

GHANA

1. INTRODUCTION

This document is aimed at providing reference information on the present status of fishery information and data collection in Ghana for the discussion during the FAO FishCode-STF/CECAF/FCWC Subregional Workshop on the Improvement of Fishery Information and Data Collection Systems in the West Central Gulf of Guinea Region held in Accra, Ghana, in June 2007. The information contained in this document has been obtained from FAO's corporate repository of information (including the Fishery Country Profile on Ghana) and other information sources.

2. GENERAL INFORMATION ON GHANA RELATED TO FISHERIES

Ghana, officially the Republic of Ghana, is a country in West Africa. It borders Côte d'Ivoire to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south. It has a total land area of 238 527 km². The country has a coastline of nearly 550 km long (Quatey, 1997; Ali, 2004) and the area of the continental shelf is about 24 300 km². The countries' exclusive economic zone has an area of 218 100 km² (Amador *et al.*, 2006).

Accra is the capital and largest city. The country's population in 2005 was 21 029 000. The country is divided in 10 regions, which are subdivided in 138 districts. The ten regions are: Ashanti, Brong-Ahafo, Central, Eastern, Greater Accra, Northern, Upper East, Upper West, Volta and Western. The regions along the coast are: Western, Central, Greater Accra and Volta. The main ethnic groups along the coast are: Ahanta, Efutu, Ewe, Fante, Ga-adangbe and Nzima (Marquette *et al.*, 2002).



Agriculture is the dominant sector of the Ghana economy, employing about 60 percent of the labour force. Agriculture, predominantly smallholder, traditional and rain-fed, contributes 45–50 percent of the GDP and about 75 percent of export earnings of Ghana. The fisheries subsector accounts for 5 percent of the country's agricultural GDP.

With a per capita consumption of about 25 kg per annum, fish is a preferred source of animal protein in Ghana. Fish contributes 60 percent of animal protein intake of Ghanaians. About 75 percent of the total domestic production of fish is consumed locally. The fishing industry in Ghana is based on resources from the marine and inland (freshwater) sectors, coastal lagoons and aquaculture (Quatey, 1997; NAFAG, 2007).

3. STRUCTURE OF THE FISHERIES SECTOR

Marine fishery subsectors

The marine fisheries sector is usually categorized into four subsectors: small scale (or artisanal), semi-industrial (or inshore), industrial and tuna. Of these the small scale, or artisanal fisheries subsector is the most important with respect to landed weight of fish, it accounts namely for approximately 70 to 80 percent of the national marine fish production (Quatey, 1997; Amador *et al.*, 2006).

Artisanal fisheries

The artisanal fishery is characterized by the use of several gears. These include purse seine nets, beach seine net, set nets, drifting gillnets and hook and line. These gears are operated from dug-out canoes. There are over 11 200 canoes and more than 124 000 fishers operating actively from over

300 landing sites located along the entire 550 km length of the coastline. About 50 percent of these canoes are powered by outboard motors with engine power of up to 40 hp (Amador *et al.*, 2006).

Various different artisanal gears target different resources: the artisanal purse seines and beach seines are exploiting mainly small pelagics. Purse seines are used to exploit adult sardinellas and chub mackerel during the upwelling periods, when these species move into coastal waters to spawn. During the non-upwelling periods, anchovies and juvenile sardinellas in coastal waters are targeted with this gear. Beach seines are operated from the beach and exploit adult sardinellas, during the upwelling periods and anchovies and juvenile sardinellas during the non-upwelling periods. The artisanal sector accounts for about 90 percent of total landings of the small pelagic resources.

Hook and line and beach seines are the main artisanal gears used to exploit demersal resources. Hook and line canoes operate in deep waters of about 80 meters on hard bottoms. Some of the hook and line canoes have facilities for storing ice to preserve fish and are therefore capable of staying up to three days at sea. They target seabreams (mainly *Dentex gibbosus*, *Pagrus caeruleostictus* and *Dentex canariensis*) snappers (*Lutjanus fulgens*, *Lutjanus goreensis*) and groupers (*Epinephelus aeneus*).

The beach seine exploits both adult and juvenile demersal fish but mainly juvenile fish. Some of their target species include burrito (*Brachydeuterus auritus*), red snapper (*Lutjanus fulgens*), grey snapper (*Lethrinus atlanticus*), mullet (*Pseudupeneus prayensis* and *Mugil spp.*) and ribbonfish (*Trichiurus lepturus*). The artisanal sector accounts for about 50 percent of total demersal fish landings annually.

Drifting gillnets are used offshore to exploit mainly large pelagics such as sharks (*Carcharhinus spp.*) tunas (*Thunnus albacares*, *Thunnus obesus*) sailfish (*Istiophorus albicans*) and swordfish (*Xiphias gladius*).

Artisanal gears are also used to exploit molluscs and crustaceans. Until 1983, the beach seines were the main exploiter of cuttlefish in Ghanaian waters; accounting for over 60 percent of landings annually. Currently, the industrial trawlers account for over 80 percent of landings annually.

Beach seines are used to exploit shrimps mainly *Parapenaeopsis atlantica* and *Penaeus kerathurus* (both adult and juvenile) and juvenile *Penaeus notialis* as they move from the estuaries into marine waters. Lobster set nets target the spiny lobster, *Panulirus regius* on rocky bottoms and in depths of about 40 m. The artisanal fishery contributes over 70 percent of total fish landings annually (Quatey, 1997).

Worth mentioning are the Lagas canoes. These are motorised canoes, which specialise in hook and line, using insulated containers and ice to preserve high valued fish. Some of these canoes are equipped with electronic fish finding devices such as echo sounders (FAO, 2007).

Inshore semi-industrial fisheries

The semi-industrial or inshore fleet consists of approximately 230 locally built wooden vessels fitted with inboard engines of up to 400 hp and have lengths ranging between 8 and 37 m. Vessels with lengths less than 12 m are referred to as small-sized while those between 12 and 22 m are referred to as medium sized vessels (Quatey, 1997).

The vessels are multipurpose and are used for both purse seining and bottom trawling. They operate as purse seiners during the upwelling periods and switch to bottom trawling for the rest of the year. The purse seiners target the sardinellas, chub mackerel and other Carangidae species. They fish in the same coastal waters as the artisanal fleet during the upwelling seasons.

The small-sized trawlers target gery triggerfish (*Balistes capriscus*), while the others exploit seabreams (mainly *Pagellus bellottii*, *Pagrus caeruleostictus* and *Dentex canariensis*), snappers (*Lutjanus fulgens* and *L. goreensis*), red mullet (*Pseudupeneus prayensis*), cassava fish (*Pseudolithus senegalensis*), burrito (*Brachydeuterus auritus*) and groupers (*Epinephelus aeneus*). Bottom trawling is done in waters greater than 30 m depth.

The semi-industrial vessels use ice for preserving fish at sea and a fishing trip usually varied between 3 and 5 days.

The disappearance of *B. capriscus* from Ghanaian waters in the late 1980s has affected greatly the performance of the sector. The species was the main resource base for many of these vessels (Quatey; 1997).

Industrial fisheries

The industrial fleet is currently made up of 48 trawlers, 7 pair trawlers, 2 shrimpers, 26 tuna baitboats and 10 tuna purse seiners. The vessels operate from Tema and Takoradi where there are deepwater ports. The trawlers and shrimpers exploit demersal and semi-pelagic species. As deep-sea vessels, these trawlers are required by law are to operate in waters deeper than 30 m depth (Fisheries Act 625 2002).

The industrial fleet has freezing facilities for preserving fish at sea and can stay for months at sea. It is reported that the industrial fleet has undergone a radical expansion in numbers since 1984 when the policy of the Government of Ghana targeted industrial fishing as a mechanism for promoting non-traditional exports (Quatey, 1997; FAO, 2007).

Trawlers are normally over 35 m in length and have engines of over 600 hp, while the shrimpers are up to 30 m in length with engines of over 350 hp. Originally, the trawlers fished off the west and south-west coast of Africa particularly in the area from Sierra Leone to Mauritania and also in the Angola to Namibia area. These vessels have been forced out of these waters by the enforcement of the 200 nautical mile EEZ Law by these countries.

Commercial shrimpers are restricted by law to operate between latitude 1°45'W to 2°30'W and 0°15'E to 1°12'E and in waters with a greater depth than 30 m. These vessels target mainly pink shrimp (*Penaeus notialis*). All shrimps caught by these vessels are exported. The by-catch of these shrimpers consists of finfish which include soles, cassava fish, seabreams, cuttlefish and red mullet.

The industrial trawlers by law are to operate in waters greater than 30 m deep. However, the bottom beyond the 75 m depth-contour is untrawlable, limiting their operational area. The industrial fleet has undergone radical expansion in numbers since the launching of the Ghana Economic Recovery Programme in 1984. The aim of the programme, among other things, was to promote non-traditional export to earn foreign exchange for the country. The number of operating trawlers has increased from 10 in 1984 to 33 in 1995. These vessels target species such as cuttlefish, seabreams, groupers, snappers, soles and cassava fish for export. Commercial shrimping also resumed in 1986 with two vessels and the number increased to 18 in 1996. There are two shrimpers operating in Ghana at present. The industrial vessels have freezing facilities for preserving fish on board and can stay for months at sea.

Tuna fisheries

The tuna fishing vessels catch mainly yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*). Most tuna vessels are operated on joint-venture basis, with Ghanaian owners having at least 50 percent of the shares, as required by the Fisheries Act 625 of 2002.

Inland fisheries

The Lake Volta, reservoirs associated with irrigation and potable water projects and fishponds are the main sources of freshwater fish in Ghana. Fishing in Lake Volta (with a surface area of 8 480 km² and 5 200 km of shoreline) contributes about 90 percent of the total inland fishery production in Ghana, which is around 90 000 mt.

About 80 000 fishers and 20 000 fish processors and traders are engaged in the Lake Volta fishery. There are 17 500 canoes actively fishing in the Lake Volta. The fishing gears used is cast and gillnets, hook and line and traps. The composition of species landed is Cichlids (38.1%), *Chrysichthys* spp. (34.4%) and *Synodontis* spp. (11.4%).

To check illegal fishing activities on the Lake Volta, the Government of Ghana recently acquired a modern patrol vessel to boost the control efforts undertaken by the Monitoring, Control and Surveillance Division of the Directorate of Fisheries.

Main resources of the marine subsector

The activities in the marine sector range from artisanal canoe operations through inshore to industrial operations. Both pelagic and demersal fishery resources are exploited. Marine fisheries in Ghana are affected by a seasonal upwelling that occurs in Ghanaian coastal waters. During upwelling periods (December/January–February and July–September) biological activity increases in the sea that results in an increased production of fish food and abundance of most marine fishes. These periods are the main fishing seasons in Ghana.

Fishery resources can be classified as:

- small pelagic species (Clupeidae [sardinellas] and Engraulidae [anchovies]);
- large pelagic species (Scombroidea [tuna-like fishes]); and
- demersal species of the families Sparidae, Lutjanidae, Mullidae, Pomadasidae, Serranidae, Polynidae and Penaeidae (FAO, 2007).

Pelagic resources

Small pelagic resources

The biomass for small pelagic resources fluctuates significantly. It is however estimated that the maximum catch the small pelagic fishery can sustain is 180 000 tonnes. Landings of sardinella fluctuate so much so that in some years (e.g. 1973 and 1978) they reached points of near collapse, then from the 1980s, there was a remarkable increase with an all time high of 140 000 tonnes in 1992. Ever since, landings declined reaching 64 000 tonnes in 1997. According to some authors, the abundance of chub mackerel (*Scomber japonicus*) is so variable from year to year that it is almost impossible to predict its abundance. Similarly anchovy landings fluctuated between 19 000 tonnes in 1986 and 82 700 tonnes in 1996, with an all time high of 93 000 tonnes in 1987 (FAO, 2007).

Large pelagic resources

The main commercial tuna resources which occur in Ghanaian Waters are yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*). In 1999, the total catch was over 83 000 tonnes but the average landing for the period 2000–2002 was 67 000 mt.

Demersal resources

Estimates of the biomass of surveys show that the potential yield of the total demersal biomass on Ghana's continental shelf is between 36 000 and 55 000 tonnes per annum with an average of approximately 43 000 tonnes. However, landings of the last decade, of around 50 000 tonnes annually, exceeded this estimated potential yield, which demonstrates the stress under which the fishery has been operating (Quatey, 1997; FAO, 2007).

Shrimp resources

Even though there is a specialized shrimp fishery in Ghana, shrimps are caught by all fleets (except tuna fishing vessels) mainly from shallow waters and close to estuaries. Artisanal operators catch shrimps mainly in beach seines, these are normally juvenile shrimps of very low commercial value. Through a modelling approach, the maximum sustainable yield (MSY) of shrimps is estimated to be 350 tonnes per annum excluding catches of artisanal fishers. Although catches have never exceeded this calculated MSY, the industry showed signs of decline in the last six years (FAO, 2007).

4. FISHERY POLICY AND MANAGEMENT OBJECTIVES

Legal framework for fisheries

Ghana is part of the UN Law of the Sea Convention and the FAO Compliance Agreement from 1993. The country is not a party to the UN Fish Stocks Agreement from 1995.

Fisheries are regulated through Fisheries Act 625 of 2002. Through the Act a Fisheries Commission has been established, which is mandated to manage the fisheries of Ghana. The objective of the Fisheries Commission is to regulate and manage the utilization of the fishery resources of Ghana and coordinate the policies in relation to them. The Minister of Fisheries has ministerial responsibility over the Fisheries Commission.

Organizations represented in the Fisheries Commission are:

- Ministry of Transportation.
- Ministry of Defence.
- Ministry of Local Government, Rural Development and Environment.
- Ghana Marine Fishing Officers Association.
- Water Research Institute.
- Ghana Irrigation Development Authority.
- National Fisheries Association of Ghana (www.nafagfish.org).
- The Ministry of Fisheries has one Directorate (the Directorate of Fisheries), which is divided in five divisions:
 - Marine Fisheries Division.
 - Inland Fisheries Division.
 - Marine Fisheries Research Division.
 - Monitoring, Control and Surveillance Division.
 - Finance and Administration Division.

Some of the functions of the Commission are listed below:

- Prepare and keep under continual review plans for the management and development of fisheries in waters under the jurisdiction of Ghana.
- Ensure the proper conservation of the fishery resources through the prevention of overfishing.
- Ensure the monitoring, control and surveillance of fishery waters.
- Promote subregional, regional and international cooperation in fisheries management.
- Carry out research and survey work for the assessment of stock of fishery resources.
- Make recommendations to the Minister on granting of licences for fishing.
- In consultation with the Minister, control and co-ordinate the importation of fresh and frozen fish.
- In collaboration with District Assemblies with fishing communities; ensure the enforcement of the fishery laws including by-laws made by the relevant District Assemblies (Act 625 of the Parliament of the Republic of Ghana, Fisheries Act, 2002).

National policy and management objectives

The Ministry's mission is to promote sustainable and thriving fisheries enterprises through research, technology, development, extension and other support services to fishers, processors and traders and to fulfil its role in ensuring food security and poverty reduction.

The objectives of the Ministry of Fisheries are:

- To prepare and keep under continual review plans for the management and development of Fisheries in waters under the Jurisdiction of Ghana.
- To ensure availability and adequate supply of fish from captured fisheries for the local and export markets.
- To provide technical support and facilitate financial assistance to fishers, fish processors and marketers.
- To facilitate effective and efficient inputs distribution system.

- To coordinate and collaborate with other Ministries, Departments and Agencies (MDAs) for the enforcement of Fisheries Laws, Regulations and Bye-Laws.
- To promote local, subregional and international co-operation in Fisheries Management and Development.
- To ensure that plans are built to improve on the Human Resources capacity of the Ministry to enhance service delivery.
- To ensure the availability of timely, reliable data and information on the fisheries sector.
- To co-ordinate and collaborate with MDAs and NGOs for poverty reduction production and value chain in the fishing industry.
- To achieve the above objections, the Ministry will continue to peruse policies aimed at:
 - Increasing Fish production consistent with the long term sustainability of the resources, for domestic consumption and for exports;
 - Reduce harvest losses and the adding values to end products of fisheries for increased income to users and for the generation of foreign exchange to the nation;
 - Intensifying Monitoring, Control and Surveillance (MCS) activities to ensure responsible fishing; and
 - Liaising with the Ministry of Trade, Industry, Private Sector Development and President's Special Initiative (PSI) to sensitise businessmen to invest in aquaculture as a business/industry.

The key functions of the Ministry of Fisheries are:

- Facilitate the formulation and implementation of appropriate policies in support of a sustainable fishing industry.
- Initiate, Coordinate, monitors and evaluate national programmes/projects in the fishing industry.
- Generate social economic data as basis for improving the Human capacity of the fishing industry.
- Ensure the implementation of Fisheries laws and regulation.
- Collaborate with HRMD in skill development of fisheries staff and Collaborate with subregional and International organization in the study and Management of shared fisheries resources.
- Play a facilitating role inputs acquisition and marketing of produce to fishers, fish farmers fish processors and traders.
- Provide a technical support to fishermen, fish farmers, fish processors and traders on improved fisheries practices, efficient utilisation and management of fisheries resources.

5. STATUS OF CAPTURE FISHERIES REPORTING

Fishery statistics reported to FAO

The national statistics as reported to FAO are presented in Figure 1.

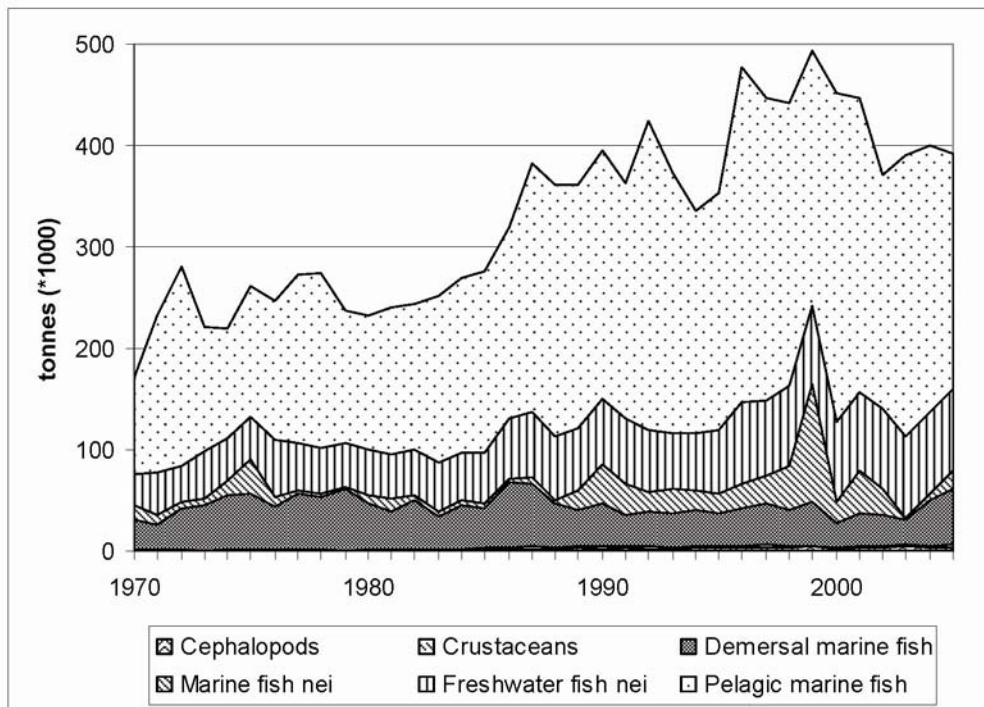


Figure 1: Fisheries statistics as reported by Ghana to FAO

The “marine fish nei” reported by Ghana is relatively low but there is a high variability. There is no species breakdown for inland fisheries.

National reporting

The Marine Fisheries Research Division (MFRD) in Tema produces annually the fisheries statistics for Ghana.

6. DESCRIPTION OF FISHERY INFORMATION AND DATA COLLECTION SYSTEM

Objectives of fishery data collection

The Fisheries Department defines the objectives of fishery data collection as follows:

Objectives	Required indicators and variables
To ensure availability of fish as a source of protein for the Ghanaian population	Total fish production, population, fish consumption per capita, fish imports, fish exports
To determine the volume of fish imports to ensure sufficient fish protein available to national population	Total fish production, population, fish consumption per capita, fish exports,

Main institutions involved in fishery data collection

Marine Fisheries Research Division of the Ministry of Fisheries

The Marine Fisheries Research Division (MFRD) was established as Fishery Research Unit in 1966 as a follow-up of a Technical Assistance Programme of the Food and Agriculture Organization (FAO) of the United Nations, which started in 1962. MFRD is one of five divisions of the Ministry of Fisheries. The Division was set up to conduct marine environmental and fisheries studies that would help the government of Ghana in its desire to modernize the fishing industry and manage fishery resources. The Division is located in Tema, the hub of fishing and shipping activities in

Ghana. It has a staff of around 65, made up of 10 scientists, 20 technicians and others in various grades.

The MFRD carries out research in the areas of Marine Environment, Fish and Fisheries and Exploitation. More specifically the MFRD:

- Monitors the marine environment and assesses its changes in so far as they affect fisheries.
- Estimates annual fish production by the various fishing fleets operating in marine waters.
- Undertakes biological studies of commercially important fish species.
- Assesses stocks of fishery resources.
- Undertakes studies and development of fishing gears.
- Provides information required for the preparation of the fisheries management plans.
- Collaborate with subregional, regional and international organizations in the study and management of shared stocks.

The Division collaborates with a number of international organizations, mainly FAO and UNESCO of the UN, the International Commission for the Conservation of Atlantic Tunas (ICCAT), Institut de recherche pour le développement/France (IRD, formerly OSTROM) and the European Commission.

Monitoring, Control and Surveillance Division of Ministry of Fisheries

The MCS Division is located in Tema. It was created in 1997 and given legal backing by the Fisheries Act 625. Its main responsibility is enforcement of the law and ensures compliance by operators in the fishing industry.

Other Governmental agencies

Ghana Statistical Service (www.gssghana.org/)

The Ghana Statistical Service (GSS) is the national institution with the mandate to provide timely and relevant statistical information for policy formulation to promote sustainable development. It publishes and disseminates data on sociodemographic and economic data and makes these available to central government, district assemblies, parliament, researchers, private business, international and regional institutions, other user agencies and the general public.

Policy, Planning, Monitoring and Evaluation Division (PPMED) of the Ministry of Food and Agriculture

Before the Ministry of Fisheries became an independent Ministry it was a directorate under the Ministry of Food and Agriculture. This Ministry kept track of the prices of several agricultural goods, amongst which were prices of smoked herring. This survey continues until now. The PPMED has an officer attached to the Fisheries Ministry.

Water Research Institute

The Water Research Institute (WRI) falls under the Council for Scientific and Industrial Research. The WRI has a mandate to conduct research into water and related resources. In pursuance of this mandate, WRI generates and provides scientific information, strategies and services towards the rational development, utilisation and management of the water resources of Ghana in support of the socio-economic advancement of the country, especially in the agriculture, health, industry, energy, transportation, education and tourism sectors. Staff expertise includes engineers (civil, soil and water, irrigation and drainage, geological, water and waste water, agricultural and chemical), hydrologists, chemists, environmental and aquatic scientists (limnochemistry, hydrobiology, entomology, parasitology and fisheries). The Fishery Division of the WRI has 14 researchers and 5 other staff. The institute serves as the African Centre for Fishbase, it is a FAO/IOC/IAES/UNEP-support Centre for Monitoring Marine and Coastal Pollution and it serves as a specialist training centre for West African scientists in hydrobiology and fisheries in relation to the Onchocerciasis (river blindness) control programme.

The main publications of the Institute include Annual Reports, Technical Reports and Consultancy Reports and the Quarterly Newsletter (Info Water). The Institute has its main offices located in Accra with branches in Tamale in the Northern Region and Akosombo in the Eastern Region. Attached to the Akosombo station is the Aquaculture Research and Development Centre (ARDEC). Programmes and projects of the Institute are carried out nationwide.

The WRI collects mainly data on fresh water fisheries and water quality. These data are published in its annual and technical reports.

Non-governmental organizations

Ghana National Canoe Fishermen Council

This Council represents the artisanal fishermen. Its head office is in Jamestown, Accra. Through the traditional Chief fishermen, representatives of all fishing communities are appointed to sit in a regional artisanal fishermen committee. These committees are united in the Council, which represents the artisanal fishermen to the Ministry of Fisheries and other organizations. The Council has no formal information system, they receive either information from the Ministry of Fisheries, or by word of mouth from their members. The Council provides fishing inputs to the fishermen and imposes a small levy on those inputs. In this way the Council has some resources to work with.

Ghana Marine Fishing Officers Association

The Ghana Marine Fishing Officers Association is represented on the Fisheries Commission. Its membership consists of fishing captains, marine engineers, etc.

National Fisheries Association of Ghana

The Ghana National Canoe Fishermen Council is represented in the National Fisheries Association of Ghana (www.nafagfish.org/index.htm).

Ghana National Association of Farmers and Fishermen (GNAFF)

In 1992, the GNAFF was established to bring small scale farmers, fishermen and women engaged in micro food processing in Ghana together under one umbrella.

National Inland Canoe Fishermen Council

Community Based Fisheries Committee (CBFC)

A Committee engaged in co-management of fisheries resources is organized at local level. It sometimes produces bye-laws for governing their operation which are subsequently proposed to District assemblies of Local Government. The District Fisheries Officer facilitates the operation of CBFC's and disseminates information to the Committee. The Assemblyman for the electoral area is represented on the Committee.

7. DATA COLLECTION SYSTEMS AND THEIR COMPONENTS

Artisanal Fisheries Catch and Effort Assessment Survey

The artisanal fisheries catch and effort assessment survey is implemented by the Marine Fisheries Research Division in Tema, by technical assistants (fisheries enumerators) of the Division. The coverage of the survey is around 25 percent, 51 landing places of the approximately 300 landing places are covered. Four days per week samples are taken in the selected sampling places (not on Saturday, Sunday and on Tuesday [fishing holiday]). Fishers work six days per week, not on the fishing holiday (Tuesdays). If less than 10 vessels land, all vessels are enumerated, if there are more than 10 active vessels, a random sample will be taken. The filled forms are sent to the MFRD in Tema. There a data quality check is done, after which the data are entered and processed in ArtFish. This software produces monthly results by species/gear/region.

Inshore Fisheries Catch and Effort Assessment Survey

The inshore fisheries catch and effort assessment survey is implemented by the MFRD in Tema. All landing sites are covered by the survey, as there are only seven (Tema, Apam, Mumford, Elmina,

Sekondi, Takoradi and Axim). There are in total 230 inshore fisheries vessels. The inshore fisheries assessment survey follows the same system as the artisanal survey; Four days per week samples are taken in the selected sampling places (not on Saturday, Sunday and on Tuesday [fishing holiday]). Fishers work six days per week, not on the fishing holiday (Tuesdays). If less than 10 vessels land, all vessels are enumerated, if there are more than 10 active vessels, a random sample will be taken. The filled forms are sent to the MFRD in Tema. There a data quality check is done, after which the data is entered and processed in ArtFish. This software produces monthly results by species/gear/region.

Industrial Fisheries Catch and Effort Assessment Survey

The industrial fisheries catch and effort assessment survey is implemented by the MFRD in Tema. All landing sites are covered by the survey. All landings are enumerated. All vessels have to declare their landings on questionnaires, which are sent to Tema, checked and entered in a dBaseIV system.

Industrial and Inshore Effort Monitoring System-Vessel position analyses

Through this system the activity of all semi-industrial vessels is recorded at the six landing sites where (semi)-industrial vessels land. Reports are prepared monthly and submitted to the Marine Fisheries Division in Accra. The reports are used to verify whether or not a vessel had to have a fishing licence, or as evidence in disputes (for instance to settle a dispute between a certain vessel being accused of destroying gear of artisanal fishers. Through the system it can be determined whether or not the vessel has been active during the period in which the supposed incident occurred).

Marine Canoe Frame Survey

The Marine Canoe Frame Survey is implemented by MFRD in Tema, when resources are available (every two years, the last marine canoe frame survey was done in 2004). The 2004 marine canoe frame survey was carried out by the District Agricultural Development Units of the four coastal regions and used district and other officers of the Ministry of Food and Agriculture (MOFA) and technical assistants of the MFRD. At each fishing village and landing beach, enumerators made count of canoes and interviewed the fishers. The data were recorded in Excel spreadsheets.

Registration

Fishing vessel registration is the responsibility of the Marine Fisheries Division of the Ministry of Fisheries. All industrial vessels are registered once in the industrial registration book, when they enter the fisheries. This registration contains fishing vessel name, tonnage (GT), engine number, owner name, vessel registration number, etc.

Artisanal canoes are not yet registered.

Inshore and Industrial fishing licence system

The fishing licence for (semi)-industrial fisheries is awarded by the Marine Fisheries Division. For the application of a fishing vessel licence a vessel owner needs to submit several documents, like the fishing vessel registration, certificate of seaworthiness, etc. After validation of the documents and payment of the licence fees (according to the Fisheries Act of 2005) the fishing licence is given. The fishing licence system is stored on paper. The vessel owner is compelled to be able to show this licence every time the vessel offloads fish at a landing site. This can be checked by the Navy and the Monitoring, Control and Surveillance Division of the Fisheries Ministry (based in Tema).

Marine environment monitoring system

The marine environment monitoring system is managed by the Marine Fisheries Research Division in Tema. Temperature is measured and samples are taken at eight environmental stations (Axim, Cape Three Points, Elmina, Half Assini, Keta, Takoradi, Tema and Winneba). The samples are sent to the MFRD where the salinity is determined.

This information is used to calculate the upwelling index.

Inland Canoe Frame-survey

The last inland canoe frame-survey was done in 1998.

Inland Fisheries Catch and Effort assessment survey

The Catch and Effort assessment survey is a sample based survey. Samples are taken in selected sampling sites around Lake Volta. The sampling sites are selected based on the canoe frame survey of 1998. The sites with the highest number of canoes at that time were selected as sampling sites. Samples are taken 3 to 4 times a week and forms are sent to the Yeji centre for processing and analysis. Processing and analysis is done using ArtFish.

The Inland Fisheries Division in Accra receives annual reports from Yeji. These reports are used to inform the Ministry of Fisheries, the rest of the Government and international organizations like FAO.

Fisheries Independent Surveys

Since 1999, the Research Vessel, DR. FRIDTJOF NANSEN carries out a trawl survey where length frequencies of several species and biomasses of several species are determined (pelagic and demersal).

Population census

The last population census was done in 2000 and was implemented by the Ghana Statistical Service.

Ghana Welfare Indicators Survey

Is implemented by the Ghana Statistical Service.

Vessel monitoring system (VMS)

The system is controlled by the Navy and is situated in the Birma Camp Barracks in Accra. The MCS division in Tema can access the system through an uplink in real time.

Frozen fish availability monitoring

The District Technical Assistants of the Ministry of Fisheries keep track of the amount of frozen fish in the cold storages around the country, most of which are located in Tema. Reports are sent weekly to the Marine Fisheries Division. This Division makes sure that 40 kg of fish are available per capita per year. The Division has calculated that this equals to 60 percent of the total amount of animal protein each person needs per year.

National fish supply monitoring

Fish production, fish imports and exports are monitored by the Marine Fisheries Division to guarantee sufficient fish is available to the population. To protect fishers, fish imports are regulated, as imported (frozen) fish is cheaper than locally caught (fresh) fish. If unregulated, importers would out-compete local fishers, endangering the livelihoods of artisanal fishers and their dependants. The Marine Fisheries division has to guarantee though that enough fish is available for the Ghanaian population, as fish is the preferred source of protein.

8. DOCUMENTATION

Amador, K., Bannerman, P., Quartey, R. and Ashong, R. 2006. Ghana Canoe Frame Survey. Information report number 34. Marine Fisheries Research Division. Ministry of Fisheries. Ghana. 43p.

FAO. 2007. *Ghana Fishery country profile* (available at: www.fao.org/fi/website/FISearch.do?dom=country)

Kamal-Deen, A. 2004. Legal and policy dimensions of the coastal zone monitoring and control: The case in Ghana. *Ocean Development and International Law*, 35:179-194.

Marquette, C.M., Koranteng, K.E., Overa, R. and Bortei-Doku Aryeetey, E. 2002. Small-scale fisheries, population dynamics and resource use in Africa: The case of Moree, Ghana. *Ambio*, Vol. 31 No 4, June 2002. Royal Swedish Academy of Sciences.

NAFAG. 2007. *National Fisheries Association of Ghana*, About Us web-page (available at: www.nafagfish.org/aboutus.htm)

Quatey, S. 1997. *Synthesis of recent evaluations undertaken on the major fish stocks in Ghanaian waters*: A working document for the eleventh session of the CECAF Working Party on Resource Evaluation held in Accra, Ghana. 35p.

WorldBank. 2003. *Implementation completion report (IDA-27130): Fisheries subsector capacity building project*. Report No: 26166 (available at: www.worldbank.org/)

ANNEX 1

Example industrial fishing vessel licence

(Semi)-Industrial fishing vessel licence

(Three sheets, Owner-sheet, Account sheet, Register sheet)

Type of fishing vessel..... Bankers draft number.....

Motor fishing vessel licence

Fee paid.....

Vessel name.....

Bearing (letters and numbers).....and owned by.....

.....of.....is hereby licenced to operate and navigate within Ghana for the purpose of taking fish therein from the.....day of20... to theday of20... (both dates inclusive)

The licence is subject to the following conditions.....

Fishing area.....

Codend mesh size.....

issued at..... this..... day 20...

Licensing officer

