitoring and research of stranded and by-caught cetaceans

Information on biomass and residence time of cetaceans has been used to indicate total consumption by cetaceans in Icelandic waters, and their potential impact on the yield of commercially important fish species.

2.4 Environmental and ecosystem data collection

The Marine Environment Section gathers core environmental data (nutrients, temperature, salinity etc.), marine geology, and the ecology of algae, zooplankton, fish larvae, fish juveniles, and benthos. Larger projects include: investigations on surface currents using satellite monitored drifters, assessment of primary productivity, over-wintering and spring spawning of zooplankton, studies on spawning of the most important exploited fish stocks.

According to Icelandic law the Marine Research Institute has as one of it's duties to improve knowledge on the physical and chemical oceanography of Icelandic waters, particularly in relation with biological resources.

From 1950 Iceland has taken annual observations of temperature and salinity in spring at stations on the Icelandic shelf to track climatic. In 1970 and onwards the institute increased the frequency of data collection to four per annum. This research is typically conducted in parallel with existing surveys, e.g. the capelin assessment in autumn. The physical and chemical data support biological studies, e.g. in relation to primary production of phytoplankton, distribution of zooplankton and planktonivorous fishes.

Spring research cruises record data on nutrients, primary production of phytoplankton and abundance and species of zooplankton etc. The quarterly cruises include routine monitoring of carbon dioxide in the sea, plus sampling for analysis of trace elements, radioactivity and sediment flux. There is continuous monitoring by MRI using moored current meters of the inflow of Atlantic water into waters north of Iceland,

2.5 Vulnerable Marine Ecosystem (VMEs)

Iceland is involved in international consideration of VMEs through its relationships with RFMOs such as NAFO and NEAFC.

2.6 Data collection on socio-economic aspects

It is interesting to note that the Inuit Circumpolar Conference (ICC) is a permanent member of the Arctic Council, of which Iceland too is a permanent member.

3. Research funding and coordination

3.1 Funding

Funding processes have not been confirmed, but it is assumed that core funding is provided from public sources. It is worth noting that the Icelandic economy depends heavily on the fishing industry, which provides 40% of export earnings, more than 12% of GDP, and employs 7% of the work force.

3.2 Research collaboration and coordination

Iceland is involved in collaborative fisheries research through bilateral and wider arrangements. It is also engaged in collaborative research within organisations such as NASCO e.g. on the SALSEA programme.

Iceland has been involved in variety of EU projects, one example being Marifish in which it was one of 9 partners that committed a total of a little more than €4m to a "virtual common pot".

4. Dissemination of Scientific Information

Scientific information is disseminated through papers, scientific meetings and symposia, and through websites. Information on shared and/or international stocks is generally managed and disseminated by the appropriate agency and in many cases that includes feedback for dissemination at the national level.

5. Sources of Information:

http://www.fao.org/fishery

Information Centre of the Icelandic Ministry for Fisheries:
http://www.fisheries.is

Ministry for Fisheries:
http://eng.sjavarutvegsraduneyti.is

Marine Research Institute:
http://www.hafro.is

Directorate for Freshwater Fisheries:
http://www.veidimalastjori.is/EnglSuma.htm

Institute for Freshwater Fisheries:
http://www.veidimal.is

Icelandic Fisheries Laboratories:
http://www.rfisk.is

Fisheries Association of Iceland:
http://www.fiskifelag.is

Statistics Iceland:
http://www.hagstofa.is

Chapter 23: Norway

Section 1: Fisheries Administration

1.1 All Types of Agreements

Norway has negotiated a series of agreements with adjacent countries. For example, Norway has such agreements with Russia, the European Union, Iceland, Greenland, and the Faroe Islands.

The cooperation with Russia takes place in the framework of the Joint Norwegian-Russian Fisheries Commission, which sets the Total Allowable Catch (TAC) for the three shared stocks of cod, haddock and capelin in the Barents Sea – Svalbard – Northern Norwegian Sea area.

The cooperation involves access for EU vessels to fish quotas for Norwegian-Arctic cod in the Barents Sea, in return for corresponding access for Norwegian vessels in EU waters. This arrangement originates in pre-Exclusive Economic Zone fishing patterns and the exchange is intended to maintain a balance in the fishing opportunities provided. The cooperation also involves development of long-term management plans for certain joint stocks such as cod, haddock, saithe and herring. Such management regimes are intended to ensure prudent management of fish stocks, and also to contribute to stable framework conditions for the fishing industry.

1.2 Membership of RFMOs

Memberships include: NEAFC, NAFO, SEAFO, NASCO, IWC, NAMMCO.

1.3 Management

Management mechanisms within Norwegian waters are at three levels, being access regulations specifying criteria for permission to participate in a fishery, output regulations that deals with the amount of fish that can be caught, and technical regulations specifying how a given fishery shall be executed. Some regulations are generic and pertain to all Norwegian waters.

The 1st level defines access to the fishery (i.e. the licensing of vessels), which for EU vessels is agreed within the arrangements described above. Foreign vessels wanting to fish in areas subject to Norwegian fisheries jurisdiction must have a licence and are obliged to report their catches to The Directorate of Fisheries.

The 2nd defines the TAC available to a vessel. Around 90 per cent of Norway's fisheries are conducted on stocks that are shared with other states. For the most important fish stocks, quota levels are set in cooperation with other countries. Since the late 1990s Norway has sought to implement a precautionary approach – based on the scientific advice from the International Council for the Exploration of the Sea, ICES, within the framework of the above agreements.

(http://www.fisheries.no/management_control/Regulatory-measures/quotas/quota_negotiations/). After the international negotiations are finalized, the domestic regulation process for quota allocation begins. The Directorate of Fisheries first makes a proposal regarding how the Norwegian part of the TAC should be shared between various vessel groups and among the vessels within each group. The directorate also propose quotas for given periods as well as when fishing should start and end. These proposals then go to the The Regulatory Board which review the proposals and give their recommendations to the Ministry of Fisheries and Coastal Affairs. Following further stakeholder involvement, the MFCA makes a final decision on how the quotas should be shared between the vessels and how the fishing should be carried out the following year. National quota regulations are established each year for the following species: cod, haddock, saithe, herring, mackerel, sprat, lumpfish, Greenland halibut, plaice, red-fish, blue whiting, shrimp, capelin, monkfish, sole, Norway pout, sand eel, red king crab, deep sea species.

The 3rd level involves the implementation of technical measures and regulations that restrict when, where and how fishing may occur. Such regulations are critical to conservation, and include prohibitions on discards of fish, as well as flexible protected areas that can be closed during the season when fisheries catch significant amounts of undersized fish, or permanent closures for fisheries catching species for which quotas are exhausted.

Ecosystems-based oceans management is introduced in Norway through designated management plans for larger ocean areas. The Management Plan for the Barents Sea was adopted in 2006, and will be reviewed in 2010. Adopted by the Parliament, it and essentially provides for a zonal arrangement where petroleum-related activities are prohibited in certain areas and periods to protect fisheries and ecosystems.

1.4 Observer Programs

The Norwegian approach to management and regulation focuses mainly on increased compliance at sea, rather than the EU system of monitoring mainly onshore. The enforcement system involves the Fisheries Directorate, the Coast Guard, and the fish sales organizations. The Coast Guard is responsible for enforcement actions at sea, the Fisheries Directorate in near-shore waters and at landings, and the sales organizations upon landings. There is close cooperation between these institutions and specific and well functioning mechanisms for cooperation between them exists. Scientific observers may be present, for example from NINA (Norwegian Institute for Nature Research) monitoring bird interactions, but routine observer programmes are not undertaken given the different approach to management, enforcement and scientific data collection (see below).

Section 2: Fisheries Research

The IMR, located in Bergen (with regional offices in Tromsø and Arendal) is the primary source of fisheries data and advice in Norway. An independent research institution, it has its own board. About half of its funding comes from the Ministry of Fisheries and Coastal Affairs, the remainder from the Norwegian Research Council, EU

programs and the industry. The mission of the IMR is to collect the data and develop models to provide scientific analysis and advice on the management of fish stocks in Norwegian waters. These activities that are directly linked to the provision of scientific advice for resource management are funded directly by the ministry.

2.1 Stocks of interest to the EU

Main stocks of interest related to the joint management by EU-Norway include cod, haddock, whiting, saithe, plaice, herring and mackerel in the North Sea and cod, haddock, whiting, plaice, herring, sprats and shrimps in the Skagerrak.

2.2 Assessment methods, assessment models and software

Assessment methods and models are consistent with those used within ICES, given that assessments and advice are finalised and peer reviewed within the ICES structure. Model software such as XSA, ICA etc. is commonly applied.

2.3 Endangered, Threatened and Protected species (ETPs)

A range of studies are being performed by IMR and other scientific/NGO groups on ETP species in Norwegian waters. Studies by IMR have been launched on *Lagenorhynchus* dolphins, following a recommendation from the North Atlantic Marine Mammal Commission (NAMMCO). The study explores the ecology of Atlantic white-sided dolphin *Lagenorhynchus acutus* and the white-beaked dolphin *Lagenorhynchus albirostris* to increase knowledge of the ecosystem dynamics, and investigate the exposure of mammalian top predators towards environmental contaminants and study effects on their health status. In addition to sightings, this programme involves the capture and post-mortem examination of specimens. The study will enable better observation of fishery links, and explore the ecology of these predators to increase understanding of the dynamics of the ecosystem and its dependent species.

To address information needs on seabird/fishery interactions, the Norwegian Government has contributed to the development of the SEAPOP (Seabird Population Management and Petroleum Operations) programme. This programme aims to improve knowledge of seabirds through studies of distribution and population size, in order to help distinguish between natural variations and anthropogenic impacts. A new web-based mapping tool for seabirds in Norway is being established to make it easier to access up-to-date information.

2.4 Data collection and analysis

2.5.1. Biological data collection

Data collection occurs through the catch reporting system (vessels reporting catch levels prior to landing through an e-logbook system or radio), sampling at port (relatively minimal) and through numerous Norwegian research and ecosystem cruises that are performed in Norwegian waters. In turn, the ‘reference fleet’, a designated range of

commercial vessels with different gears, are used to collect information throughout the season.

Scientific cruises examine benthos, fish, bird and mammal distributions and abundance. In turn, there is a large amount of research by IMR on habitats, oceanography, biological distributions, and trophic interactions. Population levels of and fishery interactions with other ETP species such as birds and marine mammals have been studied through a range of approaches, including the deployment of observers on vessels by the Institute of Nature Research (NINA). The ability of the data to quantitatively estimate outcome status with a high degree of certainty varies with the ETP species.

2.5.2. Environmental and ecosystem data collection

Study of the environment and ecosystem within the Barents and Norwegian Seas is the focus of a number of groups within the Institute of Marine Research. Areas of research include habitats and their significance for ecology and biological diversity; the health of benthic communities; oceanographic variability and changes in the marine climate for the production, distribution and behaviour of marine organisms; the distribution of species and their trophic interactions, as well as knowledge of non-commercial species, and indicators for marine ecosystem-based management. Data comes from vessel surveys, observation buoys, manual measurements, and gliders – amongst others.

Large 3D hydrodynamic numeric models are being continually developed, and models for the Barents Sea are run by both IMR and PINRO. Sub-models for phytoplankton and zooplankton are now implemented in some of the hydrodynamic models. However, strong assumptions within these models mean outputs must be viewed with caution.

Discards and release of catches that are dead or dying is prohibited in Norwegian waters, and detailed in a list of species that is expanded to include virtually all species (around 60) caught in Norwegian waters from 2009 onwards. The Norwegian discard ban is in reality a requirement to land all catches, as all catch taken on board has to be brought ashore. This facilitates a fuller analysis of the ecosystem effects of fishing.

2.5.3 Vulnerable Marine Ecosystem (VMEs)

The MAREANO programme aims to survey and perform basic studies of the seabed's physical, biological and chemical environment. This follows the Norwegian Government's go-ahead for the launch of a marine survey programme in the Lofoten - Barents Sea region in 2005. Following collection, data are entered into a database that covers Norway's coastal and marine regions, increasing the information on ecologically important benthic communities such as coral reefs and sponges.

Through the underpinning work, key geographical areas have been identified that are important for biodiversity and biological production in the area, and where adverse impacts might persist for many years. Besides being important within the life history stages of key commercial fish species (e.g. spawning and nursery areas), several areas have been identified as important as breeding, moulting or wintering areas for seabird

populations of international importance. In addition, the areas identified include valuable and vulnerable habitats where the benthic fauna included species such as cold-water corals (the largest known cold-water coral reef is off Røst in the Lofoten Islands) and sponge communities. Unintentional negative impacts on these species “are to be reduced as much as possible by 2010”.

On the basis of these studies, the most vulnerable areas within the region have been identified and oil and gas activities forbidden in these areas. The new Marine Resources Act (enabled 2009) and associated regulations cover Norwegian vessels, within Norwegian land territory with the exception of Jan Mayen and Svalbard, in the Norwegian territorial sea and internal waters, on the Norwegian continental shelf, and in the areas established under sections 1 and 5 of the Act of 17 December 1976 No. 91 relating to the Economic Zone of Norway. The Act can be extended to include Norwegian land territory on Jan Mayen, Svalbard, Bouvet Island, Peter I's Island and Dronning Maud Land.

Furthermore, the activities of IMR and the fishery organisations have identified key areas of vulnerable habitat in relation to fishing activities. Five marine protected areas have been established under the fisheries legislation to specifically protect coral reefs from damage caused by “gear that is towed during fishing and that may touch the sea floor”. These are the Sula Reef (Sularevet , 1999), Iverryggen Reef (2000), the Røst Reef (Røstrevet, 2003), Tisler and Fjellknausene Reefs (2003). These areas protect these specific vulnerable species and habitats from disturbance. The Røst Reef is the world's largest known cold water coral reef and has only been discovered in May 2002, while the Sula Ridge & Reef within the 200 nm zone of Norway is probably the best developed Lophelia coral area in the NE Atlantic. In addition, the world's shallowest known Lophelia-reef, Selligrunnen, rising up to 39 m depth below the surface, has been temporary conserved pursuant to the Norwegian Nature Conservation Act by the environmental authorities (2000) (http://www.fisheries.no/management_control/environmental_impact/coral_reefs.htm).

While the main coral areas have been identified, and the key areas protected through prohibition on benthic fishing methods within designated areas, the collection of information is ongoing, and includes the gathering of information by fishers, and targeted and annual cruises through echosounder and multibeam mapping. These activities are also related to the SUSHIMAP project which aims to develop a rapid, reliable and cost-efficient procedure for the mapping and monitoring of seabed habitats by integrating medium- and fine-scale data using visual and sediment-grab methods with large-scale bathymetric and backscatter data obtained by multi beam echo sounding.

2.5.4. Data collection on socio-economic aspects

Small scale fisheries are directly involved within Norway through the relevant fisheries industry regional group (producer organisation). In turn, research is also performed by universities (e.g. University of Tromsø) through specific contracts, and includes recreational fisheries (in particular tourism angling). This links in with the work of the EAA.

3. Research funding and coordination

3.1 Funding

About half of IMR's funding comes from the Ministry of Fisheries and Coastal Affairs, the remainder from the Norwegian Research Council, EU programs and the industry.

Research science is also funded by the Research Council, directed towards both applied and developmental marine science.

The fishing industry has its own research fund, funded by a levy on exports. These funds are governed by the industry itself and target more immediate applied research needs identified by industry.

3.2 Research collaboration and coordination

IMR's annual research plans are developed in consultation with the Ministry. The Ministry review the issue of research needs in a relatively detailed manner in its annual budget propositions to the Parliament. On the basis of this, a detailed set of instructions on research priorities are communicated to the Institute of Marine Research. These priorities are arrived at in dialogue between the institute and the fisheries authorities.

The IMR works collaboratively with the PINRO laboratory in Russia, as well as with other laboratories through ICES, where issues overlap geographically. In the bilateral cooperation with Russia, detailed plans for scientific cooperation on designated issues are regularly prepared. ICES also provide a forum for integration of research from a variety of sources. Norwegian researchers are fully engaged with ICES working groups and the ACFM.

NAMMCO (the North Atlantic Marine Mammal Commission), along with IWC and ICES, have recommended that member countries, including Norway, should monitor and report by-catches of marine mammals and seabirds.

4. Dissemination of Scientific Information

The IMR plays an important role in communicating science to the fishing industry. Communication takes place through various media: the web, newspapers, and participation in meetings with the industry. Further outputs are through the IMR webpage, and through scientific literature and ICES Working Group reports.

The Fisheries Directorate also has an information function, to inform and advise fishers on the regulations of the industry. All regulations are published in real time as they come into effect at the web site of the directorate, on national public radio (NRK), and in the industry newspaper "Fiskeribladet Fiskaren".

Chapter 24: Chile

Section 1: Fishing Administrations Questionnaire

I. For all countries: Fisheries Agreements / Private Licenses

1. All Types of Agreements

Chile does not have fisheries agreements with countries of the European Union (EU) nor with other countries that do not belong to the EU that allow foreign fleets access to waters of its Exclusive Economic Zone (EEZ).

2. EU Fleets covered by FAs and FPAs

Does not apply to Chile.

3. Private Sector Licences

An important number of industrial vessels from Spain, Denmark and Norway have fishing licenses that establish quotas and permit fishing operations in waters within the Exclusive Economic Zone.

4. Non-EU Distant water fleets (DWFs) operating within your EEZ under agreement/Licenses

The licenses are issued at the level of foreign vessels (mainly Japanese), but operating under the Chilean flag. However, details were not provided during the interviews about duration, values and levels of catches for each licensed vessel.

II. For countries with a current European agreement (FA/FPA)

Does not apply to Chile.

III. For countries without current FA or FPA with the EU

6. Previous Agreement

IV. For fishing administrations

7. Management

The administration and regulation of fisheries activities in Chile is responsibility of the Fisheries Subsecretary (SSP - initials for its name in Spanish), which operates under the Ministry of Economy. The SSP is advised by the Institute for Fisheries Development (IFOP - initials for its name in Spanish), whose mission is to prepare and provide

technical and scientific information to inform decisions on the regulation of fisheries and aquaculture and for the conservation of hydrobiological resources and their ecosystems. The SSP makes recommendations to the National Fisheries Council (CNP - initials for its name in Spanish) on management measures such as fishing quotas, closure of areas and bans. The CNP has the authority to adopt these measures.

The SSP periodically recommends management measures to the CNP based on two advisory modes: The main advisory mode is direct recommendations by the IFOP based on population and fisheries indicators and the results of stock assessments of the main national fishery operations. The second advisory mode is recommendations by Scientific Committees (established by fishery), which are composed of scientists from the IFOP, universities, industry, NGOs and government. The Scientific Committees are charged with discussing the recommendations of the IFOP to the SSP and have the potential of offering alternative recommendations.

In the case of advice that the IFOP provides directly to the SSP, population and fisheries indicators are developed in the framework of monitoring programs of main Chilean Fisheries using biological information and data about catches and effort gathered from logbooks, landing, through scientific observers or assessment surveys. The state of exploitation and the levels of population reduction are determined quantitatively through direct and indirect stock assessments employing data on catches and effort, as well as detailed data on size, proportion, sexual, reproduction, age, recruitment, maturity and fecundity.

8. Observer Programs

Since 2005 the IFOP has been carrying out a Scientific Observers Program whose mission is to quantify catches, determine incidental catches (number and volume of species) and evaluate measures for mitigating the catching of birds, mammals and endangered or at risk species (sharks, turtles, mammals). This program complements a historic Sampling Program (named by law since 2007 as “Regular Observers”), which was implemented in 1978 in the southern demersal fishery and has since been extended to the majority of industrial and artisanal fishing operations. The Regular Observers Program dedicates itself to biological sampling for target species and gathering logbook, while the Scientific Observers Program is oriented mainly to determining catch levels for subsequent cross-checking with official statistics, as well as to determine levels of incidental catches.

In the last four year and after initiating the main Chilean fishery (common hake), the Scientific Observers Program has been extended to demersal fisheries (trawling and longline), pelagic fishing (purse seine nets and longline) and crustacean fishing (trawling). Currently there are 270 Regular Observers, of which 10% are Scientific Observers, who regularly board Chilean fishing vessels.

Section 2: Researchers Questionnaire

II. To be completed during the interview

Note: In accordance with the configuration of the questionnaires, the research and data gathering topics should be coherent with main stocks/fisheries involved in agreements with third countries and the EU. Nevertheless, given the absence of agreements, we opted for obtaining detailed information about the national fleet or foreign vessels with fishing licenses for the EEZ of the country in question.

1. Important Stocks

The SSP establishes management and planning measures for 19 species of economic importance in Chile. The table below summarizes the species, exploitation status and assessment method.

Specie	Status exploitation	Trend population	Method
Yellow squat lobster	full exploitation	growing	quantitative
Nylon shrimp	full exploitation	growing	quantitative
Red squat lobster	full exploitation	decreasing	quantitative
Deep shrimp	full exploitation	stable	quantitative
southern blue whiting	full exploitation	stable	quantitative
Alfonsino	full exploitation	stable	quantitative
Anchovy	Overfishing	spawning biomass decreasing	quantitative
Common Sardine	full exploitation	decreasing	quantitative
Common Hake	full exploitation	growing juveniles	quantitative
Jack Mackerel	overexploitation	decreasing	quantitative
Swordfish	---	---	quantitative
Chub mackerel	full exploitation	Stable	quantitative
South American pilchard	full exploitation	decreasing	quantitative
pink cusk-eel	Overfishing	decreasing	quantitative
Southern hake	Overfishing	decreasing	quantitative
cardinalfish	Overfishing	decreasing	quantitative
Patagonian toothfish	Overfishing	stable (20% Bo)	quantitative
Yellownose skate	Overfishing	stable	quantitative
Patagonian grenadier	full exploitation	growing	quantitative

The condition of exploitation (overfishing, full exploitation), determined in terms of biological conservation under PBR or risk analysis, has an important influence on the establishment of management measures such as fishing quotas and seasonal close. Nevertheless, several socioeconomic questions related to the socially vulnerable fishing sector can result in the National Fisheries Council not adopting recommended conservation measures arising from quantitative methods.

2. Protected, endangered and threatened species (PETs)

Included among protected species in Chile are whales, marine birds (albatross and petrels), marine mammals (dolphins, seals) and turtles (four of the six exploited species in the southern Pacific). In the case of sharks, the government of Chile has not declared any of the species listed in CITES or UNCN as protected species, nor has it declared

any moratorium on catching them. Nevertheless, all shark and ray/skates catches requires the integral use of the specimen. Integral use implies the commercial use of the whole shark, thus avoiding that fishermen only make commercial use of the fins and discard the rest of the animal.

In the case of marine turtles, the government of Chile signed the agreement adopted at the Inter-American Convention for the Protection and Conservation of Sea Turtles (http://www.iacseaturtle.org/). At the same time the protection of sea birds is a focus of the SSP, as evidenced by the adoption of the Agreement on the Conservation of Albatross and Petrels (ACAP). Chile also participates in the International Whaling Commission (IWC).

3. Research collaboration and research coordination

Fisheries research in Chile is carried out mainly by the Institute for Fisheries Development (IFOP). Nevertheless, among the funding tools of the Chilean government are grants managed by the Fisheries Research Fund (FIP - initials for its name in Spanish). These grants provide are an option for developing fisheries research by universities and private research institutes, the latter usually associated with the fishing industry.

The IFOP, employing mainly funds directly allocated by the Chilean Government and to a lesser extent grants from the FIP, develops the main research programs in the fisheries sector, which can be classified as follow:

(i) Monitoring Program to fishing activities. This program involves monitoring and gathering fisheries and biological data through detailed sampling protocols that cover a range from the operations of vessels to sampling in processing plants. The program also involves the construction of population and fisheries indicators oriented to the biological condition of exploited species to infer their possible state of exploitation and provide the necessary inputs for stock assessments.

(ii) Assessment Survey Program: This program involves the development and programming of acoustic and trawling surveys for at least 12 species of economic importance for Chile. The main species covered by this program are hake, jack mackerel, sardines, anchovies and demersal crustaceans (lobsters). Together with a detailed report that synthesizes the current state of populations (in terms of abundance and biomass estimated by surveys), this program provides information for stock assessment models. The IFOP has a scientific vessel with the necessary equipment for fisheries and oceanographic surveys.

(iii) Economic and Development Section: The main objective of this line of research is to know the current state of development of Chilean fishing sector (mainly industrial fishing) by means of economic indicators.

(iv) Areas Management Program: This program is oriented to developing research related to the type/classification of protected marine areas, as well monitoring the fisheries management plans instituted in each of this area.

(v) Stock Assessment Program: Together with the SSP, the IFOP develops and coordinates technical groups oriented to the assessment of at least 21 fish and crustaceans stock all along the country. This program has an ongoing focus on increasing its own analytical capacities and maintaining state-of-the-art analysis standards in stock assessment.

At the same time, funding to universities and private institutes has led to the development of species-specific research. The research developed by these institutions are normally focused on individual processes (growth, reproduction, larval dispersion and life history in general) and/or demographic processes (migration, population units), which form part of the knowledge base used for qualitative or quantitative assessments of the population.

In terms of collaborations, the IFOP and the main academic and private institutions (e.g. Universidad de Conception, Institute for Fisheries Research, Universidad Austral, Centre for Fisheries Studies) regularly form alliances to develop projects. Nevertheless, owing to the duration of projects in Chile (very few projects last beyond 18 months), these alliances are short-term and are not able to give rise to lines of long term research.

The IFOP has an extensive network of alliances in which it has developed lines of research (http://www.ifop.cl/instituciones_extranjeras.html). Nevertheless, the form of allocating funds in Chile, the short duration of research projects (less than 18 months), and the brevity of these collaborative programs makes difficult the continuity the research program. Notably among the collaborations are research work with the Sea Institute of Peru (IMARPE) to assess small pelagic species and the alliance with the Institute de Recherche pour le Développement (IRD) of France in the development of acoustic surveys of small pelagic species.

In environmental and oceanographic terms, the IFOP, universities and the Navy Hydrographic and Oceanographic Services (SHOA - initials for its name in Spanish) have developed collaborative prospecting programs oriented to the oceanographic and environmental description of the main areas of fisheries exploitation.

4. Data Collection

4.1. Biological data collection

The collection of biological and fisheries information in Chile can be classified by three main sources. The first is information gathering programs developed by the IFOP that are focused on length, maturity and reproduction data, also, age, migration and recruitment, among others, as well as detailed records of catches and efforts, both under sampling protocols that are defined and agreed upon with the SSP.

A second source of data gathering comes from what is termed Researched Fish (Pesca de Investigación), which is an instrument for assigning fishing quotas subject to research requirements. This instrument of assigning fishing quotas and other fisheries information (biological, and about catches and efforts) are employed by fisheries

associations and operators who use the services of consultants or universities to analytically develop the data gathered.
The third source is data gathered by private institutions and universities with funds granted by the FIP. These records, which are generally biological and demographic data, are stored by the FIP and provided to the IFOP.

4.2. Environmental data collection

Environment data is regularly gathered in Chile by the IFOP, the SHOA and, in the case of prospecting designed to implement the Egg Production Method (MPH survey), by the Universidad de Conception and IFOP.

In the case of the IFOP, environmental information is gathered during the bulk of fishing surveys and also on cruises designed specifically to characterize biological and oceanographic conditions (MOBIO, monitoring of bio-oceanographic conditions) aboard the scientific vessel Abate Molina. There are no strict protocols in the case of fishing surveys to gather environmental information, although it is common that sea temperature and chlorophyll levels, among other indicators, are recorded. In the case of the MOBIO, the prospecting protocols are strict and based on sampling designs. The objectives of the MOBIO are:

- Determine the spatial distribution and spatial-temporal variations at the meso-scale (km), of bio-oceanographic variability, temperature, salinity, density, dissolved oxygen, chlorophyll, nutrients and light penetration, in the area of study in the vertical structure from 0 to 200 meters.

- Determine seasonal abundance, spatial distribution and plankton composition, including macrozooplankton and ictioplankton, as well as eggs and larvae of anchovy, sardine, jack mackerel and caballa from the area of study and their relationship to oceanographic conditions indicated in the aforementioned objective.

- Characterize the pelagic resources present in the area of study using relative abundance indices in relation to bio-oceanographic conditions.

- Determine monthly variations in the coastal areas of the variables indicated in the two aforementioned objectives, with observations made in at least three coastal stations within the area under study.

Using the scientific vessel Vidal Gormaz and operating under a range of protocols, the SHOA has carried out anchoring oceanographic buoys, hydrographical cruises, bio-oceanographic cruises in fiords of southern Chile, oceanographic cruises in the Chilean oceanic islands and around twenty ENOS cruises for monitoring related to El Niño event.

Finally, the Universidad de Conception and IFOP annually estimate the abundance of sardine and anchovy eggs over an extensive area, using the daily egg production method. This work has been funded by FIP.

4.3. Data collection on ecosystem effects

The mission of the IFOP Scientific Observers Program is to provide background information to: (i) estimate the levels of catches, (ii) quantify discards, (iii) assess and quantify incident catches of fish, mammals, turtles and birds, and (iv) identify mechanisms to avoid incidental catches of endangered or vulnerable species.

While there are no other program in Chile similar to the Scientific Observers, the National Action Plan de Action to reduce incidental catches of birds in longline fishing vessels (PAN-AM/CHILE) has resulted in scientific observers from several universities occasionally accompanying fishing vessels to gather data on mammals (especially whales), stomach contents and quantities of discards.

To date the IFOP does not have a program for collecting stomachs. Nevertheless, some efforts have been made in the framework of the Monitoring Program of Fishing Activities to quantify the levels of predation between economically important species. The Concepcion Universidad has made significant advances in describing eco-trophic chains of a major part of Chilean maritime territory, but under a theoretical background and with a low kind of data.

By means of MOBIO and MPH the IFOP periodically assesses primary production in the main fisheries areas as well as the main areas of coastal upwelling.

4.4. Data collection on socio-economic aspects

The SSP and the National Fisheries Service (SERNAPESCA) are responsible for gathering socioeconomic information related to Chilean fisheries.

4.5. Funding

Through the SSP and the FIP the Chilean government completely funds gathering biological and fisheries data. There is no international funding oriented to gathering this type of data.

5. Research, Funding and Assessment

5.1. Research: Vulnerable Marine Ecosystem (VMEs)

The Government of Chile recognizes that protected areas play a fundamental role in protecting nature and conserving vulnerable marine ecosystems (VMEs). In general these protected areas are geographic spaces that are defined for the purpose of the conservation and preservation of biological units, which involves two basic elements for legal regulation, the ecological unit to be protected and the jurisdictional area in which this resource is located.

The General Law of Fisheries and Aquaculture establishes that protected marine areas, termed Marine Parks and Marine Reserves, constitute fishery administration measures

to preserve ecological units of interest for science and establish areas that ensure the maintenance and diversity of hydrobiological species and their associated habitats. These areas are established by the SSP and are administered by SERNAPESCA. Nevertheless, there are other legal entities involved in the protection of marine and coastal areas. The protected marine areas decreed to the present date by different means are the following:

1) Marine parks
2) Marine reserves
3) Areas for management and exploitation of bentonic resources
4) Protected coastal areas
5) Nature sanctuaries (e.g. whale sanctuaries)
6) Wetlands

5.3. Assessment methods, assessment models and software

The IFOP carries out annual stock assessments for the group of species detailed in Table 1, composed of 21 stocks of fish and crustacean. The assessments employ abundance indices obtained from fishing operations, abundance and biomass estimates from fishing surveys, official landings levels and structured information by size and/or age.

The assessment methods cover a range from production models to age-structured models, these in function of available data and process and population hypotheses reviewed and accepted by the scientific committees (see section 7 for a description). The degree of uncertainty for the main variables is estimated by Bayesian techniques (e.g. MCMC, SIR).

The working platform of the IFOP is the numeric software Matlab, in which numerous functions and routines have been codified to implement stock assessment models. Nevertheless, in recent years ADMB software has been adopted as a complementary tool for crosschecking results.

The IFOP is the only institution in Chile that carries out stock assessments that are employed to establish fisheries management measures. The results of the stock assessments of the IFOP are discussed in technical committees coordinated by the SSP in which researchers from the IFOP, universities, other research institutes and the fishing industry participate. While some scientists in the fisheries industry implement stock assessments models to make economic projections, these evaluations do not have adequate procedures to be incorporated as advisory tools for decision making about fisheries management.

6. Dissemination of Scientific Information

The scientific information gathered in Chile is disseminated through reports prepared by the IFOP and directed to the SSP for fisheries planning and management. There is open access to all these reports (under SSP requirement) under the Transparency Law.

Websites and mailing lists are employed by the IFOP and the SSP to disseminate basic information to the society and stakeholders in the fishing sector.

Dissemination through publication in indexed scientific publications (with peer review committees) is not a priority for either the IFOP or the SSP. However, dissemination by this medium is the exclusive responsibility of researchers undertaken for personal motives.

Chapter 25: Ecuador

Section 1: Fishing Administration Questionnaire

I. For all countries: Fisheries Agreements / Private Licenses

1. All Types of Agreements

Ecuador does not have fisheries agreements with countries of the European Union (EU) nor with any country that does not belong to the EU, that allow access of foreign fishing fleets to waters within its Exclusive Economic Zone (EEZ).

2. EU Fleets covered by FAs and FPAs

Does not apply to Ecuador

3. Private Sector Licenses

Ecuador does not extend fishing licenses to companies/vessels from the UE. However, it does extend a limited number of fishing licenses to Latin American countries such as Panama, Colombia and Peru. Ecuador pointed out that to end January could send more detailed information about this issue.

4. Non-EU Distant water fleets (DWFs) operating within your EEZ under agreements/licenses

Fishing licenses are provided at the level of foreign vessels (Panama, Colombia, Peru), but operating under the Ecuadoran flag. Details were not provided during the interviews about the duration, values and levels of catches of each licensed vessel. However, it was indicated that these licenses are mainly given for catching shrimp and large pelagic species (see section II-1 page 3).

II. For countries with a current European agreement (FA/FPA)

Does not apply to Ecuador

III. For countries without current FA or FPA with the EU

6. Previous Agreement

Historically Ecuador has not had any fisheries agreement with the EU.

IV. For fishing administrations

7. Management

The administration, control, development and dissemination of industrial and artisanal fishing activities in Ecuador is managed by the Undersecretary of Fisheries Resources (SRP – initials for its name in Spanish), which operates under the Ministry of Agriculture, Livestock, Aquaculture and Fisheries. Among its attributions and responsibilities are:

a) Comply with and ensure compliance with the laws and regulations referring to the national fisheries sector;

b) Prepare plans and programs for fisheries development and submit them for approval by the National Council for Fisheries Development;

c) Control and require compliance with the tasks that other entities and dependencies of the public fishing sector should carry out;

d) Coordinate the work of the public fisheries sector as well as their relationship to the private fisheries sector;

e) Establish committees to study matters concerning the activity, planning and development of the fisheries sector;

f) Undertake pertinent administrative tasks;

g) Promote financial credit for fisheries and oversee its use;

h) Collaborate with potential credit users, especially in the artisanal sector, in the preparation of investment and operational projects that obtain medium and long-term financing; and

i) Be familiar with and approve the plans of fishing industries.

The Undersecretary of Fisheries Resources is advised on issues of planning and research by the National Fisheries Institute (INP – initials for its name in Spanish). The INP is a public body under the direction of the Ministry of Agriculture, Livestock, Aquaculture and Fisheries.

Fisheries management and administrative measures in Ecuador are made solely by means of fishery close season (hereafter “bans”) and fishing regulations (e.g. prohibitions on fishing certain species, minimal sizes, among others). Currently there are no quota-based regimes in Ecuador that perform as fisheries management and effort regulation measures. The SRP is expected to form working groups to establish possible management tool such as Total Allowable Catches (TAC), based on direct and/or indirect assessments of the main fish stocks, which make possible the protection resources.

8. Observer Programs

The SRP recently approved an Observer Program to quantify incidental catches of sharks, turtles, birds and marine mammals in artisanal and industrial tuna and large

pelagic fishing operations. The observer program has been operating for six months under the direction of the INP. There is currently no system of crosschecking between the observations and the declarations by fishing vessel owners.

Before this program, data on fishing effort, catches and incidental catches by tuna and large pelagic fishing fleets was gathered solely by means of logbooks (received by the SRP), monitoring of catches at ports of landing (carried out by the INP) and as outcomes of particular research programs. One of the disadvantages in the data gathering process is that the INP does not have access to the logbooks collected by the SRP and in many cases there are discrepancies between (i) the records gathered by the INP in the ports of landing, (ii) by means of scientific observers and the fishing logs received by the SRP.

In the case of industrial fleets that catch tuna and large pelagic species in the Eastern Pacific Ocean (EPO), the data collection protocols (biological and fisheries) and scientific observer programs are subjects to the regulations adopted by the Inter-American Tropical Tuna Commission (IATTC).

Section 2: Researchers Questionnaire

II. To be completed during the interview

Note: In accordance with the configuration of the questionnaire, the topics of research and gathering data should be in coherence with the main stocks/fisheries that involve the agreements between third countries and the UE. Nevertheless, given the lack of agreements, the option was to obtained detailed information relating to the national fleet and foreign vessels with fishing licenses for the EEZ of the country in question.

1. Important Stocks

The main stocks caught by national and foreign vessels with fishing licenses for the Ecuadoran EEZ include four groups of species:

1) Industrial fishing: Tuna and other oceanic pelagic species caught by purse-seine or longline vessels:

(i) Yellowfin tuna (*Thunnus albacares*)
(ii) Skipjack tuna (*Katsuwonus pelamis*)
(iii) Bigeye tuna (*Thunnus obesus*)
(iv) Mahimahi (*Coryphaena hippurus*)
(v) Picudo (*Tetrapterus spp., Makaira spp.*)
(vi) Swordfish (*Xiphias gladius*)
(vii) Sharks (incidental catch)

2) Industrial fishing: Small pelagic fish

(i) Chub mackerel (*Scomber japonicus*)
(ii) Pacific thread herring (*Ophistonema spp.*)

(iii) Pacific anchoveta (*Cetengraulis mysticetus*)
(iv) Round herring (*Etrumeus teres*)
(v) Sardine (*Sardinox sagax*)
(vi) Jack mackerel (*Trachurus murphyi*)

3) Industrial fishing: Shrimp trawling fleet (trawling vessels)

(i) White shrimp (*L. vannamei, L. stylirostris y L. occidentalis*) (genero *Litopenaeus*)
(ii) Crystal shrimp (*Farfantepenaeus brevirostris*)
(iii) Brown shrimp (*F. californiensis*)
(iv) Tiger shrimp (*T. byrdi, T. similis pacificus, T. faoea*) (genero *Trachypenaeus*)
(v) Pomada shrimp (*Protrachypenaeus precipua*)
(vi) Others shrimp (*Xiphopenaeus riveti, sicyona disdorsalis*)

4) Artisanal fishing: Focused on the three groups mentioned previously, as well as catching benthonic and demersal species. This sector is mainly oriented to supplying the local market.

In the case of benthonic species, we note:

(i) Concha prieta, pianga (*Anadara tuberculosa, A. similis*)
(ii) Large oyster (*Ostrea columbiensis*)
(iii) Mussel (*Mytilus guyanensis*)
(iv) Octopus (*Octopus spp.*)
(v)Snails (*Melogena spp*.)

The most important demersal species for the artisanal fishing sector are:

(i) Corvina (*Cynoscion spp*)
(ii) Snook (*Centropomus spp*)
(iii) Pacific sierra (*Scomberomorus sierra*)
(iv) Sole (*Paralichtys spp*)

The SRP has not defined exploitation status or levels of exploitation for these groups of species or any particular specie. In some cases, the management tools and/or regulatory actions (e.g. minimal size) are used to qualitatively classify the state of the population, although these qualitative classifications do not have any influence on the definition of subsequent management and/or regulatory actions.

2. Protected, endangered and threatened species (PETs)

A wide range of turtles (*Eretmochelys imbricada, Chelonia mydas agassizi, Lepidochelys olivacea, Dermochelys coriacea*, among the most important species), sharks (*Isurus oxyrinchus, Prionace glauca*, several of the genera *Carcharhinus* and *Mustelus*), rays (genera *Dasyastis*, *Mobula*, *Gymnura*, *Rhinoptera*), seahorses and birds (the Peruvian booby, albatross, cormorant, petrel) are considered PETs in Ecuador, in accordance with the criteria of the IUCN or CITES.

Among these groups of species, the sharks and turtles are the most common by-catch in longline and purse-seine fishing. On the one hand, longline fleets have made significant efforts to avoid catching turtles (e.g. using curved hooks), which, along with rigorous protocols for releasing retained species have resulted in the reducing the mortalities of these species. Likewise, a significant number of shark species cannot be caught as the target species. Nevertheless, Ecuadoran law permits incidental catches providing the specimen is reported whole (body and head) during the port sampling. This has led to a major problem in that many of the vessels that catch sharks and report the catches as incidental do so solely to remove the shark fins once the body and head are reported during the landing. On the other hand, the fishing industry is promoting the implementation of devices to mitigate catching marine birds during the fishing operations of longline fishing vessels.

The SRP has recently implemented a system for control, monitoring and gathering statistics on shark (MAGAP-SRP – initials for its name in Spanish) resources offloaded on the continental coast of Ecuador, which, together with the program of observers on large pelagic fleets, is aimed at mitigating incidental catches of PETs.

3. Research collaboration and research coordination

The INP is the only organization in Ecuador that advises the government on fisheries planning and regulation. There are other institutions (mainly academic) that carry out basal research on biological matters but these don't advice to SRP. The INP focuses on three major research programs:

- Monitoring major and minor pelagic groups. This area of research is focused on gathering data about catches and efforts from the main ports of landing, in order to construct fisheries indicators.
- Growth, reproduction and life history of the main large and small pelagic species and shrimp. This line of research is oriented to the study of populational behavior from the earliest stages (larvae to adult)
- Acoustic and trawl survey that contribute to research related to oceanographic physics and fisheries oceanography.

The INP does not have research programs in collaboration with other national institutions. There are exceptions in the framework of individual projects (e.g. some sonar cruises) in which they collaborate with the Oceanographic Institute of the Ecuadoran Navy (INOCAR) in collecting oceanographic data to research in oceanographic physics and fisheries oceanography. On the other hand, it was observed from the interviews that there is little research related to socioeconomic aspects owing to the near non-existence of monitoring of socioeconomic data related to fishing operations.

The last of the collaborative research programs at the international level (UE-VECEP) was completed in 2000. This program was a funding agreement between the European Union and the Republics of Venezuela, Colombia, Ecuador and Peru. Its main objective was the rational and sustainable development of the fisheries sector through support to

three areas of action: assessment of marine resources, artisanl fishing and training at different levels.

There are few programs in collaborative research and cooperation in fisheries science at the national level. While Ecuador is part of the ICAT, where it could establish important research links, the INP participates tangentially in the programs of this RFMO. According to the organizational chart of the SRP, it is the National Council on Fisheries Development that participates in meetings of ICAT and its opinions are based essentially on political considerations.

4. Data Collection

4.1. Biological data collection

The INP is the only organization in Ecuador responsible for gathering biological data. For the four groups of species outlined in Section II 1 (page 3), the INP focuses its efforts on gathering data on the length, sex, maturity, fecundity and growth of the main species in each of these groups. According to the details provided by the interviews, to date no studies have been carried out on migration patterns by means of tagging or through analysis of hard structures (e.g. otoliths).

The data gathering methods for the four groups of species are, in order of importance, sampling conducted at ports of landing, samples obtained from fish markets and finally, from acoustic or trawl surveys conducted by the INP. The recently implemented program of onboard observers is the first example where a two-stage (vessel and set/tonw level) design has been applied to gather biological information onboard fishing industry vessels.

While the INP carries out analyses of size compositions, either through ports of landing and in different time scales, as well as analyses of fecundity and maturity under different spatial scales, this information is currently not being employed to assess stocks or for managing fisheries.

The policies of the INP are very restrictive in all aspects related to sharing biological information with other national or international organizations, which is evident by the fact that the SRP and INP hardly share information from logbooks (data on catches and efforts), much less detailed biological data.

4.2. Environmental data collection

Among the INP research programs is a program for periodically gathering coastal environmental information such as the ocean surface temperature, chlorophyll levels, salinity, oceanic currents and other variables that are used by the INP to construct environmental indicators and to cross-check other population indicators of large and small pelagic species. One of the deficiencies of this program is its dependence on INP funding, given that it is not a priority item for the institute.

The protocols for gathering information from fisheries monitoring and/or acoustic-trawl surveys do not cover the gathering of environmental information in a periodic base.

4.3. Data collection on ecosystem effects

The INP does not include in its research lines the implementation of programs oriented to gathering data on ecosystem effects. However, the recent program of scientific observers aims to incorporate a wide spectrum of coverage of incidental species, as well the implementation of a program to collect the stomachs of large pelagic species (in order to construct trophic webs). While there are stomach samples of some species, these have been gathered in specific projects without any sampling protocol.

4.4. Data collection on socio-economic aspects

The SRP is responsible for gathering socioeconomic information in Ecuador. Its main focus is oriented to fisheries planning. In this framework, the SRP has gathered information about employment, demographics, market, technification, investments, and equality. However, it remains unclear from the interviews whether this information is routinely collected by the SRP or was gathered specifically to respond to specific fisheries planning matters or fisheries management measures.

The INP does not focus on gathering socioeconomic information related to fisheries.

4.4. Funding

All the research programs of the INP and the SRP are funded by the government in the framework of the allocation of an annual budgetary item. However, the Ministry of Agricultural, at its own discretion, has made budgetary cuts that often stop or reduce research programs that had been planned at the beginning of the year. This is one of the major disadvantages in projecting the research carried out by the INP. For example, of the five cruises programmed for 2009, only one actually took place at the beginning of the year.

5. Research, Funding and Assessment

5.1. Research: Vulnerable Marine Ecosystem (VMEs)

The INP and SRP have proposed a plan for 10 protected areas along the Ecuadoran coast. The plan is still in the discussion stage. The Galapagos Islands continues to be one of the major areas for protection in Ecuador.

5.3. Assessment methods, assessment models and software

The INP does not carry out assessments of the stocks of any exploited species. On the other hand, the SRP does not base its decisions on recommendations arising from quantitative modeling of species populations.

6. Dissemination of Scientific Information

The scientific information gathered by Ecuador is disseminated through scientific reports prepared by the INP and directed to the SRP for the management and planning of fisheries. There is often restricted access to these documents. However, the INP has

an annual bulletin for dissemination of the main results obtained from the different research programs.

The INP and SRP use web sites and mailing lists for dissemination of basic information for the general community and those interested in the fisheries sector.

Dissemination by means of indexed scientific journals (with peer review committees) is not an institutional priority for either the INP or the SRP. However, dissemination by the means is exclusively the responsibility of researchers, subject to consultation with the INP directory.

7. Management Processes

See section IV-7 page 2.

Interviewees:

- Orlando Crespo, General Direction of Fisheries, Sub-secretary of Fisheries Resources.
- Dr. Nikita Gaibor, Technical Sub-director, National Fisheries Institute.
- Dr. William Revelo, Development and Execution of Projects, National Fisheries Institute.
- Pilar Solís, Evaluation of Projects and Aquaculture and Environmental Resources, National Fisheries Institute.
- Dialhy Coello, Large Pelagic Fish Program, National Fisheries Institute.
- Luis Flores, Bentonic Species Program, National Fisheries Institute.
- Telmo de la Cuadra. Chief of Cruises, National Fisheries Institute.