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EFFORT CONTROL IN THE ARTISANAL CANOE FISHERY OF GHANA: IMPLICATIONS AND LIKELIHOOD OF SUCCESS

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EFFORT CONTROL IN THE ARTISANAL CANOE FISHERY OF GHANA:
IMPLICATIONS AND LIKELIHOOD OF SUCCESS

By

ROSINA COBBINA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
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MASTER OF ARTS IN MARINE AFFAIRS THESIS

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ABSTRACT

One of the major ways to reduce pressure on a declining fishery is through effort controls and this most often is seen to have both positive and negative effects on the people whose livelihoods depend on the fishery, specifically in instances where the control of effort leads to the exclusion of fishers out of the fishery. This study looks at some of the factors that will affect artisanal Ghanaian fishers' willingness to exit a declining fishery. It looks at what these fishers perceived to be their alternative livelihood options. The study found that fishers in an urbanized and developed area in Ghana like Tema, are well aware of the fact that their fishery is declining but still a large majority (77.5%) of them are not willing to stop fishing entirely, and even when offered an alternative, a majority of them (55.4%) are still not willing to exit the fishery for any alternative livelihood options. The study identified "generations in fishing", that is, coming from a family of fishers, to be a major factor that contributes to fishers' willingness to exit or stay in the fishery. The results indicate that direct effort reduction by forcing fisher folk to exit the fishery has a high probability of failing with the fishers not wanting to exit the fishery or likely to go back to fishing if reentry is not controlled. Thus, it is proposed to address this situation by using indirect means that seek to address the major factor, generations in fishing. Promoting alternative livelihoods among fishers, was also seen to be important to reduce over dependence on the fishery. Fishers' preferred alternative livelihoods include jobs that will not require any high qualifications and skills due to their low educational background and skills level. Based on these findings, the study recommends government support for alternative livelihoods geared towards targeting those who are in the fishery because they were forced to be

there and feel trapped since they had no other form of livelihood apart from fishing. Policies that are directed towards eliminating or reducing intergenerational transfer of fishing within a household (e.g. educational policies) could also be promoted.

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CHAPTER 1

INTRODUCTION

Ghana is trying to address the issue of overexploitation of its fisheries resources through an ambitious Fisheries Management Plan (FMP), developed by the Fisheries Commission with support from the World Bank, so as to address the decline of its fish stocks. The FMP, which aims at “reversing the declining trend of the fishery resource and establishing a sound management regime for the sustainable exploitation of the fishery” (MOFAD-FMP, 2015), seeks to implement effort reduction strategies in the various sectors of the fishery. This cause of action is being taken based on the perception that the fundamental cause of the decline is due to the unrestricted harvest of the resource by the large number of vessels exploiting the resource as a result of the open access nature of the fishery coupled with other factors such as weak management measures (MOFAD-FMP, 2015).

Marine fishery resources, as with many other renewable natural resources, supports the economy of many coastal states and serves as the backbone of many coastal communities in most developing countries, including Ghana, where coastal livelihoods mostly depend on fishing. Increasing declines in marine fisheries has thus become an issue of global concern not only because of the biological and ecological effect it has on the marine resources but also on the social and economic effect it has on the people whose livelihood in one way or the other depends on it.

Effort control is one of the management strategies that is sometimes used to address the issue of overexploitation. Reducing effort in the fishery does not necessarily translate into reducing harvest or catch or the overexploitation of the resource as

assumed and proposed by experts for the management of the fishery in many developing countries including Ghana. It is worth noting that overexploitation of the fishery thus can equally occur in the phase of technological improvement with fewer number of vessels which are highly efficient. (FAO, 2004). In the face of limited resources to ensure effective implementation, monitoring, and control of management measures, reducing effort in the form of number of vessels or even the number of fishers is seen as an initial step for a fishery with a large number of vessels that are highly dispersed as we have in Ghana.

Effort reduction strategies that seek to displace or take fishermen out of the fishery have in many cases not been effective since in most instances fishermen who are affected tend to return back to the fishery from which they were displaced. Pollnac *et al.* (2006) in their studies on job satisfaction, noted that most of these policies to reduce excessive fishing effort in the fishing industry fail because there is little effort to identify alternative options that will give these fishers equal satisfaction compared to that which they derive from fishing. It is in the light of these sorts of omissions that this study seeks to investigate how fishers in the artisanal sector in Ghana especially Tema, view their options for alternative livelihoods. Based on this, the study seeks to understand;

- What factors will influence the willingness of Ghana canoe fishermen especially in Tema to stay in or exit the fishery?
- What kind of alternative livelihoods do they see as possible for themselves other than fishing?

- What level of government support might be involved or needed if fishing effort was to be reduced?

It is hoped that the findings from this study will help inform management decision making towards the development of sustainable policies for the management of the canoe fishery sector in Ghana.

CHAPTER 2

LITERATURE REVIEW

2.1 Increasing Fishing Effort and Capacity

The Food and Agricultural Organization of the United Nations' report on excess capacity and illegal fishing, FAO (2004), defines fishing capacity as a fleet's ability to catch fish. According to the same literature, this capacity could be measured by counting the number of boats while taking into consideration variables such as the size and kind of boat making up the fleet, engine horsepower, days of operation and the gear used. In many developing countries where an open access fishery mostly exists in the small scale or artisanal fishery, increasing effort usually occurs in the form of increasing number of vessels or even fishers. This is mostly so since fishing is the livelihood that supports most of the people in these coastal communities. Increasing competition among fishers to catch more fish and open access leads to increasing fishing capacity and ultimately overcapacity with respect to the limited fishery resource available. Increasing fishing capacity on marine resources puts more pressure on the already overexploited resource. This has become a major issue of concern not only in terms of number of vessels but also in terms of increasing technology known as 'capacity creep'. Studies conducted by Bell et al. (2016) on global fishing effort capacity from 1950 to 2012 shows overcapacity in marine fisheries to be increasing in both developing and developed countries. However, this is said to be more stable in developed countries (such as in Europe and North America) where economic development is said to be high compared to developing and undeveloped countries. Fishing capacity increase is argued to be heavily dependent on the development status of a country coupled with an open access

nature of the fishery (a condition that prevails in less developed countries). The conclusion is that countries that are economically well developed are less likely to have high rates of overcapacity compared to less developed countries.

Developing coastal countries, where poverty rates are high, exhibit an over-dependence on their fishery to provide jobs to support the livelihoods of the poor people. Thus, there is a built-in tendency towards over-capacity which is usually reflected in the increase in the number of fishers exploiting the fishery (Bell et al., 2016).

Globally, studies by FAO (2004) showed that most countries faced with the issue of overcapacity in some form or another are either addressing it or have strategies in their management plans to address the issue. The United Nations Convention on the Law of the Sea (UNCLOS) Article 56 (1) allows coastal states the right to claim and have sovereign rights over their coastal waters, specifically their territorial waters and also to have jurisdiction over the resources in their exclusive economic zones (EEZ). This right allows the coastal state to develop management measures to enable sustainable exploitation and utilization of the marine resources in their jurisdiction. Due to the fact that many fish species are trans-boundary and managing them at the national level alone is insufficient, the convention also allowed bilateral, regional and international collaborations and cooperation in the management of most migratory and straddling stocks in order to reduce conflict in exploitation and management. Various management tools are employed in the management of fisheries. Depending on what one is aiming at, there are biological management methods which focus on increasing biological yield of the resources such as protecting the young fish, spawners and habitats. Common measures used includes total allowable catches (TACs), area

closures, seasonal closures and gear restrictions. Management could also be economic fisheries management which involves management measures aimed at enhancing the economic yield from the resource. In this case, efforts are made to constrain fishing effort and capital investment (Beddington et al, 2007). However, before the extension of national jurisdictions to 200 miles (via EEZs), very little federal management was done. In contrast, aboriginal societies (according to McEvoy, 1986), employed many of the conventional management tools (e.g., mesh sizes and other gear restrictions, nursery ground protection, area closures etc.) in addition to their cultural practices and local ecological knowledge to manage their fisheries at the community level and were in most ways successful. Since then, many fisheries have come under increasingly stringent management including the use of TACs, fisheries closures (to enforce TACs), effort restrictions, property rights and investment restrictions. Managing fisheries through fishing capacity reduction usually is considered to be one of the key actions required to ensure and promote sustainability of global fisheries (FAO 2004) as well as ensuring the greatest economic yield (Arnason et al. 2009; Ye et al. 2013). Though capacity reduction is seen by many to be good, it has its own challenges. In a study looking at the goal, cost and benefit of rebuilding global fisheries, Ye et al, (2013) recommended that global marine fishing capacity be reduced by 36 to 43 percent through vessel buybacks. The study noted that by implementing this, a long-term benefit of 16.5 million tonnes could be accrued in fish production. Despite this benefit, it also noted that a short-term cost of 12 to 15 million loss of employment opportunities in the fisheries sectors will occur at a cost of US\$96 to \$358 billion since people whose livelihood depends on the fishery, both directly and indirectly, would be affected. However, the study

mentioned the lack of willingness to exit from the fishery as a major hindrance for the implementation of the capacity reduction. This goes to show that in most instances, the successful implementation of management plans is mostly determined or undermined by the overall policy objective of that nation, whether it is geared towards job creation or poverty reduction or even food security. These kinds of overall goals can reduce the political will to back the implementation of many management plans notwithstanding the long-term benefits for all (Dimech 2010, Makinde, 2005).

Many countries adopt so-called rights-based fishing such as licenses, individual transferable quotas (ITQ) communal property rights, etc. to reduce or eliminate the open access externalities in the utilization and exploitation of the resource. All these measures are in one way or the other focused on addressing the issue of reducing over-exploitation of the marine resources. Due to the high cost of implementing and sustaining some of these management strategies, many developing countries resolved to addressing overcapacity through effort reduction.

2.1.1 Effort Reduction

Some of the ways of implementing effort reduction include taxation, controlling fishing inputs (limited entry) and limitation of output through individual quotas (Crutchfield, 1979). Under the taxation approach, taxes are imposed to raise the cost of fishing, making the industry unprofitable for some who then fall out of the fisheries. Alternatively, limited entry through the use of licensing features a set number of licenses issued to attain some predetermined level of “effort” where a certain number of vessels are targeted and licenses given to them to restrict access.

Effort in fishing can be looked at in various forms ranging from number of vessels, type of gear, vessel capacity, fishing days or time spent at sea etc. (Beddington, 1984). As mentioned earlier, reducing effort (capacity reduction) comes with a cost at both the social and economic levels. One major problem that is associated with effort restriction is the issue of excluding people from the fishery while creating wealth for others (those allowed to stay in the fishery who receive the initial allocation of privileges created by the scheme). This condition does not promote equity in the allocation of resource. Looking at this situation from the perspective of the Gordon-Schaefer model, one could identify this kind of system to be skewed more to the left of the model where the system is aiming towards the Maximum Economic Yield (MEY) level. Ironically, the prospects for reducing effort may be undermined if those privileged in the initial allocation reinvest their new-found wealth back into the fishery (a process known as capital stuffing), thus promoting rather than alleviating overcapitalization. Situations such as these, one could argue, do not lead to sustainable fisheries management while leading to uneven distribution of wealth in the fisheries sector.

2.1.2 Effort Reduction and Willingness to Exit

Since effort reduction most often implies getting people whose livelihood depends on the fishery out of the fishery, one major question that one needs to address is whether the fishers are willing to exit and stay out of the fishery. Fishermen are often perceived to be poor and that fishing is often regarded to be a last resort occupation for them till something better comes along. Thus many effort reduction policies propose alternative occupations for fishers. This perception or assumption has been disproven by various studies (Pollanc *et al.* 2001; Monnereau *et al.* 2010) as not always the case.

Studies conducted in Southeast Asia to introduce fishers to other forms of livelihood ended up with fishers returning back to fishing (Crawford, 2002). Fishing is said to be the 'backbone' that supports the livelihood (both directly and indirectly) of people in most coastal communities and fishers per se are not really as poor as they are often portrayed to be (Crawford, 2002). Daw *et al.* (2006) mentioned fishermen's engagement in the fishery to be based on the profitability of the industry. However, Pollnac *et al.* (2006, 2008) studies on job satisfaction in fisheries and on happiness, well-being and adaptations to stresses associated with marine fisheries, revealed that fishermen are not only concerned with the monetary aspect of the fishery. They are able to derive other benefits or satisfaction that in one way or the other are able to keep them in the fishery. These other forms of benefit keep them in the fishery to the extent that even when the fishery becomes unprofitable, they fail to leave the fishery. This reality has led to the failure of many management policies seeking to reduce overcapacity by getting fishers out of the fisheries. An example of this was mentioned in a review by Pollnac and Poggie, (2001) of a vessel buyback program where money given to fishers to reestablish themselves in an alternative livelihood lead to capital stuffing where fishers reinvest back into the fishery by purchasing better vessels to continue fishing.

One other effect associated with effort reduction is the fact that most fishermen are said to be socially dysfunctional due to the fact that they tend to spend much of their time at sea and do not fit well into the society when they are pulled out from doing what they are used to doing, bringing into play the concept of an occupational culture (Coull, 1993 and van Ginkel, 1999). Pulling them out of the fishery tends to have negative impacts on them, and the society as a whole (as was seen in the Florida net ban issue in 1994)

since they must now try to conform to a way of life outside the normal routine they were used to (Smith, Jacob, Jepson, & Israel, 2003).

Effort reduction may be considered as a viable way of reducing overcapacity in the fisheries sector. However, looking at some of these challenges that serve as drawbacks towards its sustainable implementation, having policies that take into consideration alternative livelihood options in addition to effort reducing strategies could be the best approach. The issue that one needs to consider according to Crawford (2002), is job mobility (moving from one job to another job) in the midst of job satisfaction and willingness to leave the fishery among fishermen so as to obtain long term effective results in effort reduction.

2.1.3 Job Satisfaction in Fisheries

The satisfaction fishers get from their job is said to influence their decision or willingness to exit or switch from fishing to other occupations which fulfill their satisfaction. Job satisfaction among fishermen should thus be an issue of major concern when implementing fisheries management strategies that tends to exclude fishers from fishing. Fishermen's satisfaction from engaging in fishing is said to be based not only on monetary gain, but on other non-monetary factors that contribute to their gaining satisfaction from the fishing occupation. Various studies have been conducted by various authors (Pollnac *et al.* 2001, 2008, 2012, Bavinck *et al.* 2012, etc.) to establish this fact. Some of the factors that have been identified that contribute to fishers satisfaction and their willingness to exit or stay in the fishery, aside from economic gain, are social demographic factors such as age, education, years in fishing or experience, household size, wages or income from fishing and location. (Pollnac *et al.* 2001).

Anastasiou *et al.* (2014), in their study of job satisfaction among fish farmers in Greece, also identified that fishers' ability to contribute to decision making serves as a factor that promotes job satisfaction among fishers, specifically production managers. The extent to which these factors affect the satisfaction and willingness of fishers to leave or switch from fishing may differ among fishers. For instance, Pollnac *et al.*, (2012) in their study of job satisfaction among fishers found that in the fisheries sector, younger people with less fishing experience, less time invested in the fishery and fewer household dependents, are more willing to leave the fishery. Similarly, studies in three Asian fisheries reported those who get satisfaction from the fishery and wanted to stay to be those who obtained a significant proportion of their income from fishing (Pollnac *et al.*, 2001). Monnereau *et al.*, 2010 also found Caribbean lobster fishers' satisfaction in the fishery to be mostly based on the ample time they are able to get to spend with their families and loved ones and for their recreational activities due to the nature of their work. This goes to show the extent of variability in responses among fishermen, even within the same geographical area, with respect to what causes satisfaction in their job. This is thus something to be borne in mind when making management decisions based on job satisfaction and willingness to switch from fishing to an alternative occupation. Pollnac *et al.*, 2001, thus advised against generalization of findings based on one or few studies when making management decisions based on fishermen's job satisfaction. The findings of this study will not be generalized but will be restricted solely to the study area as a result of variability that may exist within the various coastal communities.

2.2 Overview of Ghana's Fishery Sector

This section looks at the structure of Ghana fisheries. It then looks at the current status of the fishery and where the country is going in terms of management by looking briefly at the current Fisheries Management Plan.

2.2.1 Structure of the Fishery

Ghana's fisheries sector is made up of two major components: capture fisheries which contributes 91% of the total fish production and culture fisheries which accounts for the remaining 9% of the country's total fish production (MOFAD, 2015). The capture fisheries include marine (sea and lagoons) and inland (lakes, rivers and reservoirs). The Inland fisheries are primarily small scale, while the marine fisheries are a combination of mostly small scale and large scale industrial fleets with exploitation occurring along the four coastal regions of the country; Greater Accra, Western Region, Central Region and the Volta Region.

The marine capture fisheries form the backbone of the fisheries sector, contributing 70.6% of the total fish production (MOFAD, 2018) and consisting of three main sectors; the Artisanal canoe sector, the Semi-industrial sector and the Industrial fisheries sector. Operations from these various sectors contributes significantly to the social and economic development of the country.

2.2.2 Industrial Fisheries

The industrial fisheries mostly consist of foreign built trawlers, tuna bait boats (pole and line), tuna purse-seiners and shrimp trawlers with tuna vessels mostly targeting tuna species such as the yellowfin, skip jack and the bigeye tuna primarily for local canneries and export. The trawlers mostly target demersal species such as

Sparidae, Pomadasyidae, Sciaenidae etc. As of 2014, the sector had a total of 144 vessels made up of 107 bottom trawlers and 37 tuna vessels (MOFAD, 2014). The trawl fisheries which were once considered to be profitable are currently said to be making less as a result of over capitalization with low catch per unit effort as vessel numbers have more than doubled over the years specifically from 37 vessels in 1999 to 107 vessels in 2014 with a total contribution of 5.8% to the total marine landings. (Sackey 2012, MOFAD 2014). The tuna sector on the other hand has seen a reduction of 14% in the number of vessels from 43 vessels in 2011 to 37 vessels in 2014 with a total contribution of 18.91% to the total marine production. In the industrial sector, all the fishing vessels are owned mostly by Ghanaians (but most have some Chinese backing with the Ghanaians being front owners). Tuna vessels are mostly owned through joint ventures agreements with foreigners. The tuna sector, by virtue of the fact that Ghana is a signatory to the International Commission for the Conservation of Atlantic Tunas (ICCAT), appears to be well managed. However, Ghana received a yellow card from the EU banning its products from the European market (AU-IBAR 2015) as a result of increasing illegal, unreported and unregulated (IUU) fishing, and this shows the weakness in our management systems.

2.2.3 Semi-industrial Fisheries

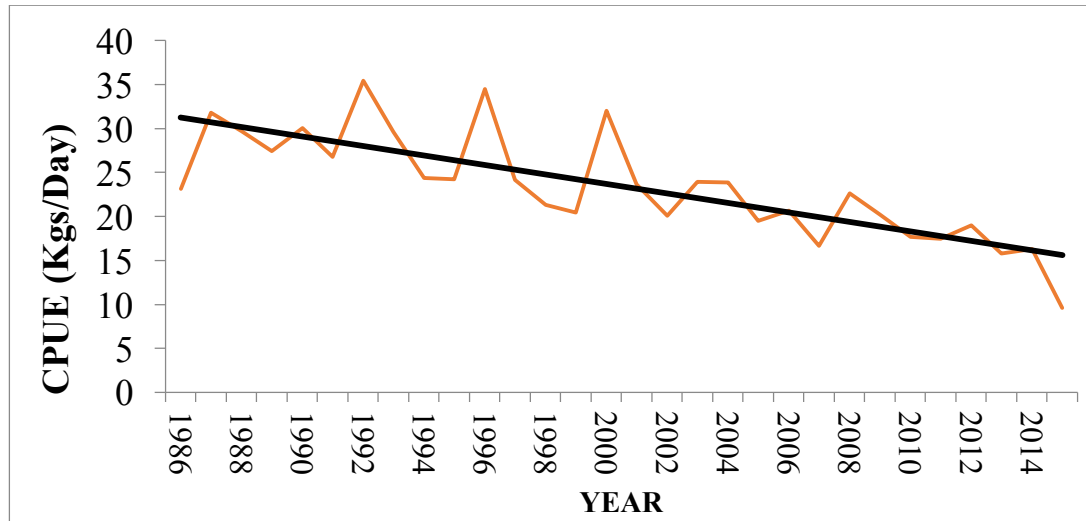
The semi-industrial sector on the other hand is made up of vessels that are locally built. These are mostly wooden vessels ranging between 20 to 30 meters in length overall (LOA), with larger vessels operating using bottom trawls and smaller sizes (between 8 to 10 meters) operating using purse seines. The sector has also seen a significant increase in the number of boats over the years with the number doubling to 403 over the past two decades with an annual contribution of only 2% to the total marine fish

production as of 2014. (MOFAD, 2014).

2.2.4 Artisanal Canoe fisheries

The artisanal canoe fishery which is the main focus of this study, traces its origin to the 1700s when it was purposely for domestic consumption. Over the years it has evolved into a vibrant industry with a mixture of both traditional and modern fishing fleets. The sector is currently said to be the most important sector within the marine sector with respect to the total volume of fish landed. It contributes 74% to the total marine fish production and employs about 98% of the total number of fishers in the fisheries sector. The sector currently has 11,583 wooden canoes with 85% of which are motorized and the remaining 15% being non- motorized. Canoe sizes range from 3 to 20 meters (Dovlo et al, 2016). Catch composition from this sector is mostly made up of low economic value species such as sardinellas, mackerels and anchovy compared to the large pelagics such as the tunas which are of much higher economic value. Like the semi-industrial sector, the artisanal sector has also been recording low profitability (also reflected in low catch per canoe) (catch per unit effort) over the past decades as shown in Figure 1. The declining trends from the various sectors shows the extent to which the fishery has been over exploited.

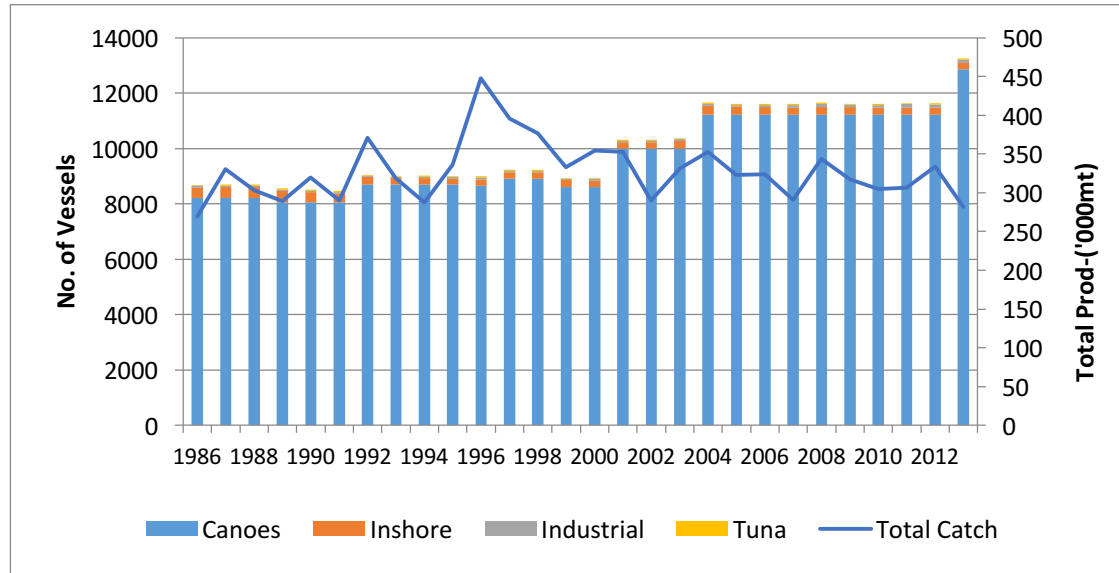
Figure 1: Catch per unit of effort (CPUE) of the Artisanal fishery (Source: CRC/SFMP data by FSSD)



2.2.5 Status of the fisheries and Strategies for Management

Ghana depends on its fisheries for both social and economic benefits. The sector is said to support the livelihood of 10% of the population directly and indirectly provides many more job opportunities. Fisheries accounts for 60% of the country’s total animal protein intake (MOFAD-FC,2015). Contributing about US\$1 billion in terms of revenue generation annually and 4.5% to the annual GDP, the sector faces many challenges which have led to the over exploitation of its fisheries resources (MOFAD-FC, 2015). Scientific evidence shows that stocks levels have declined (in terms of catch per unit effort (CPUE) despite increasing number of vessels from all the various sectors (Figure 2) with the exception of the tuna sector (MOFAD, 2015). Total production over the last decade has stagnated at around 350,000 metric tons (Figure 2) accounting for only 38% of the total fish requirement (total annual fish demand) of the country (Fisheries Commission, 2014).

Figure 2: Evolution of Ghanaian fishing fleet and catches (Source, MOFAD-FMP, 2015)



One of the key issues that most literature mentions as contributing to the decline of the sector is the large number of vessels that exploit the resource due to the open access nature of the resource in the face of weak management measures. (CRC, 2013; World Bank, 20011). The fisheries sector has thus long suffered from a vicious circle of poor economic profitability and overexploitation of stocks due to the lack of direct controls on harvest levels, but the policy focus has been on over-capacity (MOFAD-FMP, 2015). Given this policy focus, managing fishing capacity has been raised for some time in reference to growing concern about open access in the artisanal fisheries and the overcapitalization of the canoe as well as industrial fisheries, particularly in Ghana.

Management of Ghana’s fishery is governed and regulated by legislative instruments and policies such as Fisheries Act, 2002 (Act 625) Fisheries (Amendment) Act, 2014 (Act 880) Fisheries Regulations, 2010 (L.I. 1968) and Fisheries (Amendment) Regulations, 2015 (L.I. 2217), the Republic of Ghana Fisheries and Aquaculture Policy

(2008), Ghana Shared Growth Development Agenda (GSGDA II) and the Ghana Fisheries and Aquaculture Sector Development Plan 2011-2016. Management strategies adopted over the years based on these instruments to manage the fisheries are geared towards restriction of fishing methods and gears, regulation of mesh sizes, and assessment of stock status to set targets and thresholds of fishing mortality rate and other biological reference points. The overriding goal of these strategies was to maintain fish stock levels to achieve maximum sustainable yield (MSY). However, these options have not been very effective for managing the stocks due to poor governance resulting from lack of resources (both human and financial) and the political will to deal with the issue of increasing fishing effort and capacity resulting from the open access nature of the fishery.

Even though overcapacity (as seen in this case to be the number of boats and their activities) is said to be the underlying factor causing over exploitation of the resource, some government programs and projects still lead to capacity enhancement in the sector. This is mostly done with the intention of increasing production, profitability or employment in the sector. Some of these programs include fuel subsidies, a fishing vessel restructuring program, promoting the use of fiberglass boats (supported by DANIDA and GoG), subsidies for fishing inputs such as fishing nets and outboard motors, etc. (Sackey, 2012).

The fundamental criteria for effective fisheries management are based on the ability to measure and control the inputs (fishing effort) and/or the output (catch or harvest). Controlling catch is considered to be an appropriate management measure. However, in a developing country such as Ghana with its large number of canoes (about

13,000), it is considered a step in the right direction for management measures to focus first on capping and then reducing effort before any catch control measures could be effectively implemented. Monitoring catches of fishers will be difficult with the large number of canoes which are highly dispersed in addition to the limited resources (e.g. human resources) at the Fisheries Commissions' disposal. It is also important to notice that neither the management of fishing effort nor the catch, are likely to be effective unless they apply to all fishermen engaged in the fishery. Partial controls will leave space for the uncontrolled part of the fishery to expand into any gap left by controls placed upon other parts of the fishery. In the past a number of countries only controlled the effort of the larger fishing units on the basis that they created the most fishing pressure. Small artisanal sectors were left uncontrolled since they were thought to take only a small slice of the catch (PCFS, 2012). This turned out to be a significant strategic error made by fisheries managers. Today, the artisanal sector is the most efficient of all sectors taking the larger share of the catch (PCFS, 2012).

Reports from the World Bank, (2011) show that a significant increase in profits (from \$30 to \$50 million each year) could be accrued for the artisanal sector within 10 years if the country could implement strategies that focus on controlling access by reducing fishing effort. Based on this recommendation, the country with support from the World Bank has currently developed a five year (2015 to 2019) Fisheries Management Plan (FMP) to help address some of the challenges facing the marine fisheries sector. The aim of the plan is to “reverse the declining trend of the fish resource and establish a sound management regime for the sustainable exploitation of the fishery” (MOFAD-FC, 2015). One of the issues that the FMP seeks to address is the reduction

of the current levels of fishing effort and fishing capacity through the implementation of effort reduction strategies in the various sectors of the fishery.

In the industrial and semi-industrial trawl fishery, the FMP seeks to control the number and capacity of vessels through strict implementation of a sanction scheme under the Fisheries Act 2014 and also aiming at achieving a 50 percent reduction in fishing days. In the artisanal sector, the FMP calls for the registration of all canoes in order to have a data base on them, cap and then prevent new entrants into the sector thus stopping any further expansion. Looking at the fact that an expert report that recommends reducing current effort from 13,000 canoes to about 9,000 canoes in the artisanal canoe sector will maximize profits, plans are made to achieve that target reduction through a gradual process. Consideration of the fact that the artisanal sector serves as the backbone to many fishing communities, effort needs to be made to absorb and support those who will be affected. This will help to reduce the negative impact on their livelihood, thus creating a better balance and equity whereby both those who stay in the fishery and those removed could both benefit.

Most countries use the provision of alternative livelihood to address some of the issues that are associated with effort reduction (Asiedu *et al.* 2013). Ghana, in the midst of implementing effort reduction, also seeks to promote alternative livelihood programs to support those who will be affected. As mentioned earlier, most of these programs do not always last. There are instances observed when fishers refuse to participate in an alternative to fishing as a result of uncertainties that might be associated with that new job (Crawford, 2002). Some studies show however that there are instances where there appears to be a high initial rate of willingness to change occupations among fishers but

with time, many do find themselves back into the fishery. For instance, in Ghana, Anning *et al.*, (2012) assessed the willingness of fishermen to integrate aquaculture into their enterprise. They reported that 62% of the fishers were willing to adapt and add aquaculture to their fishing activities. Similarly, Asiedu *et al.* 2013, also reported a 73% willingness to adopt an alternative livelihood by fishers in their study of alternative livelihood as a sustainable management tool in Ghana. However, there was no guarantee that they are willing to exit permanently from the fishery for other jobs nor has there been any assessments of programs that have attempted to do this. What they say in a survey may not be actually what they do once in an alternative livelihood program. With time, they tend to lose interest leading to reentry back into fishing. Most studies that look at promoting alternative livelihoods among fishers mostly look at whether fishers are willing to accept it when it is introduced. Most often, “customized” options are proposed for fishers to choose from without looking at what they really want and feel would give them more satisfaction to promote long term durability of the intervention (Pollnac *et al.* 2001).

Much needs to be done to assess their willingness to leave the fishery and also their perception of alternative livelihood options in the midst of job satisfaction factors in order to promote the development of management policies with long term sustainability.

CHAPTER 3

METHODOLOGY

This chapter describes the methodology used in this study. It describes the study area, methods of data collection, interview techniques and data analysis.

3.1 Study Area

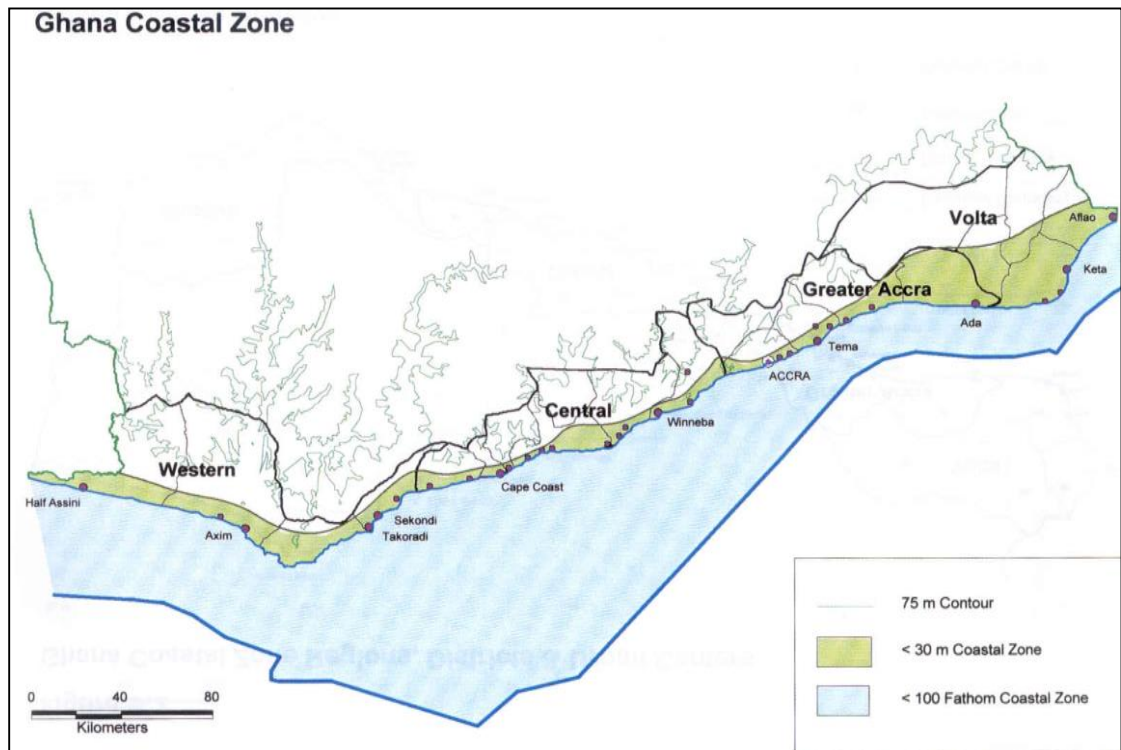
Ghana has four coastal regions where the exploitation of the marine resources takes place. There are 26 coastal metropolitan and district assemblies (MMDAs) with 186 fishing villages and 292 landing beaches. Tema, which comes under the Tema Metropolitan Assembly which forms part of the nine District Assemblies in the Greater Accra region was used as a case study to investigate the alternative livelihood perceptions of fishers in the artisanal canoe fishery sector in Ghana.

Situated 25 kilometers from the nation's capital, Tema, serves as the administrative capital for the Tema Metropolitan Assembly. As a heterogeneous community, the common basic language that is spoken is Akan, specifically Twi, with Ga being the language of the local people. Inhabitants are engaged in diverse occupations ranging from commerce, tourism, hoteliers and fishing. Tema holds the country's major fishing harbor where landings, imports and exports of fish takes place. According to the current 2016 canoe frame survey it has three landing beaches; Ashamang, Awudun and the Sakumo landing beach, with 5340 fishermen and 574 canoes, with a total annual landing of 4,000mt over the last five consecutive years (Dovlo *et al.*, 2016).

Among the three landing sites in Tema, the study focused on two landing sites, Ashamang and Awudun, (which is mostly referred to as Tema landing beach) because

these sites have the largest number (22%) of canoes in the Greater Accra Region. The selection of these sampling sites was based on purposive sampling due to the fact that both the areas fall within the most industrialized areas in the country where there are a diverse range of job opportunities available that one could engage in for an alternative livelihood. This could give a firmer basis for accessing and understanding the factors that would influence a person's decision to either stay or leave the fishery rather than selecting an area with a limited range and availability of jobs where people would be restricted and forced to stay in the fishery because they have no other option. Based on this, the findings of the study cannot be generalized to cover the other coastal regions but will apply only to the study area.

Figure 3: Coastline of Ghana indicating the fishing zones (Sackey-Mensah, 2012)



3.2 Data Collection

This study is an explorative study which employed the use of the mixed methods approach: using both quantitative and qualitative methods to achieve its objectives. Primary data was collected through a survey with the use of semi-structured questionnaires and focus group discussions in addition to the review of literature.

A canoe register was obtained from the Marine Fisheries Management Division (MFMD) of the Fisheries Commission in Ghana. The register contains information on vessels such as the canoe identification number, the landing site where it operates, the gear it uses etc. A total of 30 canoes (15 from Ashamang and 15 from Awudun) out of a total of 574 registered canoes were randomly selected. Random numbers were generated from Microsoft Excel and this was used as the basis for selecting the canoes from the register. Canoes from the register whose numbers matched the random numbers generated were selected. Based on this, the owner and the captain of that canoe were then interviewed. Crews from these canoes were identified with the help of the captains and then interviewed. According to Crawford *et al.*, 2016, each canoe has about 8 to 20 crew members, thus a maximum of six crew members from each canoe were interviewed. The selection of the crew was based on convenience sampling where any available crew from that canoe willing to participate in the survey was approached and interviewed. Interviewing these groups of fisher; boat owners, captains and crew was to help in perceiving how their responses might differ since each have different levels of expectations. It is worth noting that boat owners, who are men mostly, at one point in time have been a crew or captain before.

Duplicate names of canoes were eliminated to prevent multiple counting. Randomly selecting the sample in this way from the canoe register was a way of reducing bias in the selection process. One major shortfall that was associated with this method was that there were instances where a canoe selected by this method was not available for its captain and crew to be interviewed since the period for data collection fell within the major fishing season and most were out fishing. In such instances, the next available number on the list was used. Another major challenge that was faced during the data collection was the fact that most of the fishermen did not know their canoe numbers since most of them did not take the canoe registration and embossment program of the Fisheries Commission seriously. Most complained about the fact that they lost their number when they went to repair their canoes. This was used as an opportunity to educate the fishers on the importance of having their number in mind and having them embossed on their canoes. The issue was addressed by using the names of the owners in the register to identify the owners.

Access to the fishing community was gained by liaising with the zonal fisheries officer in charge of the Tema Metropolitan Assembly to help organize an initial familiarization visit to the landing beaches. Through the visit, the chief fishermen and some of the opinion leaders from the two landing sites were met and their consent and permission was sought for the study to take place. This helped to win the trust of the fishermen and it greatly encouraged their participation, even though they were a bit reluctant at the initial stages.

In all, a total of 240 participants were interviewed in the survey with a maximum number of 10 participants interviewed in a day. Each interview was scheduled to last

30-40 minutes but this was reduced to 20 minutes since the fishermen were not willing to spend that much time. Verbal consent was obtained from the participant before administering each questionnaire. Participants were informed about the survey, its purpose and how the data would be utilized. In most fishing communities in Ghana, literacy rates are very low among the fishermen. Because of this, the written consent document was read in the local language for the participant to seek their consent after which they were made to sign or thumb print. For those unwilling to sign or use their thumb print but willing to be surveyed, a witness was made to sign indicating that they were provided verbal consent prior to administration of the survey instrument.

Reliability in the data collected, which is a measure of the quality or consistency of the result, was ensured in this study by pre-testing the questionnaires to ensure that the questions were clear and easily understandable so as to get the right information. In addition to this, before leaving the field after each data collection event, effort was made to go through the survey data collected each day to identify any issue with the data and clarifications done in the field before leaving. Paperless data collection was employed using kobotool box which is a data collection tool that employs the use of mobile devices such as a tablet to facilitate the data collection process.

Validity of data, according to Creswell, 2014, ensures that the findings of the research are accurate and recommends the use of multiple approaches to ensure the accuracy of the results. This study employed triangulation where data were sourced from various literature sources to ensure a high level of confidence in the development of the survey instrument. In addition to this, final analysis of the results obtained from the data collected was validated by presenting it back to the participants, specifically

the opinion leaders for their feedback, so as to give them the opportunity to comment on the findings.

3.3 Data Analysis

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS), version 24.0. All statistical analyses assumed a Type I error rate of 5% level of significance; with all p-values reported in this paper being two-sided unless otherwise stated and p-values less than 0.05 were considered statistically significant. Descriptive statistics including frequencies, percentages, means, medians, interquartile range and standard deviations were calculated to describe the demographic characteristics of the study participants and their willingness to switch or exit fishing. Data from the questionnaire were categorized and coded (Table 1) for the purpose of analyses.

Comparisons across fishing groups were calculated using bivariate chi-square tests and one-way analysis of variance for categorical and continuous variables respectively. If parametric model assumptions are violated, non-parametric models such as Kruskal Wallis were employed. Chi-square tests were carried out on categorized variables to determine any form of association and level of significance between the different variables of the study. Also, correlation analyses were computed to determine the association of period in fishing with age, household, or landing site.

Finally, binary logistic regression tests of association were conducted to assess the differences between willingness to exit fishing (Yes vs No). Binary Logistic Regression was employed to model the binary outcome variable in the dataset. In this study, the log odds of the outcome (whether a fisherman intend to exit fishing or not)

was modeled as a linear combination of the covariates in the model. Stepwise removal of independent variables whose coefficients were small was done to reduce suppressor effect and multicollinearity among the independent variables so as to obtain the variable with the strongest effect for the model. An “Odds Ratio” represents an increase (if significantly greater than one (1) and decrease (if significantly less than 1) from the baseline hazard. Odds ratio of one (1) indicates no difference between the selected variable and the corresponding outcome. For simplicity, the variables that were statistically significant were the ones mostly commented on.

Table 1. Variable Coding

Demographic Variables	Coding	Factors Affecting Job satisfaction	Coding	Factors affecting willingness to exit or switch fishing	Coding
Landing site (Place where data was collected)		Grandfather in fisheries		Age effect	0
- Ashamang	1	- strongly agreed	1	0	0
- Awudun	2	- agreed	1	1	0
Educational level		- disagreed	0	2	1
- No formal education	1			3	1
- primary	2	be my own boss		4	1
- secondary	3	- strongly agreed	1	5	
- tertiary	4	- agreed	1	Educational effect	
Read and write		- disagreed	0	0	0
- No	0			1	0
- Yes	1	only job I can do		2	0
Status of fisher		- strongly agreed	1	3	1
Boat owner	1	- agreed	1	4	1
- Captain	2	- disagreed	0	5	1
- Crew	3			Household effect	
Marital status		derive satisfaction		0	0
- single	1	- strongly agreed	1	1	0
- married	2	- agreed	1	2	0
- divorce	3	- disagreed	0	3	1
- separated	4			4	1
Generation in fishing		get income		5	1
- No	0	- strongly agreed	1	Gov. legislation	
- Yes	1	- agreed	1	0	0
Origin of fisher		- disagreed	0	1	0
- Non migrant	0			2	0
- migrant	1			3	1
Type of fisher				4	1
- part time	0			5	1
- full time	1			Capital investment	
Income usage				0	0
- less than half	1			1	0
- half	2			2	0
- more than half	3			3	1
- All	4			4	1
Sufficiency of Income				5	1

Demographic Variables	Coding	Factors Affecting Job satisfaction	Coding	Factors affecting willingness to exit or switch fishing	Coding
- No	0				
- Yes	1				
Alternative livelihood engagement					
- No	0				
- Yes	1				
Switch fishing					
- No	0				
- Yes	1				
Catch perception					
- Same	0				
- Decrease	1				
- Increase	2				
Willingness to stop fishing					
- No	0				
- Yes	1				

CHAPTER 4

RESULTS

4.1 Willingness to Switch Fishing and Factors Affecting it

4.1.1 Basic Characteristics of the study population

The study aimed to survey 240 fishermen from the two landing sites, Ashamang and Awudun, and a total of 240 individuals were actually surveyed. Table 2 gives the breakdown of the number of fishers interviewed from each site. All of the respondents surveyed were male. The findings confirm that males dominate the fishing profession in Ghana even though women play a part especially when it comes to the post-harvest sector and financing of fishing trips.

Table 2: Targeted sampling frame and numbers sampled

Landing site	Population of Fishers	Sample Target	Actual No. surveyed	% of Target surveyed
Ashamang	1186	120	116	96.7
Awudun	3981	120	124	103.3

Table 3 talks about some of the basic characteristics of the fishermen surveyed for the study. Out of the 240 fishers that were sampled for the study, 116 (48%) were from Ashamang landing beach while 124 (52%) were from Awudun landing beach. Boat owners constitute 30 (16%) of the total number of fishers surveyed, captains 30 (15%) and crew 180 (69%). In terms of marital status, 201 (84%) of the respondents were married, 9 (4%) divorced, 4 (2%) separated, and 26 (11%) being single, with fishers having an average of 5 people in their household.

The results show very low literacy rate among fishermen with 111 (46%) having no formal education with 91 (38%), 35 (15%) and 3 (1%) having primary, secondary and

tertiary education respectively with 104 (43%) being able to read and write. The mean age and standard deviation of the fishermen was 39.8 and 10.3 respectively. Overall the average crew was younger (38.1) than captains (41) and captains were younger than the boat owners (46.5) with an average of 21.8 (11.6) years spent in fishing.

Table 3: Descriptive statistics of baseline characteristics of fishers by willingness to exit fishing.

Variable	Willingness to exit Fishing			Statistic
	Total (n=240)	Yes (n=107)	No (n=133)	P-value
Education				0.952
<i>No formal edu.</i>	111 (46.3)	48 (44.9)	63 (47.4)	
<i>Primary</i>	91 (37.9)	42 (39.3)	49 (36.8)	
<i>Secondary</i>	35 (14.6)	16 (15.0)	19 (14.3)	
<i>Tertiary</i>	3 (1.3)	1 (0.9)	2 (1.5)	
Occupational Status				0.643
<i>Boat owner</i>	30 (15.8)	11 (10.3)	19 (14.3)	
<i>Captain</i>	30 (15.0)	14 (13.1)	16 (12.0)	
<i>crew</i>	180 (69.2)	82 (76.6)	98 (73.7)	
Marital status				0.039**
<i>Divorce</i>	9 (3.8)	3 (2.8)	6 (4.5)	
<i>Married</i>	201 (83.8)	87 (81.3)	114 (85.7)	
<i>Separated</i>	4 (1.7)	0 (0.0)	4 (3.0)	
<i>Single</i>	26 (10.8)	17 (15.9)	9 (6.8)	
Read and write				0.923
<i>No</i>	136 (56.7)	61 (57.0)	75 (56.4)	
<i>Yes</i>	104 (43.3)	46 (43.0)	58 (43.6)	
Sufficiency of income				0.071*
<i>No</i>	128 (53.3)	64 (59.8)	64 (48.1)	
<i>Yes</i>	112 (46.7)	43 (40.2)	69 (51.9)	
Type of fisher				0.897
<i>Full time</i>	216 (90.0)	96 (89.7)	120 (90.0)	
<i>Part time</i>	24 (10.0)	11 (10.3)	13 (9.8)	
Generation in fishing				0.004**
<i>No</i>	36 (15.0)	24 (22.4)	12 (9.0)	
<i>Yes</i>	204 (85.0)	83 (77.6)	121 (91.0)	
Alternative livelihood engagement				0.032**
<i>No</i>	200 (83.3)	83 (77.6)	117 (88.0)	
<i>Yes</i>	40 (16.7)	24 (22.4)	16 (12.0)	

Variable	Willingness to exit Fishing			Statistic
Educational effect				0.423
No	143 (59.8)	61 (57.0)	82 (62.1)	
Yes	96 (40.2)	46 (43.0)	50 (37.9)	
Household effect				0.639
No	138 (57.7)	60 (56.1)	78 (59.1)	
Yes	101 (42.3)	47 (43.9)	54 (40.9)	
Gov. legislation				0.004**
No	188 (78.7)	75 (70.1)	113 (85.6)	
Yes	51 (21.3)	32 (29.9)	19 (14.4)	
Fish decline				0.005**
No	162 (68.1)	62 (58.5)	100 (75.8)	
Yes	76 (31.9)	44 (41.5)	32 (24.2)	
Capital investment				0.297
No	145 (60.7)	61 (57.0)	84 (63.6)	
Yes	94 (39.3)	46 (43.0)	48 (36.4)	
Effect of age				0.027**
No	212 (89.1)	90 (84.1)	122 (93.1)	
Yes	26 (10.9)	17 (15.9)	9 (6.9)	
Landing site				0.334
Ashamang	116 (48.3)	48 (44.9)	68 (51.1)	
Awudun	124 (51.7)	59 (55.1)	65 (48.9)	
Catch perception				0.021**
Decrease	208 (86.7)	100 (93.5)	108 (81.2)	
Increase	28 (11.7)	6 (5.6)	22 (16.5)	
The same	4 (1.7)	1 (0.9)	3 (2.3)	
Age of fisher	39.8±10.3	39.0 ±10.6	40.5±10.0	0.673
No. of household dependents	4.0±3.5	4.7±3.5	5.6±3.6	0.374
No. years in fishing	21.8±11.6	20.6±11.3	22.8±11.8	0.585
No. of landing sites used to sell fish	2.4±1.5	2.2±1.8	2.5±1.3	0.058*

**< 0.05 * < 0.10

4.1.2 Fishers perception about current state of the fishery and their Willingness to exit Fishing

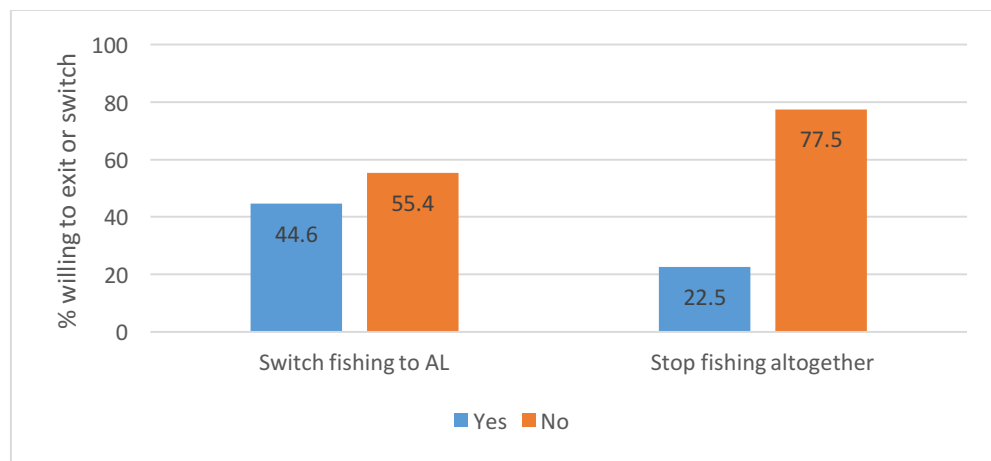
In order to ensure that fishers were aware of the current state of the fishery and also to ascertain if they actually understood what is happening, questions were asked to learn their perceptions about the state of the fishery based on their catches and what they perceived to be the causes and as to what needed to be done to help the situation. Table 4 shows their responses. Eighty-seven percent (87%) reported a decrease in the state of the fishery with 12% reporting an increase from their perspective. Seventy-seven percent (77%) considered the decrease to be a lot of decrease while 25% of the fishers consider the decrease to be a little decrease. These results conform with those obtained in a survey conducted by Crawford *et al.* 2016 on the coast of Ghana where fishers reported between 72 to 90 percent reduction in pelagic fish catches. As to the causes of the decline in the fishery, 48% of the fishers attributed it to illegal fishing activities by both local and foreign vessels, 50% attributed the cause to the activities of trawlers operating in the waters and destroying spawning grounds and 2.5% attributed it to the large number of vessels operating in the fishery. Based on their perceptions of what is happening in the fishery, their response to what needs to be done to help build the fishery was mostly centered around getting the trawlers out of the system and putting in place measures to stop the illegal fishing activities. Their perception about effort reduction was mostly centered around reducing the number of trawlers or stopping their operations entirely rather than on reducing the number of canoes in the study area.

Table 4: Fishers perception about the fishery

Perception about the fishery	% Responses
Decrease	86.7
Increase	11.7
Extent of decrease	
A little	24.9
A lot	77.1
Causes of decline	
Illegal fishing activities	47.9
Activities of trawlers	49.6
Increase in the number of vessels	2.5

Figure 4 shows the responses of fishers concerning their willingness to leave the fishery for an alternative livelihood occupation and also their responses as to whether they are willing to leave the fishery altogether in the face of a declining fishery. The majority of the fishers (78%) indicated they were not willing to stop fishing entirely. When asked if they are willing to exit or switch from fishing to an alternative livelihood that will earn the same income as they get from fishing, only 45% of the fishers were willing to switch from fishing to other alternative livelihood with the remaining 55% showing no interest of switching to any alternative livelihood occupation.

Figure 4: Fishermen's willingness to stop or switch fishing



Preliminary tests between some of the socio-demographic variables and exiting fishing shows there was no significant difference between fishermen's willingness to switch fishing and the following variables; educational status (literacy), type of fisher, educational effect (that is, if being educated will affect their willingness to exit), household effect, capital investment and landing site (Table 3). However, there was a statistically significant ($p < 0.05$) relation between switch fishing and the following variables in the study; namely marital status ($p = 0.039$), generation in fishing ($p = 0.004$), alternative livelihood engagement ($p = 0.032$), government legislation ($p = 0.004$), fish decline ($p = 0.005$), effect of age ($p = 0.027$) and catch perception ($p = 0.021$). In addition, sufficiency of income was also statistically significant ($p < 0.10$) with switch fishing.

Pearson correlations computed or calculated to compare continuous variables such as period in fishing, age of fisher, household dependent and number of landing sites (Table 5) shows a statistically significant ($p < 0.05$) strong positive linear correlation ($r = 0.827$) between the age of fishers and the period in fishing or experience in fishing. This could indicate that the older the fisher the longer he might have stayed in the fishery looking at the fact that most of them start fishing at an early stage (in their early 20s) thus giving them the chance to be more experienced in their occupation.

Other statistically significant, but moderate positive linear correlations included age and number of household dependents ($r = 0.411$), household dependents and period in fishing or years in fishing ($r = 0.414$), and household dependents and number of landing sites used to sell fish ($r = 0.310$). In terms of age and household dependents, it could be due to the fact that the older one gets, the greater their responsibility for taking care of family members due the practice of an extended family system in Ghana. The

larger a fisher's household, the more income he might need. Hence there is a possibility that a fisher might try to land his catches elsewhere to get better returns than if he sells at his local landing site if prices are bad. This might not always be the case hence the moderate correlation between the variables.

Table 5: Correlation Analysis

	Age	Household Dependent	Period in Fishing	No. of landing site
Age of fisher	1	0.411 (0.000)*	0.827 (0.000)*	-0.046 (0.483)
No. of household dependents		1	0.414 (0.000)*	0.310 (0.000)*
Period in fishing			1	0.034 (0.599)
Number of landing sites used				1

*Correlation is significant at the 0.01 level (2-tailed).

Table 6 represents a bivariate t-test analysis between period in fishing and number of household dependents with some selected variables. The results show a significant relation between period in fishing and the fishermen's ability to read and write (Wilcoxon =11192.0, p=0.012) and occupational status of fisher (Chi square 15.6, df=2, p<0.000). This signifies that the level of experience between a crew, captain and boat owner might not be the same among the fishermen considering the fact that most boat owners have passed through the stage of being crew to captain before owning a boat and also the fact that most captains were once crew before becoming a captain. In addition, the relation between period in fishing and the ability of a fisher to read and write could mean that older fishers who might have stayed in the fishery for a longer period of time might have not gotten the chance to be educated compared to younger ones who haven't been in the fishery for long and who might have had some form of education due to recent efforts to promote education in fishing communities.

Number of household dependents that a fisher has also shows a significant relation with read and write (Wilcoxon = 10806.0, p=0.004), sufficiency of income (Wilcoxon = 12048.0, p= 0.042), switch fishing (Wilcoxon = 11232.2, p=0.043), educational level (Chi square =6.7, df-3, p=0.081) and occupational status of fisher (Chi square= 19, df-2, p=0.000). Clearly, the number of dependents a fisher has could affect the usage of their income thus determining whether his income would be sufficient or not to supply the basic needs of the family. Larger households may mean more income thus in situations where fishing is the only reliable source of income, household size could likely have an effect on a fisher's decision to switch or not. Similarly, the occupational status of a fisher (whether boat owner, captain or crew) has an effect on the size of one's household. For instance, boat owners who are usually better off among the three occupational types have an average of 7.2 (4.4) dependents, while captains have an average of 6.5 (3.3) household dependents with crew having an average of 4.5 (3.2) dependents in the family.

Table 6: Bivariate t-test for period in fishing and number of household dependents with some variables

Variables	Period in fishing				No. of Household dependents			
	Wilcoxon	Chi square	df	P-value	Wilcoxon	Chi square	df	P-value
Read and write	11192.0	-	-	0.012**	10806.0	-	-	0.004**
Sufficiency of income	14827.5	-	-	0.266	12048.0	-	-	0.042**
Type of fisher	25505.0	-	-	0.105	24587.5			0.164
Alternative livelihood engagement	23800.0	-	-	0.454	4525.5	-	-	0.843
Switch fishing	12113.5	-		0.144	11232.0	-		0.043**
Educational level	-	1.5	2	0.473	-	6.7	3	0.081*
Occupational Status of fisher	-	15.6	2	0.000**	-	19.0	2	0.000**

**< 0.05 *<0.10

Results below (Table 7) from 2-sample independent t-tests shows that there was a statistically significant difference between age of fisher and the type of fisher ($p=0.002$). The average age of a full time fisher is 39 while that of the part time fisher is 46. This result may be due to the fact that older fishers might have stayed in the fisheries for a long time, acquired lots of experience and may have had the opportunity to save funds to invest in something other than fishing. Similarly, there was a statistically significant relationship between the ages of fishermen and location of landing site Ashamang and Awudun ($p=0.004$). This probably is due to the fact that most of the fishers at the Ashamang landing site are migrant fishers made up of younger fishers (average age 38 years) migrating to this place for greener pastures. While those at the Awudun (average age 42) are mostly locals from Tema.

Table 7: Parametric T-test of age of fishers with some selected variables

Age of fisher	Variables	Mean difference	SE	df	P-value
	Sufficiency of income	-0.8	1.3	236	0.567
	Alternative livelihood engagement	-2.7	1.8	236	0.141
	Type of fisher	6.8	2.2	236	0.002**
	Switch fishing	1.5	1.3	236	0.259
	Read and write	-0.0	1.3	236	0.995
	Landing site	-3.9	1.3	236	0.004**

**< 0.05 (5%)

4.1.3 Logistic Regression to determine factors affecting willingness to switch fishing

Nine indicators that appeared significant in the preliminary test (Table 3) were used in a binary logistic regression to model the relationship between fisher's willingness to exit the fishery. Five variables; generation in fishing, alternative livelihood engagement, fish decline, catch perception and government legislation were statistically significant in the initial model, thus they were predictive of fishers' willingness to exit the fisheries

for an alternative livelihood. Alternative livelihood engagement, government legislation and fish decline had a positive effect on fishers' willingness to exit the fisher. The positive effect that fishers' engagement in an alternative livelihood had signifies that fishers engaged in an alternative livelihood are more willing to exit the fishery, probably because they are sure that when they do, they might have something to fall back on that could sustain them when they exit. Similarly, the results also show that government legislation and the decline in the fishery will also increase fishermen's willingness to exit the fishery. The positive effect of government legislation on fishers' willingness to exit shows the extent to which government legislation seeking to get fishers out could work with the right support. The positive effect of fish decline on their willingness to exit could probably be mean that fishers who perceive larger declines in the fishery are more likely to see economic opportunities dwindling and hence might be more willing to exit. In addition to this, the results also indicate that generation in fishing and fishers' catch perception has a negative effect on fishers' willingness to exit the fishery for an alternative livelihood. Implying for instance that coming from a generation of fishers reduces the tendency of a fisher to leave the fishery, which he might have inherited from his predecessors, for an alternative livelihood.

A stepwise removal of variables with the least co-efficient to reduce suppressor effect and multicollinearity within the variables left "*generation in fishing*" remaining as the strongest factor, significant throughout the final model ($p=0.01$, $df = 1$, $\text{Exp}(B) = 0.343$). This indicates that coming from a household which has a history of fishing is a major factor that affects fishermen's willingness to exit the fishery.

This was the expected result since it is expected that having one's predecessors engaged in the fishery and (probably) inheriting the occupation from them would make fishers more reluctant to give up their inheritance by exiting from the fishery to do something else. The rest of the significant variables; alternative livelihood engagement, catch perception, fish decline and government legislation though significant in the initial model did not remain significant throughout the whole model. Marital status, sufficiency of income, age and number of landing sites did not have any significant effect on the fisher's willingness to exit the fishery ($p > 0.10$).

Table 8: Multivariable logistic regression analysis of factors affecting fisher's willingness to exit fishing

	Respondent would switch from fishing								
BLR Model	1	2	3	4	5	6	7	8	9
Variable Coefficients									
Marital Status	0.375	0.405	0.374	X	X	X	X	X	X
Generation in Fishing	-1.002**	-1.032**	-1.047***	-1.055***	-1.125***	-1.05***	-1.08***	-1.089***	-1.07***
Sufficient income	-.262	-.192	x	x	x	x	x	x	x
Alternative Livelihood	.870**	.802**	.827**	.840**	.757**	.777**	x	x	x
Age	0.486	0.426	0.455	0.478	x	x	x	x	x
Catch perception	-.804*	-.880**	-.944**	-.930**	-.934**	-.953**	-.867**	x	x
Landing sites	-.137	x	x	x	x	x	x	x	x
Government	.675*	.606*	.609*	.594*	.645*	.845**	.882***	.955***	x
Fish Decline	.542*	.603*	.598*	.590*	.623*	x	x	x	x
Model Statistics									
p-value	0.000062	0.000059	0.00003	0.000016	0.000012	0.000032	0.000076	0.00023	0.004
Cox/Nell R square	0.137	0.13	0.129	0.125	0.12	0.103	0.087	0.068	0.034
Nagelkerke R square	0.184	0.174	0.172	0.168	0.161	0.138	0.116	0.091	0.046
Df	9	8	7	6	5	4	3	2	1

X=variable excluded in model

*=p<0.10, **=p<0.05, ***=p<.01

4.2 Alternative Livelihood Preference

Out of the total number of fishermen interviewed, only 17% were engaged in an alternative livelihood apart from fishing. The remaining 83% were not engaged in any alternative livelihood activity apart from fishing. Some of the reasons given for their lack of engagement in any alternative livelihoods centered around lack of funds to invest in any other activities due to insufficient income and also the fact that fishing is a time consuming activity thus they do not have time for other jobs. Table 9 represents their responses when asked about the type of jobs they were interested in doing aside from fishing. Forty-nine percent (49%) wanted to do nothing else apart from fishing, signifying that with such individuals no matter what livelihood options they are presented, there is a high probability that they would return to fishing. The remaining 51% reported their interest to be in jobs such as service work (14%), driving or transport work (10%), trading (8%), company work (9%), or farming (4%). Those who weren't sure of what they want to do but were ready to welcome any kind of job that may earn them income represented 6% of the sample.

Table 9: Alternative livelihood interest of respondents

Alternative livelihood interest	Boat owners (%)	Captain (%)	Crew (%)	Total
Any job that can earn me money	10	13.9	3.6	6.3
Farming (Aquaculture, Poultry, Crops)	5.4	2.8	4.2	4.2
Company/Gov. work	5.4	2.8	10.3	8.3
Driving /car business	13.5	11.1	9.1	10.0
Service (Electrical works/welding/mechanical work, carpentry, etc.)	2.7	5.6	18.2	14.2
Still do fishing	48.6	55.6	47.9	48.7
Trading	10.8	8.3	6.7	7.5
Go to school	3.6	-	-	0.8
Total	100	100	100	100

A bivariate analysis of fishers' alternative livelihood engagement and some selected variables (Table 10) shows a significant relation between alternative livelihood engagement and type of fisher, switch fishing, household in fishing (all at $p < 0.05$) and educational level at 10% confidence interval. Looking at these results, one could infer that fishers who are part-time fishers are likely to engage in an alternative livelihood since they don't spend all their time fishing and hence they are able to make time to do other things. Similarly, those who have some level of higher education might also have needed skills and the ability to do something else. Having some form of education increases one's chance of getting a job outside fishing. Thus, those who have some form of education will probably be engaged in other forms of alternative livelihood occupation. Having some of their household in fishing may reduce the pressure that a fisher might feel in being in fishing alone and thus this might give them a little time for them to engage in something else.

Table 10: Bivariate analysis of alternative livelihood involvement with some selected variables

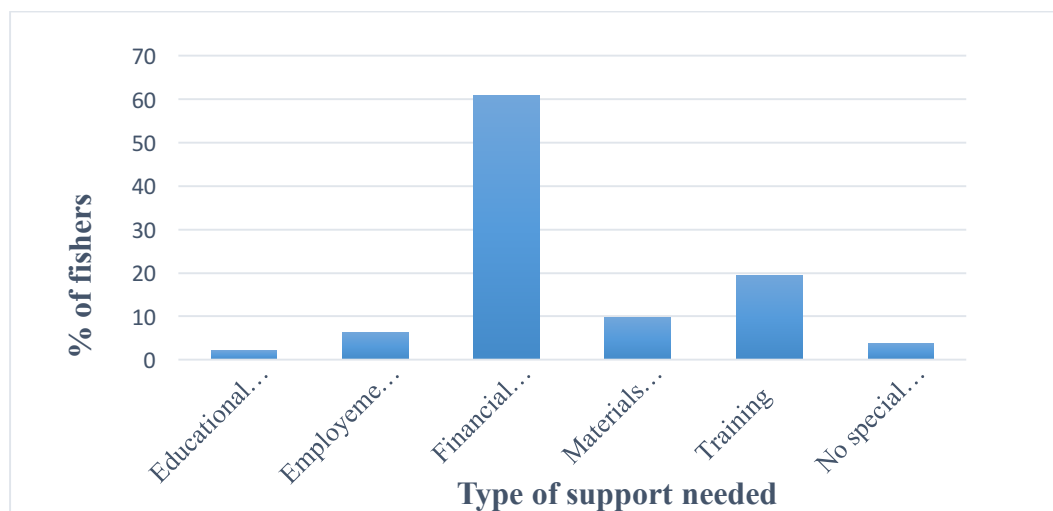
Alternative Livelihood	Variables	Chi square	df	P- value
	Type of fisher	108.0	1	0.000**
	Educational level	7.1	3	0.070*
	exit fishing	4.6	1	0.032**
	Household in fishing	11.383	2	0.003**

4.3 Type of Support Needed by Fishers

The majority of respondents who were interested in getting an alternative job mentioned financial constraints as one major limitation. Since a majority of the fishers

claim their income is not sufficient to take care of their families and also to cater for their basic needs, it is usually difficult if not impossible for them to save to invest some in any alternative occupations. Financial support from the government ranked the highest support needed by the fishers. 61% reported the need for financial support in the form of startup capital to enable them to enter into an alternative job (Figure 3). In addition to financial support, on the job training (20%) was also mentioned specifically by those who are interested in service jobs to obtain technical knowledge since most of them have no educational background and no skills in these areas. Obtaining material and equipment was also mentioned as a form of assistance needed by fishers, and 10% mentioned they will need assistance in obtaining these to be able to start their own business. Assistance in gaining employment with a company was also mentioned as a form of support needed by some of the fishers (7%).

Figure 5: Type of support needed by fishers



CHAPTER 5

DISCUSSION

The results of this study show that even though Ghana's fishery has been reporting declines in landings and profits of fishers over the past decades, most fishers still want to be in the fishery. The results show that majority of fishermen (78%), specifically in the study area, (Ahsamang and Awudun landing beaches), were not willing to stop fishing completely. This may indicate that they are satisfied with their fishing, or just that there aren't alternative jobs available. But Tema is a highly industrialized area where people can find jobs compared with the other coastal communities. Thus it might be comparatively easy for fishers to find alternatives to fishing. The fact that a majority of the fishers (55%) are unwilling to exit (for any other alternative occupation that will provide them with the same income as they obtain from fishing) suggests that the issue might not be the lack of the availability of jobs in that area. Instead, the results appear to speak to their satisfaction in the fishery. This interpretation is based on the use of willingness to exit as a measure of fisher's satisfaction. This agrees with other findings in the literature showing that fishers are not willing to exit the fishery for an alternative livelihood, but contradicts with findings from Asiedu *et al.* (2014) and Anning *et al.* (2012) who found that majority of fishers surveyed in Ghana, (73% and 62% respectively) were willing to switch from fishing to other alternative occupations. The difference between these findings could be attributed to the fact that their studies were conducted in the rural parts of the country where there are limited job opportunities for fishers, thus leading to their high willingness to welcome new opportunities to increase diversification compared to those in an urban

area like Tema. Cinner *et al.* 2008, explained this condition based on the fact that fishers in developed areas or sites usually choose fisheries over other available occupations, while those who came from less economically developed areas where job opportunities are limited with fewer options or opportunities available to them are more willing to exit if alternatives are available. An important aspect of these findings is the suggestion that fishers in developed areas choose fishing not as an occupation of last resort but as a preference, while those from less developed areas may have chosen fishing simply because it might have been the best available option. This also confirms the existence of variations in job satisfaction among fishers even within the same region or country as noted by Pollnac *et al.* 2001 and Tower, 2012.

The finding that a majority of fishers surveyed (68%) were refusing to allow their children into fishing can also be used as an indicator of satisfaction in the fishery. Pollnac *et al.* (2001), showed that even though fishers might be satisfied with what they do, their level of satisfaction might not always be based solely on monetary gain. Most parents usually would want their children to be in an occupation where they would earn a good living. Thus not wanting their children to be in the fishery might reflect changing profitability as most perceived steep declines in the fishery. Staying in the fishery goes beyond an assessment of economic gains, because other factors can affect or contribute to wellbeing in the fishery.

Five major factors have been identified as influencing fishers' willingness to exit: fishers having their generation in fishing; their engagement in alternative livelihoods; fish stock declines, fishers' perceptions of catch rates and the presence of government legislation to stop fishers from fishing. All five factors appear to affect

Tema fishers' willingness to exit the fishery. However, among these factors, fishers coming from a generation of fishers was identified to have a persistently stronger significant effect on Tema fisher's willingness to exit the fisheries.

Fishing is said to be part of the identity and culture of fishers for many generations. It is seen not to be just a source of livelihood but also a historically and culturally significant occupation. Fishing is a sector that has been identified as having a strong intergenerational tie where most children in fishing communities inherit the occupation from their parents (Blomquist *et al.* 2016). This situation is common in most fishing communities in Ghana where fishers most often fish with at least one or more of their children with the aim of transferring skills to them. This is to enable them to inherit or take over the fishing business in the near future (Afenyadu 2010), in addition to keeping income within the family (van Ginkel, 1999). With time, these children grow and become part of the crew. These children who are mostly of school-going age usually forfeit the chance of going to school or of advancing to a higher educational level, and thus find themselves stuck in the fishing industry with no other experience other than what they have in fishing. This pattern repeats itself across generations in most of the fishing communities. Looking at the number of fishers especially in the artisanal sector, and the average number of children each fisher has, if this pattern is not changed, the number of fishers in the industry will continue to increase regardless of how many enter as a free choice.

The studies show that fishers who come from a family history of fishing are less willing to exit the fishery. This is quite expected since it is usually the expected norm that those fishers who come from multiple generations of fishers and probably inherited the

occupation would want to continue the family occupation and hand it over to the next generation. Given the high rate of child labor in most of these fishing communities, there is the likelihood that this intergenerational transfer could lead to instances where many of these children who entered the fishery may have done so against their will. Being trapped in this situation with limited skills could cause them to hold on to what they already have or inherited and thus cause or even increase their reluctance to exit the fishery. This kind of trend could be changed or broken with a behavioral change of fishers towards sending their children to school to acquire diverse knowledge and skills rather than sending them fishing in order to reduce their over-dependence on fishing. The fact that most of the fishers do not want their children to be in fishing now presents a good opportunity for government intervention. The government could capitalize on it to prevent entry into the fishery in the first place rather than waiting for them to enter before trying to reduce their number.

Beyond the strong effect of family history in fishing, this study also found out that declining fish stocks and fishers' perceptions about the fishery were factors that could also affect fishermen's willingness to exit or switch from fishing even though their significance did not persist throughout the model. The results of the study indicate that declines in fish stocks will increase fishers' willingness to exit the fishery. This is consistent with various studies indicating fishers' willingness to exit the fishery at hypothesized higher levels of fish decline (Cinner *et al.* 2008 and Tower 2012). However, exactly what level of decline could cause the fishers to exit is not a settled question. Tower, (2012) reported that a 50% reduction in fisher's catch will cause more than half of his study population to exit the fishery in his study on factors affecting

fishers' readiness to exit a declining fisheries in Seychelles and Madagascar. Fishers at Tema however did not seem to agree to that. Though more than half (52%) reported more than a 50% reduction in their catches, they were still fishing. It is worth noting that amidst the decline in fisheries, fishers reported that there are times that they are able to get catches that are able to cover losses they might have accrued from previous trips. This possibility (of unexpectedly good catches) could explain why stock declines and decreasing catches though significant wasn't persistently strong through the model, that is they did not have a persistently strong effect on fishers' willingness to exit the fishery for an alternative occupation. Government legislation had an effect on fishers' willingness to exit the fishery since most often regulations that seek to take them out of fishing may work through enforcement. However, the issue often is being able to sustain them so that they do not re-enter the fishery.

Factors such as the age of fishers, their experience in the fishery, educational level, capital investment and income, have all been seen to affect fishers' willingness to exit the fishery in other studies (Cinner *et al.* 2008 and Pollnac *et al.* 2001) but these were not seen to have any significant effect on Tema fishers' willingness to exit the fishery.

Even though being engaged in an alternate form of livelihood (alternative livelihood engagement) wasn't significant throughout, it did have some effect on whether a fisher will exit the fishery or not. Having a form of alternative livelihoods would make it easier for fishers to exit the fishery since they are already engaged in something else. In instances where fishing is the only source of livelihood, fishers may need to continue fishing to support the family. These fishers face greater uncertainty

over what they might be getting themselves into when they have to switch from what they have to something entirely different in contrast to those who already are engaged in an alternative livelihood. The lack of certainty about leaving an occupation which they are used to, for one which they might not be certain about would probably reduce their willingness to exit. Thus, there is a high probability of them playing it safe by staying in the fishery rather than exiting into something that they might not be certain about. The positive effect that engagement in an alternative livelihood had on fishers' willingness to exit the fishery signifies that introducing them to alternative livelihoods could be a strong tool to use to increase their willingness to exit by diminishing the uncertainties they have about exiting. Hence, getting them to start changing their attitude about willingness to exit.

The total number of fishers (17%) engaged in an alternative livelihood falls within the 4% to 20% range obtained by Asiedu *et al.* (2013). Alternative activities engaged in included driving, farming and service work such as carpentry, masonry etc. Being a part-time fisher gives a fisher opportunity and time to engage in other forms of alternative livelihood occupations. Similarly having attained some level of education equips them with some level of skills and knowledge that opens other options in the job market. But for most, due to their low education and skills level, the alternative livelihood preference fell within sectors which usually do not require skilled laborers such as the agriculture, service, trading, and the transportation sectors. Those with some level of education wanted to work in a company as a factory hand or as laborers. The agriculture sector specifically involves fish farming and poultry since there is not enough land available in Tema for crop farming and even those lands that are available

might be too expensive for fishers to procure for farming purposes. Aside from the fact that limited skills were mentioned to be a major constraint, financial constraints were also mentioned as a limiting factor hindering their involvement.

5.1 Policy Implication and Recommendation

Looking at the fact that a high percentage of fishers still want to be in the fishery despite decline in the fishery shows that implementing direct effort control via reducing numbers of fishers engaged in fishing or reducing the number of vessels in the artisanal fisheries sector especially at Tema might not yield feasible results since fishers might still find a way to fish in one way or the other. Effort reduction methods employed by Ghana in its Fisheries Management Plan such as capping the number of canoes and registering them, replacing wooden boats with fiberglass boats and steel (that is replacing two wooden boats with one fiberglass or steel boat, with the intention of reducing the number of canoes) and increasing the number of fishing holidays from one day to two days per week might be good but might not be all that viable for the long-term sustainable management of the fishery. The main issue in my opinion is to address the situation from the initial stage by preventing people from going into the fishery in the first place by reducing the intergenerational transfer of fishing as an occupation within households in fishing communities. This could reduce the number of fishers entering into the fishery at a point in time. Reducing the number of canoes for instance does not necessarily mean reducing the number of fishers. Hardcore fishers who still want to fish might join other canoes to fish thus we could have fewer canoes but still the same number of fishers, thus increasing the fishing capacity of a canoe. In the same vein increasing the number of fishing holidays from one to two days per week doesn't

guarantee that fishers might not increase their effort to fish when the fishery is open. Replacing wooden canoes with fiberglass and steel could probably enhance fishers' capacity to fish instead of rather reducing it. Thus the best option is to reduce the number of fishers themselves by not getting them into fishing in the first place. Looking at the low literacy rates in most fishing communities clearly shows that people do not have options to make ends meet aside from joining fishing expeditions. Most fishers who might have gone through this process have seen the need to educate their children to prevent them from entering into the fishery for them to have a better life. This could be an opportunity for policymakers to capitalize on by creating flexible educational policies to help fishing communities and households keep their children in school through scholarships. Thus the next generation could have more opportunities outside fishing which is what many current fishermen want for their children.

Additionally, reducing fishers' overdependence on the fishery through the promotion of income diversification via alternative livelihoods could also help in controlling fishing effort. The result of the study shows that fishers that are engaged in an alternative livelihood occupation are more likely to exit the fishery than those who are not. But looking at the study area, only a few fishers are engaged in an alternative livelihood aside from fishing. Thus there is the need for government support promoting income diversification programs to support the fishers taking into consideration what they actually want and perceive to be their alternative occupation options. The Fisheries Management Plan also takes into consideration creating alternative livelihood programs for fishers who will be affected by effort reduction plans. In order for these programs to be adopted and to maintain long-term sustainability so that those who benefit may not

necessarily go back to put pressure on the fishery, the right group of people needs to be targeted. The study has identified two groups of people among the fishers; 1) those who might have entered the fishery by choice amidst other available options and thus might not be willing to exit and; 2) those who might be in the fishery without a choice by virtue of the fact that they came from a generation of fishers and have no option but to fish. Effort reduction strategies could target the latter group of fishers by equipping them with the right skills and support to encourage and promote engagement in alternative livelihood occupations aside fishing.

CONCLUSION

Implementation of effort reduction strategies to reduce fishing effort in a fishery which has an overwhelmingly high level of fishing effort in the form of large number of vessels putting too much pressure on an already overexploited fishery in Ghana is said to be a step in the right direction. This is to enable effective implementation and monitoring of management strategies geared towards output controls. Most often, the issue associated with this kind of management strategy is not getting the people out as has been seen in the previous chapters, but rather being able to keep them from returning back or re-entering into the fishery so as to make effort control measures more sustainable and effective. The artisanal sector is the sector that supports the domestic fish production in the country. Looking at the lack of political will to reduce effort in such a sector with the fear of creating or increasing the unemployment rate in the country, other indirect options, such as increasing education levels and promotion of income diversification in fishing communities, could be used to address the issue of increasing effort in the

artisanal sector. This might not be drastic but a gradual means which might prove effective and durable in the long term. However, it is worth noting that this finding is specific to the study area. Thus, looking at the fact that there is variation among what factors might determine whether a fisher would leave or exit the fishery, effort control plans if possible should not be generalized but be site-specific, taking into account the fact that each site or area might be different in terms of economic development and that what might work for an area like Tema might not work for the others areas. This has been the reason why many management policies fail due to generalization. In terms of the other coastal communities, this study could be replicated to identify what best suits them based on the conditions prevailing in those areas.

APPENDIX I

THE
UNIVERSITY
OF RHODE ISLAND
MARINE AFFAIRS

QUESTIONNAIRE FOR FIELD DATA COLLECTION

Control Of The Fishing Effort In The Artisanal Canoe Fishery Of Ghana: Socio-
Economic And Political Implications And Likelihood Of Success

Date Code.....

Location.....

SECTION A: Demographics and Occupational Characteristic That May Affect
Willingness to Leave Fishing.

Gender: male/ female: _____

Age

20-24 years [] 25-29 years [] 30-34years []

35-39 years [] 40-44 years []

Educational Level completed

No formal education completed

Elementary

High school

Tertiary education

Can you read or write in any language i) Yes ii) No

Are you a captain/bosun or Crew member or vessel owner?

Marital Status

a) Single b) Married c) Divorce d) Separated

1. No. of persons in the household:
Below 18 years.....
Above 18 years
2. How many in your household depend on you?
3. Is anyone in your household also involved in fishing activities
i)Yes ii) No
if yes check all that applies
 - processing
 - marketing
 - other
4. How long have you been fishing?
5. How old were you when you started fishing?
6. Were your last generation fishers?
7. Your area of residence now?
8. Where are you from originally?
9. How many landing sites do you fish from in a course of one year?
10. Are you a full time or part time fisherman?
11. How much of your income from fishing do you rely on?
i) All ii) more than half iii) half iii) less than half
12. Is the income you earn from your current fishing practice enough to live on
13. Do you have any alternative livelihood?
 - If yes specify all
 - If no, why?

SECTION B: FISHERS CRITERIAL FOR FEASIBLE ALTERNATIVE

LIVELIHOOD

If there were other jobs available that offer same income as fishing, would you switch jobs or continue to fish.

Yes

No

Why?

Apart from fishing what kind of jobs would you like to do

What kind of skills or resources will you need to do that job?

If government wants to assist you what kind of support would you want from them to enter into the job?

SECTION C: PERCEPTION ABOUT FISHING EFFORT REDUCTION

Compared to 5 years ago has catches

increased

decreased

○ stayed the same

1. How far has it decreased a lot or a little?
2. By how much (percent or fraction) has your catches decreased
3. What do you think has caused the decrease in catches?
 - a) Increase in number of fishers
 - Can you estimate the percentage increase in fishers in your fishing area since you began fishing?
 - Where did the new fishers come from
 - b) More efficient gears
 - i) Bigger
 - ii) Longer.
 - c) Illegal fishing (light fishing, fine mesh nets)
 - d) trawlers catching all the fish,
 - e) Other
4. What do you think should be done to prevent further decrease in catches?
5. Do you think the number of fishing vessels should be reduced?
Why or why not
6. If you think it should be reduced, by how much do you proposed
 - i) Half
 - ii) less than half
 - ii) more than half
7. Would you be willing to stop fishing altogether?
8. If the government were to established a vessel buy back scheme, will you consider giving up fishing?
 - a) Yes
 - b) No
 - If Yes, why?
 - If No, why?
- 9) Would you like your children to work in the fisheries sector?
 - a) Yes
 - b) No
 - Why

SECTION D: FACTORS AFFECTING WILLINGNESS TO EXIST

What would influence your decision to leave the fisheries?

1. To what extent can the following affect your decision to exist the fishery?

Factors	Range 0 to 5	Comments
Age		
Education		
Household size		
Government legislation		
Decline in fish		
Capital assert investment		
Others		

E. JOB SATISFACTION

Consider each of the items below and indicate how much you agree or disagree

	Agree	Do not agree	Strongly agree	I don't know
I like fishing because my grandfather was a fishermen				
I like to fish because I get regular income				
I like fishing because I like been my own boss				
I like fishing because that is the only job I can do				
I like fishing because I derive satisfaction from fishing.				

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