Western Region Fisheries Sector Review

Final Report
December 2010

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University of Rhode Island

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Cover Photo: Artisanal fisher in Busua, Western Region, Ghana

Cover Photo Credit: Cambria Finegold

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Acronyms

AECID	Agencia Española de Cooperación Internacional para el Desarrollo
APW	Ali-Poli-Watsa
BAC	Boat Activity Coefficient
CBFMC	Community Based Fisheries Management Committee
CPUE	Catch per Unit Effort
CRC	Coastal Resources Center
DA	District Assembly
DFID	Department for International Development [UK]
DFMC	District Fisheries Management Committee
DoF	Department of Fisheries / Fisheries Directorate
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organisation of the United Nations
FC	Fisheries Commission
FoN	Friends of the Nation
FSCBP	Fisheries Subsector Capacity Building Project
GCLME	Guinea Current Large Marine Ecosystem
GDP	Gross Domestic Product
GoG	Government of Ghana
GPRSP II	Ghanaian Poverty Reduction Strategy Plan II
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICFG	Integrated Coastal and Fisheries Governance Initiative
IEZ	Inshore Exclusive Zone
IMF	International Monetary Fund
LME	Large Marine Ecosystem
MCS	Monitoring, Control, and Surveillance
MDS	Multi-Dimensional Scaling
MFRD	Marine Fisheries Research Division
MOFA	Ministry of Food and Agriculture
MOFI	Ministry of Fisheries
MOLG	Ministry of Local Government and Rural Development
MP	Member of Parliament
NEPAD	New Economic Partnership for Africa's Development
NGO	Non-Governmental Organisation
PNDC	Provisional National Defence Council
RCC	Regional Coordinating Council
SFLP	Sustainable Fisheries Livelihood Programme
URI	University of Rhode Island
USAID	United States Agency for International Development
WRI	Water Research Institute

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While every effort is made to ensure accuracy, any errors are solely the responsibility of the authors.

Executive Summary

This report was prepared by the WorldFish Center as part of the Integrated Coastal and Fisheries Governance Initiative, led by the Coastal Resources Center of the University of Rhode Island, and aims to provide an overview of the current status and recent history of coastal fisheries in the Western Region of Ghana.

Fish catches in the Western Region and all along the Ghanaian coast have begun to fall, even as the number of vessels active in the fishery continues to increase. While boat numbers are higher than ever, this doesn't tell the full story – effort has increased even more sharply with the introduction of technologies such as light fishing, mobile phones, and increasingly powerful outboard motors. This increase in effort over time is not captured in fisheries data, and the actual situation is likely to be far more dire than official figures suggest.

The uncontrolled depletion of fisheries resources we are currently witnessing is at least partially due to the difficulties in managing the fishery. Though fisheries management has taken on several forms of the years, attempts at limiting access or reducing effort have seen little success, and there are serious geographical, legal, political, and institutional challenges to effective management.

Fish capture, processing, marketing and associated services constitute a significant source of livelihood in Ghana, with one fishing job creating as many as seven additional livelihoods. Most of the Western Region catch enters the processed (smoked) fish marketing chain, and as elsewhere in Ghana, women are dominant in traditional fish processing and trade.

In addition to stakeholders directly involved in fishing, fisheries management, and support sectors at different scales, there are a large number of individuals and organizations involved in governance structures and/or livelihoods strategies that link to the fishery. Coastal fisheries tend to be extremely complex to manage due to the number and variety of stakeholder groups involved, and the Western Region marine fishery is no exception. Key actors in fishing-related governance structures are traditional authorities, including chiefs, chief fishermen, chief fishmongers, and councils of elders; the Government of Ghana; and donors involved in fisheries issues. The Fisheries and Aquaculture Sector Development Plan (2010-2015), developed by the Ministry of Food and Agriculture in consultation with in-country stakeholders and the World Bank, provides the main framework for fisheries development.

It is clear that if the fishery is to be able to continue to play a central role as a major source of livelihoods and key driver of the economy in the coastal zone of the Western Region, its ability to absorb shocks and adapt to change will be critical. Any attempt to promote fisheries development and fisheries management reform in Western Region must address a wide range of issues, including developing an improved understanding of the dynamics of the fishery, working towards solutions for improved management, promoting pro-poor livelihood opportunities, and building a stronger and more informed constituency to tackle these issues in transparent and equitable ways.

1. Introduction

Background

This study has been undertaken for the *Integrated Coastal and Fisheries Governance (ICFG)* Programme - a four-year initiative (2009-2013) supported by the U.S. Agency for International Development (USAID). Implemented through a cooperative agreement with the Coastal Resources Center (CRC) University of Rhode Island (URI), key partners include the WorldFish Center, SustainaMetrix, Friends of the Nation, the Department of Fisheries, coastal districts in the Western Region and other key government, private sector and nongovernmental organizations (NGO) stakeholders along the coast and in the fisheries sector. Programme activities are concentrated in the coastal districts of Ghana's Western Region, where coastal communities and the local government are the intended primary beneficiaries.

The goal of the ICFG Programme is to support the Government of Ghana in achieving its development objectives of poverty reduction, food security, sustainable fisheries management and biodiversity conservation by contributing to the following vision:

> *Ghana's coastal and marine ecosystems are sustainably managed to provide goods and services that generate long term socio-economic benefits to communities while sustaining biodiversity.* (CRC, 2009).

Objectives of the Western Region fisheries sector review

The objectives of this review are:

1. to provide key baseline information to inform the identification and design of Phase 2 ICFG programme activities
2. to build consensus and foster buy-in to those critical building blocks for the ICFG programme

This will serve as a key building block to inform subsequent work, including the design of fisheries management initiatives, and as a reference point or sector baseline. It will focus on Western Region but nest the analysis in national and regional context where relevant.

Programme of work

The findings reported here are based on fieldwork by the WorldFish team together with the Sekondi-based CRC and Friends of the Nation teams, supported by secondary data where available (including the coastal district surveys undertaken by ICFG in early 2010). The WorldFish team comprised: Dave Mills (marine fish ecologist), Cambria Finegold (livelihoods specialist), Ann Gordon (economist), Katherine Snyder (social anthropologist and gender expert), Randall Brummett (aquaculture scientist), Lori Curtis and Alan Pulis (research

assistants). Amongst the many ICFG and FoN staff who contributed substantively to this work, Godfred Ameyaw and Kyei Yamoah's inputs merit particular mention.

Fieldwork (largely based on key informant interviews, focus group discussions and direct observation) was conducted between November 2009 and August 2010 and took place in Western Region coastal communities and key towns that serve those communities (including Takoradi-Sekondi, the regional capital, and markets on the Ivory Coast border). Meetings were also held with key informants in Accra, Tema and Cape Coast and stakeholder consultations held at the regional- and national-level.

With much of the field work for this initial study conducted (of necessity) outside the main fishing season, coupled with results and analysis that require more investigation, the findings presented here should be viewed as preliminary. Much of the work started in the course of this review, will be further elaborated in Years 2-4 of the project, shifting gradually from understanding and learning, to piloting and learning.

Organisation of this report

After this introductory section, the remainder of the report is organized as follows:

- state of the fisheries resource
- fisheries management
- markets, marketing systems and fish-based livelihoods
- stakeholder analysis
- an overview of cultural traditions relating to marine fishing
- institutional and policy context (focus, shifts and processes)
- the way forward

2. State of the Fisheries Resource

Ghana is truly a fishing nation. While both marine and inland fisheries are not massive in area, they have been, and to some extent remain, extremely productive. Ghanaians rely heavily on fisheries for employment, income and nutrition. It has been suggested that up to 20% of the workforce are directly or indirectly supported by fishing activities (Atta-Mills et al 2004).

Ghana has a coastline of 539km and a continental shelf area of 20,900 km^2 (DoF, 2003). The relatively narrow area of continental shelf varies in width from a minimum of 20km at Cape St. Paul to 100km between Takoradi and Cape Coast (Quaatey 1997, Bannerman and Cowx 2002). Ghana's Exclusive Economic Zone covers an area of 218,100 km^2 (GCLME, 2006). There are 310 beach landing sites and 189 coastal fishing villages, as well as major ports where fish is also landed (DoF, 2003).

The productivity of the marine system is supported by a coastal upwelling system, known as the Central West African Upwelling (Cury 2004). Upwelling systems are seasonal phenomena that bring cool, nutrient rich water to the surface, resulting in high productivity, and sustaining a biomass of organisms not seen in other areas of the ocean. By their nature upwelling systems are directly linked with ocean and atmospheric circulation, and the level of productivity they provide can vary massively from year to year. On evolutionary time-scales the instability of upwelling systems, both within and between years, favours small plankton-eating fish with rapid generations times that can take advantage of unpredictably periods of high productivity.

The high biomass of small pelagic species is indeed fortuitous for the people of countries such as Ghana. These lifecycles, developed to take advantage of environmental change, have also proven resilient to fishing pressure, and in some instances shown the ability to recover rapidly from overexploitation (Bakun 1998). Additionally, these small water-column dwelling species, often collectively referred to as 'small pelagics', tend to be rich in oils and micronutrients, providing exceptional nutritional quality (e.g. Lokko et al 2004). While small pelagic species dominate the catch, they in turn serve as food for a rich diversity of predators. As such Ghana's fishery for high-value large pelagic species (such as tunas, billfish, and marlin) has also been significant. The productivity supported by the upwelling system 'spills over' into the benthic (sea floor) environment, supporting a rich ecosystem of demersal, or bottom-dwelling, fish on Ghana's continental shelf, Some 90 lagoons along the coast of Ghana complete the available habitats for marine resources, and provide vital seasonal income and subsistence fish and crustacean catches for adjacent communities.

This rich ecosystem has supported a massive increase in fishing yield since the 1970s, yet there are strong signs that it is increasingly under strain. Abundance of prominent fishery species have declined; most notably those high in the food web, as is often the case in heavily exploited systems (Pauly et al. 1998), but also more recently the small prey species. The contribution of the fishing sector to the Ghanaian economy has declined (Atta-Mills et al, 2004) and striking, sudden system shifts (disappearance and appearance of fish species)

(Koranteng 1998, cited in Koranteng and Pauly, 2004, Aggery-Fynn 2007) can at least in part be attributed to high fishing pressure (Koranteng and Pauly 2004). These observed changes make it clear that without reform in the way the system is governed, the future of the services provided by marine and coastal habitats are by no means assured.

The challenges of managing a system such as this are multi-faceted. The inherent unpredictability of productivity on the Ghanaian coast (Perry and Sumaila 2007) severely compounds the universal governance issues associated with managing common pool resources in a developing country setting. A history of repeated failure shows that the standard 'toolbox' of techniques still taught in many fishery management courses simply cannot apply. Instead new and innovative governance and management systems must be developed that are built with the nature of the Ghanaian coastal social-ecological systems in mind.

In this section we paint a picture of the exploitation and status Ghana's coastal fisheries from a data and research perspective, but more importantly from the perspective of those whose day to day subsistence depends directly on the state of the resource. Doing so provides alternative views on resource status, and represents a critical early step in building appropriate monitoring, management and governance systems.

Fishing in Ghana – fleet structure

Coastal fisheries of Ghana have a colourful history, and the industry is characterized by change and innovation. The fleet today is commonly divided into 4 major categories; the canoe fleet, the inshore fleet, the industrial fleet, and the tuna fleet. In addition here we briefly consider a further important, but extremely data poor, segment; the coastal lagoon fisheries.

The Canoe fleet

By far the most numerous and diverse fleet segment in Ghana, the canoe 'fishery' harvest from all resource sectors; large pelagic fish (tuna, billfish, sharks) though the use of drift gillnets and hook and line gear, small pelagic fish though purse seine and beach seine equipment, and demersal species through set nets and beach seines. The canoe fleet has typically been further classified by size, the groupings also reflecting the types of gear employed:

Small or 'one man canoes' – these are typically 4-5m long, are used inshore for line fishing, use of small gill net gears, and cast nets (notably in lagoons). During the last census of canoes (2004), these comprised only 5% of the surveyed canoe fleet. Vessels are typically propelled by paddle or sail, and subsistence fishing, particularly in lagoons, is not captured in landing statistics.

Mid-sized canoes – are 6 to 11 m long, and are predominantly used for bottom-set and floating/drifting gill nets and line fishing. Some are also used with smaller beach seine nets. They typically have a crew of 2 to 11 fishers. Smaller canoes may be propelled by sail/paddle or 8hp outboard, while larger canoes in this class often have 40hp (occasionally 25hp) outboards.

Large canoes – are 11 to 17 m long, and crewed by 10 to 25 fishers. This size of vessel can again be subdivided. Ali/Poli/Watsa (APW) canoes are generally the larger boats in this category. They are named after the fishing gear they have traditionally used. The 'ali' net was a gill net constructed from traditional fibres. Poli and watsa nets are types of purse seine. These gear types have evolved considerably over the last century. These canoes also employ large drift nets (such as the so-called 'nifa-nifa' net). The second sub-category is the large beach seine vessels, these typically have high planking at the bow to prevent large waves coming on board when operating in the surf. The majority of large canoes are powered by 40hp outboards.

With no registration requirements or limits on access, the number of active canoes in Ghana has continually increased from a low of 7000 in 1980 (Figure 1) to an estimated current fleet size of 13,500[1]. From 1970 to 1980, approximately 85% of all canoes were reported to be motorized. Since then the figure has fallen to a fairly consistent 55%.

The continued rapid expansion of the canoe fleet over recent years has been distinctly non-uniform (Figure 2). While growth has been most rapid in the Volta region, this region has only 4-6% of the national total of operational canoes. Substantial increases in the Western Region (representing some 36% of the national fleet) have been a significant driver of the national growth in the canoe fleet and number of fishers.

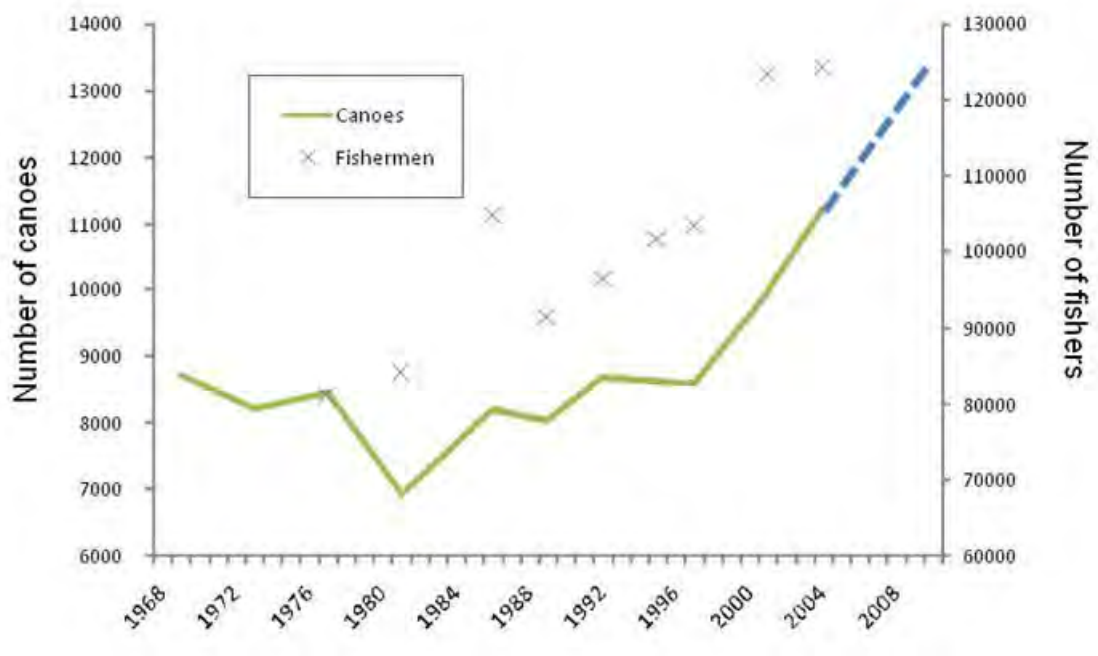


Figure 1. Numbers of canoes and canoe fishermen in Ghana from 1969 until 2004. A simple arithmetic projection until 2010 (dashed line) suggest there may be around 13,500 canoes presently. Anecdotal evidence suggests there may be more (source: Canoe frame surveys, Marine Fisheries Research Division, Tema)

[1] Canoe surveys were carried out every 3-4 years from 1969 to 2004. As there have been no surveys since then, the current estimate is made by projection from the previous 10 years of surveys

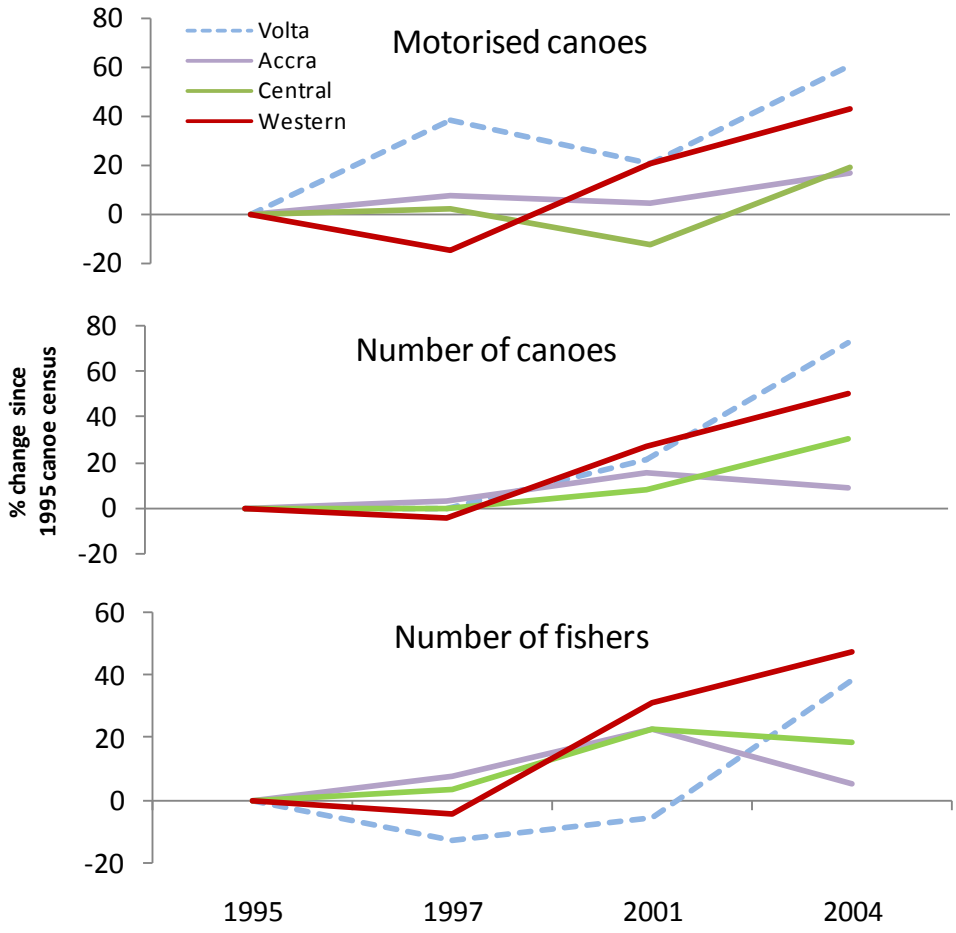


Figure 2. Growth in number of canoes, fishers and motors from the last 4 canoe frame surveys, split by region. Note that the Volta region represents <6% of the national fleet, while the Western region represents some 36% as of the last census. Source: Marine Fisheries Research Division, Tema

The 'inshore' or semi-industrial fleet

The semi-industrial (also called 'inshore') fleet comprises mostly locally-built, planked wooden-hulled vessels between 8m and 30m in length, with inboard diesel engines of between 90 and 400hp (Nunoo et al, 2009, Bannerman and Cowx, 2002, DoF, 2003). These vessels use both trawling gear to catch demersal fish, as well as purse seine gear to capture small pelagic fish during the major and minor upwelling periods. Smaller vessels are generally underpowered for trawling, and with the adoption of light-fishing in the minor seasons, there has been a tendency to specialize in purse seining. Most purse seine nets measure 400-800m long and 40-70m deep with a mesh size of 25-40mm, although nets up to 2km long are used by the larger vessels. The first of these vessels was built in 1948, and numbers quickly boomed to a peak in the early 1970s. Following significant decline, vessel numbers have again peaked in the last few years (Figure 3), sending a warning sign of increasing effort. This likely relates to the adoption of light fishing, and the associated year-round access to the small pelagic resource.

The industrial fleet

The industrial fleet consists of large, steel hulled foreign-built vessels that are further distinguished from the inshore fleet by their ability to freeze fish at sea, and hence their

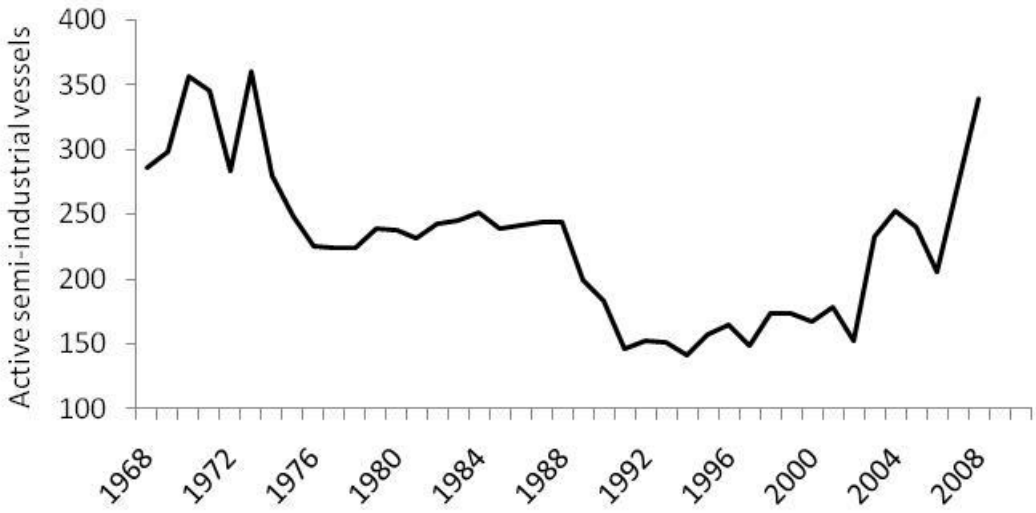


Figure 3. Numbers of active semi-industrial vessels since 1968. A rapid expansion of vessel numbers from 2002 is evident (Source: Marine Fisheries Research Division, Tema and Fisheries Commission, Accra)

propensity to stay at sea for long periods of time. Apart from the tuna fleet (dealt with separately here) today the industrial fleet largely engages in demersal trawling. A sub-fleet specifically targeting shrimp operated in the 1990s with a maximum of 22 operational vessels; however since 2002 only 2 operational shrimpers have been reported. . Another sub-fleet consists of ships practicing pair trawling, in which two industrial vessels pull a trawl net between them. Pair trawling was introduced in 2000, and the fleet grew to 20 vessels before the practice was banned in 2008. Though pair trawlers were supposed to be re-fitted as single trawlers following the ban, some may still be operating in pairs, leaving port separately and meeting up at sea. Fishermen in the Western Region report seeing pair trawling practiced off the coast as recently as this year.

Figure 4. Numbers of active industrial vessels (excluding tuna vessels) since 1968 (Data source; Marine Fisheries Research Division, Tema and Fisheries Commission, Accra)

The industrial fleet shows a steady expansion, since the mid 1980s (Figure 4) when government policy targeted this fleet to drive fishery development and improved incomes from the sector.

The industrial fleet also supports another emergent 'fishery'; one where 'trash fish' (low value, small or damaged fish) are transferred at sea from trawlers to canoes specially modified to transport large volumes of fish (Nunoo et al. 2009). These fish then enter the normal beach-based market chain as accessed by canoe fishers. This represents an unusual example of cooperation between the small and large scale sectors.

The tuna fleet

The tuna fleet is commonly considered to be part of the industrial fleet, however being subject to an entirely different governance system, regulated to some degree by international conventions (under the International Commission for the Conservation of Atlantic Tuna – ICCAT), targeting a different resource with very different gear types, and often fishing much further from shore than the other fleets, it should be considered as a separate entity.

The fishery was initially exploited by foreign-flagged vessels, peaking at some 80 active vessels in 1970. The first Ghanaian-flagged vessel began operating in 1973, with the last foreign vessels leaving in 1984. Since this time the number of active tuna vessels has stayed fairly constant at 35 to 40. Here we do not provide further analysis of the tuna fleet or catch, as the fleet is not based in the Western Region, data are not readily available, and there are only tangential links between the operations of this fleet and the coastal environment.

Lagoon-based subsistence and commercial fisheries

As the smallest 'fishery segment' in Ghana, lagoon fisheries have received little attention from either the scientific community of national fishery authorities. Yet with some 90 lagoons along Ghana's coast, they are significant in terms of both subsistence and seasonal commercial fishing for many communities (Koranteng *et al.* 2000). Gear used in lagoons is for the most part not recorded in gear surveys, and along with nets operated from small canoes, cast nets, line fishing and various types of traps are commonly employed. Data on yields are also non-existent outside of a few studies in the scientific literature.

In many ways lagoon fisheries stand apart from marine fisheries in terms of prospects for effective governance. Their degree of exposure to external environmental drivers (up-stream effects, competition for water resources, erosion, and extreme pollution) is more akin to inland fisheries resources than their marine counterparts. The strong traditional belief systems around lagoons (see box 1) and the de-facto property right due to proximity of villages exploiting the resource present an entirely different set of incentives for governance to those seen in coastal and offshore fisheries.

Box 1. Lagoon fisheries in the Western Region of Ghana

Lagoon fisheries in Ghana are important for the livelihoods of both fishers and consumers alike. Particularly during the lean seasons in marine fishing or when bad weather prevents ocean fishing, they provide an alternative. A significant portion of the animal protein required by the residents of neighbouring communities can be met by lagoons, with 30% of fish consumed at Akitekya, for example, coming from adjacent lagoons. Lagoon fisheries must weather many of the same exploitation pressures as marine fisheries, but in addition suffer additional problems due to land degradation and proximity to human habitation.

In the Western Region of Ghana, communities living around the Abbey and Efasu Lagoons in the Jomoro district rely heavily on catches from these lagoons. The same goes for the Nana Busua, Achowa, and Ehonle Lagoons in the Ahanta West district. Common fish species include tilapia and mudfish, caught using cast nets (the most common lagoon fishing gear), and crabs, caught in crab traps. At Akitekya once a year crabs from the adjacent lagoons walk through the village and are picked up by children who walk to the highway to sell them, pocketing around 3cedis (≈US$2) per crab. This provides seasonal income for those involved.

The Essipon Community in the Sekondi-Takoradi Metropolitan Area (STMA) undertakes significant fishing activities in the neighbouring Anankwar Lagoon, particularly in rainy periods when the lagoon waters are connected to the sea. During high fishing periods, up to 300 fishers can be seen fishing at any time and fishmongers from surrounding communities travel to the lagoon area to purchase fish. Whilst fishing activities here are undertaken throughout the year, other communities only fish in lagoons during particular periods, based on traditional practices. The Anlomatoape Community in the Jomoro district, for example, is only allowed to fish in the Ehuroti Lagoon once a year. Fish farming activities occur in a limited number of lagoons: a portion of the Nana Bekyie Lagoon in the STMA is converted into an aquaculture farm and species such as tilapias, crabs, and mudfish are harvested there.

The importance of lagoon fisheries has been traditionally recognised by communities and a number of management practices are in place, often based on taboos. At Akitekya an apparently sustainable shrimp fishery in the lagoon exists for supply as a local delicacy only – it is taboo to sell shrimp, the villagers believing that if they do so there will be no more shrimp. Many communities ban fishing on particular days or seasons. At Akitekya with lagoons to the east and west, the eastern lagoon is closed on Wednesdays, and the western on Thursdays. At Anakwar Lagoon, the traditional belief is that the god of the lagoon takes a bath every Tuesday and fishing is not allowed on this day. In addition, the use of certain gears is sometimes prohibited – dragnets being the most common. Some lagoons are even restricted to certain fishers – normally indigenous people and/or members of neighbouring communities. These practices serve to reduce overfishing in lagoons and are a form of resource conservation. Due to the associated 'property right', incentives for co-management of such areas are strong, and initiatives based on these traditional practices are appear to have a good chance of success.

A history of change and innovation

Ghanaian fishers are by nature innovators. This contributed greatly to their past success as a prominent fishing nation in the region, but is perhaps also a driving factor in the current depleted state of fish stocks. When catches are low, fishers have not stood by and watched their livelihoods disappear, but rather have worked to refine fishing methods and adopt new technology and gear types to maximise catch efficiency. This accounts for in excess of 20 identifiable gear types (Doyi and Neequaye 1990) employed in the canoe fishery. Due to the

early adoption by Ghanaians of large canoes, through the early exploration of offshore waters, and uptake of gear innovations, a highly efficient harvesting system has evolved.

At the beginning of the 20th century, Ghanaian canoe fleets spread out to neighbouring countries becoming truly regional in their fishing range (Figure 5). It was not until 1948 that vessels larger than the canoe fleet were first introduced. In a drive to increase fishing capacity, the State Fishing Corporation (1961) was established. Almost coincident with this, interest in West African fishing waters from European fleets increased markedly. As a result, the price of access agreements skyrocketed, and Ghanaian fleets were progressively excluded from offshore waters through the 60's and early 70's (Atta-Mills and Sumaila 2004). A rapid build-up of industrial and semi-industrial vessels prompted by investment through the State Fishing Corporation, was followed by a rapid decline though the '70's and into the 80's as large vessels were forced to compete for limited space with existing fishers on the continental slope within Ghanaian waters. In the mid-80's government policy encouraged further development of industrial fleets essentially for use in national waters, although owners were encouraged to find offshore fishing agreements where possible.

Fuel subsidies offered for 'Premix' (outboard motor fuel) from the late 80's may be a strong driver of the continuous climb in canoe numbers seen from that time until today, alongside population pressure and insufficient perceived opportunities for livelihood diversification.

The state of fish resources in Ghana

The current survey and data system used to track catch and effort of the canoe and semi-industrial fleets in Ghana was developed in 1972 in consultation with FAO. The system is robust in design, and has long been considered the best data system in the region. The system relies on regular (every 2-3 years in the past) national frame surveys of vessels to quantify vessel and gear types. These data are used to develop a representative 'frame' (survey structure) for daily sampling of fishing catches and effort conducted by field officers at. This ensures that vessel and gear types are sampled in proportion to their occurrence in the different regions. As set up, the survey employed 35 full-time data recorders each covering 2 landing beaches. Data outputs include time spent fishing by different types of vessels, the gear-types used, and the catch of prominent species.

While essentially unaltered since inception (apart from technological developments in data entry, storage and processing), the system has slowly degraded due to a lack of resourcing. Canoe frame surveys have not been conducted since 2004, and numbers of field officers have been steadily dropping; those who move on or retire are generally not replaced. As a result, fewer landing beaches are sampled, and the use of the outdated survey frame makes accurate extrapolation difficult.

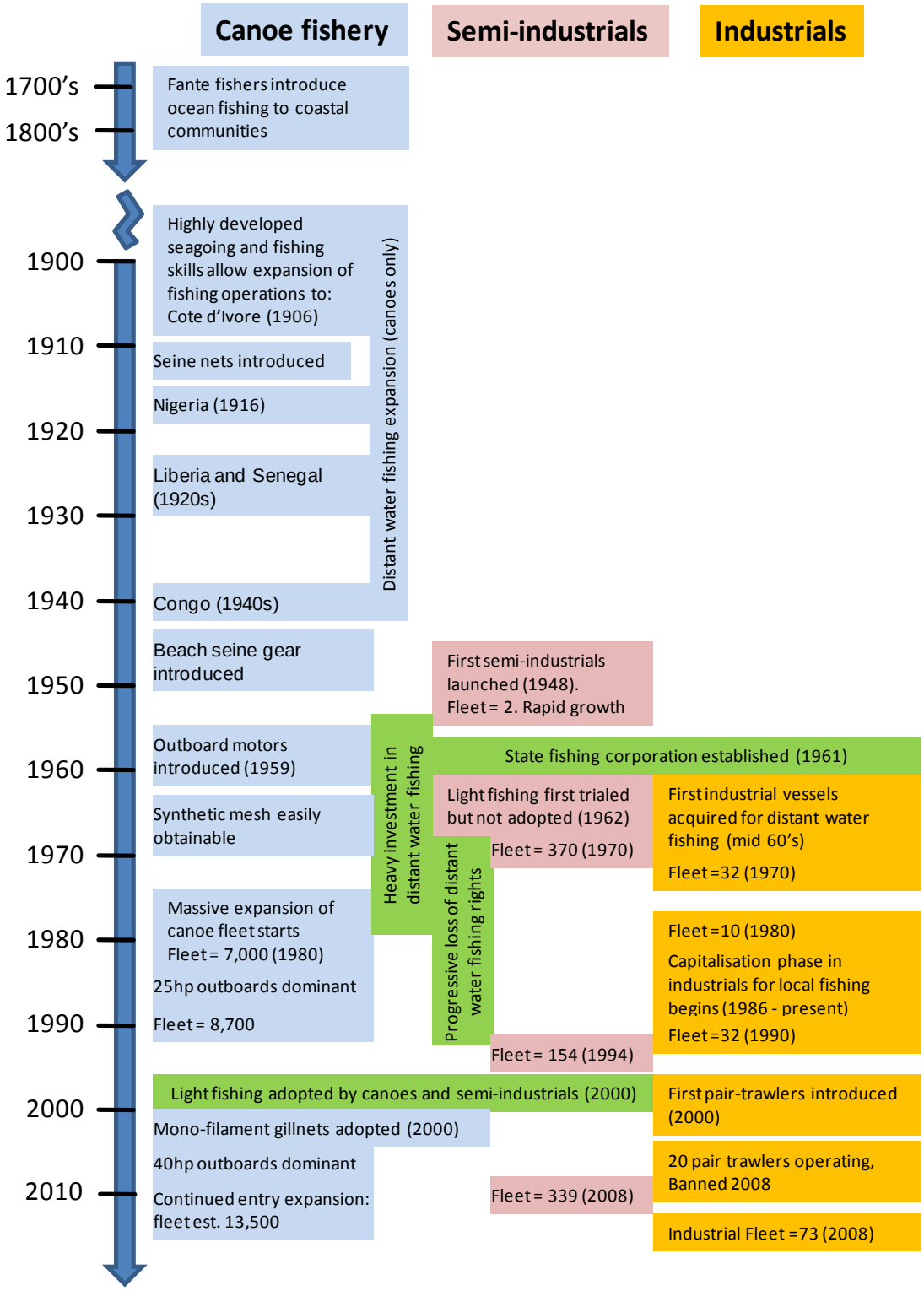


Figure 5. Timeline of fleet development for canoe (light), semi-industrial (mauve) and industrial (yellow) fleets (excluding tuna vessels). Green highlights changes directly affecting more than one fleet. Data are from interview with Chief Fishers, staff of the Marine Fisheries Research Division, Tema, Doyi 1984, Atta-Mills et al 2004, Koranteng 1984, Koranteng and Pauly 2004, DOF 2003, and the national fisheries data system.

Perhaps the most problematic gap in the sampling system is that industrial vessels 'self report'. They are asked to provide information on their own catches, and there is no method in place for verifying the information provided. The extremely low catch and effort reported by this fleet provide a strong indication that vessels are substantially under-reporting catches (Further observations regarding the field collection of data are articulated in Annex 1). For these reasons, no direct comparison between fleets is provided here; such a comparison would undoubtedly overemphasise the catch of the relatively well-sampled canoe fleet. Data collection is further complicated by the trans-boundary nature of fishing, as well as the migratory habits of many fishers (Ferraris and Koranteng 2004), factors that are not accounted for in the collection system.

Data on catch from Ghana's coastal fisheries are available as far back as 1950 (Figure 6) however with the more recent advent of the current system, comparisons of reported catches before and after 1972 should be regarded with caution. Viewed at the macro level, slow development up to the early 1970s is followed by a fairly consistent increase in catch through until the late 1990s. The variability between 1970 and 1990 is expected given the environmental drivers involved in regulating pelagic productivity. It should be noted, however, that the sizeable dip in pelagic catches from 1972 through to the mid 1980's coincides with a near-complete crash and slow recovery of the population of the round sardinella (*Sardinella aurita*) (Koranteng 2004). Since 2000, there has been a clear and continuing trend of decline in total catch, driven largely by a marked decline in pelagic resources, and recently offset to some degree by a rise in catch of demersal species.

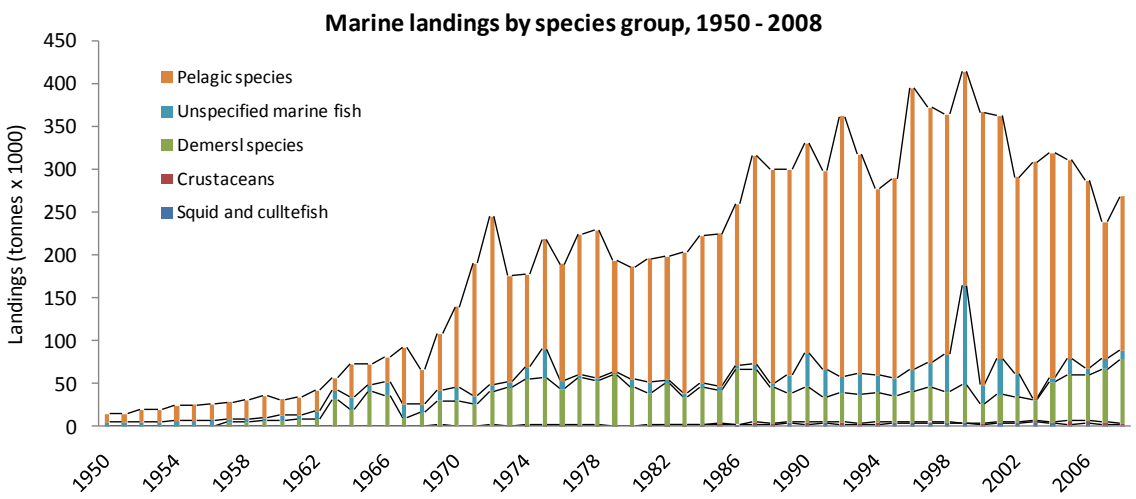


Figure 6. Total reported catches from Ghana's marine fisheries from 1950 to 2008 split by major species grouping. Source: FAO FishStat Plus

Pelagic stocks

The management of pelagic fish resources is significantly complicated by the nature of these species. They are not associated with seafloor habitats, relying totally on oceanic productivity. They tend to be fast swimming, schooling species which migrate widely, and crossing national boundaries. Clearly then, to be effective management must be considered at a very broad scale, encompassing neighbouring countries sharing the resource. This represents an added level of vulnerability to pelagic resource sustainability.

The pelagic resource in Ghanaian waters is exploited by all fleet segments, although catches are largely incidental to industrial trawlers. Small, schooling species (sardinellas, anchovies, mackerel) make up the vast majority of this catch. It is clear that the small pelagic catch is currently at its lowest level since the 1970's (Figure 7). Given the inherent, environmentally driven variability of the small pelagic resource, we cannot say definitively that the current decline represents a fishery-driven stock collapse that will have lasting effect. What we can say, however, is that we are in the most sustained period of decline in this resource since heavy exploitation began. It is also notable that this decline coincides directly with the uptake of light fishing (discussed below), massively increasing the pressure on this resource.

A detailed review of the small pelagic species catch since the mid 1980's (Figure 7, inset) shows that the decline is not due to the crash of one dominant species (as happened in the 1970's), but rather three of the four main small pelagic species have clearly declined together. Indications from fisher interviews carried out in the Western region are that this trend has continued in 2010.

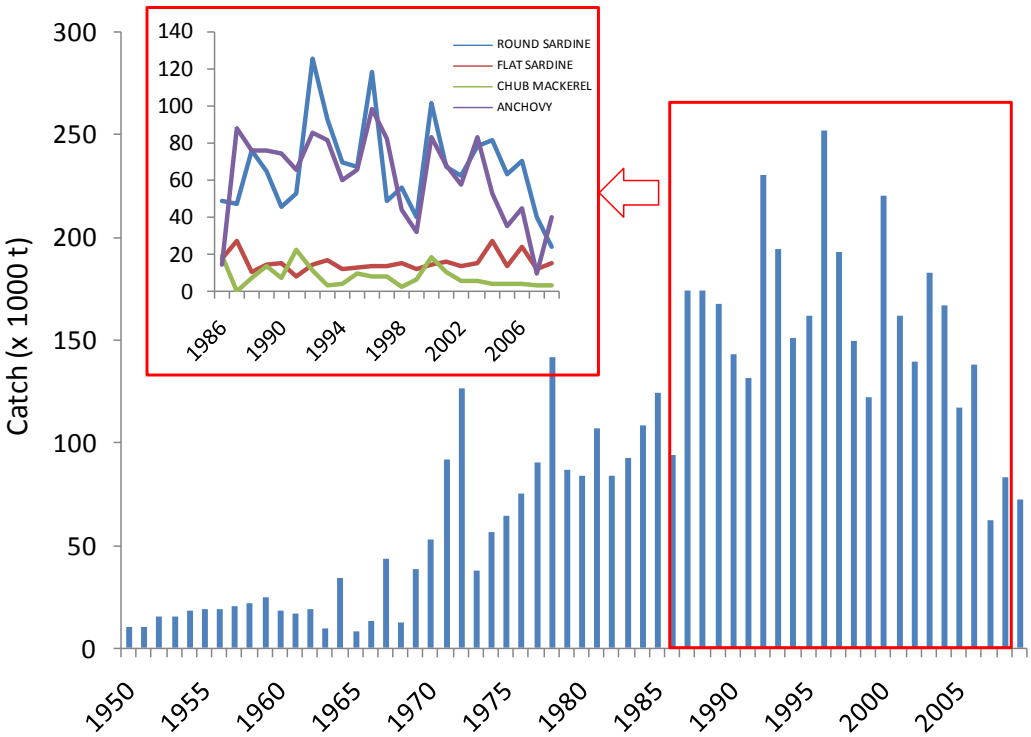


Figure 7. National data on changes in catch of the small pelagic resource (main graph), including details on catches of sardines, anchovy and chub mackerel since 1986 (inset). Data source: FISHSTAT (FAO) and Marine Fisheries Research Division, Tema.

Demersal stocks

Demersal fish are 'bottom associated' – they are dependent to varying degrees on benthic (seafloor) habitat, and are less mobile than pelagic species. As such, the transboundary issues seen with pelagic stock are less of a problem; however the habitat association and the sedentary nature of this group make them highly susceptible to overfishing and habitat damage. The resource is exploited in inshore waters and on the continental shelf to a depth of about 75m. The resource is targeted by all three prominent fishing fleets; by the canoe

fishery though line fishing, bottom-set gill nets and beach seine nets; by the semi-industrial fleet through low season trawling, and; by the industrial fleet through trawling.

By the early 1970s, researchers were already noting the heavily exploited status of demersal stocks in this region, and appealing for urgent reforms in governance systems (Gulland et al. 1973). More recent reviews of the state of demersal stocks in Ghana (e.g. Koranteng and Pauly 2004) report clear trends in the reduction of biomass of longer lived and predatory fishes, suggesting overexploitation of the fishery. These results come from national catch statistics, but also from fishery-independent sources; a series of research trawl surveys conducted between 1963 and 2000. These independent surveys showed a particularly marked decline in the abundance of demersal resources in the 0-30m depth zone.

Ecosystems under heavy pressure are known to become 'unstable' and this is a trend seen in Ghana. The most notable examples of such changes are the repeated collapse and recovery of a shrimp fishery operating around the Volta estuary (Koranteng 1998, cited in Koranteng and Pauly, 2004) and the massive increase in trigger fish (*Balistes carolinensis*) in 1973 followed by near-total collapse in 1989 (Aggery-Fynn 2007). The latter species had not previously been reported in the area, yet it rapidly came to dominate trawl catches. It is considered likely that its appearance related to the availability of newly created 'niche space' due to the wholesale removal of other demersal species by trawl fisheries.

While national fisheries statistics are typically analysed for catch and effort as a measure of exploitation rates, there is often information within such datasets that can tell us much more about the state of the fishery, and the effects of exploitation. Effort data in particular can be misleading if the broader notion of 'effective effort' is not taken into account (see below). Catch composition, and the nature of the fish species in the catch can be particularly revealing. Coded in this information are changes in both fish community composition and fisher behaviour – separating the effects of the two can be very difficult, and the interactions between the two add a further complication. Nonetheless, as an indicator of change, catch composition remains very valuable.

The presentation here (Figure 8) is a multi-dimensional scaling (MDS) plot of fishery catch statistics from 1972 until 2008. A multidimensional scaling plot is a very straightforward technique of data representation that simply plots 'distance' between a series of points. There are a range of indices that can be used to measure 'distance' between sets of community data, or put simply, how different they are from each other. The one employed here is a 'Bray-Curtis similarity index'. This measure is in effect the ratio of the number of species that differ between two sites and the total species richness of the two sites. Each point on the graph represents catch data from a year, and it is graphed in a position relative only to all other samples. As such, the axes of the plot have no specific values relating to species.

As soon as four points are included in such a graph, it can become three dimensional. What is shown here is a 'squashed' version of a distance plot. The 'stress' value shown in the upper right corner indicates the degree of distortion due to 'squashing' the plot from three dimensional to two dimensions. The stress value here is very low, indicating a good representation of the data in two dimensions.

The blue (70%) and green (85%) circles on the graph show statistically significant groupings of similar catches. The most significant shift occurs between 1988 and 1989. This coincides with the crash of the trigger fish fishery, and an increase in Burrito catch (Figure 9). The increase in Burrito catch may well be due to fishers targeting Burrito as a replacement for trigger fish. The second shift between 1997 and 1998 is driven by a decline in Burrito catch and an increase in Cassava fish catch. The continuing change in catch composition right through to the last sample in 2008 is driven by the increasing dominance of Cassava fish in the catch.

While we cannot conclusively relate community shifts to fishing pressure, demersal communities are typically far more stable than pelagic communities. Shifts in community structure due to environmental factors (such as upwelling strength) are unlikely to lead to the permanent changes seen here. Indeed, similar analysis conducted on pelagic catches showed no long-term consistent changes. The shifts seen coincide with the removal of species that are dominant in catches, and as such, the evidence would suggest that fishing pressure may be the principal cause of these changes.

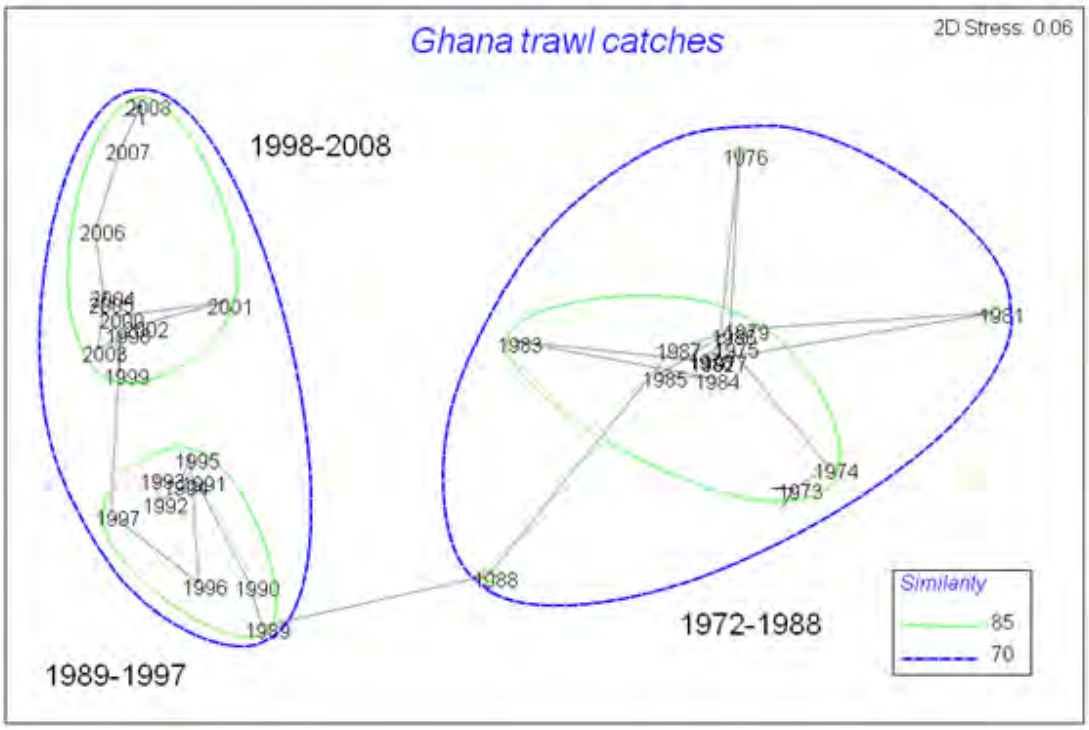


Figure 8. Multi-dimensional scaling plot of fish catches from Ghana's trawl fleet from 1973 until 2008. Green lines highlight years where catch composition is very similar (85% similarity measure) while blue lines highlight years with a lower level of similarity (70%). These groupings are statistically significant. The grey line links years in sequence.

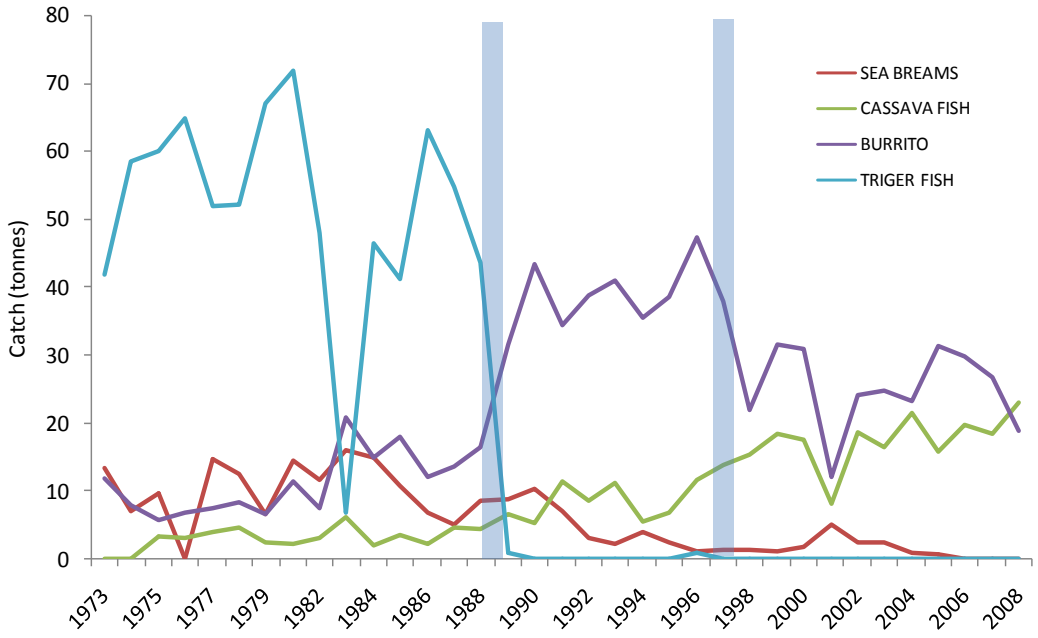


Figure 9. Major species contributing to changes in community composition highlighted in figure 8. Blue bars represent the years where major community shifts were highlighted in the MDS analysis.

Perspectives on fishing effort

The most frequently reported catch statistic is landings – simply the quantity of fish caught and returned to shore. Landing data alone, even if very accurate, do not provide a full account of the state of a fishery. It is easy to imagine that if the same quantity of fish is caught in two years, but it took twice as many hours of fishing to catch them in the second year, this is not a good sign for the fishery. This second required measurement is known as 'fishing effort'. If we can measure effort we can then report a 'catch per unit effort' – in the case above, the hours fished would be the measure of effort, and if we calculated catch per unit effort (CPUE) as Kg of fish caught per hour of fishing, we would see that in the second year the catch per hour was half as much as it was in the first. Clearly then, looking at catch only tells part of the story.

While the notion of fishing effort is conceptually simple, it is somewhat more complicated to measure, particularly over the long term. There is a diverse range of factors that can contribute to changes in fishing effort that cannot be captured in simple measures. While the Ghanaian fishery information system has been a shining light among African systems, among its most significant shortfalls is the recording of fishing effort, a point that is compounded by the history of change and innovation in Ghanaian fisheries.

At the coarsest level, fleet size provides a measure of effort. An increase in the number of active vessels will likely lead to greater fishing pressure on resources. Taking the situation in Ghana, we can see that the expansion of all fleets from the 1990s (see Figure 1, Figure 3, Figure 4) is not mirrored in total landings (Figure 6). In fact as fleet size has increased, catch has dropped. This crude level of measurement will not provide the whole story, but should be noted as a warning sign regarding the state of resources.

Moving beyond vessel numbers, it is important to know how long vessels spend fishing. If vessel numbers increase, but the number of days spent fishing by each vessel decreases, then vessel numbers alone may represent an overestimate of the change in fishing effort. This is the level at which the fisheries information system in Ghana operates. Field staff working at landing sites record the number of active vessels in a given week, but also the duration of fishing trips for the vessels sampled for catch information. These data are simplified somewhat in the data system, and effort for the canoe and inshore fleets is reported in terms of catch per trip. For the industrial fleet, with the capacity to stay at sea for long periods of time, effort is reported as catch per days at sea (Figure 10). Data suggest a severe decline in catch per unit effort (CPUE) for the inshore fleet, but no particular trends for the canoe or industrial fleet.

While a step beyond looking at fleet size only, measuring effort in terms of number of fishing trips only can be misleading over the long term. Changes in technology and fishing practices can have a dramatic impact on effective fishing effort with no associated change in number of fishing trips (the chosen measure of effort). As a simple example, the length of fishing

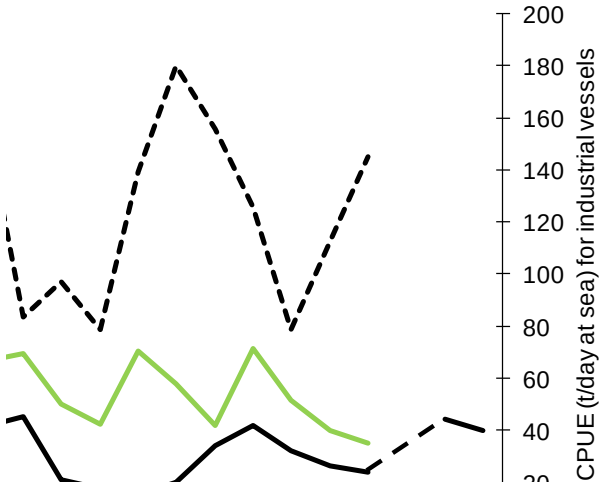


Figure 10. Catch per unit effort (CPUE) for the major fishing fleets in Ghana since 1986.

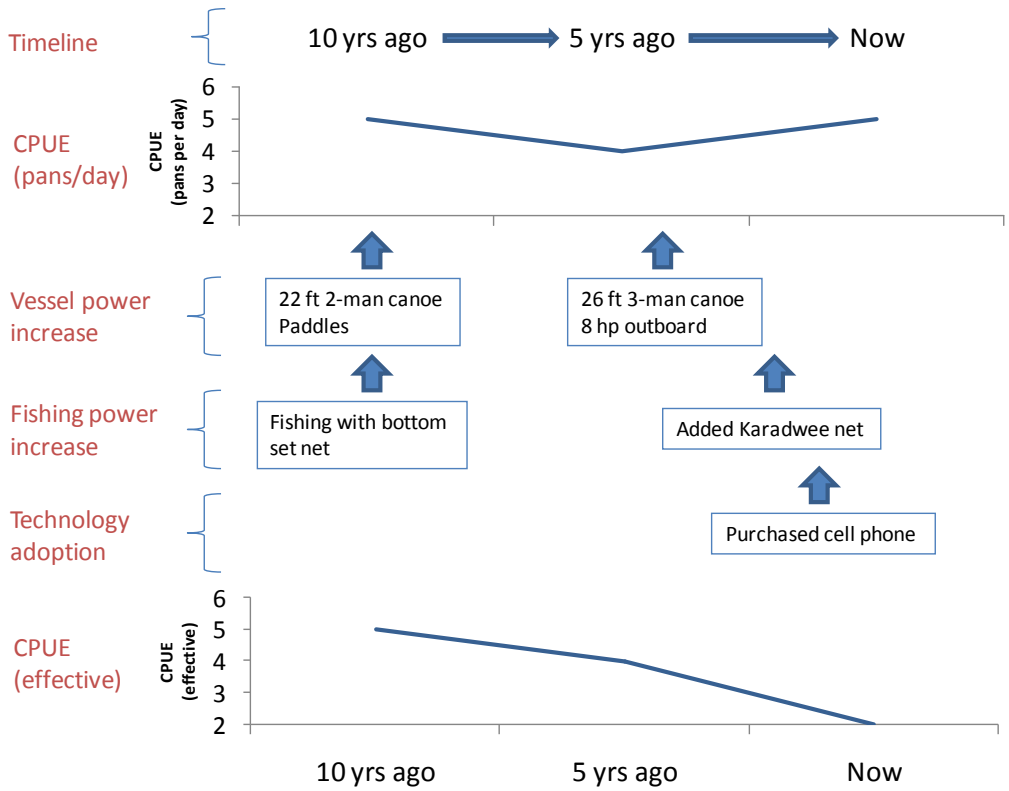
trips may change. If ice is made available to fishers, they will stay at sea longer – perhaps for two days instead of one – yet the catch for the two day trip would still be recorded as catch for one trip, and directly compared with the catch for a one day trip. Beyond this, changes in fishing practice and technology adoption can have a severe impact on the effective fishing effort on the resource from one fishing trip. Box 2 below illustrates this concept through outlining the results from an interview conducted with a fisherman from Axim.

Box 2. **Innovation and development masking stock declines**

The diagram below represents real data from an interview with a canoe fisherman in Axim. It shows change in catch and fishing operations over the last 10 years. The top graph shows an estimate of 'normal' catch per fishing day by this fisherman. He reported that 10 years ago he was catching around five pans of fish a day. Five years ago this had dropped to around four pans of fish, but now is back up to five pans. This is the type of data currently captured by the fishery information system in Ghana – catch, and days fished. Looking at the top graph, we would probably say that the fishery has fluctuated, but shows no sign of decline over the last 10 years – it looks quite healthy.

A more detailed view of fishing effort shows a very different picture. There have been a number of critical changes over this 10 year period that influenced the ability of this fisherman to catch fish. In response to declining catches five years ago, this fisherman made a several changes. Four years ago he upgraded to a larger boat with extra crew and an outboard motor. This gave him the option of going further afield to catch fish or spending less time getting to fishing grounds (more time fishing). He also employed an extra crew member to speed up fishing operations. Three years ago he added a new set of gear (a multi-panel gill net system known a 'karadwee') almost doubling the length of net he was deploying each day. Lastly, two years ago he purchased a cell phone, and uses this to call other fishers and discuss where the catch is good on any given day – this also increases his ability to find fish.

While quantifying the direct effect of each of these changes (particularly the cell phone) is difficult, through the use of extra gear and an extra crew member we could estimate that he has more than doubled his 'fishing power' or 'effective effort'. The final graph below therefore shows a re-estimated value of catch per unit effort, suggesting substantial declines in fish availability over the last five years. These changes are not seen if days spent fishing or the number of fishing trips are the only measures of effort used. These measures when used alone can be very deceptive.



Over the past 10 years, the fisher has adopted a number of changes to his fishing practices that have substantially increased the effective effort of a single fishing trip. Measurement of catch per trip suggests a fairly healthy fish stock, while a more detailed analysis shows a very substantial decline in catch per unit effort.

The long history of innovation and change in Ghana's coastal fisheries mean that these concerns are very real. In the canoe and inshore fleets in particular, continued innovation and change have massively increased fishing power, even in the last decade. Below are outlined examples of how technological and behavioural changes undetected by the current data system have had a dramatic impact on effective fishing effort.

Use of and uptake of outboard motors

In 1959 outboard motors were first introduced, along with a government credit system to assist fishers in obtaining engines. Prior to this all fishing vessels in Ghana were powered by sail and oars. Through adopting outboard motors, fishers were able to travel greater distances, following the small pelagic shoals as they moved around seasonally. This had a profound effect on both the catching power of the canoe fleet, and on fisher behaviour and lifestyle. Not only could the fishers 'chase' the migrating shoals, but their own frequency of migration decreased, as they were able to access fish further from their camp.

Similarly, the introduction of outboard motors gave gill netters or line fishers accessing the fairly sedentary demersal stocks the ability to maintain catches despite dwindling fish stocks. The term 'serial depletion' is used to describe the process where one area is effectively 'fished out', so fishers move to another area to maintain catch rates. In Ghana, as shallow water stocks have declined, the use of outboard motors has allowed canoe fishers to move further afield and go further offshore to find new fishing grounds. This is clearly seen over the last 10 years in the Western Region. Interviews with fishers revealed that today on average they travel 2.7 times longer to get to fishing grounds than they did 10 years ago (Figure 11). Given the increase in engine power over this period, the increase in distance which they must travel to find fish would be even higher. Serial depletion masks stock declines up to the point where no further productive fishing grounds are available to fishers. At this point, a severe decline in CPUE would be seen.

1n 1981, engines of 25 to 30 hp dominated the large canoe fleet (Doyi 1984) yet today large canoes are rarely seen with anything other than 40 hp outboards. Due to improving mechanical efficiency of modern outboards and propellers, this may represent a doubling of effective engine power over the past 3 decades. Similarly, small canoes are now often equipped with small (generally 8hp) engines, again increasing effective range.

Change in net systems

Effort measured in terms of fishing trips only cannot account for any changes in net type, net construction or net size. This can have enormous impact on fishing power. Detailed data on gear changes in Ghana are not available, however field observations, interview with fishers and a limited number of written reports point to significant changes.

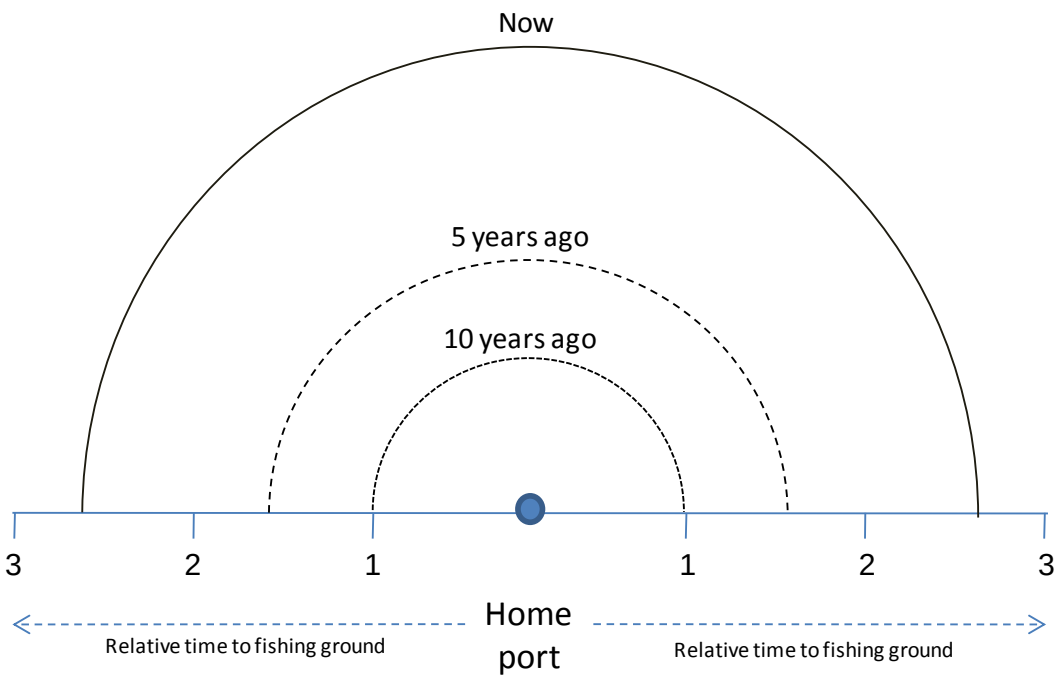


Figure 11. Relative time taken for fishers to reach their fishing grounds 10 years ago, 5 years ago and now. Data are based on 50 interviews from 8 landing sites in the Western Region.

Changes in net length: As illustrated in Box 2, fishers can double their effective fishing capacity by doubling the length of net used, yet this would not change the measure of effort if number of fishing trips was the only metric used. Direct data on changes in net length were not identified for Ghana. A study of the canoe fishery for large pelagic species (targeting billfish, sharks and tuna) in neighbouring Cote d'Ivoire (Bard and Goran 2001) showed that the average length of gill nets doubled between 1984 and 2000 (Figure 12). The fishery data system in Cote d'Ivoire reported an increase in fishing trips from very low levels in 1984 (<500 trips) to around 7000 trips in 2000. In fact, if the data are standardised based on the average net length deployed rather than simply number of trips, the effective fishing effort had increased by a factor of 30 rather than a factor of 14 as represented in the data system. The formal statistics gathered on the fishery underestimate change in effective effort by half.

There is no reason to think that the situation will be any different in Ghana. Recent survey results from our study showed that among fishers using multi-panel gill nets (such as *tenga* and *karadwee*) there is almost invariably a progression where a small number of net 'bundles' are initially purchased, and these are added to over time, perhaps purchasing 12 'bundles' initially, and adding 2 or 3 more per year.

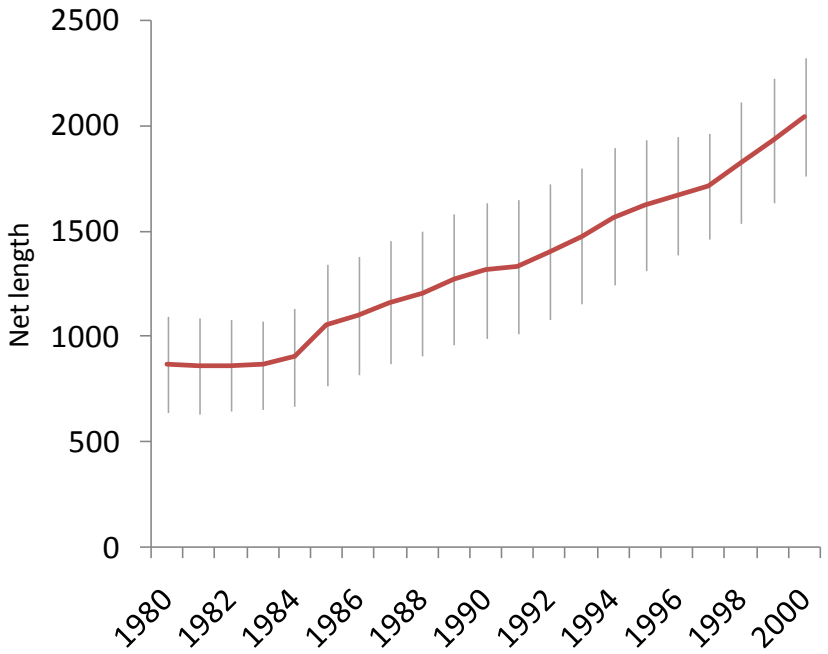


Figure 12. Evolution of gill net length in the coastal fishery of Cote d'Ivoire (+/- 1 standard deviation) (data from Bard and Goran 2001, units for net length not provided)

Changes in net materials, mesh size and design

Substantial changes in the materials used to construct nets over the years have had a marked impact on catch efficiency. Early nets were constructed from natural fibres. These had a tendency to rot, and as such required frequent repairs and maintenance, and 'soak time' (the time nets are left in the water on any fishing trip) was limited. This directly detracted from time spent fishing. Easy access to synthetic fibres substantially improved net efficiency and longevity, and allowed soak times to increase. Monofilament gill nets, which have increased massively in uptake over the last decade, catch fish far more efficiently than synthetic multifilament nets. With this, mesh sizes have continued to decrease, also increasing catch rates. During interviews, a number of fishers in the Western Region noted that they do not travel as far to fish as they used to, as their catches have increased substantially due to using smaller mesh monofilament gill nets.

Mesh sizes used in the construction of purse seine nets and drift nets are also thought to have decreased in recent years.

Light fishing

Light fishing involves using lights to aggregate small pelagic fish to increase their catchability. Light fishing has rapidly become the technological innovation that has had the greatest impact on Ghanaian fishing in the past 20 years. The technique was initially introduced by the Marine Fisheries Research Division (MFRD) and the motivation for this was essentially a one of poverty alleviation and increasing food availability. Canoe fishers found it difficult to make a living outside of the major upwelling season (generally mid-June until September – the '*maura'* season) as their main target species, the small pelagics (herrings, sardinella and

anchovies), were not accessible. Trials were conducted initially in 1962 and showed promise (Bannerman and Quartey, undated), however the equipment was too expensive for most fishers, and clearly the potential benefits were not fully understood.

The incentives for light fishing clearly changed in the early 1990's when the inshore fleet began to adopt the technology, and canoe fishers followed. The benefits to the inshore fleet were considerable. These vessels were designed with the intent of operating purse seine gear during the high (upwelling) season, then converting to trawling in the low season. However, most had engines that struggled to pull trawls – light fishing gave them an option to continue purse seine operations throughout the year. Interviews with fishers revealed that catch in the low season may be between 3 and 8 times higher when using lights. Many fishers suggested that with the current level of fish stocks, they would not expect to catch any fish in the low season without lights.

Light fishing is now carried out by purse seiners (predominantly 'watsa' gear) from both the large canoes, and the inshore fleet. Small generators are used to power high wattage incandescent lights that are lowered into the sea on long cables. The use of this technique has essentially extended the targeted small pelagic fishery from a 3 month fishery to a year-round fishery. For many canoe fishers, prior to the adoption of light fishing, fishing activities in the low season were largely for subsistence purposes – it was rare that enough fish were caught to turn a profit. With the use of lights, despite a decline in fish stocks, the chance of turning a profit in the low season has substantially increased. Many fishers who used to move to line or drift net fishing in the low season now continue seine netting year-round.

Notably, lights are not effective around the time of the full moon, and many fishers report only fishing for two weeks every month – a week either side of the new moon. In effect, this may act to decrease fishing effort as measured in number of trips. Yet once the uptake of light fishing is considered, the overall increase in fishing pressure is still considerable, once again confounding CPUE estimates from the fisheries information system.

Light fishing activities were the focus of one component of recent interviews of fishermen in the Western Region. While initial uptake of the technology was by the inshore fleet, over the past decade increasingly more canoe purse-seiners have adopted this fishing method (Figure 13). When coupled with the large increase in the canoe and inshore fleets, it is likely that this has lead, over the last 10 years, to a massive increase in the fishing pressure on the small pelagic resource.

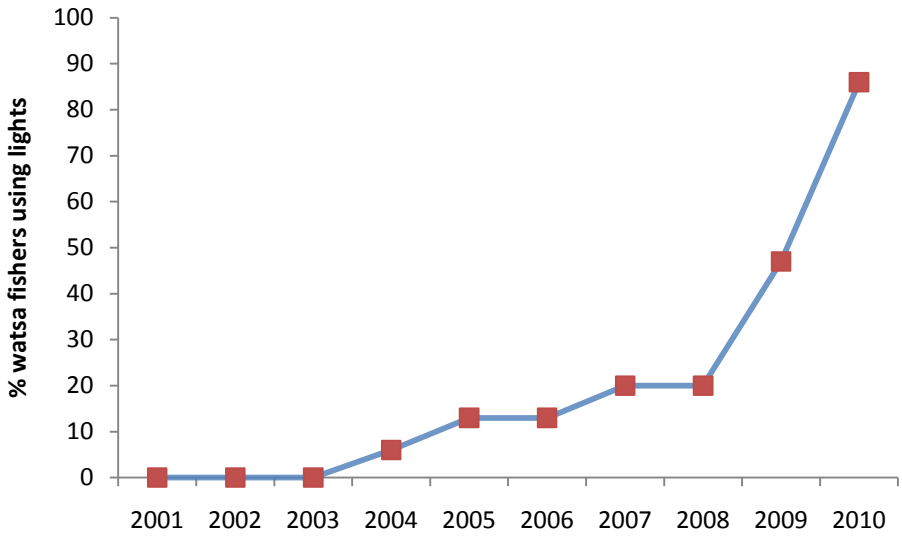


Figure 13. Percentage of interviewed watsa fishers in the Western region engaging in light fishing over the past 10 years. Time of uptake varied considerably between landing areas.

Fishers perceptions and the future

It is clear that through factors such as technological change, motorization, change in fishing methods (such as the adoption of light fishing), net length increases, as well as considerable and ongoing increases in fleet sizes, effective fishing effort in Ghana's coastal regions is exploding. Ultimately, however, it is very difficult for a fishery data system to compensate for this multitude of changes in the calculation of effort.

As an alternative indicator of changing catch rates, fishers in the Western Region were asked a series of questions about observed changes in catch and fishing practices over the past decade. Their responses regarding catch rates (Figure 14) stand in stark contrast to CPUE data from the fisheries information system (see Figure 10) which would indicate an increase in CPUE for the canoe fleet over this period. The graph of fisher's perceptions shows that most fishers believe their catches today are in the order of 1/3 the size of catches 10 years ago[2]. Interestingly this coincides quite well with the raw data on landings, showing a similar rate of decline in landings of small pelagic species over the same period.

Given the dramatic and ongoing changes seen in the Ghanaian fishing fleet, the value of CPUE data calculated from fishing trips alone must be questioned. It is clear that it is of little use as an indicator of management effectiveness or state of fish stocks. The nature of appropriate indicators, however, is not obvious, and development of alternatives should therefore be an immediate priority for research. Indicators strongly linked to community

[2] High variability is driven by changes in fishing practices. For example, watsa fishermen who have adopted light fishing methods often reported similar catches now to those obtained without lights 10 years ago. However, those who experienced substantial drops in catches almost universally stated that the use of light fishing was a major contributor to the declines in their catches.

based or co-management initiatives must be considered, looking outside the classical fishery manager's toolbox. Effective and reactive governance systems cannot be developed in the absence of such indicators.

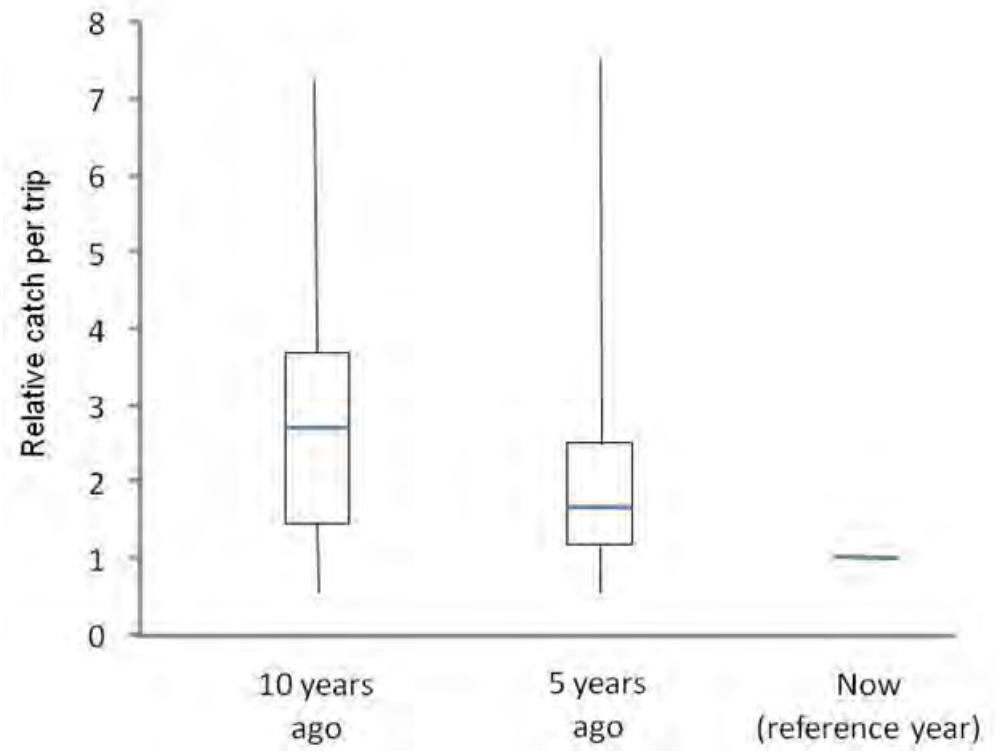


Figure 14. Fisher's opinions of declines in the coastal fishery over the last 10 years, suggesting current catches are around one third of what they were 10 years ago. Data are presented as standardised scores across gear types and canoe sizes. The presentation here is a 'box and whisker' plot with the blue line showing the median score for each year, the box showing the 25% and 75% quartiles of the distribution, and the 'whiskers' showing the range. This presentation is used because the distributions are decidedly non-normal, and therefore presenting an average is misleading.

Existing information, past research and local knowledge make it clear that the fishery system is under considerable stress. Demersal resources have long been recognised as overfished, and analysis of catch composition presented here suggests that the system balance continues to shift, likely because of fishing pressure. Recent instability and phase-shifts is a further sign of a stressed system. Small pelagic stocks have shown a marked decline over the past decade. While high levels of variability are inherent in such stocks, this is clearly the longest and most consistent decline since catch data has been recorded. The co-occurrence of this decline with the advent of widespread light fishing and continued rapid increases in vessel numbers is unlikely to be coincidence alone. Ultimately, whether or not the decline is due to fishing, natural variability, or (most likely) a combination of both, the route back from low stock levels is now severely impeded by the dramatic rise in fishing effort. In the face of these recent and continuing increases in effort across the board, it is clear that current issues will snowball over the years ahead if urgent measures to reform governance are not taken.

3. Fisheries Management

The history of the management of Ghana's coastal fisheries to date can be usefully organised into four eras – colonial fisheries management, the rise of centralised conventional management, decentralization, and an early experience with co-management - as well as the current period, encompassing the recent past and a series of reform initiatives currently underway.

The fishery is highly complex, and presents several challenges to effective management, including questions of finding appropriate scales for different management activities, legal and political obstacles, significant overlap between fleets, questions around how best to involve traditional authorities, input and fuel subsidies, and conflicting objectives of different stakeholders.

Governance Era 1: Colonial fisheries management

The Fisheries Department (DoF)[3] was established by the British in 1946, carrying out primarily fisheries development activities such as the introduction of semi-industrial boats and outboard engines. Both prior to and after the creation of the Fisheries Department, the emphasis of the colonial administration was on encouraging increases in effective fishing effort, particularly through the use of modern fishing gears, in order to boost catches. There are records of conflicts dating back to the 19th century, as local attempts to ban specific gears for being too effective or indiscriminate were overturned by colonial officials. In the first legal case, *Akwufio and Others v. Mensah and Others* (1899), the Supreme Court of the Gold Coast overturned a local law banning *ali* nets in Teshi on the grounds that the law was not in place before the Supreme Court Ordinance of 1876. While locally-made laws made before this date were still enforceable, local authorities were deemed to no longer have the authority to make and enforce any new local laws or regulations. Ruling on the case, Chief Justice Sir W. Brandford Griffith further concluded that the *ali* net would have no negative impacts on future fish supply and that "the Government should rather encourage than discourage the use of the Ali net". This case was used as a precedent throughout the colonial period, with the attitude that "the best fishing net is the net which catches the most fish"[4] prevailing, and colonial courts consistently ruling that traditional leaders did not have the authority to restrict fishing or ban gears (Atta-Kesson & Atuguba, no date).

[3] Fisheries, whether in the form of a department, directorate, or commission, has historically fallen under the Ministry of Food and Agriculture (MOFA), though it gained ministerial status (Ministry of Fisheries, MOFI) from 2005 – 2008 during the presidency of John Kufuor. The abbreviation DoF is used here as a generic term to refer to this institution, though its official name has changed over time.

[4] This, along with the *Akwufio v. Mensah* precedent, is the reasoning put forward by the Colonial Secretary of Agriculture in 1934 for overturning a local by-law banning three types of nets in Winneba.

Governance Era 2: From traditional to centralised management

The first attempt at regulating fishing came with the Fisheries Regulations LI364 of 1964, seven years after independence (1957), but there was little concern over the sustainability of the fishery at the time, and the focus was more on providing a general administrative framework than on limiting effort. The fishery remained totally open-access and effectively unregulated. Links between fishing communities and the DoF were weak, and where management and conservation measures were introduced, this was typically by chief fishermen rather than the government. As one senior staff member in the DoF put it, the fishery "barely needed management at all" in the 1960s and into the 70s, with far fewer boats and fishermen, and stronger management by chief fishermen. While effort-limiting measures by chief fishermen had been consistently overruled by colonial courts, they still commanded a good deal of respect and authority locally, and many were able to effectively implement local regulations and manage fishers during this period.

Field-based fisheries staff carried out extension activities, channelled subsidised inputs and fuel to fishermen (typically through chief fishermen), and collected fisheries data, though resources and capacity for comprehensive coverage were limited. At the national level, the DoF formulated fisheries policy, managed local and regional fisheries staff, and carried out fisheries research, including running their own research vessel.

Gradually the DoF took on increasing responsibility for fisheries management, though given its limited resources and weak capacity, this was never particularly effective. With increasing numbers of boats and fishermen in an open-access fishery with very limited enforcement capacity, the department proved unable to effectively regulate the increasingly challenging fishery.

Governance Era 3: Decentralisation

Under the decentralisation reforms of the late 1980s and early 1990s, many formerly centralised government functions were shifted to District Assemblies (DAs), new local government units formed in 1988/89. DAs were overseen by the Ministry of Local Government and Rural Development (MOLG) via Regional Coordinating Councils (RCC), and made responsible for over 80 functions, including planning, finance, infrastructural development, and security. With the authority to make local by-laws (though these must be approved by the RCCs), they were expected to take on responsibility for the implementation of all development programmes. Twenty-two ministries and departments, including the Ministry of Agriculture (MOFA) – which covers fisheries – were decentralised to district level, ostensibly reporting to the DAs rather than to their line ministries. Through these reforms, responsibility for fisheries management and implementation of fisheries policy was delegated to the district level, with the central department retaining responsibility for a limited set of functions such as formulation of policy and monitoring and evaluation. Implementation was patchy, however, and the legal framework for the restructuring of the civil service did not come until several years later in 1993. District-level civil servants continued reporting to their line ministries rather than to the DAs, and DAs lacked the resources to carry out many of their assigned functions. Few if any districts had representatives from all 22 decentralised agencies, hindered by lack of resources and

logistical difficulties presented by a lack of office space and equipment such as typewriters (Ayee, 1997).

While many of the initial difficulties have now been resolved, the institutional configuration created by these reforms still poses challenges for fisheries management. Fisheries, falling under MOFA, are typically represented at the district level by agriculture specialists[5], and despite having formal responsibility for fisheries management, DAs rarely engage with fisheries issues. A World Bank evaluation of the Fisheries Sub-sector Capacity Building Project (see below), a five year initiative designed to strengthen the capacity of the DoF, identified the decentralisation reforms as a constraint to effective fisheries management and as a factor which limited the success of the project (World Bank, 2003).

Moreover, while one of the theoretical benefits of decentralisation is that it brings the civil service under greater control of democratically elected local representatives, the flip side of this can be a politicisation of the civil service, and accusations of both corruption and appointments based on party loyalty rather than technical capacity abound. In this context, is it likely that at least part of the failure of district-level authorities to effectively carry out their fisheries enforcement responsibilities may be due not only to lack of resources but lack of political will.

It is also worth noting that one of the key trends of this period, rapid growth in the number of industrial trawlers and the introduction of pair trawling, would have made the fishery more complex to manage, and DAs under whose jurisdiction these ships fell, already lacking the capacity and resources to manage the canoe fleet, would have been ill-equipped to regulate these international business operations. Trawler numbers increased rapidly from just a handful in the 1980s to nearly 80 by the mid-1990s, and have never been subject to effective enforcement or regulation.

Though decentralisation reforms strongly affected fisheries management through their reconfiguration of roles and responsibilities, the impetus for these changes came not from drivers within the fishery, but broader political events. Though earlier decentralisation reforms had been attempted, the most comprehensive ones (and the ones which created the DAs and gave them responsibility for fisheries management) were carried out under the Provisional National Defence Council (PNDC) in the context of other changes such as a restructuring of the civil service and an IMF structural adjustment programme. Even though concerns about overfishing and overcapacity were beginning to emerge by the late 1980s, the most profound changes in fisheries governance in this period were brought about by non-fisheries concerns such as a need to respond to donor imperatives for structural adjustment and 'good governance', and a desire on the part of the PNDC to legitimise the political system by creating opportunities for local-level democratic participation (Ayee, 1997).

[5] While it was certainly more common for MOFA agricultural staff to represent both agriculture and fisheries at the district level, there were also cases of highly trained fisheries staff being re-assigned to district level agriculture positions, representing a further loss of capacity in the DoF.

Governance Era 4: Early experiences with co-management

Decentralisation reforms, however, failed to generate much more participation by local communities in fisheries management than was present in the previous system, and in 1997 a co-management project in the form of Community Based Fisheries Management Committees (CBFMCs) was initiated as part of the World Bank Fisheries Sub-sector Capacity Building Project (FSCBP). The CBFMCs were largely modelled after a management framework developed by the fishing community in Mumford, Central Region, which empowered a local committee, comprising the chief fisherman and seven village elders, to collectively enforce fisheries regulations prepared in consultation with all stakeholders in the fishing community (Braimah, 2009).

The objective of the CBFMC initiative was for artisanal fishing communities, and in particular their traditional leaders, to develop the capacity to formulate and adopt constitutions with stringent by-laws; with financial and practical support and legal backing from DAs in enforcing both local by-laws and national fisheries law. As the government partner in the co-management initiative, the DAs were to help form and sustain CBFMCs (including providing legal and financial support); collaborate with the Department of Fisheries on enforcement activities; and approve the by-laws and levies proposed by the CBFMCs.

At the completion of the project, 133 CBFMCs had been formed along the coast and their constitutions and by-laws passed and adopted by their District Assemblies (DAs), though the vast majority collapsed shortly thereafter. Some of the inland CBFMCs around Lake Volta were revived as part of the Sustainable Fisheries Livelihoods Programme (SFLP), and Friends of the Nation (FoN) is currently engaged in a project to revive or re-create CBFMCs in 16 fishing communities across four coastal regions. In Axim, for example, FoN reorganized a 20 member committee from four defunct ones to comprise five members from each of the previous committees.

Among the factors identified by the World Bank at the time as having had a strong influence on the success or failure of co-management were whether communities were established or transient, and the degree of collaboration and cooperation between DoF, MOFA, and the DAs in lending support to the communities to formulate management committees (World Bank, 2003). In a follow up study by the World Bank (Braimah, 2009), community stakeholders identified a number of reasons for failure or inactivity of the committees, including:

- lack of funds for operational costs;
- absence of a constitution to regulate/enforce tenure of office;
- lack of or irregular meetings and poor attendance;
- members of the committee themselves using illegal fishing gear[6];

[6] While there is a degree of ambiguity around which types of fishing gears and techniques are illegal, the term is used here to refer to gears that are commonly perceived to be illegal and are known to be destructive – such as explosives, poisons, and undersized mesh. Until the introduction of new fisheries regulations in August 2010, mesh size limits, though not enshrined in law, were well known (60mm for trawling, 40mm for shrimping, 25 mm for any nets used by canoes, including beach seining). The case of light fishing was less clear, with some fishers believing that it was legal, and

- lack of monitoring/supervision of the committees;
- lack of supply of inputs at subsidized rates and inability of committees to be in charge of inputs distribution;
- no motivation/incentives despite immense sacrifices;
- lack of equipment for work;
- dissipation of funds;
- belligerency of chief fishermen;

Some important lessons can be drawn from this, both for future co-management initiatives in Ghana, and about co-management in general. If one had to summarise the reasons for the failure of the CBFMCs in one sentence, it would probably be fair to say that they failed because the initiative was conceived and planned with little real input from the people who were to be responsible for its implementation, and that neither fisherfolk, nor DAs, nor traditional authorities, found it in their interest to participate.

For the most part, the CBFMCs were an example of instrumental co-management – the idea was that fishers would be more likely to comply with fisheries regulations if they were involved in fisheries management rather than passive recipients of it. While committees were allowed to develop their own by-laws, and several of them devised local rules (e.g. banning children from the beach during school hours), they were also expected to enforce and comply with national fisheries regulations. One of the most-cited examples of problems arising from this is around mesh size. The minimum permitted mesh size for artisanal fishing is 25mm – a regulation with which many fishers disagree, arguing either that it prevents them from catching mature anchovies or that it effectively rules out beach seining (traditionally practiced by Ewe fishers). Many CBFMC members therefore not only refused to enforce this rule, but also to comply with it. Moreover, expressions of disappointment over the lack of 'incentives' and inability of committees to control distribution of subsidised inputs, combined with the fact that many of the CBFMCs collapsed when project funding for expenses such as per diems ended points to one of the fundamental problems with instrumental co-management. When communities see no intrinsic benefits from participating – that is, when the objectives of the initiative in which they are asked to participate do not match their own objectives – their participation will be contingent on receiving some other sort of benefit, typically in the form of material handouts.

For DAs, participation in the CBFMC initiative represented a substantial burden in terms of expected financial, administrative, and legal support for the CBFMCs under their jurisdiction. While most of the by-laws were eventually developed by the CBFMCs and passed by the

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others believing that it was legal as long as the bulb does not exceed a certain wattage (100 – 1000W). Until the introduction of the fisheries regulations, prohibited gears were banned by virtue of section 88(1) of the Fisheries Act, which prohibits the use of "any explosive, poison or other noxious substance for the purpose of killing, stunning, disabling or catching fish, or in any way rendering fish more easily caught" The DoF considered that monofilament nets, light fishing, and pair trawling render fish more easily caught, and were therefore illegal. This was the subject of a legal challenge by semi-industrial purse seiners, who objected that by that any fishing gear renders fish more easily caught, and that this clause is not an appropriate legal basis for banning specific gears.

DAs, the vast majority were never gazetted, so have no legal force. DAs, facing problems of their own around lack of human and financial resources to support all of their new responsibilities, had neither the ability nor the interest to engage seriously with co-management. Moreover, as mentioned above, the decentralisation reforms placed fisheries under the District Department of Agriculture, and most districts did not have any staff working on fisheries issues at all, much less with the interest, resources, and inclination to work closely with several CBFMCs scattered throughout the district.

In many areas, CBFMCs also encountered hostility from chief fishermen. Despite a gradual erosion of their power with the rise of both Christianity and modern fisheries management, chief fishermen were still the most powerful figure in fisheries management in many communities, particularly where governmental management was weak or non-existent. Recognising the importance of chief fishermen, the initiative made sure to include them in the CBFMCs, often as chair of the committee. Much of the funding for the CBFMCs, however, was expected to come from levies such as those imposed on fish landings and migrant fishermen, as well as mark-ups on the sale of subsidised inputs and pre-mix fuel – levies and mark-ups which had, until that point, funded the activities and patronage networks of the chief fishermen. Many chief fishermen saw this as a threat, and decided that it was much more in their interest to maintain the status quo, under which they had greater control over rents from fishing, than to support co-management.

Governance Era 5: A rebirth of co-management in a managed access fishery?

Having reviewed the previous four eras of fisheries management, the obvious question now is – what is the fifth? Following the collapse of the CBFMCs, the fishery has reverted to the system of decentralised management, but with an increasing sense that things are not working. The fishery remains totally open access, and new, ever larger, boats are being built at nearly every landing site. Management measures such as minimum mesh sizes, prohibitions on destructive fishing methods, and designated areas for artisanal fishing are routinely flouted, as are licensing and registration requirements for semi-industrial and industrial vessels. Demersal stocks have been considered seriously overfished for longer than many of the fishers have been alive, though it is impossible to know with any degree of certainty how many fish are actually being caught, particularly by industrial trawlers who operate on an honour system, self-reporting their catches. Resources for enforcement are limited, and where enforcement activities are carried out, many of the fishers found in violation of the rules are able to avoid any consequences.

In recognition of these problems, a number of initiatives are currently underway to reform fisheries management in the coastal fishery. These include new fisheries regulations, an initiative to revive co-management through the creation of District Fisheries Management Committees, the rise of wealth-based management approaches (and concomitant moves towards first limiting and then reducing fleet size), and support for increased monitoring and surveillance activities.

New fisheries regulations were introduced in August 2010, providing further detail and guidance on the implementation of the Fisheries Act. In addition to provisions around licensing, monitoring, aquaculture, and fisheries plans, the regulations set minimum mesh sizes for nets and ban light fishing, pair trawling, monofilament nets, and the use of bamboo to aggregate fish (a practice common in the tuna fishery). Prior to the introduction of the regulations, many of these practices were understood as destructive and were commonly referred to as 'illegal', despite the lack of official documents indicating that they were banned.

There is also interest in reviving co-management, including the creation of District Fisheries Management Committees to strengthen the co-management effort of the Government by creating district-level entities with responsibilities for fisheries management that are better able to work closely with DAs. The committees would oversee the CBFMCs and are to have adequate legal and institutional mandate to promote and contribute to sustainable exploitation of the fisheries resources, and efforts are being made to give recognition to the DFMCs as sub-committees of the District Assemblies so as to give them a legal standing and legislative authority (GoG, 2009). The reorganisation and operationalisation of some 200 CBFMCs along with 22 DFMCs in the coastal districts began in November 2009, with DFMCs to be given a set of consolidated by-laws based on the by-laws developed by the CBFMCs in that district, as well as responsibility for implementing the existing fisheries law and regulations.

A further development is the rise of a wealth-based approach to fisheries management, promoted by the World Bank, and based on the idea that when subsidies and investment are taken into account, the actual net contribution of marine fisheries in Ghana to GDP is negligible at best, but may even be negative[7]. They attribute this to overcapitalisation in the fishery, and are arguing for, among other measures, a reduction in fleet size. As a first step towards this, the Fisheries Directorate have begun to register canoes, with aim of capping the fleet at its existing size, and eventually transitioning to a managed access fishery. The hope is that by reducing investment in the fishery and gradually removing subsidies, fishing effort would reduce to a more sustainable level and the ratio of money invested in the fishery to wealth generated by it would adjust so that fisheries became a net contributor to GDP. The 2002 Fisheries Act, however, requires that canoes be licensed 'on demand' – that is, that the canoe fishery be open access. Any changes to this licensing regime would require

[7] The argument that returns are negative seems implausible, however, and rests heavily on the assumption that subsidies are a "cost of fishing", despite the fact that it is well known that a substantial portion of the subsidies are diverted. Moreover, people are still investing in the fishery, and are still able to recoup their investments quickly. This observation, coupled with the fact that fishers are reinvesting profits back into the fishery, indicates that there is still money to be made in fishing. While there are not a lot of enormously profitable operations, many fishers, particularly larger operators, are making normal profits, and the fishery is still a major source of employment and the main economic driver in coastal communities. Catches are almost certainly unsustainably high, meaning both that they are "fishing away the future" and that the fishery could be generating more net revenue than it currently is, but it seems highly unlikely that returns are negative.

that the act be amended or replaced by new fisheries legislation, otherwise they are unlikely to stand up to the legal challenges that would inevitably follow.

There is also increasing interest in strengthening monitoring, control, and surveillance (MCS) activities, reducing effort by curtailing the use of illegal gears and cracking down on unregistered foreign vessels fishing in Ghanaian waters, as well as enforcing the artisanal fishing zone. Possible donor support could include provision or refitting of equipment and boats, and capacity building.

Key challenges facing fisheries management in the Western Region

Will the reforms currently being planned or undertaken lead to a new era of co-management in a managed access fishery? While possible, this is by no means guaranteed. The initiatives will need to overcome the barriers that have caused both the last attempt at co-management and repeated attempts at limiting access or reducing effort to fail. Some of this will be clear from the above discussion on past management regimes, but there are several challenges that merit a more in-depth exploration. These include questions of scale and their implications for co-management, legal and political barriers to effective management, overlapping geographies of the different fleets, the question of how best to involve traditional authorities in fisheries management, problems introduced by subsidies, and the difficulty of reconciling the often-conflicting objectives of different stakeholders. It is also worth remembering that co-management is a means to an end, not an end in itself, and that it fails more often than it succeeds. Any attempt at reviving co-management needs to be clear on what it is trying to achieve and to design institutions and structures around the realisation of those goals. Interventions which start from the premise of co-management and work backwards are unlikely to succeed.

Districts, regions and nations – issues of scale

Many of the fish stocks upon which fishing communities in the Western Region depend are highly migratory, as are the fishing communities themselves. During the main fishing seasons, fishers from all along the coast follow stocks, travelling along the coast and staying in fishing communities along the way. There is also a strong international element to this migration, with Ghanaian, particularly Fante, fishers travelling to other countries to fish since the 1700s. Before the widespread implementation and enforcement of exclusive economic zones (EEZs) in the 1970s and 1980s, Ghanaian semi-industrial fishers commonly fished as far north as Morocco and as far south as Angola, though access is much reduced now and many of these boats returned to Ghanaian waters following the introduction of EEZs.

The mobility of many Ghanaian fishing communities poses a challenge for fisheries management, and the integration of migrant fishermen into local-level management structures has not always been smooth. Traditionally, migrant fishermen must report to the chief fisherman of the host community, and pay a tribute or fee in order to receive permission to fish there. Migrant communities often have their own chief fisherman and chief fishmonger, and disputes between migrants and members of the host community are dealt with through the joint efforts of the migrant and host chief fishermen. Discussions

with chief fishermen, however, reveal that relations between migrant and host communities do not always look like this in practice[8], and that migrant fishermen do not necessarily request permission to fish or respect local regulations. In Axim, for example, light fishing began much later than at other landing sites as it was locally prohibited by one of the chief fishermen, but this regulation was eventually abandoned since migrant fishers in Axim were practising light fishing despite the local injunction.

Similar problems arose during the FSCBP, with neither CBFMCs nor DAs having a legal status or sense of legitimacy which would give them jurisdiction over fishers from other areas. The CBFMC in Egyan found itself in conflict with migrant fishers, mostly from Princes Town, who refused to follow local by-laws or recognise the authority of the CBFMC. In one incident, the CBFMC confiscated undersized nets from migrant fishers who were fishing in Egyan, and the fishers in question challenged this in court. Despite the fact that the nets were not only prohibited locally but were also smaller than the national minimum mesh size, the court ruled in favour of the migrant fishers and found that the CBFMC had stolen their nets (Lenselink, 2004).

The migratory nature of both fishing communities and fish stocks highlights a need for local-level fisheries management institutions to be 'nested' in larger structures and for clarification of the legal status and rights and responsibilities of the different entities involved. Moreover, efforts to enforce both national-level fisheries regulations and local by-laws would be far more effective in the context of clearly delineated jurisdictions which explicitly address the issue of migration, providing clarity on which set of local by-laws fishers are expected to follow when fishing outside of their home community and who has the authority to sanction them for violations of local or national regulations.

This also raises the question of the appropriate scale for fisheries management. The Western Region fishery is influenced by management decisions at higher (national) and lower (district) levels, as well as ecological feedbacks at higher and lower levels and social drivers (such as poverty and migration) at higher and lower levels. Which aspects of fisheries management are best carried out at a regional level? And which need to be addressed at the community, district, national, or international scale? Some issues – such as how to deal with illegal fishing by international fleets in Ghanaian waters, are clearly best dealt with by the national government, while others, such as how to best keep the local beach clean, are a good fit for community-level management. But many issues are less clear-cut, and finding the appropriate scale can be a challenge.

[8] This raises a more general point about differences between the 'official' story of how fisheries management institutions work, often told as though these systems looked the same everywhere in Ghana, and the actual diversity in practices, structures, and values, which can vary widely from one place to the next.

Legal and political barriers to effective management

In addition to highlighting some of the difficulties of managing at the community scale where fishers are highly mobile, the Egyan court case raises issues about the legal status of the CBFMCs, who were expected to play an enforcement role without having been delegated the authority to do so. More generally, fisheries management initiatives have been hindered by both a lack of a legal framework to facilitate effective management and by a lack of political will at all levels. Many key reforms have not been accompanied by the legal framework required to support them until years later (e.g. the decentralisation reforms discussed above) or not at all (e.g. co-management). The presence of such a legal framework is a necessary, though not a sufficient condition for reforms to be effective. In the current situation, this means that: 1) attempts to revive co-management should be accompanied by legislation that sets out the roles and responsibilities of different actors, including resource mobilisation, accountability mechanisms, and authority for enforcement and prosecution; and 2) fisheries management measures (e.g. freeze on new trawler licensing) need to be clarified beyond the very general provisions in the Fisheries Act 625 (2002). The new fisheries regulations do provide some clarity here, though it remains to be seen how widespread fisher understanding and support of the regulations will be.

Even where there is some sort of legal framework, there is not always political will to implement it. The 2001 Fisheries Management Plan is a good example of this – several years of work went into developing a fisheries management plan in response to growing concern about overfishing. By this point, demersal stocks had been considered seriously overfished for nearly a decade, with no management response, and the plan envisioned a 3 month closed period in the demersal fishery, a ban on new trawlers, and increases in minimum mesh sizes for all categories of nets, among other measures. The political will to back up this management plan never materialised, however, and the plan was never implemented. Nearly ten years later, it is now caught in a Catch-22: the plan is out of date so cannot be implemented, but was never implemented so cannot be updated. The difficulties and delays in convening the Fisheries Commission, enshrined in the 2002 Fisheries Act, are another good example.

Despite the decline of the fishery, there are still people making money from it, including some people who are still making quite a lot of money. Where management measures such as a closed season or a ban on new trawler registrations would have a negative impact on their profits, these people can be expected to use whatever political influence they have to forestall such measures (as was the case with the 2001 Fisheries Management Plan), or, failing that, to get around them.

Overlapping geographies of the different fleets

Increasingly frequent incursions by semi-industrial and industrial boats into the Inshore Exclusive Zone (IEZ), waters of less than 30m depth reserved for artisanal fishing and small (<10m) semi-industrial vessels, combined with the use of increasingly powerful outboard motors by large canoes, allowing them to fish in deeper waters, has resulted in a large degree of overlap in fishing grounds. Where the fleets used to fish in relatively well defined and somewhat separate areas, they are increasingly fishing for the same fish in the same places, and, in the case of semi-industrial vessels and large canoe, using the same gears.

This has already resulted in increasing conflicts between artisanal fishers on the one hand, and semi-industrial and industrial fishers on the other. The destruction of (often poorly marked) artisanal gear by larger vessels that run over nets without seeing them is a particular point of contention, and collisions, especially at night, are not unheard of. As fishing practices (canoes fishing in waters deeper than 30m, light fishing, increasingly frequent incursions into the IEZ by larger boats) and fleet composition (particularly the explosive growth in semi-industrial boats following the introduction of light fishing) change, old rules for reducing conflict by keeping the fleets relatively separate no longer seem to be working. Ensuring that these rules evolve along with the fishery is a management challenge that will become increasingly pressing in the near future.

Role of traditional authorities

Among the major factors identified in the failure of the CBFMCs was resistance from chief fishermen, who, although included in the committees, typically in a leadership role, felt that the CBFMCs threatened their traditional position. While the CBFMCs did not pose much of a challenge to the leadership, religious, or conflict resolution roles of chief fishermen, they were seen as a threat to their resource base, as these same levies and mark-ups that were to fund the CBFMCs had traditionally gone to the chief fishermen. Many chief fishermen did not want to share this income with the CBFMCs and DAs, and some refused to participate altogether.

Where chief fishermen did participate in co-management, however, their political influence gave legitimacy to CBFMC decisions. In Moree, for example, the CBFMC decided to ban the use of explosives and poisons, but lacked the resources for any sort of enforcement activity. The chief fisherman and his council of elders performed a ritual in which the canoe owners swore an oath to the Sea God, the God Almighty, the God of Thunder and Lightning, and the Earth God, promising to refrain from using explosives and poisons. The chief fisherman then issued them all with identity cards, without which they could be assumed to be using banned substances and fined, though the religious consequences of breaking the oath were far more severe than the administrative ones - “thunder and lightning will strike your canoe and drown all the crew members, and if you keep dynamite in your room, thunder and lightning will strike there too and destroy it” (Overå, 2001). Similar rituals have been performed at other landing sites, including in the Western Region, though with varying degrees of compliance. Some fishermen explain that with the rise of Christianity, traditional religious beliefs have weakened, and oaths sworn to the Sea God are no longer taken as seriously as in the past.

For a fisheries management system (particularly at the local level) to be sustainable, careful consideration must be given to the role of traditional authorities. On the one hand, uncritically strengthening existing power structures may result in institutions which are vulnerable to elite capture and fail to benefit the poorest, but on the other hand, the experience of the CBFMCs highlights the importance of ensuring that chief fishermen are involved in a meaningful way and buy in to management institutions. The issue of controlling rents from fishing appears to be a key one, and surfaced during discussions with chief fishermen as well. Many feel that the institution of chief fisherman has been weakened by modern fisheries management, but when asked for more details, the examples

given tend to revolve around more recent changes which have removed the distribution of subsidised inputs and fuel from their remit rather than modern fisheries management *per se.* It is worth noting, however, that the desire on the part of chief fishermen for control over the distribution of subsidised inputs and fuel or to maintain their traditional sources of revenue is not entirely (or even mostly) a question of personal profit. The income that accrues to chief fishermen allows them to carry out activities and projects for the benefit of the fishing communities, and their past role as the conduit for subsidised inputs put them in a position to determine how these inputs were distributed – both of which enabled them to build and maintain patronage networks which increased their prestige and standing in the eyes of the local fishing community.

Subsidies

While the government offers a range of fishing inputs at subsidised prices, the subsidy on pre-mix (outboard motor) fuel is both the most visible and the most contentious. Introduced in 1991 for reasons of equity with farmers who receive subsidised fertiliser, the subsidy on pre-mix fuel has proven both immensely difficult to manage and immensely difficult to remove. Sold to local committees at production cost, the fuel is then sold on to fishermen with an administrative mark-up, aiming to support their livelihoods and increase the availability of affordable fish for consumers. In practice, much of the fuel is diverted on to the black market, and pre-mix fuel is often unavailable at many landing sites (some fishers report up to 50% of the time), leaving fishers with the choice of not fishing, buying 'super' (which often results in fishing at a loss), or travelling to another landing site in hopes of finding pre-mix there. The government has introduced various measures over the years to combat the diversion of the pre-mix, including changing who is in charge of its distribution (pre-mix committees, landing beach committees, etc) and adding blue dye to make it readily identifiable, but to little avail.

The pre-mix subsidy highlights several broader issues around fishing subsidies, including the role of subsidies in encouraging increased (rather than reduced) effort, difficulties in generating the political will to remove subsidies once they are in place, conflicts over control of the benefits from subsidies, and the role of subsidies in limiting adaptive capacity.

There is recognition in policy circles that subsidies encourage increased effort, both in the form of growth in fleet size and in the form of longer fishing trips. Subsidising fuel, motors, and other inputs keeps people in the fishery that would otherwise no longer be able to afford to fish, enables moderately successful fishers to expand their fleets more rapidly than they would otherwise be able to, and encourages increased effort in the form of longer fishing trips. Despite the fact that reducing effort is increasingly seen as critical to the long-term health of the fishery, no one sees removing subsidies, particularly the pre-mix subsidy as a feasible option. It is an emotive issue in fishing communities, and one which became a major issue in the 2008 presidential election, reportedly leading the NPP government to be voted out in the face of promises by the NDC to remedy the problems of the pre-mix distribution system. It is widely asserted that any government who dared to remove the pre-mix subsidy would be summarily voted out of office in the next election.

While it is certainly instructive to look at the *net* benefits to society from fishing, including the net contribution to GDP or government revenues (an issue highlighted by wealth-based approaches), subsidies do form part of the benefits from fishing, and it is also important to understand who gains from fishing and how at a very local level. This entails recognising that not only are there still people who are making money from fishing who will attempt to subvert effort-limiting measures which interfere with those profits (as mentioned in the text), but that control over distribution of subsidised fuel and inputs is remunerative in itself. Leaving aside the obvious money to be made by diverting pre-mix fuel onto the black market, controlling distribution of subsidised goods is lucrative both because there is money to be made from mark-ups on the subsidised goods and because control over distribution facilitates the maintenance of patronage networks – particularly important for chief fishermen.

A final point worth making about the current system of subsidies is that, despite widespread recognition that numbers of fishers and boats need to be reduced in order to lower fishing effort to sustainable levels, by subsidising pre-mix fuel and fishing inputs rather than alternative coastal livelihoods, the government is effectively subsidising fishers to not adapt and to not diversify their livelihoods rather than subsidising them to adapt in a way that is consistent with policy objectives. Such a subsidy structure ultimately has the effect of *delaying* adaptation in a context where adaptation will be increasingly difficult the longer it is delayed.

Mismatched objectives

As is the case in any fishery, or indeed any social or economic system, the various actors involved in fisheries management in Ghana have different, often conflicting, interests and objectives. These include international donors, government agencies, traditional authorities, artisanal fishers, and semi-industrial & industrial fishers, though these categories are far from homogenous. These stakeholder groups are discussed in more detail in the stakeholder analysis section of this report, but it is worth highlighting here a few of the more noteworthy conflicts in their objectives.

The above discussion on co-management highlighted a gap between the interests of those who initiated the CBFMC experiment and those who were expected to implement it. World Bank policy documents talk of participation and of empowering communities, while the Fisheries Directorate, though reluctant to hand over any real power, participated in the hope that it would induce fishermen to either voluntarily comply with existing regulations or police themselves. Traditional authorities, on the other hand, saw co-management as a threat to their power and resource flows, while DAs saw it as an extra burden on their already-stretched resources. Fishers were less interested in creating and enforcing fisheries regulations than they were in using the committees to resolve local conflicts – arranging compensation for damaged gear, etc – which neither the DAs nor the DoF saw as a priority.

In general (and vastly oversimplifying it), fishers want to catch fish. For artisanal fishers, this means that, from fisheries management, they would like to see reduced competition from semi-industrial and industrial vessels, stronger enforcement to keep these vessels out of the Inshore Exclusive Zone (IEZ), clear arrangements for receiving compensation when their

gears are run over, and support for their fishing activities in the form of subsidised inputs (particularly outboard motors) and fuel. They are generally reluctant to support measures which would restrict their effort (e.g. minimum mesh size, restrictions on light fishing), and do not see their fishing activities as the ones which are harming the fishery. Box 3 provides further insight into the perceptions of artisanal fishers of issues facing the fishery.

Similarly, semi-industrial and industrial fishers would hesitate to support measures aimed at reducing their effort, pointing instead to the use of explosives, poisons, undersized mesh (e.g. *poli* net), and beach seining (often practiced in the mouths of estuaries with very small mesh sizes, catching a high proportion of juveniles) by artisanal fishers. While most fishers of all types recognise that it is becoming increasingly difficult to catch and find fish, they are all engaged in a 'race to catch the last fish' and don't want to be limit their effort, particularly when they cannot be assured that others will do the same.

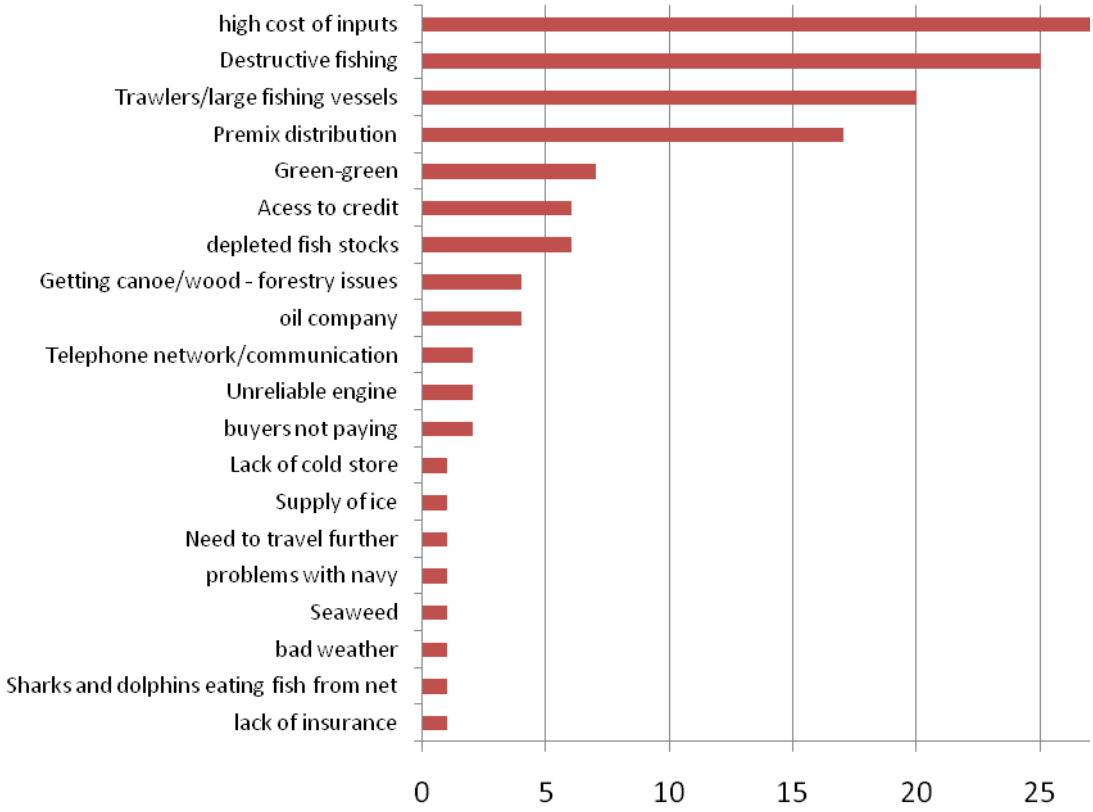
If most of the fishers are heavily invested in a short-term perspective at the expense of longer-term sustainability, at the other end of the spectrum are those, particularly within international donor agencies, whose focus is firmly on long-term sustainability (including the major reductions in effort that this would entail), but who have much less to say about short and medium term livelihoods – that is, how are these people to make a living if they are no longer allowed to fish? One of the biggest challenges faced by any initiative to manage Ghanaian coastal fisheries will be how to reconcile those two positions. As a minimum, it will entail moving beyond a narrowly sectoral perspective – reductions in fishing effort cannot come from fisheries management alone, but will also require the creation of non-fishing livelihood opportunities capable of playing a similarly central role in local economies. This is not an easy task, as artisanal fishing tends to generate relatively high economic and employment multipliers, and there are no obvious solutions.

It is also worth noting that the relationship between fishers and those involved in managing the fishery has largely broken down, with fishers seeing many management measures as arbitrary and unfair, and managers increasingly frustrated with non-compliance on the part of the fishers. For management to be sustainable, stakeholders will need to develop channels of communication and a working relationship which facilitates voluntary compliance and collective action towards shared objectives for the future of the fishery.

Box 3: Issues concerning artisanal fishers:

Fishers were asked to describe the three most critical things that made their fishing activities difficult, affected viability, or that concerned them most about the fishery. This was presented as an open question, and care was taken to maintain independence in answers by ensuring that fishers to be interviewed subsequently were not within earshot when this question was asked.

These perceptions are important, as they highlight areas where action or reform may illicit good cooperation, or alternatively create friction, among fishers and those driving reform. The cost of inputs (fuel, nets, motors, vessels) was most frequently cited, with many fishers stating that the government should provide additional subsidies (particularly for motors) to improve the profitability of fishing. Closely linked to this, and also highly ranked were ongoing issues with premix distribution, and access to credit. Destructive fishing practices were a major concern among fishers employing all gear types. Notably, those who used light fishing were almost as likely as other fishers to rank light fishing as a major problem to the fishery. The presence of large vessels in general was frequently cited as a major problem. Concerns were 2-fold; industrial and semi-industrial vessels fishing within the inshore exclusion zone (thereby directly competing for resource) and, large fishing or oil company vessels destroying fishing gear. Most fishers cited multiple occasions where they had personally lost gear due to damage from large vessels.



Omissions are as important as inclusions in these answers. Most notably, there is no notion among fishers of overcapacity – not a single fisher mentioned that there were too many boats or too many fishers. Rather, when specifically prompted about this issue, fishers generally said that if other problems such as unsustainable fishing practices were dealt with, there would be enough fish for everyone who wanted to fish. This underlines the magnitude of the political and social challenge regarding mechanisms for constraining entry or removing vessels from the fleet.

4. Fish markets, marketing and fish-based livelihoods in Western Region

National overview

Fish capture, processing, marketing and associated services constitute a significant source of livelihood in Ghana – certainly in coastal areas and around lakes and rivers but in other areas too. Fish is extremely important in the Ghanaian diet, accounting for 40-60% of animal protein supply. Fish is widely consumed throughout the country – as a fresh product near the landing sites and as smoked and dried fish in more distant markets. FAO data (2001) indicate an overall food fish balance of almost 600,000 tonnes (or nearly 30kg per capita). The marketing systems, although largely based on traditional products, are relatively well-developed and extend into neighbouring countries. For example, Ghana's artisanal sector is an important source of processed fish for the Nigerian market. The domestic market is the most important market for Ghanaian fish production.

FAO statistics indicate that Ghana is a net importer of fish (by volume and value). Exports in 2006 were worth about $50 million ($52 million) and imports more than twice this amount ($125 million), but as recently as 2003 the situation was the reverse, when exports were worth $120 million and imports $58 million (FAO Commodity Trade and Production Statistics). However, given the importance of regional trade, much of which is handled by the informal sector, and the role of fishing agreements (whereby not all catch is landed in Ghana), as well as the controversies concerning Illegal Unreported Unregulated (IUU) fishing, the trade balance data, at least in detail, should be interpreted cautiously.

Official data indicate that important destinations for Ghanaian fish product exports are European Union, Japan, United States of America, Canada, Togo, Mali, Cote d'Ivoire, Burkina Faso, Benin, Nigeria, Hong Kong and Singapore. Ghana has 3 tuna canneries at Tema, whose exports are destined mainly for UK and Germany.

Western Region – important markets

With scarcely more than 10% of Ghana's population, but 30% of its coastline and perhaps 20-30% of the country's landing sites, Western Region produces marine fish destined for markets throughout Ghana and beyond. It is an important source of fish despite its distance from Accra, most likely becoming more important with increasing pressure on marine fish resources. Kumasi and Accra are important as end-markets and transit markets and fish is sent directly to both centres from Western Region. In addition fish is traded within inland parts of Western Region and sent to Central Region, where it may be processed, consumed or sold-on. Takoradi also serves as a port of export for low volume processed fish products.

Marketing systems and fish products in Western Region

Most of the Western Region catch enters the processed (smoked) fish marketing chain[9]. Fish is purchased at the beach and smoked there by resident processors, or by "short-term migrant"[10] processors residing their temporarily during periods of abundant catch and low prices (sometimes sub-contracting the smoking), or it is immediately transported back to the home base of visiting processors for processing there. These outcomes depend on relative prices, with women processors juggling considerations of fresh and processed fish prices, as well as processing and transport costs, all of which will vary depending on market conditions.

Although some of the larger landings have cold stores, only those in Sekondi seem to be operational at present for fish cold storage. Ice can also be purchased in Sekondi port – for use by the boats and sometimes for transport of fresh fish back to a more distant processing centre.

As elsewhere in Ghana, women are dominant in traditional fish processing and trade – be it in relation to large- or small-scale operations. This position is long-standing as indicated by their traditional roles too (analogous to the Chief Fishermen), which, interestingly, include roles in coastal areas and inland markets (underlining the historical importance of fish trade in Ghana). At landing centres, the "konkohene" (whose role dates to the early 20th century) sets or influences the prices at which fish is sold from the boats – and although these women traders may advance fishing trip costs to boat-operators, which in turn will give them access to that boat's catch, the price-setting mechanism means that they will not buy at the preferential prices that so often result from trader-credit relationships in fisheries. There is some indication of erosion of these systems (e.g., in Sekondi, where prices are negotiated on an individual basis), particularly in places with improved landing facilities – notably where landing fees are payable – or where there are particularly successful and powerful fish mongers.

In Western Region, smoking is the most common form of processing. Women use so-called Chorkor kilns, where fish is slowly smoked on stacked racks, with relatively efficient use of fuel wood, producing a relatively evenly-smoked product. (Fish preparation depends on the size and type of fish).

The economic importance of fisheries in Western Region

A noteworthy point, when describing the local fish economy in Ghana's coastal areas is the number of people that are drawn into related activity and the extent to which it seems to

[9] No fish drying was observed during visits to landings (and adjacent processing areas) in Western region.

[10] This term is used to distinguish these temporary migrants from the long-term migrants in Western Region, where many of the fishing communities have been settled for more than a generation by migrant fishers (often Fante) from other regions. Such short-term migrants or processors visiting for just a few days or less tend to come from Central Region or from other places in Western Region.

drive all other activity[11]. Economic multipliers are generally categorised as: backward (i.e., the supply of goods and services that are inputs to the production process – such as boat-building or fuel); forward (those linked to marketing, such as processing and transport services); and "consumption" (the economic effects of people simply spending their income on other goods and services). A visit to a Ghanaian landing site when boats are unloading reveals an astonishing array of economic activity, with numerous examples of multiple activities that support production, marketing and other economic development in the vicinity (notwithstanding some blurred boundaries between these):

Production

- numerous fishers and deck-hands (large canoes may have a crew of 25) – all paid on a catch share basis
- traders, walking from boat to boat, selling a wide variety of fishing related goods (e.g., raincoats) and other items
- lots of people mending nets (presumably boat-hands)
- an "outboard motor lock-up /guardian" service
- workshops offering outboard repair services
- shops selling spare parts, engine oil, nets
- boat-building activity

Marketing

- fish mongers buying from the boats (large and small quantities)
- porters – ferrying fish to and from the boats and fish mongers (taking a share as payment)
- porters – ferrying the accumulated purchases of the fishmongers to waiting transport or to near-by fish processors
- fish processing sites usually a hundred meters or so away, which in turn create demand for fuel wood and porters to carry wood
- people renting freezer space or selling ice
- hired transport (trucks, minibuses, taxis)
- use of telephone services (mobile and landline)
- small informal guest-houses (or people renting out rooms at home)

Other economic development

- women cooking and selling food (without any premises *per se*)
- people selling "ready to eat" fruit (e.g., peeled oranges)
- other snacks and processed food being sold from stalls
- drinks being sold by ambulant traders
- cafes offering food and drink

[11] 42% of Ghana's population lives within 100 kms of the sea. Whilst clearly reflecting a number of factors (including agro-ecology) the importance of fisheries has also helped retain and attract populations to the coastal zone.

- buildings or tented areas where videos are viewed
- an enormous variety of other consumer goods being sold from stalls or by ambulant traders (clothes, telephone cards, linen, kitchenware, toiletries, maps, books, stationery, jewellery, handbags, medicines, matches, cigarettes, newspapers, ironmonger goods, cassettes and CDs, radio/"hi-fi"s, mobile phones, batteries, plastic bags, etc).
- water trading (fishing boats will carry and fill water containers, for a fee, collecting water from nearby villages where water is less scarce).

This list is only illustrative and certainly not exhaustive. Studies in rural Africa suggest that local agricultural employment and income multipliers are in the range of 2-3 (i.e., new income in a rural area of $1 - perhaps from trading crops - will generate a further $1-$2 through multiplier effects). Local income and employment multipliers are strongest where recipients spend high shares of their income locally. There has been relatively little work done on multipliers in fisheries, but an SFLP[12] study in Ghana suggested that one fishing job created 7 additional livelihoods. The household security effect is even wider – since each of these incomes will help support an extended family. Although fishing is becoming more difficult, there is no doubt that it nonetheless remains a critical economic driver in coastal Ghana.

These livelihood impacts are extremely important – particularly in the context of very limited alternatives for the coastal community. This merits emphasis moreover within the current discourse on "wealth-based fisheries management" which argues that fisheries in Ghana are only marginally profitable at best. Whatever the evidence for and against that position[13], the importance of fisheries as a (direct or indirect) source of livelihood for millions of people in Ghana should not be under-estimated. Statements like the following are often quoted in Ghana:

"As many as 2.2 million people are dependent on the fisheries sector for their livelihoods including some 135,000 fishers in the marine sector…" (p5, Republic of Ghana Fisheries and Aquaculture Development Plan 2010-2015).

Public support for investment in post-harvest infrastructure in Western Region

The Ghana Fisheries and Aquaculture Sector Development Plan (2010-2015) includes targets for the "the promotion of value addition in the fisheries sector and the improvement of livelihoods in the fisheries communities". It outlines three opportunities to add value (reducing post-harvest losses, reducing handling costs and producing higher value products) but warns that careful consideration of sequencing is needed because, whilst fishing remains

[12] Sustainable Fisheries Livelihoods Programme – A DFID/FAO West Africa regional fisheries development programme (1999-2007).

[13] The WorldFish/CRC work in Western Region during 2010 suggests that although many current fishing practices in Ghana are unsustainable, they are nonetheless still highly remunerative.

essentially open access, any increase in value will stimulate further entry into fishing and further increases in effort.

Nevertheless, some early investments are planned – focusing on infrastructure at selected landing sites. Within Western Region, AECID proposes to support cold chain development with cold stores and a fleet of refrigerated trucks planned for Takoradi and Axim (with the intention to lease these to the private sector, according to Sciortino 2010). Normally, it would be assumed that investments of this nature are best left to the private sector. If the private sector is to run but not own these assets, transparent and fair (most likely competitive) leasing arrangements will be needed.

A Ministry of Food and Agriculture/World Bank landing site needs assessment conducted in April 2010 (Sciortino) made the following infrastructure proposals for Western Region:

- solar lighting, an outfall (to divert sewage from the beach) and clean sea water (for washing fish) for Axim and Dixcove
- a new port at Axim (intended for use by naval vessels used for monitoring, control and surveillance).

The MOFA/World Bank infrastructure proposals seem to offer prospects to improve facilities in a way that could have widespread benefits. However, their manner of implementation will influence the scale and distribution of benefits. In landing sites where improved infrastructure has resulted in landing fees, traditional price-setting arrangements have tended to be eroded.

With any such interventions, prospects for a successful outcome are improved where:

- there is a good prior understanding of the existing system
- the intended beneficiaries are consulted and their views taken into account – not just on the initial ideas but on the nature and location of infrastructure (with all due regard for potential for elite capture)
- the institutional arrangements are feasible and sustainable – and these too are worked out in consultation with intended users.

Of possibly greater concern will be the new port, with a naval presence, at Axim, particularly as, over time, this might be expected to take on an additional security role with respect to nearby oilfields. Sciortino (2010) states that it "should be designed exclusively for MCS[14] assets and vessels supporting other sustainable activities, such as cage farming, off-shore services and eco-tourism[15]". Whilst this may create some additional employment opportunities, there may also be sources of conflict with regard to marine access, beach access and competition for marine resources.

[14] Monitoring, Control and Surveillance

[15] Sciortino suggests that offshore services could include logistics, warehousing and diving for the oil industry, as well as support for offshore cage farms, and whale-watching and sports fishing for ecotourism.

Preliminary identification of fish marketing constraints

Stakeholders highlight a number of issues, which require more detailed investigation in the marketing studies planned for Year 2:

- fish mongers lament the lack of affordable credit (which would enable them to purchase and process more fish when it is abundant and cheap)
- some observers report high losses – on boats, at the beach and in transit
- transport and smoking capacity is also sometimes cited as a constraint to the marketing of large catches; and
- market conditions are volatile, allegedly sometimes resulting in failure to sell fish that has been landed

More analysis is needed (planned for Year 2) before making prescriptions about the needs of the fish marketing system. However, a number of points can be made.

First, it is important to stress the point made above: any improvements in the value generated by the fishery, in the absence of any effective resource management, will lead to increased effort. So there are critical sequencing issues to consider.

Second, Ghana has very well-developed, high volume, long distance (including export) market chains for traditional processed products. There is also strong demand for fresh or frozen fish in (nearby) coastal areas. There is nonetheless likely to be considerable dynamism in these systems, in response to strong and growing urban demand and pressure on the resource (i.e., supply constraints). These require careful value chain analysis to identify bottlenecks and constraints, as well as opportunities – noting that these existing systems have considerable worth in their ability to deliver affordable fish to the Ghanaian population and in terms of their high volumes and accessibility (and hence significant contribution to livelihood generation).

Third, Ghanaians consume imported and locally produced fish, sourced from the sea, from freshwater and (to a small but growing extent) from aquaculture. Careful analysis of the market is required, to identify trends in supply and demand, as well as changes in consumption by income group or geographical area.

Fourth, what is meant by "improve" the marketing system? Consideration needs to be given to the range of different benefits the present system delivers – the product range, their prices and quality – as well as what appear to be significant and widely-spread livelihood opportunities. There may well be opportunities to increase value added but it is also important to assess these from the perspective of who will benefit from those opportunities.

Fifth, given the importance and accessibility of the Ghanaian domestic market, this must be an important focus. High value export markets often appear to offer significant rewards but high volume local markets in Ghana are likely to present fewer market access constraints and offer robust and growing opportunities for large numbers of fishers and processor/traders.

Analysis of value chains and markets will be an important focus in Year 2.

5. Stakeholder Analysis

The question of identifying stakeholders – those with a legitimate interest – in fisheries management is a critical step towards establishing effective and credible management structures. This is often not straightforward, however, with small-scale fisheries in particular often blurring the lines between fisheries, conservation, and development, and large chunks of society potentially having an interest in management outcomes.

Evans & Andrew (2009) propose several questions to guide the process of stakeholder analysis:

- Which individuals and groups are involved in the SSF system at the different spatial and administrative scales included within the fishery boundary?
- Who should be included from a social justice perspective?
- Who should be included from a strategic perspective in order to work towards both effective management and resilience of the SSF to external sources of disturbance (including those outside the fishery system)?
- What types of relationships do different stakeholders have?

In the Western Region, in addition to obvious stakeholders directly involved in fishing, fisheries management, and support sectors at different scales, there are a large number of individuals and organizations who are involved in governance structures and/or livelihoods strategies that link to the fishery. These include government officials and agencies, civil society organizations, donors, communities, and non-fishing economic actors at various scales. The degree to which each of these should be included depends on the questions above. Some actors outside of the fishery need to be included either from a social justice perspective (e.g. poor community members who depend on handouts of a few fish from canoes as they land) or a strategic one while others are far enough removed from the fishery that there is no need to consider them direct stakeholders.

As a general rule, the closer to shore the fishery is, the greater the number and variety of stakeholder groups will be. This makes the management of coastal fisheries extremely complex, and the task of balancing often-conflicting needs and interests and ensuring meaningful participation by stakeholders is a daunting one (Jentoft, 2000).

Once stakeholders have been identified, there are various frameworks available for categorising and grouping them. Brown et al. (2002) use a matrix of *influence* and *importance*, sorting actors according to whether they have a high or low degree of influence over fisheries management and are strongly or weakly affected by it. Mikalsen and Jentoft (2001) add a third element, ranking stakeholders by *legitimacy* (similar to *importance* – the degree to which groups have a "legal, moral or presumed stake" in the fishery), *power* (similar to *influence*), and *urgency*, the degree to which groups are able to make claims that "demand immediate attention from managers." (Table 1). It is worth noting that 'legitimacy' here refers only to the degree to which an actor has a stake in the fishery, and says nothing about the nature of the claims themselves.

Scale	Stakeholder Groups	Legitimacy	Power	Urgency
Supra-national	World Bank	Medium	High	High
	NEPAD	Medium	Med-high	High
	FAO	Medium	High	Medium
	USAID	Medium	Medium	Low-med
	DFID	Medium	Med-high	Medium
	AECID	Medium	Medium	Low
	Other donors	Medium	Low-Med	Low
	ICAAT	High	High	Medium
	LME commission	High	Medium	Medium
	International oil companies (+ oil service companies)	Low	High	High
	International fishing companies	High	High	Medium
National	Fisheries Commission	High	Med-high	High
	Fisheries Department	High	Med-high	High
	Environmental Protection Agency	Medium	Med	Low
	Oil negotiators (+ state oil company?)	Low	High	High
	Ministry of Rural Development and Local Government	Medium	High	Low
	National Canoe Fishers' Assn.	High	Low	High
	National Inshore Fishers Assn.	High	Low-med	Med-high
	National Fisheries Assn. Of Ghana (industrial)	High	Med-high	Low-med
	NGOs	Low-med	Varied	Varied
Regional	Fisheries Commission	High	Medium	High
	Fisheries Department	High	Medium	High
	Regional Coordinating Councils	Low	Medium	Low
	NGOs	Low-med	Varied	Varied
District	District Assemblies	Medium	Medium	Low
	District Chief Executives	Low	Medium	Low
	District Department of Agriculture	Medium	Medium	Low
	District Fisheries Management Committees	High	Low	Low
Local	Canoe fishers	High	Low	High
	Chief fishermen	High	Varied	High
	CBFMCs	High	Low	Low
	Fish traders & processors	High	Low	High
	Konkohene	High	Varied	Low
	Traditional authorities	Varied	Varied	Low
	Semi-industrial fishers	High	Med-low*	Med-high
	Industrial fishers	High	Med-high*	Med-high
	Local fisheries service providers	Medium	Low	Low
	Other local economic actors	Low	Varied	Low

Table 1: Fisheries stakeholders

*** Power of individual stakeholders in these groups depends in large part on the degree to which they are connected to politicians or high-level civil servants**

In this framework, stakeholders are separated into three broad groups depending on the salience of their claims. Those who possess all three attributes – legitimacy, power, and urgency – are *definitive* stakeholders, while those with two are *expectant* stakeholders and those with one are *latent* stakeholders. Table 1 shows key stakeholder groups clustered by spatial scale and ranked in terms of their legitimacy, power, and urgency.

Within the category of expectant stakeholders, different combinations of attributes have different implications for fisheries management. Groups that possess power and legitimacy tend to be able to command a good deal of influence, often including formal representation in policy processes. Those with legitimacy and urgency but not power, on the other hand, typically find themselves reliant on either managerial benevolence or alliances with more powerful stakeholders to make their claims heard (Mikalsen & Jentoft, 2001). These are typically among the stakeholders identified by the question of who ought to be included from a social justice perspective, and care must be taken to ensure that their needs are not drowned out by those of stakeholders who possess combinations of either power and legitimacy or power and urgency. Mikalsen & Jentoft (2001) consider this final group – those with power and urgency but not legitimacy – to be potentially dangerous, noting that they may seek to advance their claims through the use of force or coercion.

The interests that different stakeholders hold in the fishery are shaped by the nature of their stake. Economic actors, including fishers, have a financial interest in the fishery, and stand to benefit from either a shift in the distribution of benefits that favours them or an across-the-board increase in profitability. Changes in regulation or enforcement that constrain the fishing activities of some groups more than others will be perceived as unfair by those groups, and will struggle to achieve voluntary compliance, and even those which are equitable will likely be seen by those stakeholders attempting to make a living from the fishery as against their interests. This applies not only to changes affecting fishing practices, but also to those affecting subsidies. Between subsidies and unsustainably high catch levels, there is still money being made in the fishery, and attempts to either lower subsidies and/or catches or to redistribute these revenues are likely to be resisted by those who currently benefit from them. Power within this group is highly variable, with some stakeholders (e.g. poor artisanal fishers with small canoes) all but powerless to advance their claims, and others (e.g. well-connected industrial fishers) able to both influence policy processes and to violate regulations with impunity.

In addition to those with an economic interest in the fishery, some key stakeholders have a legal or administrative stake, having been granted some degree of responsibility for fisheries management by virtue of their job or office. For these stakeholders, the strength of their stake depends on the degree to which the performance of the sector affects their status and/or funding, and the positions they will take in management debates often depends less on their personal views and more on to whom they are accountable. In addition to their interest in management outcomes, actors involved in management, including traditional authorities, government agencies, and co-management bodies also have an interest in pursuing 'system goals' (maintaining existing institutions and structures, consolidating and increasing their power and standing) alongside explicit management goals (Mosse, 2004).

A third group of stakeholders comprises donors and other international stakeholders who, although not themselves located within the fishery, have become involved in management through their partnerships with the Government of Ghana. Their stake in the fishery is a more abstract one. Whereas failures in fisheries management could pose an existential risk to fishers and even the government - destroying livelihoods and undermining possibilities of re-election – the only risk borne by donors is a reputational one. If their approaches fail, they stand to lose face to varying degrees depending on how involved they are in shaping management in Ghana and how important their Ghana activities are to their overall programme. They are among the most powerful stakeholder groups in shaping fisheries management, but also one of the groups least affected by it.

In very broad terms, there is almost an inverse relationship between the degree of influence that stakeholders have over management decisions and the degree to which they are affected by them. Even amongst the fishers, those who are powerful enough to make their voices heard in consultations and public dialogue are often also those who are powerful enough to get away with non-compliance, whereas those who are likely to bear the brunt of enforcement (e.g. small canoe fishers who use monofilament set nets) tend to have little influence. While far from uncommon, this situation raises concerns over the risk of elite capture of not only benefits from donor investments but also of benefits from management reforms that change the distribution of benefits from the fishery itself between stakeholders. Care should be taken in consultation processes and any attempts at reviving co-management to ensure that the voices of those who are strongly affected by management decisions but lacking power to make their claims heard (high legitimacy and urgency, low power) are taken into account.

Constituency building

To move from identifying stakeholders to building a management constituency, it is important to examine the interactions between the different stakeholder groups and the networks, institutions, and decision-making forums in which they must collaborate. While this analysis is beyond the scope of this report, it is worth highlighting some key guiding questions for those discussions (Evans & Andrew, 2009) .

- At which spatial and temporal scales is it useful and necessary to involve different stakeholders?
- In which management functions and stages is it useful and necessary to involve different stakeholders?
- Are the costs of participation commensurate with the value of the fishery?
- Which stakeholders need support to participate meaningfully?
- Is it appropriate and viable to weight local voices to ensure that they are not diluted by more vocal, powerful and experienced stakeholders?
- Are the different types of decision-making forums achieving the expected outcomes? If not, how can they be re-designed?
- Are different knowledge systems incorporated and taken into account in management decisions? If not, how can this be facilitated?

6. Fishing Culture and Traditions

Although the Nzema and Ahanta are the main ethnic groups in the Western Region, fishing communities are more likely to be of the Fante (or Fanti), Anlo-Ewe or Ga ethnic group, particularly in larger communities where economic activities are diverse or where fishing is not as dominant. The Nzemas and Ahantas are generally engaged in other activities outside of fishing (Kraan, 2009) and do not appear to be the dominant fishing group in any community in the Western Region. While the traditions of the Fante are detailed in a variety of sources, there is much less information on the Anlo-Ewe and Ga. Literature on the Fante comes mainly from research in the Central Region, but due to the fact that the Fante have strong fishing traditions which persist wherever they are, it applies to Fante fishers in the Western Region as well.

There are three main traditional institutions that shape life and fishing activity: village chiefs; chief fishermen, chief processors and/or chief fish traders; and, in the case of the Fante, old military companies, known as *asafo* companies.

Village Chiefs

In communities where fishing plays a less important role in the local economy, it is likely that the village chief will be Nzema or Ahanta. Where fishing is the dominant activity, the village chief may be Fante or Anlo-Ewe.

The village chiefs (*omanhene/ohene*) and lineage elders (*beesonfo*) influence the lives of the community in general. There are often seven lineage elders, as the number seven is important among the Fante people, and they are often determined through past military formations, territorial and religious functions, with lineage determining eligibility to these roles. There may also be a female chief at this level, (as is common in Akan societies), called *ohemina*, or queen mother, although their role is limited to women in the community, while the *omanhene*'s is community-wide (Overa, 2003; Odotei, 1999).

Chief Fisherman/Chief Processor/Chief Trader

The institution of chief fisherman among originated among the Fante, but has since been adopted by the Anlo-Ewe and mixed with management structures of the Government of Ghana creating a hybrid form of management among the Anlo-Ewe (Kraan, 2009).

Chief Fisherman

The chief fisherman (*apofohene*) is often accompanied by a council of elders (*beesonfo*), determined in the same manner as those of the *omanhene*. The *apofohene* is determined by either fishing experience and expertise or lineage, depending on the town. Places where the role is determined by merit as opposed to heredity, determination of eligibility can be further divided into towns which allow nomination by all, and those where nomination is limited to certain individuals (Odetei, 1999; Overa, 2000). The council is generally all male, though among the matrilineal Fante, the queen mother female sub-chief can speak on

behalf of women (Odotei, 1999; Marquette *et al.*, 2002). In communities where fishing ranks as one of the most important activities, the *apofohene* may actually be a more important institution than the village chief, with regards to politics and economics, as it is him who negotiates with the Department of Fisheries or the Agricultural Development Bank for subsidized items and then determines who will receive them (Overa, 2000).

The duties of the *apofohene* include negotiations between fishermen, negotiations of conflicts at the beach (e.g. between fishermen and fish buyers), and provision of advice to the fishermen. He is also the religious leader of the fishermen, and together with the priests of the Sea God (*Bosompo*) and of other gods that are relevant to fishing, he performs rituals to ensure good catches (Overa, 2000). The *apofohene* receives a token fee from migrant fishers who come to his town to land fish, and when a migrant crew arrives at a new location the crew must report to the *apofohene*. He also raises some revenue from fines both when fishermen break religious taboos and fisheries laws or regulations. In the periods when premix fuel has been subsidized, the chief fisherman had the authority to issue licenses to the beneficiaries and to distributors of the subsidized fuel (Overa, 2000).

The *apofohene* has a responsibility to work in the interest of the fishermen and will go beyond his own community. As part of his role he will often travel, not only to governmental offices, NGOs and import companies, but also to fishing communities with migrants from his community of origin, although rarely outside of Ghana. Additionally, his authority can reach migrants through his own messengers and through collaboration with both migrants' leaders and local leaders of the host community (Overa, 2000).

Chief Fish Processor/Chief Fish Trader

According to Odotei (1999), there are two public offices for women in Fante fishing communities. These are: 1) The Chief Fishmonger/Processor *Konkohene* and her council (*Beesonfo*) in coastal communities; and 2) The Chief Fish Trader *Konkohene/Konkohemaa, Enamhemaa* and her council (*Beesonfo*) in inland markets. The primary difference between these two figures is their location, and the duties which stem from this.

The Chief Fishmonger/Processor (with her council of seven elders) influence the price of fish, represent the interests of women in bargaining, and settle disputes between women competing over the purchase of fish. Additionally, she settles cases of debts between men and women (and between women), and assists with contributions of cash or kind to ritual performances for the Sea God (Odetei, 1999). Fishermen may also go to her with issues of quality and price. In conflicts between fishermen and female fish traders, the *konkohene* represents the traders (with the *apofohene* representing the fishermen), hears the case, negotiates, and decides with the *apofohene* on the best action to take in order to solve the matter. The *konkohene* is often called upon to give advice to the *apofohene* (Overa, 2000; Lenselink, 2002).

The *konkohene/enamhemaa* or Chief Fish Trader in the market (communities not directly on the coast) is responsible for the solution of problems related to travelling, transport of goods, selling and debt collection (Odotei, 1999). Her role also includes acting as an intermediary between fish traders and local traditional authorities, as well as presenting fish

to the traditional authorities during festivals, ritual occasions, funerals and when official guests visit the town.

In a study in of Moree, a coastal town in the Central Region, Overa (2000) found that the *konkohene* in Moree mentioned the decline of her influence since many of the most influential fish traders now own canoes as well, and, as canoe owners, are also represented by the *apofohene*. Additionally, since the *apofohene* is recognized by the state and other external agencies as the community's representative in all fishery related matters, the *konkohene* has little influence beyond the female field of fish traders (Overa, 2000).

Asafo Companies

The *asafo* companies were originally ward-based military defence groups, dating from the early 18th century (Shumway, 2001). Membership in these groups is passed down paternally. Each town has a number of *asafo* companies, to a maximum of seven, which are led primarily by a position called the *supi* (a male), as well as several *safohene*, which can include both men and women. Each *asafo* company has a women's division, the *asafo akyere*. In some towns there may exist an overall leader of all the *asafo* companies in the town, a *tufuhene*.

The *asafo* companies can mobilize their members to gain collective support for an issue or on an action, perform communal labour, and to issue warnings of danger (e.g. a fire, cholera outbreak). Crime is often reported to the *supi* and his board of elders. The asafo companies organize elaborate annual festivals, and migrants travel long distances to attend the *Abangye* festival in August. The festivals provide an opportunity for migrants to retain some of the links with their home town (Overa, 2000). Conflicts over access to resources and power, such as chieftaincy conflicts, may be relegated to *asafo* leaders, who can use their positions to mobilize their members' support (Overa, 2000).

Additionally*, Asafo* companies may be particularly important for migrants, as the main companies all have representatives in major migrant settlements. Upon arrival, migrants are asked about which town they come from and of which *asafo* company they are members (Marquette *et al*., 2002). Additionally, canoes are often decorated with colours or symbols[16] which communicate the specific companies to which one belongs[17] (Gray, 1996).

[16] By *asafo* company, the canoe symbols are as follows: Company 1(Bentsir): snake beating a fish; Company 2 (Anafo): an eagle; Company 3 (Nsin/Ntsin): a ship or canoe motif; Company 4 (Nkum): an elephant; Company 5 Aborofumba/Aborofunkwa): a clock; Company 6 (Akrampa): a sword or tiger; and Company 7 (Amanfur): a whale (Gray, 1996; Perkins, 1994).

[17] While many canoes are decorated in relation to membership *asafo* company this is not necessarily the primary factor in deciding how to decorate one's canoe. It is also likely that they will be decorated with the symbol of their favourite football team, the flags of foreign countries, scriptures from the bible, and other quotes or phrases.

In many coastal Fante towns there is an ongoing struggle between various factions of *asafo* companies, with some receiving the support of the *omanhene*, and others mobilizing through political parties (Overa, 2000).

Traditional Institutional Relationships

Price Setting

In most landing sites, the price of the catch is negotiated collectively by the *konkohene* on behalf of the women. This may be a negotiation between the *konkohene* and *apofohene* (Britwum 2009) or between the *konkohene* and the first crew to land a given species (Odotei, 1999). Once negotiated, prices may prevail for anywhere between a day and a week, depending on the stability of catch and the landing site in question.

Migration

Ghanaian fishermen have migrated for decades to accumulate material wealth, and long-term stays away from social and economic obligations create the possibility of accumulating savings. The primary goal for migrant fishermen and fish traders is to invest these savings in their home town to enhance the well-being of their family (Marquette *et al.*, 2002). Migration is seen as an essential part of being a professional fisherman or fish trader. In Ghana the ethnic-technical division in the artisanal sector creates specialised niches along the coast. The different fishing techniques used by different ethnic groups use different fishing zones at sea, partly targeting other species, reducing somewhat the potential for conflict between different migrant groups or between migrants and locals.

When fishers migrate to other destinations both inside and outside Ghana, their traditional institutions and their regulatory powers are recreated or extended to their new location, particularly among the Fante, who are known for having strong institutionalised fishing traditions. The migrant *apofohene* and *konkohene* also work with their counterparts in the town. If they face problems in the migrant settlement that are too complicated to be solved on their own, they can refer the issue back to the *apofohene* or *konkohene* in their village of origin. The fishing companies linked to *asafo* military divisions are also important among migrants, and the main ones all have representatives in major migrant settlements. (Marquette *et al*, 2002).

One notable exception to the replication of home-community institutions in new locations is in fish trading, as local women in host communities generally process and sell the catch, instead of the wives of crew. Fish caught by migrants generally enters the market chain through their fish wholesaler or fish mammy (*maame nyi*). This is not uniform across gear types, however. When the canoe is fishing with *ali* nets, fish is sold to local women as described above, and wives generally do not accompany crews. When migrants use *tenga* set nets, the disposal of the catch follows a different system. The wives of the canoe owner, net owners, and the crew may join their husbands and are able to process and sell catch. When fishers bring along both types of nets the fish caught with the *ali* nets cannot be bought by the fishers' wives unless a special arrangement is made with the *maame nyi* (Marquette *et al*, 2002).

Cultural Symbols

The golden stool is symbolic of power, an all chiefs and queen mothers sit on them to emphasize their roles and the power that is associated with them (Gray, 1996). It is called "enstooling" when a chief is placed into their role.

The wooden paddle is another symbol, which the chief fishermen (*apofohene*) use to summon people. The *apofohene* will often give it to his spokesman when he needs to speak to someone, who will go to that person and show the paddle. The person must report to the chief, and if he/she does not, they risk being arrested (Gray, 1996).

The Sea God, Bosompo, is one of the main divinities in Ghanaian traditional religion, and the prohibition on fishing on Tuesdays in many communities is in his honour. In all Akan culture (of which the Fante are part), nature is believed to be capable of having its own power and spirits. Other gods that are important to fisheries are the God Almighty (*Onyame*), the God of Thunder and Lightning (*Osor Nyansrama*), and the Earth God (*Efua*). The sea is acknowledged as a god containing lesser gods. The function of the Sea God is important as the fishermen believe the abundance or scarcity of the fish depends on the Sea God. In cases of scarcity the *apofohene* and his council are expected to consult the God to ascertain what he wants as pacification and offerings are also made annually.

Involving Traditional Authorities in Fisheries Management

An obvious question in a place like the Western Region where there is a strong presence of both traditional and modern fisheries management institutions is where the balance between the two should lie and how responsibilities should be divided between them. Traditional authorities are key figures in both fishing and in community life more broadly, and, despite having been weakened somewhat over the years, traditional practices and beliefs remain strong. While it is clear that these institutions have an important role to play in fisheries management, it is not always as clear what that role should be, and the incorporation of traditional structures into modern ones is not unproblematic.

Traditional authorities generally command quite a lot of respect within their communities, and chief fishermen in particular have well-established roles as both a leader of fishermen and as their representative. This makes them critical actors to engage in both consultation processes and in the implementation of fisheries policy. Participation of chief fishermen in policy formulation can give fisheries regulations a degree of legitimacy in the eyes of fishers who respect the authority of the chief fishermen, as can their support and involvement in implementing and enforcing regulations. In some cases, as discussed in example presented above where fishermen swore oaths to the Sea God to not use dynamite, chief fishermen may also be able to invoke their religious authority to support compliance with regulations.

There are questions, however, around how accountable traditional authorities are to their constituents and to what extent they represent the interests of all fishers. The unelected nature of many traditional authorities limits possibilities for accountability, and tends to result in highly variable effectiveness, with outcomes often depending more on the

individual personalities and aims of each chief than on the democratic will of those who they represent.

Interventions which channel support through chief fishermen and are overly dependent on them for information may become vulnerable to elite capture, while those which seek to bypass traditional authorities in the name of democracy may find themselves unable to operate effectively without the support of these highly respected public figures.

The balance which must be struck, then, is how to involve traditional authorities in a way which provides structures to incorporate their insights and understanding of the communities they represent, but which also provides channels for ensuring that the poor and vulnerable are able to participate fully and that their interests are well represented as well.

7. Institutional and policy context for fisheries development in Ghana

This section first describes the main emphases of Ghana's Fisheries and Aquaculture Sector Development Plan (2010-2015). It then briefly summarises the roles of the main public organisations whose remit covers fisheries and outlines the interests of key donors. This section complements the review of fisheries management regimes and traditional fisheries institutions in sections 4 and 5, as well as the stakeholder analysis provided in the previous section.

Fisheries and Aquaculture Sector Development Plan (2010-2015)

The plan was developed by the Ministry of Food and Agriculture over the course of 2009 and 2010, in consultation with in-country stakeholders and the World Bank. It is set within the overall context, and seen as a contributor to the achievement of the 2nd Ghanaian Poverty Reduction Strategy (GPRSP II). GPRSP II aims to double the size of the economy and raise per capita income to middle income levels by 2015.

It is argued that the contribution that the fisheries contribution to GDP (4.5%) may be unsustainable under the current management regime. The plan proposes that high costs (including subsidies) coupled with stagnating or falling catches have led to steadily declining profitability and increasing levels of poverty among fishermen. It argues that with improved management Ghana's fisheries could generate at least $300 million in profits each year. Four policy areas and associated 5-year targets are proposed, as detailed in Box 4 below.

Box 4 Fisheries and Aquaculture Sector Development Plan	
Policy strategic areas of focus	**Five year target**
Policy area 1: management of fisheries, conservation of natural resources and protection of their natural environment	1. volume of capture fishery production maintained (no fish stock collapses)
Policy area 2: the promotion of value addition in the fisheries sector and the improvement of livelihoods in the fisheries communities	2. value of annual fish income increased by US$50 million from value added projects 3. fisheries sector achieving annual surplus of income over costs of US$50 million from value added projects and efficiency gains

	4. Ghana (port of Tema) remains a landing processing hub within the West Africa tuna fishery
Policy area 3: the sustainable development of aquaculture	5. Aquaculture production has expanded 10 times by volume (35,000 tonnes)
Policy area 4: the improvement and sustainability of services provided to the sector by the Fisheries Commission and the other supporting institutions	6. Fisheries management and compliance systems are in place to allow effective control of all the commercial fishing effort in Ghana 7. Government of Ghana fisheries management costs are self-funded (fisheries sector overall makes a fiscal contribution to Government revenues)

The defining characteristics of the plan can be described as a heavy emphasis on the need for effective fisheries management, the intention to increase value added generated by the sector (though not to do this whilst the fishery remains effectively open access, since that would only increase the incentive to fish more) and greater recognition of the role of aquaculture. The plan tables the need for a reduction in fishing effort (a politically sensitive issue in Ghana), but notes issues of timing and pace ("… to ensure that alternative livelihood and / or compensatory support can be provided to complement such change.") It is noteworthy that new fisheries regulations were passed by Parliament and came into law 1 August 2010 – seeming to signal an intention to promptly follow through on the policy.

The Fisheries Administration

Over the last ten years there have been a number of changes in the Ghanaian Fisheries Administration.

- The Fisheries Commission (FC) was created by the Fisheries Commission Act (1993) and was originally housed within the Ministry of Food and Agriculture (MOFA). The Commission was headed by a Chairman and had a secretariat and a directorate, comprising five divisions
    - Marine Fisheries Management
    - Inland Fisheries Management (including Aquaculture)
    - Marine Fisheries Research
    - Monitoring, Control and Surveillance, and
    - Finance and administration.
- With a new Government in 2001, the Fisheries Commission collapsed although the Fisheries directorate still existed within the MOFA.

- The Fisheries Act of 2002 expanded the functions of the Fisheries Commission, giving the FC the power to develop regulations and manage fisheries development funds
- In 2005 the Ministry of Fisheries was created and in August 2008 a new Fisheries Commission was created (based on the 2002 Act), with a remit that included the provision of advice to the Minister.
- The new Government that took office in early 2009 dissolved the Ministry of Fisheries and the FC and placed Fisheries back within the MOFA; a new Fisheries Commission was then re-established there (1 September 2009).
- The development of a new sector plan was quickly followed by Parliament passing new fisheries regulations which officially became law 1 August 2010. These do not change the administrative structure for Fisheries, although they do add clarity to role and remit of some parts of the administration. (More detail on their scope is provided in Section 4above).

The FC chairman would usually be a political appointee (though not necessarily an MP) and the Directorate/Division heads are civil servants. Nevertheless, with a change in Government, some of the senior civil service positions tend to change. The Fisheries Commission has a regional structure too and the regional heads of the FC are considered more senior appointments than the Division heads within the Directorate (although the latter are also viewed as desirable and influential positions by virtue of their location close to the "centre" in Accra or Tema).

As is quite common in fisheries, administrative resources are stretched (particularly at regional level), but the sector does wield political clout on account of the apparently powerful industrial interests (both in fishing itself and in tuna processing at Tema), the importance of fisheries in GDP and because the canoe fishers are a numerically important constituency. (Their vote and the new Government's promise to maintain the pre-mix subsidy were important factors in the close elections of end-2008).

Other public sector organisations with an important fisheries role

The **Environmental Protection Agency** (EPA) is the leading public body for protecting and improving the environment in Ghana.

The EPA seeks to[18]:

- Create awareness to mainstream environment into the development process at the national, regional, district and community levels;
- Ensure that the implementation of environmental policy and planning are integrated and consistent with the country's desire for effective, long-term maintenance of

[18] http://www.epa.gov.gh/index.php?option=com_content&view=article&id=46&Itemid=53. Accessed 20 September 2010.

environmental quality;

- Ensure environmentally sound and efficient use of both renewable and non-renewable resources in the process of national development;
- Guide development to prevent, reduce, and as far as possible, eliminate pollution and actions that lower the quality of life;
- To apply the legal processes in a fair, equitable manner to ensure responsible environmental behaviour in the country;
- Continuously improve EPA's performance to meet changing environmental trends and community aspirations;
- Encourage and reward a commitment by all EPA staff to a culture based on continuous improvement and on working in partnership with all members of the Ghanaian community

Its work impinges on fisheries particularly in the context of the environmental impact assessments (EIAs) required for marine developments including the exploitation of off-shore petroleum resources; and the EIA's required for large-scale aquaculture development. The Ministry of the Environment is also represented within the Fisheries Commission.

Several public entities provide research, consultancy and advisory services relating to fisheries. Ghana's **Council for Scientific and Industrial Research** includes the **Water Research Institute** (WRI[19]), whose fisheries focus is mainly freshwater fisheries and aquaculture, whilst the **University of Ghana** at Legon and **University of Cape Coast** provide short course and degree-level training programmes and conduct fisheries research. The WRI and universities collaborate with other organisations in Ghana and overseas to host fora on specific topics and to provide advice and consultancy services to Government, to donors and to other organisations with fisheries interests.

A number of other public organisations – both central and decentralised – have roles that impinge on fisheries. For example, at the launch of the New Fisheries Regulations in August 2010, a police representative announced the establishment of marine police in Ghana. Queries from fish processors, at the same event, were answered with reference to the work of the Ministry of Trade and Industry and the Ghana Standards Board.

At the district level, the **District Assemblies** are responsible for fisheries management, and their power to pass local bylaws includes fisheries bylaws (see discussion on decentralisation in Section 3 for more detail).

[19] There are also regional and continental umbrella research organizations: the West and Central African Council for Agricultural Research and Development, based in Dakar, and the Forum for Agricultural Research in Africa, based in Accra. In the past, neither organization has had a strong focus on fisheries and aquaculture, though both are now trying to develop stronger capacity in this area.

Important Fisheries Donors and Regional Organisations in Ghana

The **FAO** has had a long-standing presence in Ghana, where it has both country and regional offices. It provides important support to fisheries and aquaculture, including stock assessment (periodic surveys conducted from the Friedhof Nansen research vessel), capacity development for data collection, policy advice and the management of a regional project on Tilapia in the Volta Basin "TiVo" (current). It also implemented the DFID-funded 1997-2007 Sustainable Fisheries Livelihood Programme (a regional initiative that sought to promote a more integrated poverty-focused approach to fisheries planning and development).

The **World Bank** is a key donor to Ghana's fisheries sector at present, providing support to policy and regulatory processes (see above), as well as technical assistance to scope out important new investments to be funded as part of a major new loan expected in 2011. (In the late 1990s it also funded a fisheries management capacity development project – see section3) The present activities are part of a World Bank West Africa Regional Fisheries Programme (WARFP), covering the stretch from Mauritania to Ghana, which has country components (referred to as "vertical" programming) and country-group activities ("horizontal" programming). Planned WARFP investments are organised under 4 headings:

- good governance and sustainable management of the fisheries
- reduction of illegal fishing
- increasing the contribution of marine fish resources to the local economies, and
- co-ordination, monitoring and evaluation, and project management.

Funding of WARFP in 9 countries for five years commencing in 2008 is expected to be of the order of $100 million (WARFP programme brief, December 2009).

The World Bank also supports fisheries projects through the Global Environmental Facility (GEF). The regional "Guinea Current Large Marine Ecosystem Commission" is now based in Ghana (having formerly been hosted by Cote d'Ivoire) with funding from several sources including GEF. The goals of this 16 state programme are:

- recover depleted fish stocks,
- restore degraded habitat,
- reduce land and ship-based pollution
- create an ecosystem-wide assessment and management framework for sustainable use of living and non-living resources in the GCLME; and
- establish viable regional consultative and coordination mechanisms for joint actions in transboundary management of the GCLME including a Guinea Current Commission

DFID has historically been an important donor in Ghana. Its recent support for fisheries development in Ghana is seen in the funding of the Sustainable Fisheries Livelihood Development Programme (see above) and its support through **NEPAD** to combat Illegal, Unreported, and Unregulated (IUU) fishing and other activities closely linked to the priorities recently identified by the MOFA with World Bank support. In the 1990s it also funded work on improved post-harvest handling in Ghana's fisheries.

The Spanish donor **AECID** has recently provided support to fisheries and aquaculture development in Ghana, via its support for cold chain development (see Section 6) and its funding of the TiVo project mentioned above.

8. The Way Forward

The nature of the challenge

Clearly any attempt to promote fisheries development and fisheries management reform in Western Region must address a wide range of issues, which can broadly be categorised as follows:

- developing an improved understanding of the dynamics of the fishery, in all its multi-dimensional and complex nature
- working towards a solution for improved management of the marine fishery
- promoting pro-poor livelihood opportunities for coastal communities, and
- building a stronger and more informed constituency to tackle these issues in transparent and equitable ways.

Given the combination of current biophysical and institutional changes and the prominence of external drivers such as climate change and market forces, it is clear that if the fishery in the coastal zone of the Western Region is to continue to play a central role as a major source of livelihoods and key driver of the economy, its ability to absorb shocks and adapt to change will be critical. The system at the moment is very limited in its ability to respond in a productive way to change, with inflexible and ineffective management structures, few livelihood alternatives, and few channels for communication and learning. Indeed, any notion of intentional response to change or crisis in extremely limited. Traditional governance institutions have been undermined by the notion of top-down control, yet the latter has proven almost entirely ineffective.

Severely compounding governance issues the current incentive structure strongly favours non-adaptation, with institutions invested in maintaining their current structures and power and subsidies supporting people to NOT change rather than to adapt to the changing world around them. Strong, adaptive institutions need to be fostered, with options including adaptive co-management, diversified livelihoods, and (if subsidies are to be used) subsidies which support people to adapt rather than to maintain the status quo. Significant challenges to the development of these institutions and management systems include poor relationships between stakeholders and weak legitimacy of current and historical management initiatives and structures.

Given the legacy of unsuccessful initiatives (e.g. CBFMCs) and regulations which are perceived as unfair and arbitrary (e.g. minimum mesh size), it is critical that future initiatives be well thought out and firmly grounded in an understanding of likely impacts, including indirect and unintentional impacts, and are based in meaningful engagement with fishing communities. There is a very real danger that some of the initiatives currently underway – such as the new regulations or attempts at reviving CBFMCs – could fail if they neglect either the complexity of the system which they seek to change or the interests and concerns of those who depend on the fishery. Such a failure would further undermine the credibility of

fisheries management in the Western Region and the rest of Ghana, making it even more difficult for the Fisheries Commission to forge the sort of constructive relationship with resource users which is a necessary foundation for effective management.

Such communication channels and mutual trust need to be developed not only between the Fisheries Commission and fishers, but between fishers as well – particularly the different fleets. Stakeholder interests and relations are currently characterised by conflict and by serious collective action problems. These form a major impediment to achieving voluntary compliance to any sort of management measures; everyone feels they will lose out by complying when no one else is. Credible mechanisms need to be established for mediating conflicting interests of the different fleets and creating sufficient trust between stakeholders for compliance.

In this context, enforcement activities become necessary to the extent that they support credible commitments to voluntary compliance – fishers will be more likely to cooperate with management measures if they believe that violators will be caught and punished – but they are certainly not sufficient for a well-managed fishery. Moreover, without also creating the conditions for voluntary compliance, the enforcement burden will quickly become unsustainable. The focus of enforcement activities needs to be on facilitating voluntary compliance, and not on punitive sanctions, particularly as an overly confrontational approach risks further alienating fishers, many of whom see quite a few of the rules as unfair and illegitimate. A further danger of a focus on enforcement is the risk that poor artisanal fishers will bear the brunt of it. Well-connected industrial and semi-industrial fishers have long been able to violate rules with relative impunity, banking on the scarcity of enforcement patrols and their ability to escape sanction with a well-placed phone call. An enforcement drive in a fishery where nearly everyone breaks the rules but where fishers vary widely in terms of the amount of influence they wield and the degree to which they are 'above the law' raises serious equity concerns.

The lack of safety nets and support structures for the protection of the poor raises further concerns in a context where the fishery on which they depend is undergoing major changes, most of which will leave many stakeholders worse off. These changes include declining fish stocks, increasing effort, climate change, oil exploration and production, and fisheries reform initiatives, among others. It is worth highlighting that any reform, by its very nature, entails a reconfiguration of the benefits of the fishery, resulting in winners and losers. Given that richer, more powerful stakeholders are better able to make their voices heard both within and outside of formal consultation processes, there is a strong chance that many of these changes will be to the detriment of the poor, who, in the absence of any sort of safety nets, will find themselves with few options as their livelihoods become less and less viable.

The challenges, therefore, are immense. What are the options for fisheries management structures which provide the flexibility and adaptability needed, in a context where communication and trust have broken down, fish stocks are overexploited, and stakeholders are characterised by vast inequalities in terms both of their assets and resources and the amount of influence they command? Any management initiative must be clear on what it is trying to achieve and which institutions and structures will lead to the realisation of those

goals - rather than starting from the assumption that a particular configuration (e.g. co-management) is desirable - and be based on serious and inclusive discussions around the challenges that this will face and how they can be overcome.

Improved understanding of the dynamics of the fishery

Much remains unknown about the structure and feedbacks of the fishery, though it is clear from even a very cursory glance that it is a highly complex system. Several distinct fleets operate in the coastal zone, often overlapping in terms of where they fish, the gears they use, and the species they target. Little is known about the factors which influence their fishing strategies or about key (ecological and social) drivers which shape outcomes. Further research is needed to understand fisher behaviour, market dynamics, and the ecology of the fishery, among other things.

The introduction of management measures without a more complete understanding of the fishery can lead to unintended, unpredictable, and possibly undesirable results, as the rest of the system adjusts to the change. Much of the information that is required for a better understanding of the fishery in the Western Region is likely to be similar all along the coast, providing opportunities for scaling up findings to the national level relatively easily.

Recommendations:

While the quantity and quality of data demanded by the models used in conventional fisheries management are rarely, if ever, available in developing countries, there is quite a lot of information that would be feasible to collect and very useful for informing management decisions. This includes:

- An understanding of the determinants of fisher behaviour and decision-making, which can provide a foundation for modelling changes in fishing effort in response to both management measures and other key drivers
- Development of meaningful indicators (of change, health of the fishery, effectiveness of management measures) which can be monitored in partnership by communities and the DoF
- An refocusing of data collection activities at landing sites to include the collection of management-focused information (including data on effort and monitoring of the above-mentioned indicators) in addition to the production of national fisheries statistics
- An analysis of likely impacts of management measures introduced by the new fishing regulations. In particular, the question of whether a ban on light fishing will lead semi-industrial vessels to trawl in the off-season, putting further pressure on already overexploited demersal stocks
- An assessment of likely biophysical and social impacts of proposed management measures, including closed seasons and areas (Which configurations would be acceptable to /respected by communities? Which configurations would allow which fish populations to regenerate?) and banning light fishing (what is the impact on fish

populations of using light to catch them in the off season and how does this change with a ban?) .

Towards a solution for improved management in the marine fishery

The shift from an open access fishery to a sustainably managed one is one of the biggest challenges facing fisheries in the Western Region and Ghana as a whole. On the one hand, the fishing communities have a strong sense of self-identification as fishers and feeling of entitlement to fisheries resources, and access restrictions are likely to be resisted. The migratory nature of fishers and the lack of an appropriate legal framework further complicate attempts to control access. On the other hand, despite the fact that it is well established that top-down, command-and-control approaches to fisheries management will not work in this setting, alternatives are not straightforward to implement and are often resisted by managers who may be reluctant to see their remit shrink and power become increasingly shared between stakeholders. Participation during the CBFMC project was instrumental at best, with the DoF hesitant to grant any substantive powers to communities or even districts. Increased participation also brings with it the risk of elite capture, and the effectiveness of past measures has often depended on the individual personalities and priorities of chief fishermen rather than involving a broader segment of the community.

Moreover, a fishery in crisis is a particularly difficult context in which to introduce management changes. The rapid decline in the resource makes managers prone to heavy-handed measures with an emphasis on punitive enforcement at the same time as it makes fishers even more resistant to effort-limiting measures as they feel a need to increase effort in order to maintain their catches. These conflicting objectives lead to a breakdown in the very trust and communication that must form the basis of the collaboration required for any sort of effective management, as managers increasingly see fishers as “the problem” rather than as resource users, and fishers increasingly see managers as arbitrary and regulations as illegitimate.

Recommendations

Whatever form fisheries management in the Western Region and in Ghana takes, in order for it to be effective, it must be *adaptive*. Management measures must be flexible enough to adapt as the fishery undergoes further changes, and management structures must be organised in a way that facilitates recognising and understanding these changes. Feedback mechanisms that provide the raw material for targeted adaptation must be a central component of management systems and institutions. A number of things are necessary for such systems to work:

- Structures to facilitate two-way communication between stakeholders, including fora for conflict resolution, meaningful consultation processes, and an emphasis on ensuring that the voices of the poorest and least influential stakeholders are also heard

- Mechanisms for encouraging voluntary compliance and mutual self-enforcement, as excessive emphasis on punitive enforcement will not only prove unsustainable, requiring permanent commitment of significant resources for patrolling, but will further contribute to the breakdown in the relationship between fishers and managers
- Institutions to facilitate iterative and collaborative learning and evaluation, with the flexibility to easily modify management measures in response to either changes in the fishery or the realisation that existing measures are not working.
- Appropriate legal frameworks delineating rights and responsibilities of all stakeholders in a nested system of adaptive management
- Collective action within fishing communities to build trust and increase confidence in the commitment of other fishers to compliance. This must cross fleet lines as it is particularly critical to achieving voluntary compliance that stakeholders with conflicting interests – industrial and canoe fishers, for example – be able to trust that their counterparts will abide by the rules.
- Appropriate incentives to create 'buy-in' to the idea of managed access by ensuring that fishing communities reap the benefits of controlling access to the fishery.

Promoting pro-poor livelihood opportunities

The marine fishery supports numerous livelihoods – in fishing, in the supply of fishing inputs/services and in the marketing chain. In addition, this income – much of which is spent locally – drives wider economic development in the community. Whilst those who own larger boats and gear, and those who trade large quantities of fish, are not poor, many of the other livelihoods supported are pro-poor (e.g., casual labouring and deck-hand opportunities, as well as low volume trading of fish and other goods and services). Yet these livelihoods are threatened: the fishery itself is under pressure, whilst steadily increasing demand and new investment (e.g., at landings and in cold chain infrastructure) are leading to changes in the marketing chain. Given the importance of fishing to livelihoods in coastal areas, an improved understanding of how these trends and changes affect fish-based livelihoods, and identifying the best opportunities for livelihood promotion (in fisheries and in other sectors), are critically important components in promoting development in Ghana's Western Region.

Recommendations

The importance of sustaining livelihood opportunities in populous and poor coastal communities points to the need for work on a number of related issues:

- analyses of the most important existing (a) value chains and (b) markets, to identify opportunities for (and constraints to) pro-poor growth and inform the development of pilot value chain "interventions" (this word is used advisedly, stressing the importance of using facilitative approaches in market chains, that enable private actors to develop and seize opportunities themselves);
- timely analyses of the livelihood impacts of significant planned or mooted investments (e.g., new port or post-harvest infrastructure) targeting the fishing

economy in Western Region and identification of key levers that would improve the poverty impacts of such investments; and

- investigation of opportunities for collaboration and promotion of pro-poor livelihoods in coastal areas unrelated to fishing. (See the WorldFish report on livelihood diversification opportunities which identifies two potentially sectors – tourism and oil – both of which will require very careful management if they are to result in pro-poor livelihood opportunities for local residents).

Building a stronger and more informed constituency

This report and other work by ICFG have highlighted a number of seemingly intractable issues and strong but largely irreconcilable views held by different stakeholders. There are also areas of sound policy, but weak follow-through, areas of overlapping mandates or structures that are not internally consistent (in terms of objectives and incentives) as well as policy issues on which there is insufficient debate between different groups of stakeholders. To give just a few examples:

- the pre-mix subsidy – clearly an economically unhelpful instrument that is nonetheless viewed by many as politically critical and hence non-negotiable;
- the risk that the fishing regulations will be disproportionately enforced against canoe fishers relative to the larger vessels; the latter have historically largely escaped penalty, with charges inexplicably withdrawn or special pleas made on their behalf;
- the negotiations with the oil companies – that allegedly include a strong focus on "local content" (usually meaning host country content in the supply of the required goods and services) but little apparent emphasis on truly local input and the mechanisms that would be required to support that (again – see the separate WorldFish report on livelihood diversification opportunities);

Some of these issues will not be easily resolved at all – since most will result in "losers" as well as "winners" and those able to will attempt to defend existing powers or privilege. However, for any process of reform and development to be effective, an enabling institutional environment is required, in which there are not only shared goals but also people and systems that work in support of those goals. A critical building block in this process is to identify and tackle some of the key "sticking points" that result in institutional inertia or resistance in the implementation of reform.

Recommendations

Building a stronger and more informed constituency to tackle these issues in transparent and equitable ways points to the need for a multi-pronged approach, including:

- undertaking and profiling sound and impartial analysis of key issues, possibly involving key players as contributors or discussants;
- convening workshops, field trips and exchange visits to promote dialogue and a shared understanding of key issues; and

- identifying champions to lead informed debate and help build consensus on critical issues.

Time for change

Whilst this report goes some way to explain the complexity and difficulties facing any attempt to reform the marine fisheries management and development path in Ghana, the current situation is marked by both concerns over the state of the fishery and reasons for optimism about the potential for introducing key reforms.

There is tremendous interest in the fishery at the moment, and all stakeholders recognise its key economic and livelihood roles. An alliance of interests appears to be forming, with funding becoming available to support changes in fisheries management, new fisheries regulations being introduced, and clear interest on the part of a range of stakeholders in acting now to ensure the sustainability of the fishery. There is a critical role for ICFG and its partners in helping facilitate that dialogue and making sure that voices of key stakeholders are heard and that the fishery is able to deliver on its critically important economic and livelihoods potential, particularly for the many poor people who depend on it.

The recommendations made in this report will contribute to that vision, working towards filling critical knowledge gaps and creating conditions for effective management, creating pro-poor livelihood options in coastal communities, and building a constituency for change based on participation of and dialogue between the diverse stakeholders of the coastal zone of the Western Region.

Bibliography

Aggery-Fynn, J. 2007. The fishery of Balistes capriscus (Balistidae) in Ghana and possible reasons for its collapse. PhD Thesis. Center for Tropical Marine Ecology, University of Bremen

Anon., 2009, Introducing the West Africa Regional Fisheries Program (World Bank, mimeo).

Atta-Kesson, R. & Atuguba, R.A., no date. Of fish, fishing, fisherfolk, the law, and fishing institutions. Corporate Social Responsibility Movement (CSRM). http://www.revitalization.org/csrm/Documents/LEGAL_FRAMEWOK_OF_FISHERIES_IN_GHANA_ArticleFINAL_with_BIBLIOGRAPHY.doc [Accessed 17 April 2010].

Atta-Mills J., Alder J., Sumaila U.R (2004). The decline of a regional fishing nation: The case of Ghana and West Africa. Natural Resources Forum 28, pp 13-21.

Ayee, J., 1997. The Adjustment of Central Bodies to Decentralization: The Case of the Ghanaian Bureaucracy. African Studies Association, 40(2), pp.37-57.

Bakun, A. 1998. Ocean triads and radical interdecadal stock variability: bane and boon for fishery management science. In Reinventing Fisheries Management, pp. 331–358. Ed. by T. J. Pitcher, P. J. B. Hart, and D. Pauly. Chapman and Hall, London.

Bannerman, P.O., and Cowx, I.G. (2002) Stock assessment of the big-eye grunt (brachydeuterus auritus, Val.) fishery in Ghanaian coastal waters. Fisheries Research 59, pp 197-207.

Bannerman, P and Quartey, R. Undated. Report on the observation of commercial light fishing operations in Ghana, February to June 2004. Marine Fisheries Research Division, Tema.

Bard, F.X. and Goran, N.Y.N., 2001. Evolution of fishing effort of gill netting canoes targeting large pelagic fish in the Gulf of Guinea. Collective Volume of Scientific Papers, ICCAT 52, 483-487

Braimah, P., 2009. Lessons from previous experience of co-management initiatives in fisheries in Ghana. Accra: World Bank.

Britwum, A.O. 2009. The gendered dynamics of production relations in Ghanaian coastal fishing. Feminist Africa. Issue 12. 2009.

Brown, K., Thompkins, E. & Adger, N., 2002. Making Waves: Integrating coastal conservation and development. London: Earthscan Publications.

CRC, 2009, The Integrated Coastal and Fisheries Governance Program for the Western Region of Ghana, Phase 1 Implementation Plan 1/1/2010-30/9/2010

Cury, P. 2004. Comparison of the Ivoiro-Ghanaian Fishery with other exploited upwelling systems of the world. In F.X. Bard and K.A. Koranteng (Eds) Dynamics and Use of Sardinella Resources from Upwelling off Ghana and Ivory Coast. Paris, OSTROM Editions. pp 169 - 193

DOF (2003) Ghana: Post-Harvest Fisheries Overview, Directorate of Fisheries, Ministry of Food and Agriculture, GhanaFAO (2006) FAO yearbook. Fishery and Aquaculture Statistics 2006. FAO Fisheries and Aquaculture Information and Statistics Service. Rome, FAO. 2008. 57p.

Doyi, B. A. 1984. Catalogue of small-scale fishing gear of Ghana. CECAFECAF Series 84/31 , Food and Agriculture Organisation, Rome.

Doyi, B. A. and G. Neequaye. 1990. Report on pilot artisanal fishing gear survey in Ghana, Inf. Rep. No. 24, Fishery Research and Utilisation Branch, Tema, Ghana.

Evans, L. & Andrew, N., 2009. Diagnosis and the Management Constituency of Small-scale Fisheries. WorldFish Center Working Paper 1941. Penang, Malaysia: The WorldFish Center.

FAO 2002. Sample-Based Fishery Surveys – A Technical Handbook. FAO Fisheries Technical Paper 425

Ferraris, J. and Koranteng, K.A. 2004. Statistical analysis of canoe fishery data in Ghana with particular reference to sardinellas. In F.X. Bard and K.A. Koranteng (Eds) Dynamics and Use of Sardinella Resources from Upwelling off Ghana and Ivory Coast. Paris, OSTROM Editions. pp 205-221

GCLME, 2006, Strategic Action Program. Guinea Current Large Marine Ecosystem

Gray, A.W. 1996. Canoe decoration and meaning among the Fante of Cape Coast. African Diaspora Collection. SIT Graduate Institute. http://digitalcollections.sit.edu/african_diaspora_isp/25/ [Accessed 18 August 2010]

Gulland, J., Troadec, J.P., Bayagbona, E.O., 1973. Management and development of fisheries in the eastern central Atlantic. Journal of the Fisheries Research Board of Canada, 30: 2264–2275.

Jentoft, S., 2000. Co-managing the coastal zone: is the task too complex? Ocean & Coastal Management, 43, pp.527-35.

Koranteng, K. and Pauly, D (2004) Long-term trends in demersal fishery resources of Ghana in response to fishing pressure. In: Palomares, MLD, Pauly, D. (eds.) West African marine ecosystems: models and fisheries impacts. Fisheries Centre Research Reports 12(7). Fisheries Centre, UBC, Vancouver.

Koranteng, K. 2004. The Ghanaian Fishery for Sardinellas. In F.X. Bard and K.A. Koranteng (Eds) Dynamics and Use of Sardinella Resources from Upwelling off Ghana and Ivory Coast. Paris, OSTROM Editions. pp 243-257

Koranteng , K.A., Ofori-Danson, P.K., and Entsua-Mensah, M. 2000. Fish and fisheries of the Muni lagoon in Ghana, West Africa. Biodiversity and Conservation 9, 487 – 499

Kraan, M. 2009. Creating space for fishermen's livelihoods: Anlo-Ewe beach seine fishermen's negotiations for livelihood space within multiple governance structures in Ghana. African Studies Collection. Vol 29. African Studies Center, The Netherlands.

Lenselink,N. M. 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. FAO. 2002.

Lokko , P., Asibey-Berko, E., and Nerquaye-Tetteh, G. 2001. Iodine content of marine fish in Ghana. Ghana Journal of Science 41, 43-48

Marquette, C.M., Koranteng K.A., Overa R. & Aryeetey E.B.D. 2002. Small-scale fisheries, population dynamics and resource use in Africa: The case of Moree, Ghana. Ambio. Vol 31. No 4. Population, Consumption, Environment, pp. 324-336.

Mikalsen, K. & Jentoft, S., 2001. From user-groups to stakeholders? The public interest in fisheries management. Marine Policy, 25, pp.281-92.

Mosse, D., 2004. Is good policy unimplementable? Reflections on the ethnography of aid policy and practice. Development and Change, 35(4), pp.639-71.

Nunoo FKE, Boaten J.O., Ahulu A.M., Agyekum K.A., Sumaila U.R. (2009) When trash fish is treasure: The case of Ghana in West Africa, Fisheries Research 96 pp 167-172

Odotei, I. 1999. Gender and traditional authority in the artisanal marine fishing industry in Ghana. Journal Institute of African Studies. Research Review. Vol 15. No 1. 1999: 15-38.

Overå, R., 2001. Institutions, mobility and resilience in the Fante migratory fisheries of West Africa. CMI Working Papers 2001:2. Bergen, Norway: Chr. Michelson Institute.

Overå, R. 2003. Gender ideology and maneuvering space for female fisheries entrepreneurs. Research Review NS. 19.2. 2003.

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F.C. Torres Jr. 1998. Fishing down marine food webs. Science 279:860-863.

Perkins, B.L. 1994. Traditional Institution in Coastal Development: Asafo Companies in Cape Coast History. African Diaspora Collection. SIT Graduate Institute. http://digitalcollections.sit.edu/cgi/viewcontent.cgi?article=1001&context=african_diaspora_isp [Accessed 17 August 2010]

Perry R.I, Sumaila U.R (2007) Marine ecosystem variability and human community responses: The example of Ghana, West Africa. Marine Policy 31, pp 125-134.

Quaatey, 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. 35pp.

Republic of Ghana Fisheries and Aquaculture Sector Development Plan, 2010-2015.

Sciortino, J. A. (2010), Fisheries Landing Sites Needs Assessment. Government of Ghana, Ministry of Food and Agriculture

Shumway, L. 2001. Transformation Within the Asafo "Warriors" Institution of Ghana, 1700-2000. Southeastern Regional Seminar in African Studies (SERSAS), Oct 12th -13th, 2001. http://www.ecu.edu/african/sersas/Papers/ShumwayRebeccaFall2001.htm [Accessed 17 August 2010]

World Bank, 2003. Implementation completion report (IDA-27130) on a credit in the amount of US$ 9.0 million to the Republic of Ghana for a Fisheries Sub-Sector Capacity Building Project. Africa Region: World Bank.

Annex 1: Fisheries Data Collection

The national fisheries information system used in Ghana was established in 1972 in collaboration with FAO. The survey is stratified by region (Volta, Greater Accra, Central, and Western), month, and gear type (principal divisions are ali/poli/watsa, beach seine, line, set net and drift gill net)[20]. Given the variation in ethnic groups (who often specialise in particular gear-types) among regions, the seasonal variation in fishing, and the differing resources accessed by different gear types, these were seen as dominant drivers of variability in catch.

Survey structure relies on a regular census to assess total numbers and types of active vessels and gear. These censuses are nominally conducted every 2-3 years, as was the practice between 1969 and 2004, however due to lack of resources the most recent was in 2004. Census data are used to develop a representative 'frame' for surveys, selecting numbers of each gear type to be sampled per region according to their occurrence in the census.

The landing sites are highly heterogeneous, from beaches with a few small paddle canoes to large harbours with hundreds of canoes, semi-industrial, and industrial boats. The sampling system attempts to capture a representative group of landing sites, including both small and large landing sites. However a 'probability proportional to size' selection method for sample beaches means that landing sites with large numbers of canoes are more likely to be selected (Ferraris and Koranteng 2004). This is indeed reflected in the observed distribution of landing sites.

Daily data come from 50 of Ghana's roughly 300 coastal landing sites. Of these landing sites, ten are within the Western Region – Shama, Sekondi, New Takoradi, Axim, Half Assini, Upper Dixcove, Atenkyen, Anto Apewusika, Lower Dixcove and Akitekyi. Fisheries officers collect catch and effort data, which are sent on a monthly basis to regional fisheries offices, and then on to the Marine Fisheries Research Division in Tema, where they are checked and entered into the computer system.

Daily data are subject to three 'raising factors' to produce the ultimate system output; the first expands totals from sampled trips for a given gear type at a given site to site totals for that gear type; the second produces a monthly total for a given landing site based on the ratio of number of sampled days to number of fishing days in the month (dependent largely on fishing holidays and weather conditions); the third uses the ratio of number of sampled canoes using a given gear type to the total number of similar canoes in the region (from the canoe census), to produce an estimate of catch per month for a given gear type and region.

[20] A full description of the system is apparently provided in Banjeri, S.K. 1974. Fisheries statistics in West Africa. Work undertaken during the period September 1971 – February 1973. Rome. FAO, WS E7100. This paper, however proved highly elusive, and has not been cited nor sighted by the project team.

Sampling

Field observations of vessel sampling at landing areas provided insights into the realities of daily data collection. It is important that this is taken into consideration if additions to, or revisions of the data system are being considered.

Fisheries officers record catch data from a sample of the boats that land on any given day (see table 2 for sample sizes). In landing sites that have both canoes and semi-industrial boats, it is not uncommon for one officer to record the canoes and another to record the semi-industrial fleet. So-called "China-China" boats (both industrial and semi-industrial) are not recorded by fisheries officers, so the semi-industrial sample includes only the locally built vessels.

The fisheries officers track the order in which boats come in, and have tables that indicate which boats to sample for any number of boats that may land on a given day (e.g. if x boats land, they need to sample the first, fifth, *n*th etc). Boats which use different gears remain at sea for different periods of time, with purse seiners typically going out overnight and returning the following morning, while trawlers, hook-and-line canoes, and drift gillnet canoes may remain at sea for several days, depending on how much fuel and ice they carry. Sampling is based on the set of boats landing on a given day regardless of when (or from which port) they left. The Research Division in Tema reports that fisheries officers alternate their sampling efforts between gear type on a weekly basis (i.e. sampling hook and line canoes this week, purse seine canoes next week, etc), although this was not observed in the field.

Boats	Sample
Canoes	
<5	All
5-20	5
21-40	6
>40	7
Semi-Industrial	
<10	All
>10	10

Table 2: Sample sizes

Catch recording

For each boat within the sample, fisheries officers observe the catch as it is unloaded, and record catch by volume. Fish is sold by the pan, and even where they do not actually see the fish being measured into pans, the fisheries officers are able to "eyeball" the catch and estimate the volume. Where a pan or pile of fish contains several species, it is recorded as the dominant species, though it is not clear whether this is part of the system design or merely a practice adopted by some fisheries officers. Large fish such as marlins are recorded by length rather than number of buckets – though at landing sites which do not specialise in drift gillnet fishing, capacity for this appears to be lower, and these fish may not be recorded.

Species	Weight (kg)
Sardinella	31
Shrimp	23
Burrito	31
Longfin Herring	31
Sole	32
Bumper	30
Barracuda	30
Ribbonfish	30
Cassava fish	32
Threadfin	31
Sea Bream	32
Snapper	32
Grouper	32
"Balabala"	30
Tuna	29
Mackerel	29

Table 2: Standard weights

In addition to recording volume, fisheries officers record price data. In landing sites where a *konkohene* negotiates the price on behalf of the fishmongers, this is the price that is recorded. In other landing sites, the price can vary significantly even during the course of a single day, so the fisheries officers record the price for each transaction. There is a certain degree of estimation involved in this – for example, an officer may hear a seller ask for ten Ghana Cedis, and record seven on the assumption that the price will be negotiated down.

Fisheries officers have small notebooks that they take with them to the landing sites to record these data. For each boat sampled, they record the registration number, and standard weight, volume, and price by species. If a boat caught six pans of round sardinella, eight of horse mackerel, and one of yellowfin tuna, which they sold for 6, 12, and 18 Ghana Cedis per kg, respectively, it would be recorded like this:

T342
Round Sardinella: 31 x 6 x 6
Horse Mackerel: 29 x 8 x 12
Yellowfin Tuna: 29 x 1 x 18

Once all of the boats in the sample have been recorded (often at the very end of the day), the fisheries officers fill in the reporting forms using the data from their notebooks. Some landing sites (e.g. Axim) also keep logbooks which are basically a copy of the reporting forms, with one notebook for each boat and gear combination (e.g. drift gillnet canoes), while others use only the reporting forms and do not keep their own logbooks.

The thoroughness of the sampling and recording appears to vary strongly from one landing site to the next, and depends heavily on the individual officers involved. All of the landing sites are under-resourced, and fisheries officers are, for the most part, not replaced as they retire. In Axim, for example, there used to be ten officers recording the catch, but now only two are left, both of whom will be retiring within the next few years.

Boat Activity Surveys

Basic effort data are recorded in the form of boat landings per day. No data are recorded on net sizes, duration of fishing operations, or number of fishing operations, and while departure and arrival times for the boats sampled are recorded, they are not entered into the computer system and do not inform effort calculations.

For each sampled landing site, a monthly activity form is prepared, with fisheries officers recording the number of active boats by gear type on a daily basis, following the weekly gear rotation described above. In a landing site that has both purse seine and hook and line canoes, for example, fisheries officers would record the number of purse seiners that were active each day during the first and third weeks, and the number of hook and line canoes that were active each day during the second and fourth weeks.

These data are then used to estimate the Boat Activity Coefficient (BAC), or the probability that a given boat is active on a given day. This is done by dividing the number of potential

boat-days (e.g. 100 hook and line canoes in the sampled landing sites within this minor stratum x 14 fishing days sampled this month = 1400) by the number of active boat-days (e.g. 70 canoes active on the 1st + 63 active on the 2nd + ... +x active on the nth = 1142). In this example, the BAC would be 1142/1400 = 0.816 – so over the course of this month, an average of 81.6% of the hook and line canoes in this minor stratum were active on any given day.

Industrial and tuna data

Industrial trawlers and tuna boats are required, as a condition of their license, to submit catch and effort records on a monthly basis. In practice, many submit them on an annual basis at best, and typically after many reminders. The data tend to be poorly organised and often do not include basic information such as when one fishing trip ends and the next begins – particularly problematic for tuna boats, which may remain at sea for several months at a time and send catch ashore on carrier vessels. They are required to send records with each shipment and indicate in their logbooks when tuna are offloaded onto the carrier boats to distinguish between batches. This rarely if ever happens, and it has been estimated that at least a quarter of tuna caught in Ghanaian waters is neither landed nor reported in Ghana. A similar problem affects trawler data, with at least 10% of demersals (high value species such as grouper and lobster) being landed in other countries. Moreover, since the same records are used to assess tax liabilities, there is a strong incentive to underreport the proportion of the catch that is landed in Ghana. Since records are submitted so infrequently, it is difficult or impossible to verify how accurately industrial vessels report their catch. To do so would require substantial investment in vessel monitoring equipment and on-board observers.

Data processing

Data are sent on a monthly basis to the Research Division in Tema, where they are checked for irregularities. If any problems (e.g. implausible fish/gear combinations) are identified, the fisheries officer who produced the data will receive surprise visits to check that they are following required procedures, and future data from him or her will be subject to extra scrutiny. Data are then entered into the FAO ARTFISH system by three teams – one working on canoe data, one on semi-industrial data, and one on industrial and tuna data.

Estimates of total catch are performed at the minor stratum level, following the standard FAO sample survey system (figure 15). Effort is estimated in terms of boat-days by multiplying the total number of potentially active boats of each gear type by the BAC for that gear type and the number of active days in the month. Tuesdays are fishing holidays in many places, and there are days when no boats go to sea due to weather or other concerns, so these days would be excluded.

In the earlier example, if the 100 hook and line canoes based in the sampled landing sites were part of a total of 500 hook and line canoes in the whole district, effort would be calculated by multiplying the BAC of 0.816 x 500 canoes x the number of active days this month – say 24. This gives a total of 9792 boat-days in the minor stratum for the month.

Since effort is measured in terms of boat-days, catch per unit effort (CPUE) in this context is simply the average daily catch for a boat of a given gear type (catch per boat-day).

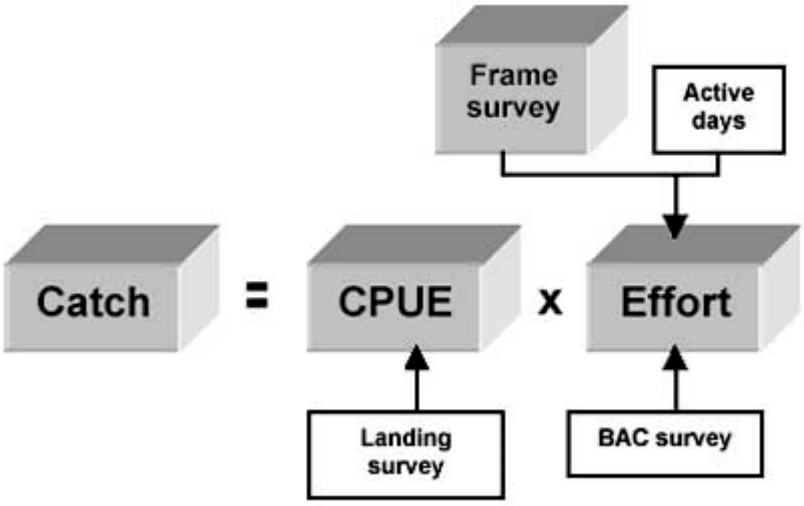


Figure 15: Standard FAO fisheries data collection system (FAO, 2002)

The Research Division has been using ARTFISH to make these estimates since 2000. Prior to that, they were calculated manually using spreadsheet software (Lotus 123, then Excel).

Probable biases in catch data

As discussed in section 2, the data collection system captures basic information about fishing effort, and its estimates of CPUE and how this has changed over time are likely to be somewhat misleading. Catch data, however, are less problematic, with a fundamentally sound system hampered primarily by under resourcing and by a reliance on self-reporting of industrial catches.

Canoes

Biases in the canoe data come from two main sources: lack of recent information about the size and structure of the canoe fleet, and insufficient sampling capacity. Since the last frame survey in 2004, the total number of canoes has increased, and there has probably been a shift towards more large purse seine and hook and line canoes and fewer small set net canoes. As a result, the data almost certainly underestimate effort and therefore catch, a tendency which will be particularly pronounced for small pelagics caught by the purse seine canoes.

Moreover, it is believed that, due to insufficient staffing to effectively monitor sample landing sites, much of the data is either obtained by phoning clerks from some of the boats to ask what they caught or, in some cases, may be simply estimated. Unlike industrial boats, canoes have no incentive to understate their catch, so data from clerks who keep good records may be relatively accurate. Where data are estimated, experience in other

countries has shown that numbers are typically based on an understanding of what is plausible, given historical catches. Rather than leading to wildly far-fetched figures, invented data typically look reasonable but fail to capture changes in the fishery over time – in the case of Ghana, this would include trends such as declining stocks and the use of light fishing.

The migratory nature of a considerable proportion of the canoe fleet is also a potential source of bias. The substantial seasonal variability of vessel/gear types among regions does not coincide well with the fixed estimates of fleet distributions provided by frame surveys (census) (see Ferraris and Koranteng 2004 for further detail).

Semi-industrial

Data on the semi-industrial fleet may be the best of the three fleets. They are monitored by fisheries officers rather than being expected to self-report, are concentrated in a more manageable number of landing sites than the canoes, and are more thoroughly sampled than the canoes. There is probably a certain degree of inventing figures and obtaining catch data from clerks, but to a lesser extent than with the canoe fleet.

Industrial

Given the poor track record of the industrial fleet in handing over catch data and the incentives to under-report discussed above, it is likely that there is a strong downward bias in the industrial data, due both to fish being transhipped at sea and never landed in Ghana, and to probable underreporting of landed catch.

The reported catch from industrial fleets in Ghana is so low that it is inconceivable that these vessels could make a profit. Similarly comparing vessel registration data from the Fisheries Commission with effort reported to MFRD suggests that each vessel only fishes for a handful of days a year. Given the catch potential of these large vessels, and their ability to stay at sea for long periods, better data on this fleet segment is urgently required.