AN INVESTIGATION INTO THE SUSTAINABLE UTILISATION OF ARTISANAL FISHERIES IN LIBERIA: A CASE STUDY OF WEST POINT

A THESIS SUBMITTED TO THE UNIVERSITY OF NAIROBI IN PARTIAL FULFILLMENT OF MASTERS OF SCIENCE DEGREE IN ENVIRONMENTAL GOVERNANCE.

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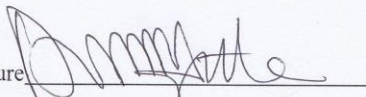
December 2017

Declaration

I, **Alexander Dunbar** declare that this thesis is my original work and has not been presented in any university for the award of a degree.

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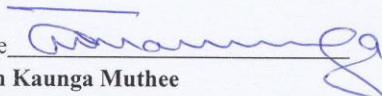**Alexander Dunbar- A60/81983/2015**

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Dedication

This thesis is dedicated to my dear family-my late father Otto M. Dunbar, mother, Sangai Dorley Dunbar, my brothers Otto, Otis, and Tilman Dunbar, and son A. Alexander Dunbar and finally the woman in my life Mildred Millidee Morris.

Acknowledgement

Table of Contents

List of Tables

List of Figures

Abbreviations and acronyms

AMANFU: Association of Fanti fishermen

BNF: Bureau of National Fisheries

CCRC: Code of conduct for responsible fisheries

EEZ: Exclusive Economic Zone

FAO: Food and Agriculture Organization of the United Nations

Hp: House power

IEZ: Inshore Exclusive Zone

IUU: Illegal Unregulated Unreported

LMA: Liberia Maritime Authority

LRA: Liberia Revenue Authority

MOA: Ministry of Agriculture

NM: Nautical mile

SES: Social-Ecological System

SSE: Small-scale Fisheries

TURF: Territorial Use Right in Fisheries

UNCLOS: United Nation convention on the laws of the sea

UNESCO: United Nations educational scientific and cultural organization

USAID: United States agency for international development

WARFP: West Africa Regional Fisheries Project

Abstract

Fish is the world's most-traded food product with an international seafood trade value of about $141.6 billion in 2016. Compared to industrial fisheries, artisanal fisheries provide about 90% of world fisheries employment, provide more food, and it is comparatively less environmentally damaging. The sector provides means of livelihood for 33,000 fishers and processors in Liberia, of which 60% are women. The artisanal fisheries are characterised by low capital, labour-intensive, remote landing sites, conflicts, and post-harvest problems such as spoilage and wastage in Liberia generally and in West Point particularly. The sector is open accessed and managed under an informal management system. This informal management system is self-organising but leading to unsustainable use of the fisheries resources, due to the use of gill nets and beach seine methods. There exist limited studies on the use of the artisanal fisheries resources through the informal self-governance regime. This research was therefore conducted to investigate the factors which affect the sustainable utilisation of the artisanal fisheries in Liberia with particular reference to WestPoint, a slum community next to Monrovia city centre with 1,249 fulltime fishermen. The population was stratified according to fishing methods and a proportion allocation method was applied to each stratum to obtain the sample size. Data was collected using structured questionnaire administered to 303 fishermen, focus group discussions in the two fishing communities of West Point, key informants interviews and a fish weight sampling. The results were analysed using descriptive statistics such as frequency distribution, percentages, and the results were presented in charts, graphs, and tables. Findings showed that there was a 41.7% decrease in total production of fish from the artisanal fisheries between 2013 and 2014 with key informants attributing the huge drop to inadequate assessment of landed catch and the 2014 Ebola outbreak. The study also revealed that key factors affecting the sustainable utilization included lack of rules of reciprocity to govern the resources, beach seine (5.3%) and different gear types: monofilament gill nets (41.6%),

monofilament gill lines (11.2%), and multifilament net (47.2%). The multifilament gears are the recommended gears for sustainable fisheries while monofilament gears are illegal and pose a greater threat to the fisheries. These gears (monofilament), due to their fibre, continuously fish once lost or left at sea destroying the spawning grounds of the species and increasing the rate of juvenile catch. Based on these findings, we conclude that factors influencing the sustainable use of the fisheries include methods of fishing, gears used and the local governance system and therefore recommends constant monitoring and assessment of the impact of fishing methods on coastal fisheries and a total ban of gears that are classified as harmful. The informal self-organized governance system should incorporate rules that protect not only the fishermen but also the fisheries resources. The Bureau of National Fisheries should widen the scope of artisanal data collection for more accurate catch report for a full representation of the marine small-scale fisheries yield.

CHAPTER ONE: INTRODUCTION

This chapter presents the introduction to the study. It provides a brief background on the importance of fisheries globally and Liberia specifically. It discusses the opportunities and challenges of fisheries in Liberia and West point in particular. The chapter concludes with the research objectives and questions, scope and limitations and justifications.

1.1 Background

Fisheries are the primary source of protein for over 1 billion people globally (Leslie et *al*., 2015). It's the world most widely traded food product with an international seafood trade value of about $141.6 billion in 2016 (FAO, 2017e) more than half of it from the artisanal fisheries (Kittinger *et al*.. 2013). Artisanal fishing and fish farming account for about 90% of the world fisheries' jobs (Renner, 2014). Sustainable management of this sector is critical to achieving local food security, poverty reduction, and sustainable livelihoods of small-scale fishers. The sector has a less environmental impact as compared to the industrial sector, and also provide more jobs and food (Blythe, 2015). Food and Agriculture Organization of the United Nations (FAO) international guidelines for securing sustainable small-scale fisheries proposed that a sustainable livelihood depends on the sustainable management and utilization of the fish on which the livelihood depends. It also reported that this is achievable through the application of precautionary approach and risk management to avoid undesirable outcomes such as over-exploitation of the resources and adverse environmental impacts.

The artisanal fisheries in Liberia are called the marine small-scale fisheries comprising of the Kru and the Fanti canoes. The subsector provides a means of livelihood for up to 33000 full-time fishers and processors of which 60% are women within the nine coastal counties of Liberia

operating from 114 landing sites (BNF 2014b). However, women are not involved in actual fishing activities; most women are involved in some form of fish processing (Sec. 4.1 & 4.8). The largest crafts are the Fanti canoes (BNF, 2014b) considered as semi-industrial because they are bigger and are motorised and fishing at longer distances compared to the Kru canoes that use paddles and sails and carry out their fishing operations closer to shore (BNF 2014b). The small-scale marine fisheries are characterised by low capital, labour-intensive, multi-gear and multi-species, remote landing sites, conflict among fleets (canoes, industrial and recreational vessels), and postharvest problems such as spoilage and wastage due to the lack of infrastructure for preservation and value addition. Challenges faced by the small-scale fisheries are common to countries around the world (Salas *et al*., 2007). Such challenges include an increase in coastal population, lack of well-defined management structures, increased reliance on the coastal resources and increased competition amongst users (Salas *et al*., 2007).

Open resources are prone to rivalry and non-excludability (Hardin 1968; Ostrom 2009). A case at this point is the artisanal fisheries in Liberia. Thus these fisheries are prone to unattainable utilization and depletion of fish stock and that management reform is necessary under such systems (Asare & Okyere 2012). Despite the vulnerability of the open access of the artisanal fisheries, there exist limited knowledge of the factors that influence the sustainable management and governance of this vital resource

1.2 Statement of the Research Problem

Sustainable utilisation of the artisanal fisheries in Liberia is facing challenges, particularly in the Westpoint area. Although canoes are licensed, the artisanal fisheries in Liberia and West Point, in particular, are operating as an open-access resource system. This situation is known as a common property resource where access is unrestricted implying they are open to everyone. This encourages high dependency on the resources leading to high extractability of

the resource and low excludability of users (Ostrom, 2009). The sector is also managed under a self-organised informal management system headed by a sea chief. This management regime brings together fishermen to address issues of mutual interest and concern focusing on social sustainability (the means by which fishermen will generate money to provide basic needs for their families such as food, shelter, clothing, and medical services) and forgetting resource sustainability (the use of the resource in a way that promote its renewability). As a result of this open-access regime, there is an increasing participation in the artisanal fisheries with the coastal communities becoming more dependent on the resources for their livelihoods. This high dependency results in unsustainable fishing practices such as beach seine, dynamite fishing, the use of illegal nets and conflict among users. These conflicts threaten the resource base due to different needs by actors and competition to satisfy those needs (FAO 2017d). A study conducted by Olomola (1998); outlined the sources of conflict as a continued violation of management rules and regulations., infringements on rights of ownership, access, and use of the fisheries resources. Ratner *et al*. (2014) also reported that these sources served as constraints to the sustainable utilisation and development of the subsector. These conflicts are prevalent in West Point, especially between the Kru and Fanti fishermen. Due to the semi-industrial nature of Fanti fishing, there is a huge disparity between the two communities regarding competition and catch with the Kru fisheries always at a disadvantage. Secondly, the policies of the Bureau of national fisheries (BNF) are directed to managing the fish stock forgetting all users and the usage. The BNF does not also have a well-defined fisheries management strategy that focuses specifically on the open-access regime of the artisanal fisheries for sustainable utilisation of the resources.

Open resource systems often collapse to the disadvantage of many when they are utilised without developing rules for their use (Ostrom 2009). Moreover, the open-access nature of artisanal fisheries is not sustainable because it leads to overexploitation and depletion of fish

stock and that management reform is necessary under such systems (Asare & Okyere 2012). In addition, the community based self-organised informal management system in west point is leading to unsustainable utilisation of the artisanal fisheries as seen in their fishing methods and use of monofilament gears which contradict the Ostrom (2009) SES theory that resources can be sustainably managed if communities self-organized, communicate, and develop rules of reciprocity. In this regard, the factors affecting the sustainable use of the fisheries resources under this self-organizing regime in West point are inadequately investigated. Therefore, there is a need to study how the West Point communities self-organised and self-regulated form of governance is impacting the fish stocks and community livelihoods.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of the study was to investigate the factors that influence the sustainable utilisation of the artisanal fisheries at the West Point area in Monrovia, Liberia

1.3.2 The specific objectives

1. To establish the status of the artisanal fisheries in Liberia and West Point in particular.

2. To establish the livelihood assets and activities of the artisanal fisher folks at Westpoint

3. To identify the stakeholders and their responsibilities in the fisheries of West Point area of Monrovia

4. To establish the system of governance of the artisanal fisheries in the study area and how it affects the fish stocks and livelihoods of the artisanal fishing communities in West Point area of Monrovia

1.3.3 Research Questions

The following questions are formulated according to the research objectives:

1. What is the current status of the artisanal fisheries in Liberia and how does it impact the livelihoods of its users?

2. What are the livelihood assets and activities of the artisanal fisherfolk at West Point in Monrovia?

3. Who are the stakeholders of the fisheries in West Point area of Monrovia?

4. What system of governance exists in West Point artisanal fisheries and how effective is it in promoting sustainable and equitable utilisation of the fisheries resource?

1.4 Scope and Limitations

The scope of the research was to investigate the sustainable utilisation of the artisanal fisheries in west-point, Liberia using the Ostrom (2009) Social-Ecological Systems Framework.

The study was conducted from October 2016 to January 2017 and was limited to the artisanal fisheries, fish landing sites and fishing communities in Westpoint, Liberia. The framework was designed as a common tool for interdisciplinary research into social-ecological systems. However, it focuses on institutional studies of the commons belies its interdisciplinary ambition and highlight its limitation in the area of ecology and natural science knowledge (Epstein *et al.*, 2013) which limit this study to institutional governance and sustainable use of the fisheries resources rather than focusing on the ecological aspect.

1.5 Justification

The per capita consumption of fish in Liberia is at 5kg; the lowest in the sub-region next to Sierra Leone, 25.3 kg, and Guinea, 10.5 kg, (USAID, 2016a). Furthermore, about 34% of Liberians experience food insecurity. Fish which is the second most purchased food product

(next to rice) provides about 15% of the animal protein supply (USAID, 2017). Data from the Bureau of National Fisheries showed that while the industrial fisheries which are largely operated by foreign vessels export their fish, the artisanal fisheries provide more fish for local consumption. The data also stated that about 89% of the total fishing industry employment of 33000 people are from the artisanal fisheries of which 60% are women. Recent research (USAID 2016b) reported that the country fisheries can significantly contribute to its protein need but faced problems related to governance, infrastructure, capacity, illegal, unreported and unregulated activities. A social-ecological systems approach helped identify the resource system, the resource users and their attribute including gears and methods of fishing, and how they are organised as well as the governance system. The detailed understanding of the governance challenges facing artisanal fisheries in the West Point area will assist in drawing attention to the need to formulate appropriate policies for equitable and sustainable exploitation of the fisheries resource in Liberia; hence, West Point is the biggest fishing community in the country. Information generated by this study will also contribute to Liberia agenda for transformation (Vision 2030) which aims at using Liberia's resources (e.g., fisheries) in a manner that promotes economic development, social equity and environmental sustainability. It will also contribute to the Sustainable Development Goals number fourteen by ensuring food security through good governance. SDG: 14 talks about conservation and the sustainable use of the world marine, seas and oceans resources for sustainable development.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents the literature review. The first section discusses the global fisheries trend followed by an overview of the artisanal fisheries in Liberia including its production trend. The subsequent sections explain the systems of governance, adaptive co-management, its legal and institutional frameworks, and governing fisheries as a common pool resource. The chapter concludes by discussing the theoretical framework and the point of entry into the Ostrom SES theory as the conceptual framework

2.1 Global fisheries trend

Over the last 50 years, global fish production has multiplied outpacing the rate of population growth 3.2% to 1.6% respectively (FAO, 2014). With this increment, per-capita consumption of fish also increased from 9.9 kg in 1960 to 19.2kg in 2012 (FAO, 2014). This means that the need for fish is fast growing exceeding the rate of population growth at the same time global fish production is declaiming and most oceans depleting. Governance and sustainable utilisation of the fisheries resources will ensure food security and maintain a supply of fish protein to dependent countries (such as Liberia) as future population increases. Garcia & Rosenberg. (2010) reported that the world population is expected to grow from 6.8 to 9 billion people by 2050. Fisheries governance, national and international policies and legal frameworks will ensure sustainable harvest. The need for fish as population rises can also be achieved by improving preservation of the artisanal catch to avoid physical and economic losses. This will reduce the fishing intensity and further reduce pressure on the resource base.

Artisanal fisheries are essential for food security and livelihood but attract less attention from fisheries managers (Cardinale *et al*., 2014). The total number of global artisanal fishers (0.98

million in Africa, 1.2 million in the Americas and Caribbean, and 6.1 million in Asia) catch an estimated 6.9 million tons of fish annually (Johnson *et al*., 2013). More than half of this catch is from developing countries. About 70% of total fish caught in the eastern Atlantic fisheries commission (of which Liberia is a party) is from the artisanal fisheries (Theodore, unpublished report) but these fisheries are met with undesirable challenges relating to illegal, unreported, and unregulated (IUU) activities including gears and methods. Liberia loses up to $ 75 million a year from IUU activities according to a USAID (2016a) report.

2.2 Artisanal fisheries in Liberia

The artisanal fisheries in Liberia are referred to as the marine small-scale fisheries. It is a subsection of the marine division of BNF headed by a sectional head. The subsector is divided into the artisanal and the semi-industrial fisheries. The artisanal is made of the Kru Fleets comprising of indigenous Kru canoes (about 7metre and 1-5 passengers) operated by the Kru fishermen using paddles or sail. They deploy hooks, longline and gillnet and targeting barracudas, croackers, grunters, *Dentex maroccanus* and crustaceans (BNF, 2014). The semi-industrial component is made of the Fanti fleets (about 12-20metre long and crew of up to 19), operated or owned by mostly Ghanaians or fishermen of Ghanaian ancestry. These semi-industrial canoes are powered by outboard engines with 10-40 horsepower (BNF 2016). The fishers use gears such as ring and purse nets for small pelagic species; larger gillnets are used for different species and seasons (BNF, 2014). Some Fanti canoes are permanently based in Liberia while others migrate along the coast from countries such as Ghana and northern West Africa as far as Senegal. The sector is key to the marine capture fisheries; accounting for approximately 3800 canoes and over 11000 fisher folks actively operating from 114 fish landing sites in the nine coastal counties of Liberia 15 counties (BNF, 2016).

2.3 Production trends of the artisanal fisheries in Liberia (1950-2010)

The country has one of the longest coastlines in West Africa, slightly longer than that of Senegal. The continental shelf is narrow at 34km in width and 570 km of coastline extending 200 nautical miles (Sherif, 2014) providing an area of 20,000 Km^2 of fishing ground (Drammeh 2007) making the country less productive in finfish demersal species and more productive in large pelagic species such as tuna, marlin and bonito. Shrimps, lobsters and other crustaceans are also of much higher value than the finish but less in abundance (Drammeh, 2007). It is upon these resources (finfish and crustaceans) that the artisanal fisheries depend. A study by Drammeh (2007) estimates the continental shelf of Liberia to have a maximum sustainable yield (MSY) of 180,000 tons per year in the 1980s.

The development of fisheries started with the establishment of BNF in 1957. The sector was at its maximum peak of production from the 1960s-80s. Data from the small-scale marine sector shows conflicting results as analysis shows that artisanal catches represent 20% of total harvest (Belhabib *et al*. 2016). But Data submitted to FAO by BNF shows that catch from the small-scale marine fisheries alone is 66% higher than data submitted to FAO (337,900t) and two times higher when accounting for lagoon catches (Belhabib *et al.* 2016). Data shows that the industrial fisheries produced about 1.8 million tons of fish during the period under review while Illegal, unregulated and unreported catch was responsible for 1.3 million ton and 249,000 tons of illegal discard at the same time (Belhabib et al. 2016). Total fish harvested increased from 9900 ton per year in 1950 to a peak of about 112,000 ton per year in 1988 and then decrease to 89000 ton per in 2010 (Belhabib et al. 2016). A study by Belhabib *et al*. (2013) reported that data from the artisanal fisheries shows serious inconsistencies with catch report (4.1 million tons) 15 time more than the 337,900 tons reported by FAO from 1950-2010. These discrepancies can be attributed to the methods of collecting data. Only between 1 to 3 counties

out of the nine coastal counties are covered by fisheries enumerators representing seven landing sites out of 114 and 20% of all the canoes with no countrywide extrapolations (Belhabib *et al*. 2013)

2.4 Governance and institutional arrangements of the artisanal fisheries in Liberia

Governance is defined as the rules, processes, and behaviour by which interests are articulated, resources are managed, and power is exercised (European Commission, 2017). Governance framework includes laws and regulations, local and international conventions, policies and administrative structures including local and international institutions, social norms and traditions. All these summarise governance to have three elements at three different levels: formal and informal rules, the way and process they are established, and who contribute to it (HLPE, 2014). In short, governance is characterised by national rules, international rules, local and customary practices (HLPE, 2014)

Institutional framework for the management of fisheries and aquaculture in Liberia is within the power of the Ministry of Agriculture (MOA) through the Bureau of National Fisheries (Drammeh, 2007). The Ministry of agriculture is headed by a minister and four deputy ministers with activities coordinated through its four departments (departments of Technical Services, Extension and Rural Development, Planning and Research, and Administration). It is the government body responsible for the development of a sustainable agricultural sector through institutional organisations or framework. The Bureau of National Fisheries (BNF), which is in charge of regulating fisheries activities in the Liberian waters, was created by an act of legislation in 1957 under the natural resource law of 1956 within the Ministry of Agriculture (BNF 2016). The Bureau is charged with the responsibilities of sustainable management and development of fisheries and aquaculture in Liberia. It is also charged with balancing the needs for ecosystem health, food security, economic growth, and social welfare

through the application of good governance framework, values, and principles (BNF, 2016). The BNF is headed by a coordinator who reports to the deputy minister for technical services at the ministry of agriculture. In support of the sector, the West African Regional Fisheries Project was established in 2010 through a grant from the Global Environment Facility, African Catalytic Growth, and the World Bank for the sustainable management of Liberia marine fisheries resources, and to strengthen BNF's capacity to govern the resources and reduce Illegal Unreported and Unregulated (IUU) activities. Since its establishment, West Africa Regional Fisheries Program has helped strengthen the Bureau through a number of regulatory frameworks. The establishment and enforcement of the six nautical miles for the artisanal fisheries have reduced conflict between the artisanal and the industrial fleets; others include the 2010 Fisheries Regulation, the fisheries and aquaculture policy and strategy of 2015. A World Bank (2016) report indicates that the level of IUU activities have dropped from 83% before the start of the project to 30%. The target was 33%. The same report indicates that based on fisheries performance indicator, the social, ecological and economic performances of the artisanal fisheries have improved especially in West Point affecting all three dimensions of sustainability namely environmental, social, and economic. The enforcement of the 6nm and reduction in IUU activities have also allowed stock within the inshore exclusive zone to recover thereby increasing the catch of artisanal fishermen. Governance and institutional arrangements and impact on the utilization of the artisanal fisheries has not been carried out in a study.

2.4.1 Adaptive co-management and Participatory Governance

Many studies have been conducted on adaptive co-management and Participatory Governance. For instance, Asare & Okyere (2012) argue that the sustainable livelihood of Small-scale fisher folks depends on the fisheries management strategy. In addition, Aguilera *et al.* (2015) concluded that the subsector is influenced by the level of governance which brings social-ecological challenges and opportunities. Moreover, Kofinas (2009) reported that adaptive co-

management is a concept of participatory governance that deals with the sharing of power and responsibility among local resource user communities and management agencies for more collaborative and coordinated actions. The researcher further stressed that a successful adaptive co-management should be holistic, flexible and responsive to changes in social-ecological systems. Therefore, we can conclude that the adaptive co-management and Participatory Governance have an influence on the sustainable utilisation of common resources such as fisheries. Nevertheless, this study will assess how fishermen participate in the local governance and to what extent is it affecting sustainable utilisation of artisanal fisheries. Especially in the context of West Point.

2.4.2 Institutional and legal instruments governing the sector

Salas et al. (2007) reported that legal frameworks exist in most countries as a major tool to regulate fisheries. The researcher also outlined management failures to weak institutions, lack of surveillance, unclear legal management instrument, and limited involvement of fishers in the management process. As part of its mandate to build the capacity of BNF, the West Africa Regional Fisheries Project drafted the first fisheries regulation, which was enacted and signed into law by the national legislature in 2010. The regulation is backed by the natural resource law of 1956 and serves as the legal framework for regulating the Liberian marine fisheries.

The Bureau over the years (since establishment) has institutionalised in its capacity the governance of fisheries; becoming a member of two primary internationally legally binding instruments (BNF 2014a). Firstly, the 1982 united nation's convention on the law of the sea (UNCLOS). UNCLOS, an internationally recognised rule dealing with the law of the sea is a comprehensive regime covering all aspects and uses of the sea. It requires states to conserve and manage living marine resources in areas within their national jurisdiction and cooperate in the management and conservation of living marine resources in areas beyond their national jurisdiction. It establishes a legal regime for conversation and management of fisheries

resources (BNF 2014a). Secondly, BNF is also a party to the 1995 Fish Stock Agreement, which is based upon the United Nations agreement for the implementation of the provisions of the 1982 convention on the law of the sea emphasising management responsibility through precautionary approaches, scientific information, and Regional Fisheries Management Organizations (RFMO). Additionally, some elements from the FAO code of conduct for responsible fisheries (CCRF) were adopted by the MOA 2008 food and agriculture policy to govern the Fisheries (BNF 2014a). The country is also a party to some international environmental instruments that are relevant to fisheries (Table: 1). The BNF has failed to enact national legislations as tools to implement these international binding instruments to sustainably manage the fisheries resources such as management base on precautionary approach as mandated by the 1995 fish stock agreement. As a result, fishing communities in Liberia especially West Point do not understand or adhere to the sustainability practices established by these international instruments.

Table 1: International Environmental instruments relevant to fisheries

International Environmental institutions pertinsent to fisheries	Objectives
1963 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	*aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival*
1971 Ramsar Convention on wetlands	*Is an intergovernmental treaty that provides the framework for international cooperation and national action for the conservation and wise use of wetland and their resources*
1992 Convention on Biological Diversity	*To protect biodiversity, e.g. fisheries* *To use its components sustainably* *To share fairly and equitably genetic resource benefit.*
*The convention for the Co-operation in the Protection, conversation, Development of the Marine and Coastal Environment of the West, Central, and southern Africa Region (**in short, Abidjan Convention**)*	*Its mission is to protect, conserve, and developed the convention area (14000 coastlines from Mauritania to South Africa) and the resources therein for the benefit of its people*

Source: The Bureau of National Fisheries –BNF, 2016

2.4.3 Governing the Commons

The most famous governance theory of common pool resources is Hardin (1968), who said that the tragedy of the commons is characterised by high extractability of resources and low excludability of users and that this tragedy can be averted through nationalisation and privatisation or cohesive laws and taxes. Or as a food basket such as fisheries, Hardin (1968) failed to highlight the concept of property right system such as a territorial use right fisheries (TURF). TURFs is a Co-management tool adopted by the BNF through WARFP to share management responsibilities with the fishing communities in ensuring sustainability by involving the elders and sea-chiefs of west point and other fishing communities in decisions made by the BNF that directly affect fishermen. Due to the importance given to the fishermen participation in the artisanal sector, BNF (2014) policy and aquaculture strategy proposed a co-management association in all 15 counties for both marine and inland fisheries as a way of incorporating all users and usage in the management of fisheries resources and sharing responsibility for the purpose of sustainable utilization of the resources.

Ostrom (1990) proposed an alternative approach to governing the commons; this approach highlights how the tragedy of small-scale common pool resources are overcome through self-organising and self-governing of communities with no government or market interventions. Ostrom (2009) also suggested that resources can successfully be governed through a community management process if those communities can be self-organised, communicate, and develop rules of reciprocity. This study tested the Ostrom SES framework to investigate the effectiveness of the self-organising and self-governing system of the artisanal fisher folks in West Point

2.5 Theoretical Framework

2.5.1 Polycentric Governance system

The study is based on poly-centricity theory as expounded by Ostrom *et al*. (1999) and many other scholars (Phal-Wostl 2009; Alston 2016). This theoretical framework is useful in understating polycentric governance of natural resources and the influence of formal and informal institutions, state and non-state actors, the nature of multi-level interactions, bureaucratic hierarchies, and markets (Phal-Wostl 2009). This theoretical framework also provides an analytical framework in the form of a socio-ecological system (SES). This framework has a structure of multiple actors or centres of decision making that establish collaboration or in an informal commitment to address common problems through self-governance (McGinnis 2016).

McGinnis (2016) also reported the failures of polycentric governance as structural inequities and fissures, coordination failures and lack of normative clarity. However, Parente & Pessoa (2009) reported that polycentric governance promotes sustainable development, economic competitiveness, and social cohesion which are the critical goals of the BNF through WARFP. We conclude that In West Point, the pattern of social order for the sustainable utilisation of the fisheries resources is polycentric. However, it is unknown to what extend fishermen have a shared understanding of laws, rules or norms from their self-governance system.

2.5.2 Conceptual framework

Studies (Leslie *et al*. 2015; Ostrom 2009) have proven that the Ostrom SES framework is the best tool for investigating the sustainability of common pool resources such as fisheries. This study adopted the Ostrom SES framework to examine the polycentric governance and use of the artisanal fisheries within the study area.

Governing common pool resources such as fisheries is beyond market and state; collective actions are needed to solve collective problems (Ostrom, 2010) such as resource collapse. Consistent with the Ostrom SES framework, polycentric governance involves multiple actors of decision-making authority with overlapping jurisdictions of which formal collaboration or informal commitments are made through a process of mutual adjustment for which interactions provides a secure foundation for self-governance (McGinnis, 2016). The theory of polycentric governance was used alongside the Ostrom SES framework to investigate factors that are influencing the sustainable use of the artisanal fisheries in WestPoint. Hence, the theoretical approach to the study was built on a point of entry into the Ostrom framework by beginning with investigating the artisanal fisheries as a resource system and all other factors that influence the sustainability of the system disregarding a focus on a specific resource unit (Figure 1). This concept contributes to understanding the feedbacks of change in the artisanal fisheries to the behaviour of fishermen (and vice versa). The framework looks into how fishermen (resource users) extract different types of fish species (resource units) from the artisanal fisheries (resource system) and how these users maintain the sustainability of the resource system through a self-organized system and rules (overarching Governance system). The objectives of the study were achieved by investigating these pillars of the Ostrom SESs framework.

Conceptual framework

Contextual factors (action situation: **inputs**)
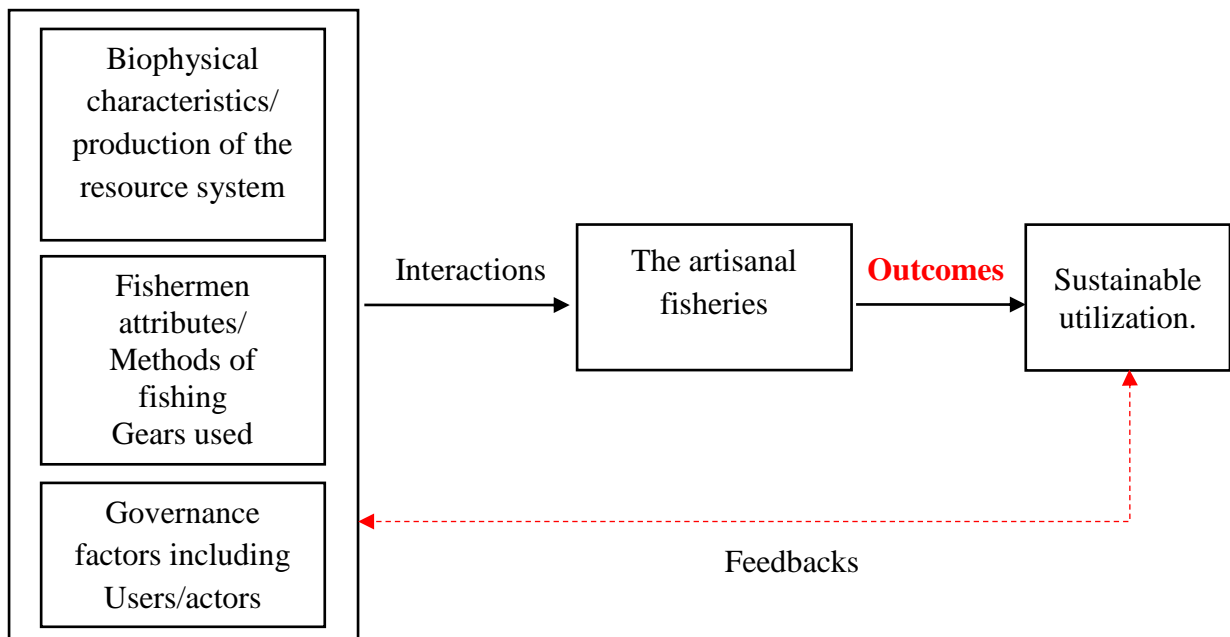
Source: *Author, modified from (Ostrom 2009; Ostrom 2014)*

Figure 1: Conceptual framework

2.6 Research Gaps

Studies have been conducted around the world to analyse factors that are influencing the sustainable utilisation of artisanal fisheries. A study done in Ghana by Asare & Okyere (2012) indicates that open resource system creates conflicts of competition for fishing grounds among users and unsustainable exploitation such as the use of illegal gears resulting in resource collapse as it was with the Ghanaian artisanal fisheries. Other studies in Nigeria, South Africa, India, and the Philippines by Olomola (1998); Ratner *et al*. (2014), list the sources of conflicts that serve as constraints to the sustainable utilisation and development of artisanal fisheries. These include violation of rules and regulations, infringement on the right of ownership, competitions for fishing ground, access and use. No studies have been done in Liberia

17

particularly in West Point to investigate the factors that influence the sustainable utilisation of the artisanal fisheries.

The informal management system in West Point is a form of self-organization of the artisanal fisher folks where the head or sea chief is either appointed or elected by the community and assisted by a council of elders. This self-organizing governance regime promotes sustainability according to Ostrom (2009); Basurto *et al*. (2013). No research has been done to investigate the effectiveness of the self-organising informal system of the artisanal fisheries in Liberia particularity in West Point.

CHAPTER THREE: MATERIALS AND METHODS

This chapter provides information on the study area and methods used in the research and the means by which the data was analysed. The chapter begins with the general characteristics and location of Liberia and narrowing it down to West Point. The last sections discuss the topographic features of the study area and the research design and materials used to collect data.

3.1 Location of the study area
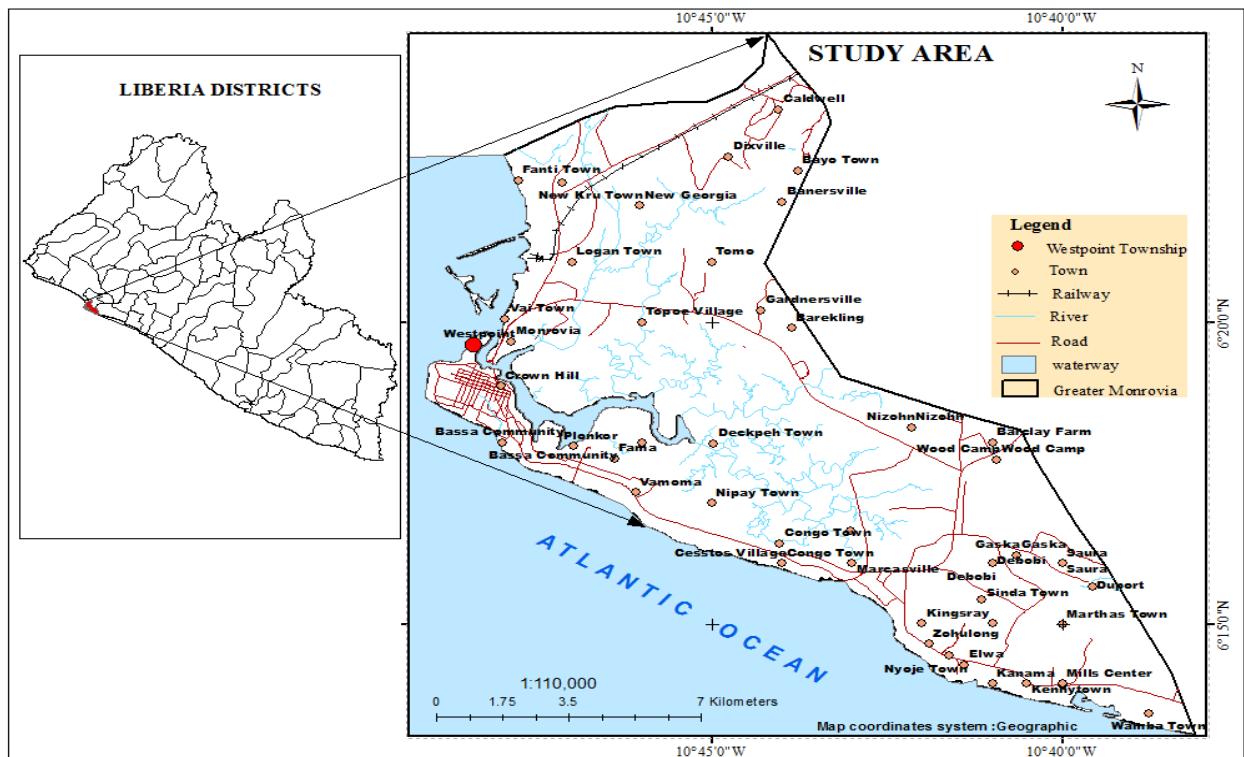
Figure 2: The study area

The study was conducted in Westpoint, Liberia (Figure 2); a slum township community next to Monrovia city centre with two fishing communities (Kru and Fanti town). Kru town has a geographical coordinate as 6.3265^0N, 10.8081^0W and Fanti town at 6.3285^0N, 10.8031^0W. West Point lies between the St. Paul and the Mesurrado rivers jutting out into the Atlantic Ocean. The Mesurrado River separates West Point from Bushrod and the providence islands.

3.2 Biophysical features

3.2.1 Geology and soil

The soils in West Point are Regosols or coastal sandy soils, which are well-drained, 60% coarse sand, deficient water-holding capacity, low humus and few mineral nutrients with low agricultural potential (FAO 2016). Sandy beaches and lagoons are also key features.

3.2.2 Climate

West Point has a tropical climate with two seasons. The rainy season covers May to November with an annual average rainfall of about 1905mm while the dry season is between December and April. Between December and February, the hot and dry wind "the Harmattan" blows from the Sahara and causes marked fluctuations of temperature between day and night with a minimum of 10 degrees Celsius.

3.2.3 Hydrology

West Point is saturated and filled with water because of its location between the Atlantic Ocean and the Mesurrado River and other drainages with underground water sources rooting from the Ocean or river. Most of these waters are contaminated due to the high population and increase in waste production, toilets and other waste. A study conducted by Runkle et al. (2013) found elevated levels of nitrates, nitrites, total coliforms and E. coli in West point wells. This contamination has caused most residents to get drinking water from outside sources such as the commercial plastic packaged water supplied by water vendors.

3.2.4 Vegetation and Fauna

The soil characteristics in west point have little vegetation due to its low mineral content. However, its waters are rich in high-value commercial species and wild marine lives such as *Lutjandidae spp* (red snapper), marine mammals (dolphins), and sea turtles (leatherback).

3.3 Demographic features

With a population of about 4.5 million people 60% under the age of 25 years and a literacy rate of 47.6% (World Bank, 2016), Liberia is sparsely populated and covers an area of 111,370 square kilometres. On the other hand, West Point is a densely populated slumcommunity of 75,000 people, Fishing and related activities such as fish processing are the primary sources of livelihood for the residents. The area faces problems such as coastal erosion, pollution, and overpopulation, which threaten livelihoods.

Fourteen percent of the total land area of Liberia (15,050 square kilometres) is freshwater resources such as rivers, creeks, streams, lakes, and lagoons, that flow throughout the country from north to the south and drains into the Atlantic Ocean bringing nutrients to support the primary production of the continental shelf. Ninety-six thousand three hundred and twenty (96,320) square kilometres (86%) of Liberia is dry land. With 579 km of coastline, the country has an average continental shelf of 34km in width and fishing ground covering 186322.2km^2 up to the 200 nautical miles (nm) Exclusive Economic Zone (EEZ) (Wiles, 2005)

3.4 Research Design

The study employed a descriptive research design that took observational, case study and survey methods. Both qualitative and quantitative data were collected by the use of different techniques from both primary and secondary sources. An In-depth analysis of the socio-ecological system was made as well as interviews and comprehensive discussions regarding the utilisation of the fisheries resources in the study area. West Point was selected because it is the largest artisanal fishing community in Liberia.

3.4.1 Scoping Study

A scoping study was carried out with two-trained research assistants and a research guide who were all familiar with the study area. A checklist was prepared in the form of a Social-ecological system inventory to establish preliminary information on the objectives of the study. The checklist mapped key actors, their importance, and knowledge about fishing and fishing practices, the existing governance structure of the artisanal fisheries in West Point. This exercise enabled the researchers to select the key informants through a pre-interview screening at which a formal interview was set up for data purposes. During this period, a survey was conducted on the number of canoes and crews per canoe, methods of fishing, gear type and method of Maneuverability.

3.4.2 Population distribution and criteria for sample size selection

The scoping study revealed (Table: 2) that there was a total of 1366 fishermen in west point of which 1249 are considered active and 117 inactive. Out of 297 canoes, 23 were also regarded as inactive. Canoes and it crewmembers are deemed inactive during maintenance or repair. The respondents were picked from active fishermen involved in day-to-day fishing operations to ascertain most reliable and resent information on the utilisation of the fisheries resources in west point.

Table 2: Population distribution according to landing site

Landing site	# of canoe	# of canoe-inactive	# of fishermen	# of fishermen-inactive	Active fishermen
Power Plan	19	6	87	6	81
Dosa beach	48	3	119	6	113
kru beach	91	6	149	10	139
Fanti town	139	10	1011	95	916
Grand Total	297	25	1366	117	1249

Author, 2017

3.4.3 Sampling

The township of West Point is divided into the Kru and Fanti towns (Table: 3). There are three landing sites in Kru town (Power plan, Kru, and Dosa beaches). Each beach has a distinct fishing method. Power plan beach is exclusively for beach seine fishers while Kru and Dosa beaches are used by hook and line and set net fishers respectively. There are only two methods of fishing (Ring net and Set net) in Fanti town.

The sampling frame was developed with the help of key informants identified during the scoping study. The sample size was determined from the population (1249 fishermen) in a stratified random sampling process with 95% confidence interval. A proportional allocation method was applied to allow every stratum to contribute equitably to the sample size. An equal stratification and distribution method presents an equal observation to every stratum and also make sure that all parts of the population are presented in the sample size to increase efficiency (Thomsen, 1976; Fienberg, 2003).

Sample size was calculated using the Cochran formula (Cochran, 1977; Polonia, 2013): $n = N/1 + N(e^2)$, where n = sample size, N = Population. e = Error

$$n = \frac{1249}{1 + 1249 (0.05^2)} = 303 \text{ Sample size (artisanal fishermen)}$$

A proportional allocation was used (Table: 3) to determine the appropriate sample from each stratum in the various fishing communities utilising the formula $n_i = n(N_i/N)$ by Guwahat S (2013). Where n_i = sample size per landing site, n = sample size selected from the population, N_i = population of the ith strata per landing site, N = accessible population of the study.

$$n_i = 303 \frac{(333)}{1249} \quad \textbf{81} \text{ sample size from Kru town}$$

23

$n_{i=}$ 303(916/1249) **222** sample size from Fanti town beach.

Table 3:Sample size distribution according to fishing methods

	Kru town		Fanti town	
Methods of fishing	Population	sample size	Population	sample size
Ring net	0	0	447	108
set net	128	31	469	114
Beach seine	66	16	0	0
Hooks and line	139	34	0	0
Subtotal	333	81	916	222

Source: Author, 2017

3.4.4 Data Collection

Questionnaire

The questionnaire was pre-tested using four fishermen from each stratum. The pilot testing was meant to validate the research tool and for its final adjustment (Namuma and Kong 2016). The semi-structured questionnaire was administered to 303 fishermen that were all male due to the gender difference that women are not allowed to go fishing but to do post-harvest handling activities because of the physical strength demanded by the job. The administering of the questionnaire was done by the researcher and three trained research assistants. To minimise errors and increase confidence and reliability in the data capture, and to avoid issues of non-response as described by Nolinske & Nolinske (1998), the trained research assistants filled-out the questionnaires for respondents who were illiterate. The questionnaire was used to collect data on fishing practices, fishing methods and gears used and to ascertain information on the livelihood of fishermen and the governance of the marine small-scale fisheries in the study area.

Focus Group Discussion

There were two focus group discussions (of ten members each) conducted within the two fishing communities of West Point; Fanti and Kru towns. Members of the council of elders,

the sea chiefs, fishermen, and fishmongers formed part of the FGDs. They were identified through mapping of the key players and their knowledge on West Point SES. The FGDs were designed to promote discussion among participants to generate new insights and facilitate open deliberation and different views. It also aimed at gathering information on similarities and differences among the factors that are affecting the sustainable use of the fisheries resources in the two fishing communities, interaction among the SESs components, and internal and external disturbances that influenced essential elements.

Key informant's interviews

A total of 15 key informants were interviewed. The study identified the key informants after a mapping exercise carried out during the scoping study from the head of fishing communities, or sea chiefs and sectional heads, property and canoe owners, heads of the Liberian artisanal fishermen association, fishmongers and processors, fishermen and officials of the Bureau of National Fisheries.

Participant observation

The study used participant observation as a tool to get a general understanding of the artisanal fisheries in West point and to enable the researcher to describe the behaviour of the artisanal fisher folks in the study area. The researcher participated in activities from fishing at sea to fish landing, Processing, storing and selling. These observations enabled the researcher to understand fishermen livelihood activities.

Fish weighing

Catch reports from the BNF between 2013 and 2014 were incomplete in weight. Fish were measured using Tub, Bucket, Bag, Bunch, Piece, and hand disregarding the weight of these units. Year to year catch report is measured in these units (Tub, Bucket, Bag, Bunch, Piece, and hand) with most fish types and units having no corresponding weights. The researcher

designed a weight sampling form after that of the Bureau and a species weight sampling was conducted on species without weight. All the informal weight measurements were now converted into a single unit in Kg and then tons.

The average weight of a fish is calculated from collecting sample weight of that fish or the unit in which it is measured. Nine to eighty-one sample weights are collected depending on the frequency of that species in landed catches. The average weight is now extrapolated to the number of pieces or units (e.g. bucket). The scales (flat and hanging salter) can measure a maximum of 250kg and 100 kg respectively. Fish species above 100kg are weighed using the flat scale while the rest of the catches are weighed using the hanging scale. Fish species above 250kg are cut in pieces and weighed.

3.4.5 Data Analysis

The qualitative data on the self-organized informal governance system of the artisanal fisheries and preservation and processing of fish gathered through interviews, focus groups and informal discussions was transcribed, coded and interpreted based on identified thematic areas (Taylor-Powell, E.; Renner 2003; Tba 2016). The summaries of the narrations are used in the discussion in the subsequent section. Quantitative data were processed through editing and coding and entered into Microsoft Office Excel and SPSS V20 for analysis and the results are presented using descriptive statistics in graphs, charts, and tables. A sample T-test and a Pearson chi-square were employed to compare mean canoe sizes, gears, distance covered and catch between Fanti and Kru fisheries to establish the differences and similarities between these parameters in terms of industrialization.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

This chapter presents and discusses findings on factors that influence the sustainable utilisation of the artisanal fisheries in the study area. The first section describes the demographic characteristics of respondents and compares the two fishing communities fishing communities in West Point in terms of general fishing characteristics. The second section describes the status of the artisanal fisheries in Liberia including the harvest level of most commercialised species. The third section discusses fishermen livelihood assets and the activities upon which their livelihood depends. Section four presents findings on the governance of artisanal fisheries. The chapter concludes by giving detailed discussions on key factors influencing the sustainable utilisation of the artisanal fisheries in Liberia with a specific reference to West Point.

4.1 Demographic characteristics of respondents

A total of 303 respondents were sampled from the various landing sites in the two fishing communities of West Point with 81 fishermen from Kru Town and 222 fishermen from Fanti Town (Table 4). Fanti Town had a proportionately larger sample compared to Kru Town. The results showed that all the respondents from the fishing communities (100%) were men. According to findings of focus group discussions and own observation, the participation of women in the fisheries' value chain is mainly as fishmongers and processors confirming a study by Harper *et al*. (2017). The mean age of fishermen interviewed was 34 ±10.29 years in both Kru Town and Fanti Towns. The study further showed that fishing was practised by a relatively large proportion (57.1%) of fishermen below thirty-five years of age. This implies that most of the fishermen are youthful and have the strength demanded by the job and undertake fishing as the main source of their livelihood. The average fishing experience of a fisherman is 15 years with minimum and maximum experiences being 1 and 60 years respectively.

Out of the 303 respondents, 49.2% of them have no formal education. The study further revealed a significant difference in education with 58% of Fanti having no form of education compared to 25% of Kru. The highest level of education attained by fishermen is a secondary school which constitutes 23.4% of those surveyed. Only 0.3% of respondents have a university education. The high rate of illiteracy negatively influences the sustainable use of the fisheries resources A UNESCO (2012) report indicates that sustainability requires a lot of skills, learning, and values and that Education is a major tool for achieving sustainable goal. The report and Haughes, (2014) also indicated that environmental education such as the cleaning of beaches improves conservation of sea turtles. Bhuiyana *et al*., (2010) also reported that conservation is a useful part of an education system and emphasized that communities can play a major role in this regard through awareness. The data further revealed that 50.5% of respondents are single; 45.9% married and 3.6% divorced while 52.1% have their highest household size 1-4 family members and the lowest at above 13, which is 1%.

Table 4: Demographic characteristics of respondents

Categories	Kru town		Fanti town		overall frequency	Overall Percent
	Frequency	percent	Frequency	Percent		
Family size						
1-4	48	59%	110	50%	158	52.10%
5-8	29	36%	97	44%	126	41.60%
9-12	4	5%	12	5%	16	5.30%
>13	0	0%	3	1%	3	1.00%
Total	81	100%	222	100%	303	100%
age group						
16-35	42	52%	131	59%	173	57.10%
36-55	38	47%	78	35%	116	38.30%
56-74	1	1%	13	6%	14	4.60%
Total	81	100%	222	100%	303	100%
Marital status						
Single	52	64%	101	45%	153	50.50%
Married	26	32%	113	51%	139	45.90%
Divorce	3	4%	8	4%	11	3.60%
Total	81	100%	222	100%	303	100%
Gender						
Male	81	100%	222	100%	303	100%
Level of Education						
no education	20	25%	129	58%	149	49.20%
Primary school	21	26%	50	23%	71	23.40%
Secondary school	19	23%	23	10%	42	13.90%
High school	18	22%	14	6%	32	10.60%
vocational school	3	4%	5	2%	8	2.60%
University	0	0%	1	0%	1	0.30%
Total	81	100%	222	100%	303	100%

Source: *Author, 2017*

4.2 Characteristics of West Point artisanal fisheries

The study showed that the key distinguishing features between Fanti and Kru fishing are the methods of fishing, preservation methods, the gear types and characteristics, the frequency of sea trips and the days spent at sea. These and other features such as the canoe size, engine capacity determine the fishing intensity and catch level within the two communities. The proximity of West Point also plays a major part in fishing effort and intensity as reported by Adriat *et al*. (2011). Salas *et al.* (2007) also reported that these distinguishing features such as different gears and canoes targeting different species pose challenges to evaluating the state of the resources.

The artisanal fisheries are carried out within a distance of six nautical miles (nm) from the baseline, established exclusively for the small-scale fisheries by the fisheries regulation of 2010 as the inshore exclusive zone (IEZ). This IEZ serves as a breeding ground for most valuable species of the Liberian fisheries

4.2.1 Dimension of canoes in length and crew sizes

Sizes of canoes (Table 5) in West Point are ranged from 1 to 20 metres. Between 1-7 metres are mostly used by Kru fishermen (65%) compare to the Fanti (10%). Additionally, Fanti fishermen (45%) used canoes size between 12-20 metres followed by 8-11 metres (43%) compared to 30% of Kru fishers that are using 8-11metres long canoes. The study revealed (Table:6) that 45.9% of respondents are fishing with crew size between 1 and 6 fishers and 32.3% fishing in a canoe with crew member 13-18. It further revealed that Kru fishermen (83%) are fishing with crew size 1-6 compared to the Fanti fishermen (41%) with crew between 13-18. Only 4.6% of respondents specifically from the Fanti fisheries are fishing with crew above 18 members.

Table 5: Sizes of canoes in west point

Canoe size	Fanti town		Kru town		overall Frequency	overall Percent
	Frequency	Percent	Frequency	Percent		
1 to 7 meters	23	10%	53	65%	76	25.1%
8 to 11 meters	95	43%	24	30%	119	39.3%
12 to 20 meters	101	45%	3	4%	104	34.3%
above 20	3	1%	1	1%	4	1.3%
Total	222	100%	81	100%	303	100%

Source: *Author, 2017*

Table 6: Crew size in West Point

Crew size	Kru town		Fanti town		overall Frequency	Overall Percent
	Frequency	percent	Frequency	Percent		
1-6	67	83%	72	32%	139	45.90%
7-12	8	10%	44	20%	52	17.20%
13-18	6	7%	92	41%	98	32.30%
above 18	0	0%	14	6%	13	4.60%
Total	81	100%	222	100%	303	100.00%

Source: *Author, 2017*

4.2.2 Canoes Maneuverability and mode of propulsion

Still, regarding the characteristics of the artisanal fisheries, there are 296 canoes (Table: 7) in West Point representing only 7.8% of all the canoes operating along the nine coastal counties of Liberia. Among these, 152 or 51.2% are motorised compared to 145 canoes or 48.6% that are non-motorized using sail and paddle to manoeuvre. Findings revealed that the motorised canoes have engine capacity ranging from 8 to 40 horsepower (hp) with a majority of the canoes (47%) using 40hp engine capacity as a mode of propulsion and Maneuverability. The study further showed that 93% of Fanti canoes are motorised compared to 91% of Kru canoes that used sail and paddle. This implies that Fantis have more fishing power and capacity to travel longer distances.

Table 7: Vessels Maneuverability and mode of propulsion

	Fanti town		Kru town			
	Frequency	Percent	Frequency	Percent	overall Frequency	overall Percent
40hp	139	93%	0	0%	139	47%
25hp	0	0%	1	1%	1	0.30%
18hp	0	0%	2	1%	2	0.70%
15hp	0	0%	7	5%	7	2.40%
10hp	0	0%	1	1%	1	0.30%
8hp	0	0%	2	1%	2	0.70%
Sail or paddle	11	7%	133	91%	144	48.60%
Total	150	100%	146	100%	296	100%

Source: *Author, 2017*

4.2.3 Distance to fishing ground

The research revealed (Table:8) that the longest distance cover by fishermen is 8nm by 5.9%
of respondents exclusively from the Fanti fishing community contradicting Glasgow (2008)
who reported that these fishermen covered up to 50nm. Majority of the fishermen (39.6%)
covered a distance of 4-6nm. Compared to the Fanti, 53% Kru fishermen fishing within a
distance of 4-6nm followed by 37% who fishing from the baseline to 3nm while Fanti
fishermen (47%) covered fishing distance up to 8nm followed by 35% that fishing between 4-
6nm. This and the aforementioned canoe and crew sizes, engine capacity imply that Fanti
fishermen are more sophisticated with gears and equipment and travel long distances compared
to the Kru except for the beach seine fishermen that usually fish between 0-3nm. The majority
of respondents (39.6%) from all methods preferred fishing between 4-6nm.

Table 8: Distance travelled by canoes

	Kru town		Fanti town			
Sea distance	Frequency	Percent	Frequency	Percent	overall Frequency	overall Percent
0-3NM	30	37%	23	10%	53	17.50%
4-6NM	43	53%	77	35%	120	39.60%
7-8NM	8	10%	104	47%	112	37%
Above 8NM	0	0%	18	8%	18	5.90%
Total	81	100%	222	100%	303	100%

Source: *Author, 2017*

4.2.4 Fishing depth

A sample T. test revealed that there is a significant variation in distance covered by the Fanti and Kru fishermen at P=.004. Table 9 illustrates that 23% of respondents fishing at a fishing depth of 11-20 metres. Though fishermen are usually confused about fishing depth and ocean depth, the study was interested in the fishing depth, which is often measured according to the length of the nets or fishing gears. Some of the respondents, 2.3%, mostly ring net fishermen fishing the deepest at 50m while the beach seiners are fishing at the lowest depth of 0-10m. The study showed (Table: 8 and 9) that majority of the fishing activities occur from 4-6nm at a fishing depth of 11-50 metres.

The aforementioned characteristics of canoes and crew sizes, canoe mode of manoeuvrability, distance to fishing grounds and fishing depth revealed that the Fantis are more industrialised than the Krus as reported by Belhabib *et al*. (2015). An assessment of catch level from a single sea trip revealed that the mean catch of Fanti was 0.95 ton more than that of Kru with the minimum and maximum catch per sea trip at 0.0527 ton and 0.08 ton in Kru town and 0.0 ton and 4.8 tons in Fanti town respectively.This is due to the semi-industrialised nature of the Fanti fishing using bigger and motorised canoes compared to the Kru that used smaller canoes with sail and paddles.

Table 9: Depth of fishing ground

Depth in meters	Kru town		Fanti town		overall Frequency	overall Percent
	Frequency	Percent	Frequency	Percent		
0-10m	20	25%	12	5%	32	11%
11-20m	18	22%	52	23%	70	23%
21-30m	22	27%	40	18%	62	21%
31-40m	8	10%	49	22%	57	19%
41-50m	10	12%	62	28%	72	24%
No measurement	0	0%	3	1%	3	1%
Above 50	3	4%	4	2%	7	2%
Total	81	100%	222	100%	303	100%

Source: *Author, 2017*

4.3 Fishing methods in West Point

The primary fishing activities in WestPoint include Beach seine, hooks and line, set net, and ring net. A Pearson chi-square revealed a significant difference in the methods of fishing within the study area with P= .000. The dominant method of fishing (Table: 10) in the two communities is set net, practised by 47.9% of respondents followed by ring net with 35.6%. Ring net is exclusively practised by the Fantis while set net is practice in the two communities. Findings also showed that 38% Kru fishermen practice set net fishing activities compared to 51% of Fanti fishers. Hook and line and beach seine are the two least methods practised

Table 10: Methods of fishing according to communities

Methods of fishing	Kru town		Fanti town		overall Frequency	overall percent
	Frequency	Percent	Frequency	Percent		
Beach seine	16	20%	0	0%	16	5.3
Set net	31	38%	114	51%	145	47.9
Hook and line	34	42%	0	0%	34	11.2
Ring net	0	0%	108	49%	108	35.6
Total	81	100%	222	100%	303	100

Source: *Author, 2017*

4.3.1 Beach Seine

The method constitutes 5.3% of all the fishing activities in West Point and 20% in Kru town. It is practised exclusively by the Kru fishermen. Wilson & Zitha (2007) outlined the effects of beach seine on the environment as high share of juvenile species and overfishing due to small mesh sizes of nets. BNF is not enforcing the fisheries regulation on the use of beach seine for fear that the total abolishment of the method may further increase poverty. With fishing being the primary livelihood of beach seiners, most of them cannot acquire gears that will allow them to practice sustainable fishing.

This method is practised in shallow waters along the beach close to shore on power plan beach in Kru town. Eleven crewmembers deploy the gear with a small canoe between 0-8meters in a semi-circle starting from shore targeting small pelagic species such as *ilisha Africana.* It was

further observed that they dragged their catch for picking and sorting along the beaches, which are heavily contaminated with human waste as the neighbouring slums lack inappropriate toilet facilities.

Figure 3: Beach seine in Power plan, West Point

4.3.2 Hooks and Line and Trapline

The study revealed that these are two combined methods of fishing adopted by fishermen on Kru beach in Kru town. It is practised by about 11.2% of respondents in West Point in general and 42% of fishermen in Kru town, in particular, using monofilament lines. Hooks and line is a gear used to catch fish using natural or artificial baits placed on a hook at the end of a line targeting pike fish, and *pseudotolithus spp.* The trap line is a vertical line deployed as the fishermen use their hooks and line to fish and it's only retrieved when coming back to port or changing fishing grounds. It is deployed with one end of the mainline attached to the canoe and the other end attached to an anchor. Hooks are attached to the branch line at short intervals with the mainline. These are selective gears that are less environmentally damaging with limited by-catch that can be operated at different ranges of depth even in rough terrains targeting different species according to the type and size of hooks and kind of bait (FAO, 2017b). The method is more selective in terms of species and size and provides high-quality

fish (Alzos *et al.* 2008). Alzos *et al.* (2008) also reported that large hooks were associated with larger mean of fish caught compare to smaller hooks. Although the method is sustainable, it is used with monofilament lines. These lines have destructive effects on the fisheries. Yoshikawa (2004) reported that the use of these lines results in a coral reefs entanglement; killing the reefs. The coral reefs serve as the storage for marine ecosystems and biodiversity.

4.3.3 Set net

This method of fishing is practised in both Fanti and Kru town by 469 Fanti and 127 Kru fishermen respectively representing 47.9 % of respondents. In Kru town, set nets fishers use monofilament nylon nets (Set Gillnet) deployed either at the surface, mid or bottom waters according to its types, and buoyancy and mesh sizes targeting varieties of species such as *Arius latiscutantus*, *Pseudotolithus senegalensis*, *cynoglossus macrolepidotus*. The artisanal Kru fishermen prefer this gear due to low-cost. It is kept in a constant position by a floating line and a weight ground line creating a vertical single netting wall (FAO, 2017b). FAO2017; describe its key environmental impact as ghost fishing of lost gears due to the non-degradability of the fibre, incidental catch of marine mammals, sea turtles, and sharks. Fanti fishermen use set drift net. A method used to target *Sardinella maderensis.*

4.3.4 Ring net

This is practised by the Fanti fishermen (49%) and 35.6% of respondents using bigger motorised canoes (12-20 meters) crew member between 11-19 and targeting *Sardinella maderensis*. This method is described as a surrounding net in the form of both purse seine and lamp. These are nets taking the shape of a spoon (Figure 4) (FAO, 2017b). The gear is usually used to target species at water surface or column. FAO (2017b) list potential harmful impacts as high juvenile species sometimes not marketable and bycatch.
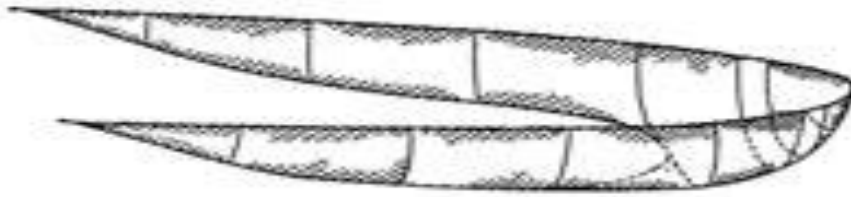
Figure 4: Ring net

Fishing activities in Fanti town are organised into fishing companies with every company having its own landing site or yard. Methods of fishing are based on the size of the canoes and gears.

Consistent with a study conducted by Belhabib *et al*. (2013) fishing activities in Fanti town are dominated by the Fantis from Ghana. There are two kinds of canoes in Fanti town namely: Borsue and Wecher canoes. Named according to their method of fishing in the Fanti language. Borsue is smaller set net canoes with 3-6 crewmembers. Wercher canoes are the biggest of all the canoes in WestPoint with crewmembers ranging from 12-19. Fishing activities are done with motorised canoes and much heavier multifilament ring nets

The third method of fishing by the Fanti is called Napleh fishing carried out by wecher canoes. This method uses either set or ring net to target Napleh fish (*Istiophorus albicans)*. Napleh is a billfish *Istiophorus albicans* that is of high commercial value to the artisanal fisheries in Liberia. It is targeted by the Fanti using set driftnet on motorised canoes. Napleh fishers spend a longer time at sea, up to three days using ice to preserve their catch from spoilage. The research reveals that 7.6% of respondents conduct Napleh fishing compared to 55.6 % that target *S. Maderensis*

4.4. Status of the Artisanal fisheries

4.4.1 Most Targeted and commercialised fish species in West Point

The present state of the artisanal fisheries in Liberia can be captured in the productivity of the resource system and input mechanisms by actors. Out of the more than 52 commercially valuable species within the artisanal fisheries of Liberia, (according to the database of BNF), there are only nine species that are of interest to fishermen within the study area (figure 4). The most preferred commercialised fish species is *Sardinella Madernsis* of which 56.8% of respondents considered as their primary target followed by *sphyraena afra* (9.9%) and *pseudotolithus spp* (9.6%). The least targeted species are flying fish and sharks. Incidental catch from the *s. maderensis* and *I. albicans* fisheries are tuna species and *Euthynnus alletteratus* that are usually seen in the landed catches. A consistent target and exploitation of a particular fishery over a period can lead to overexploitation and depletion of that stock of fish. Morison (2004) proposed managing output control in the form of total allowable catch (TAC), quotas and trip limit to restrict the quantity of fish being caught or to prevent the over-exploitation of a particular fish species.
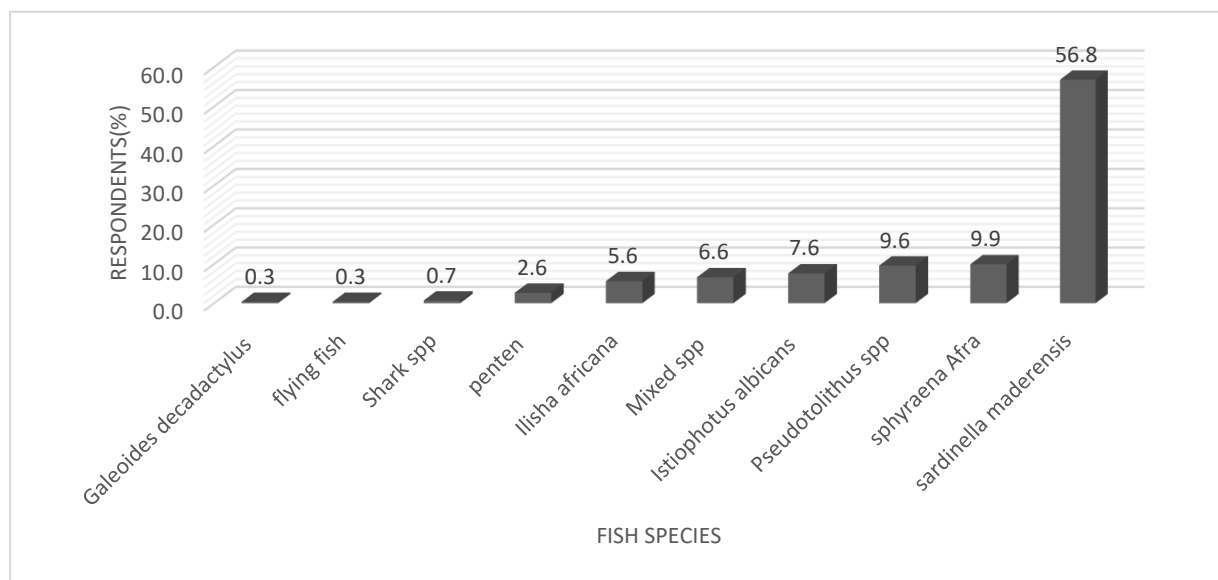
Figure 5: Most valuable and commercialised species in West Point

4.4.2 Total fish harvested from the artisanal fisheries in Liberia (2013-2014)

The research failed to establish the trend of the artisanal fisheries not only due to the lack of time-series data but also because to lack of adequate assessment of fishing effort or catch statistics. Adriat *et al*. (2011) Stressed the need for a long-term time series data to correctly estimate the status of exploited resources and their development over time. However, the research was able to establish a two-year catch report as presented in Figure 4 to understand the productive nature of the artisanal fisheries. Results revealed that during the period under review 2013 and 2014, the total fish harvested was 57,137.34 and 33,338.37 tons respectively. This shows a 41.7% decrease in total production within the two years. Data also revealed that 63% of total fish harvested during this period was in 2013 alone and 37% in 2014 with year-to-year average catch per canoe as 15 and 8.7 tons in 2013 and 2014 respectively. Key informants from the BNF acknowledged the huge drop in fish harvested and attributed it to the lack of funding for the assessment of catch statistics and fishing effort and the outbreak of the Ebola virus in 2014 which halted all fishing activities. A reliability assessment revealed that there are twenty-four sampling stations out of the one hundred and fourteen landing sites along the nine coastal counties of Liberia representing 21% of the total landing sites in the country. Seven canoes are sampled at each sampling station representing 4.42% of the 3800 artisanal vessels in Liberia. This implies that catch reports from the artisanal fisheries are underestimated confirming a study by Belhabib *et al*. (2013). It also suggests that the artisanal fleets are under-represented in the sampling of canoes. This is due to inadequate coverage by fisheries enumerators conducting catch assessments at various landing sites.
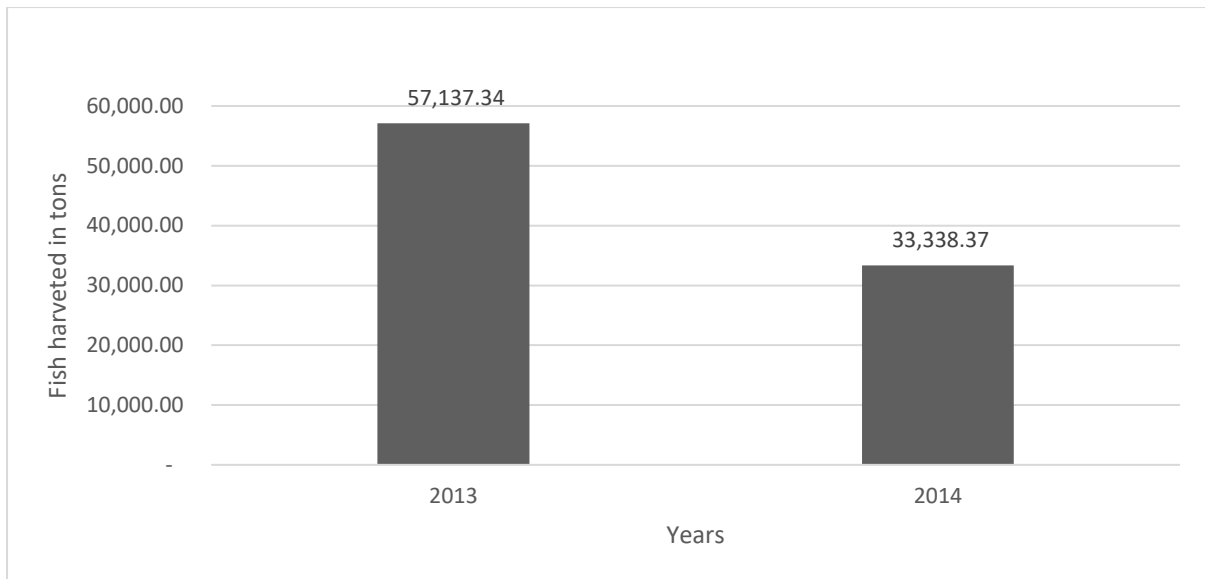
Figure 6: Total production from the artisanal fisheries 2013-2014

Source: *Data from BNF complemented with data from the survey, 2017*

4.4.3 Rate of harvest of commercialised fish stock 2013-2014

In an effort to show the yield of the artisanal fisheries by species, findings (Table 11) showed that *S. maderensis* was the most harvested species accounting for 87.89% and 72.70% of total fish production of the artisanal fisheries in 2013 and 2014 respectively followed by *P. senegalensis* (3.93% in 2013) and *C. chrysurus* (12.89% in 2014). The drop in the total yield of the artisanal fisheries (Figure 6) also showed an increase in the rate of harvest of some species while other species showed a decrease in yield (Table 11).

Table 11: Rate of harvest per species

Fish harvested per species in 2013 and 2014			
Local name	Scientific name	2013	2014
Napleh	*Istiophorus albicans*	1.03%	0.02%
Forbor	*Coryphaena hippurus*	0.49%	0.01%
Sharks	*sharks spp*	0.43%	0.30%
Penten	*Spp unid*	0.39%	0.29%
Cavalla	*Caranx fischeri*	0.37%	0.59%
Flying fish	*flying fish*	0.32%	0.56%
Mixed	*Mixed spp*	0.14%	1.02%
Pojoe	*Chloroscombrus chrysurus*	0.13%	12.89%
Gbakpelleh	*Ilisha africana*	0.11%	2.02%
Grouper	*Lutjanus goreensis*	0.09%	0.82%
Snapper	*Dentex spp*	0.01%	0.62%
Tuna	*Tuna app*	0.00%	0.62%
Cassava fish	*Pseudotolithus Spp*	3.93%	1.33%
Blood fish	*Euthynnus alletteratus*	0.84%	2.35%
Sole fish	*sole fish unid*	0.69%	0.42%
Catfish	*Arius latiscutatus*	0.83%	1.73%
Butternose	*Galeoides decadactylus*	0.97%	0.47%
Bonny	*Sidenella. maderensis*	87.89%	72.70%

Source: *calculated from data from BNF and the study, 2017*

Table 12: Mean catch and weight of capture fish

Quantity of fish for different informal methods of expressing
fish caught in Liberia and weight (in Kg)

| Local name | Scientific name | Units of measurement (Mean±SD) 2013&14 | | | | | | Weight (Mean±SD) |
		Bucket	Bunch	Bag	Piece	Hand	Tub	mean weight(Kg)
Napleh	*Istiophorus albicans*				5.41±2.54			302±14.2
Forbor	*Coryphaena hippurus*		7±0.1	7.7±1.7	4.1±0.4	9.54±5.36	3.4±2.3	150±15.9
Sharks	*sharks spp*				3±2.2	2.9±1.9	1.75±0.95	53±37
Penten	*Spp unid*	4.4±0.5		46±0.0	8±6.1	12.4±11	7.9±0.84	14.7±1.9
Cavalla	*Caranx fischeri*				4.6±0.37			42±3.4
Flying fish	*flying fish*	9.7±3.0		1.5±0.73				61.5±30
Mixed	*Mixed spp*	1.8±0.96					2.6±1.4	41±1.9
Pojoe	*Chloroscombrus chrysurus*	2.4±0.7		22.4±2.8	5.8±1		28.7±4.3	34.4±1.7
Gbakpelleh	*Ilisha africana*	3.2±0.24		13.3±1.8	3.9±1.1		5.5±3.7	18±1.6
Grouper	*Lutjanus goreensis*		5±3.2		2.8±0.24	3.2±0.9		16.3±1.4
Snapper	*Dentex spp*		10±5.9		7.1±5	6.3±3.6	1±0.0	4.6±0.56
Tuna	*Tuna app*			2±1.1	5.5±2	6.4±1.8	3.4±2.5	40.6±20.7
Cassava fish	*Pseudotolithus Spp*	2.8±2.3	3.4±3	11.5±5.2	11.4±6.6	3.34±1.93	2.6±0.37	40.6±9.1
Blood fish	*Euthynnus alletteratus*	1.21±0.42	1.66±1.15	28±20.3	8.4±5.62	14.2±6.3	5.7±5.3	206.5±19.2
Sole fish	*sole fish unid*	3.4±1.3	4.1±2	9±4.4	5±3.3	3.7±2.7	2.9±1.4	20.6±2
Catfish	*Arius latiscutatus*		7.8±5.5	15.7±5.1	7.5±1.1	4.4±2.5		9.5±9
Butternose	*Galeoides decadactylus*	1.46±0.95	6.2±5	11.4±7.2	10±1.3	3.3±2.1	1.3±0.85	31.2±3.9
Bonny	*Sidenella. maderensis*	37±2.8	2.3±1.2	12.7±1.6	5±1.4	7.3±6.1	38±6.6	38±20

Note: Values in mean weight column are represented as; Mean ±S D of weight while values in units of measurement are represented by mean±SD of catch

Source: *calculated from data from BNF and the study, 2017*

4.5 Livelihood assets and activities of the artisanal fisher folks in West Point

From the fishermen point of view, Sustainable use of fisheries resources depends on how well their livelihoods can be sustained monetarily from fishing operations. Livelihood covers assets and activities required for a means of living (Knutsson, 2006). It is sustainable when it can withstand stresses and shocks and maintain its capacities, assets and activities now and in the future without undermining the natural resource base (Knutsson, 2006). Respondents depend on fishing and related activities such as net sewing as their primary source of livelihood.

4.5.1 Livelihood assets

Most of the respondents linked factors affecting their livelihood assets and activities to environmental factors. These include Sea erosion and floating seaweed, which wear away their homes and canoes and their fishing gears continuously getting entangled in the seaweeds. Respondents Livelihood assets were categorised into five components:

Natural capital- defined as the stock of natural assets, 83% of respondents mentioned fish with 16% saying ocean resources as natural capital upon which their livelihoods depend. This revealed that fishermen are 99% dependent on the artisanal fisheries as a source of living. Such high dependency leads to an undesirable outcome of its use such as pollution of the resource system, and overexploitation (Hardin 1968; Ostrom 2014). The Mesurrado River was also mentioned; interviews revealed that it is used for fishing, especially dynamite; it also serves as a sewage system and dump site for residents of Fanti town, and as a means of transportation in and out of West Point through Clara town.

Physical capital- these are assets such as machinery, house, and fishing materials. Fishermen tangible assets (Table: 13) are mainly fishing materials (68.3%). These include canoes, nets, engine, hook and line, paddles and sail, and materials from their alternative livelihood activities. Although land is a natural asset according to Erdenesan *et al*. (2014), it is considered

a physical asset to some fishermen (1.2%). On the tenure of the canoe on which they are fishing,

31.4% of the respondents expressed ownership with 63.7% saying they are only crewmembers,

4%, and 1.3% saying they rented or are caretakers respectively (Table 14).

Table 13: Livelihood Physical assets

Physical assets	respondents %
fishing materials	68.30%
No assets	24.70%
House	4.20%
Land	1.20%
Car	1.20%
Gas station	0.40%
Total	100.00%

Source: *Author, 2017*

Table 14 : Tenure of canoe

characteristics	Frequency	Percent
Own	95	31.35
Lease/Rent	11	3.63
Crew member	193	63.7
Caretaker	4	1.32
Total	303	100

Source: *Author, 2017*

Financial capital- these are financial assets in the form of cash, savings and access to credit

(Morse & McNamara 2013). Fishermen financial assets are in two categories, namely banking

and Susu clubs (Table: 15). Susu clubs are in other areas referred to as table banking or Merry-

go-round. Within this cooperative saving system, monies are collected and given to one

member within a specified period until every member benefits. Money may be given out daily,

monthly or annually depending on the agreement of its members or founder(s). Money

contributed by members on an annual basis are given back to members or non-members with

an interest rate. Data shows that 51.7% of fishermen have no financial assets with 3.1% having

an unspecified asset. Some fishermen (15.4%) have savings in banks while 29.3% save with

Susu clubs. Only 0.4% indicated having insurance.

Table 15: Fishermen financial assets

Financial assets	Respondents
No financial assets	51.80%
Unspecified financial assets	3.10%
Insurance	0.40%
Banking	15.40%
Susu clubs	29.30%
Total	100.00%

Source: *Author, 2017*

Human capital – this includes education and training (Erdenesan et al. 2014), and also intelligence, skills, and expertise (Kucharčíková 2011). As presented in Table: 4**,** 49.2% of fishermen have no formal education followed by secondary school education (23.4%). University education is the least (0.3%). On the other hand, 45.6% of respondents indicated fishing as the only skill use for a living. This is due to the lack of vocational training and other forms of education.

Social capital: Findings (figure: 7) revealed that 93% of respondents are within a form of the social network while 7% are not in any social grouping. Many scholars have reported that social capital positively influences economic growth and development, promotes trust and cooperation among actors, solve collection problems through collective action (McGinnis 2016; Ostrom 2008), reduces crime rate and other social problems (Rupasingha et al. 2006). It is a network of patrons and neighbours, and a relationship of mutual trust and support and a mechanism for participation in decision making to solve collective problem through collective action (Rupasingha *et al*. 2006).

Results also demonstrated that respondents that are part of social networks are members of different social groups (Table: 16) such as AMANFU (association of Fanti fishermen name in the Fanti language), United fishermen association in Kru town, Seamen union, and Liberia artisanal fishermen association (LAFA). AMANFU is the largest social group (64%) followed

by United fishermen association (11%). Although LAFA is the mother association under which all other associations fall, 17% of respondents mentioned being members; while 1% considered only being part of the seamen union which is also a subgroup of LAFA. Only 7% of respondents mentioned not been part of any social groups. This degree of social networking confirms that fishermen can solve collective problems through collective actions and promote cooperation and trust among themselves as expounded by several studies (Basurto et al. 2013; Ostrom 2010; Rupasingha et al. 2006)
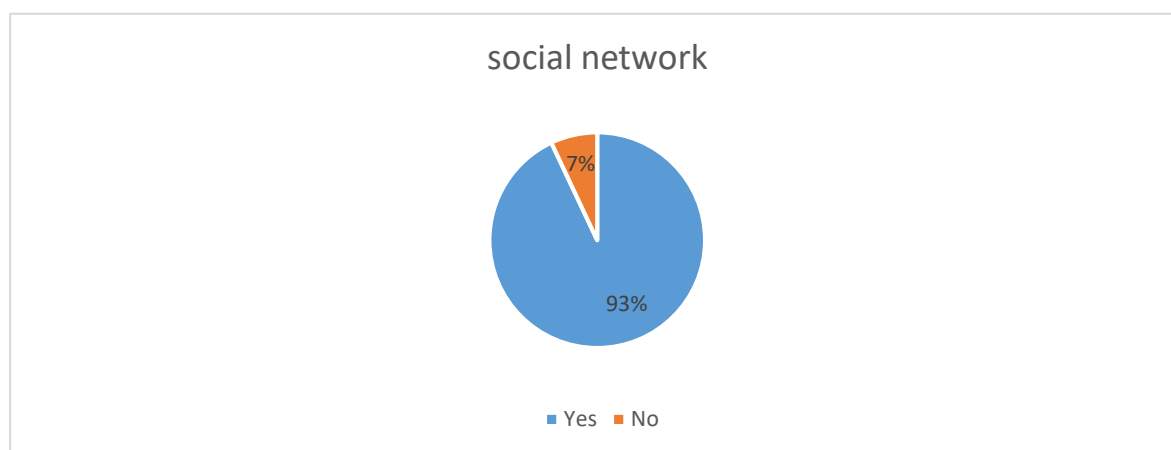
Figure 7: Social network

Source: *Author, 2017*

Table 16 : Social grouping

Social groups	Kru town		Fanti town		Overall frequency	Overall Percent
	Frequency	percent	frequency	percent		
LAFA	38	47%	14	6%	52	17%
Seamen union	2	2%	0	0%	2	1%
AMANFU	0	0%	194	87%	194	64%
United fishermen	34	42%	0	0%	34	11%
None	7	9%	14	6%	21	7%
Total	81	100%	222	100%	303	100%

Source: *Author, 2017*

4.5.2 Alternative Livelihood activities

The researcher also sought to find out respondents' alternative livelihood activities and skills. Results (Table-17) Showed that 60.4% of respondents do nothing if not fishing followed by petty trade (10.6%). This also shows the high dependency on the fisheries resources as a source of livelihood. Asare & Okyere (2012) reported that increase reliance on a resource creates competition, conflicts and overexploitation of the resource.

Table 17: Alternative livelihood activities and skills

Alternative Livelihood Activities	Frequency	Percent
Net sewing	16	5.3
Football	8	2.6
Electrician	4	1.3
Agriculture	1	0.3
Commercial motorcyclist	5	1.7
Teaching	1	0.3
Canoe Discharger	3	1
Petty Trade	32	10.6
Mechanic	7	2.3
Masonry	21	6.9
Power saw operator	1	0.3
Commercial Driver	8	2.6
Nothing(no activity)	183	60.4
Sand mining	2	0.7
Carpentry	11	3.6
Total	303	100

Source: *Author, 2017*

4.6 West Point Fisheries stakeholders and their responsibilities

The key stakeholders in West Point artisanal fisheries include the sea chiefs, officials and members of the Liberian artisanal fishermen Association (LAFA), boat owners, fishmongers, and local fishermen. Others include government agencies fisheries inspectors/Enumerators and officials of the Bureau of National Fisheries.

Data gathered (Table: 18) from the study and review of the fisheries regulation of 2010, the Liberian fisheries and aquaculture policy strategy of 2014, revealed several stakeholders spread

out at different locations making it different to govern the fisheries sustainably through coordination and synthesizing of ideas. The study further revealed an overlapping function of the Liberia Revenue Authority (LRA) and the Bureau of National Fisheries in the collection of canoes registration and license fees. The LRA is mandated by law to collect Liberia's revenues but license fees are collected by the BNF. Additionally, in cases of damaged gears and fishing equipment by ships registered under the Liberia Maritime Authority (LMA), Maritime takes no blame because canoes license fees are paid to the BNF at the same time the BNF is referring such cases to the LMA. Araral, Ed; Hartley (2013) reported that a successful model of environmental governance is when autonomous actors at high levels coordinate, monitor, and synthesize ideas while local actors (e.g. fishermen) independently pursue policy goals through implementation.

Table 18: Liberian Fishery stakeholders and their responsibilities

KEY STAKEHOLDERS	ROLES AND RESPONSIBILITIES
The Ministry of Agriculture	The Ministry of Agriculture was established with the mandate to develop the agriculture sector. The 1956 natural resource law of Liberia created the BNF as part of the ministry until April 2017 when executive order 84 transferred it to the LMA
The Bureau of National Fisheries	The Bureau of national fisheries was established by an act of legislation under the ministry by the 1956 natural resource law of Liberia to regulate all fishing activities in the Liberian waters
Ministry of Justice (MOJ) Bureau of immigration Liberia National Police (BIN) The Drug enforcement agency (DEA)	The ministry of justice is responsible for law and order in Liberia. It interacts with fishermen through the following auxiliary agencies: Liberia immigration service (LIS) formerly the Bureau of immigration and naturalization: It is responsible for implementing the ECOWAS protocol on free movement of persons, goods and services from countries within the regional body, to implement the Alien and nationality law of Liberia and to admit alien's resident status and also monitoring the country's borders (air, land and sea) The Liberia Police is charged with the responsibility of protecting lives and properties, maintenance of law and order, to prevent, detect and investigate crimes, to preserve and enhance internal security These mandates are applied to all fishing communities in Liberia including West Point

	The police are only involved in conflict resolution when the sea chief and elders fail to handle that conflict
	DEA as an auxiliary agency of the MOJ responsible to fight crimes relating to drugs including dealers and traffickers
Environmental protection Agency (EPA)	Established in 2003 under the EPA act, the agency is responsible for the protection of Liberia's environment and natural resources or in consultation with the relevant line ministry or agency issue guidelines and management measure.
Ministry of Defence (MOD) Liberian Coast Guard (LCG)	MOD was established to protect the Liberian territory from external aggression. The national defence act (2008) establishes the role of the Liberian coast guard to the Bureau of National Fisheries. LCG is a military maritime force charged with protecting lives and property at sea, preventing smuggling, and enforcing pollution standards. The Bureau of national fisheries and artisanal fisheries depend on the LCG for search and rescue operations. LCG protects fishermen from industrial vessels that enter the IEZ to fishing
Ministry of internal affairs (MIA) WestPoint Commissioner	MIA- the government institution responsible for the administering of local governance. The commissioner of the township WestPoint works directly with the ministry of internal affairs to supervise local administration of government
Liberia Maritime Authority	The objectives of the Authority is to promote the enactment of national legislation regarding discharge of the responsibilities of Liberia under the United Nations Convention on the Law of the Sea of 1982 and other maritime-related international instruments. Functions include the administration, development, coordination and implementation of the National Maritime Strategy and the management of Liberia's coastal zone

Executive order 84 of April 22, 2017, gives the Liberia maritime authority the power of supervisory, oversight, and fiscal authority of the Bureau of National Fisheries and all fisheries resources pending the enactment of the national act. |
Liberia Revenue Authority	This is the government institution responsible for the collection of taxes and canoes license fees
Sea chief	The chief is head of all fishermen; he brings together fishermen and all parties to discuss issues of common concern
Fishermen	These are people whose livelihood depends on fishing activities,

Fish processors and traders	These are mainly women. They buy fish from fishermen directly or from the canoe owners who may or may not be a fisherman. The fish trader can sell the fish fresh or process it depending on the self-life The traders in some instances are not processors because they buy and sell without processing. All processors are traders. The processors add value to their fish through smoking and/or fermentation

Source: *Author, 2017*

4.7 Governance structure of the artisanal fisheries in west point

4.7.1 Self-organization

The survey showed that all fishermen (100%) were organised within an informal management system headed by the sea chiefs in both Fanti and Kru towns. A system established by their ancestors and inherited by them. The sea chiefs are appointed by council of elders and are endorsed by the communities. Once appointed, 97.6% of respondents agreed that the chiefs stay in power forever in the two fishing communities depending on the level of good work, character, commitment and service to the community violating the constitutional period of four years in Kru town. Interviews with respondents revealed discontent among Kru fishermen with more fisher folks expressing that the system does not reflect the will of the majority. These fishermen mentioned that the position of the sea chief is an elected position and that previous chiefs were elected but the current chief was appointed by few elders. Following the constitution creates possibilities of a change of leadership, which is highly detested by the current administration. The Fantis have no formal law or constitution.

Findings showed that the sea chief is appointed based on his fishing experience (98% of respondents) followed by 1.3% indicating education as the determinant of appointment. Data revealed that 89.1% of respondents agree that all fishermen are involved in decision-making processes by the sea chief while 6.9% disagreed. This augurs well with the FAO code of conduct for responsible fisheries which states that "to whom the right is given to fish is also

given the responsibility to manage the resources" (FAO. 1995). At the level of the Bureau of National Fisheries, fishermen (86.1%) agreed that they are involved in decisions made by the Bureau that directly affects them. Hence, their leaders are contacted by the BNF and views are solicited before decisions are made. Same results showed 13.9% disagreeing. On the other hand, 97.9% of fishermen describe communication and the sharing of information among themselves as excellent or good while 2.1% regard it as poor or very poor. This also augurs well with Ostrom (2009) SESs framework which states that resources can be sustainably managed without government or market intervention if communities self-organized, communicate, and share information.

4.7.2 Local Rules governing the artisanal fisheries in west point

In establishing the structure of Governance, the researcher sought to identify local rules governing the fishermen. The results (Figure-8) shows 11 rules that are commonly mentioned by fishermen. These are mainly social economic rules emphasizing the well-being of the artisan fishers. Environmental rules that protect the resource base are known by few key informants and are not followed by the fishermen. A number of key informants mentioned rules such as no chemical fishing locate and retrieve lost nets as rules for the sustainable use of the fisheries. The study showed that 48.1% of respondents mentioned No fighting at sea as the most important rule followed by No smoking (14.9%). Findings further revealed that the rule of no smoking was put in place to deter fishermen from the use of drugs such as marijuana. The lack of rules of reciprocity governing the sector was emphasized in a study by Blythe, (2015) and the Ostrom, 2009 SES theory on governing the commons that resources can be sustainably governed if communities can develop rules of reciprocity to govern themselves and the resources. Blythe (2015) also reported that such rules are necessary for the sustainability of resources. Fishermen reveal that most of these rules were established by their ancestors and violation of any of these rules is punishable by fines or complete bans from fishing.
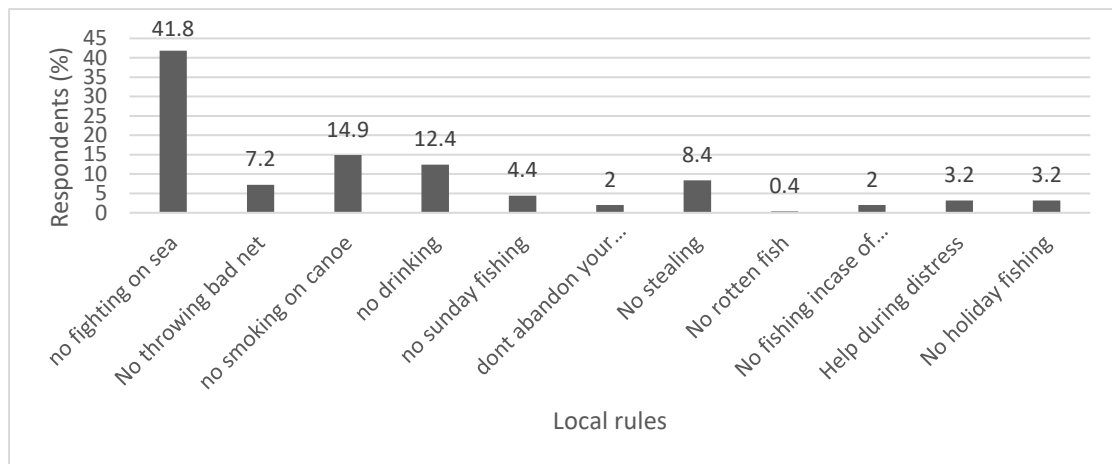
Figure 8: Self-organized local rules

Source: *Author,2017*

4.7.3 Governance of Kru fisheries

Data from the FGD revealed that there is a minimum coordination between the current leadership and council of elders due to what the council deem as lack of recognition in decision-making processes such as the making rules and the appointment of sectional heads. Elders in Kru town express a divided opinion on the leadership structure and the criteria for becoming a sea chief. Few elders expressed that the position of the sea chief is an elected position according to their constitution (previous chiefs were elected) causing division within the council of elders. The study revealed that the current sea chief in Kru town appointed by few elders and has ruled for fifteen years. The Ostrom SES theory states that a self-organising system of common pool resources can avert the tragedy of the commons if the community self-organized (Ostrom 2009; Ostrom 1990). The system of governance from Kru town (Table: 19) to Fanti towns (Table: 20) vary regarding structure as illustrated in figure- 9 and figure -10.

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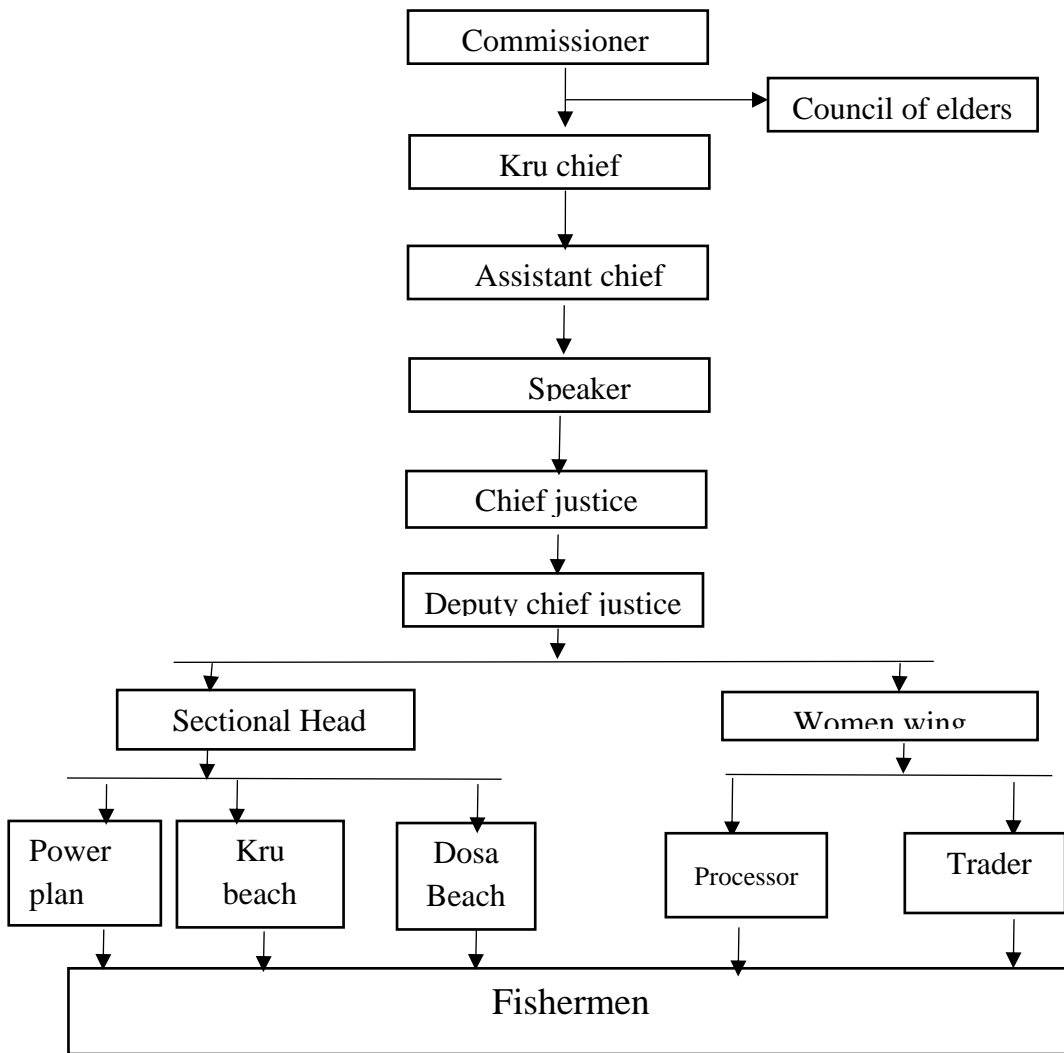

Figure 9: Governance structure of the Kru fisheries

Source: *Author, 2017*

Table 19: Members of the Kru Governance structure and their importance

Members of the Governance structure	Roles/ importance
The commissioner	The commissioner of the township of West Point is the chief executive officer of the town representing the government under the ministry of internal affairs
Council of Elders	The council is a team of elders responsible for the general overseeing of the functions of the sea chief and his officials. Their roles include the settlement of conflict, appointing of the sea chief in collaboration with the fishermen and the fishing community
The sea chief (Kru chief)	The chief is head of all fishermen; he brings together fishermen and all concern parties to discuss issues of common concern
Assistant chief	The assistant chief is directly next to the Kru chief in the leadership structure. He assists the chief in the development and implementation of rules
Speaker	The speaker is responsible for information sharing. Calling for meetings at the request of the chief through the town Cryer
Chief justice	The chief justice is the head of Kru town rules and ethics committee. The committee is responsible for the making of rules
Assistant chief justice	The assistant chief justice is responsible for the implementation of the law or rules developed by the rules and ethics committee. He investigates cases and renders judgement.
Sectional head	There are three sections or landing sites according to their fishing methods in Kru town, and a section head represents each of the sections.
Power plan section	Power plan is mainly for beach seine fishermen, their landing site and fishing activities. The head of the beach is a sectional head and reports to the Kru chief. He is head of the beach seine fishermen association

Kru beach section	The main fishing activities on the Kru beaches are hook and line targeting pike, cassava fish. It serves as the base of the of the Kru chief, and he is the head of the hook and line fishermen association
Dosa beach section	Every fishing activity associated with set net occurs on dosa beach. The head of the beach is considered a sectional head and reports to the Kru chief
Chair lady (women's wing)	The women's wing is headed by the chair lady. Her roles include organising women for activities such as a collection of dues and contributions for victims in a disaster.
Fish processors and traders	These are mainly women. They buy fish from fishermen directly or from the canoe owners who may or may not be a fisherman. The fish trader can sell the fish fresh or process it depending on the self-life
	The traders in some instances are not processors because they buy and sell without processing. All processors are traders. The processors add value to their fish through smoking and/or fermentation.

Source: *Author, 2017*

4.7.4 Governance of Fanti fisheries

The Fanti structure of governance begins with the Fanti governor as the head who oversees the well-being and activities of all Fantis in Liberia including the fishermen. The west point Fanti chief (sea chief) serves as the Fanti governor. Head of the local government administration, the commissioner of the township of WestPoint, tops the local governance structure as head of the two fishing communities

The Fanti fishermen are more organised regarding structure and functionality (Figure 9 and 10) with a more bureaucratic system. This implies that the Fantis are better able to solve collective problems through collective actions as indicated by McGinnis (2016) and Ostrom (2009).

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                        ┌──────────────────┐
                        │   Commissione    │
                        └──────────────────┘
                                 │
                                 ▼
                        ┌──────────────────┐
                        │   Fanti chief/   │
                        │     Governor     │
                        └──────────────────┘
                                 │
        ┌─────────────┐          ▼           ┌──────────────┐
        │   Deputy    │◄───────────────────►│  Seven men   │
        │   Chief     │                      │   council    │
        └─────────────┘                      └──────────────┘
               │                                     │
               ▼                                     ▼
        ┌──────────────────────────────────────────────────┐
        │                  Canoe owners                     │
        └──────────────────────────────────────────────────┘
                                 │
                                 ▼
        ┌──────────────────────────────────────────────────┐
        │              Fishermen/ canoe crew                │
        └──────────────────────────────────────────────────┘
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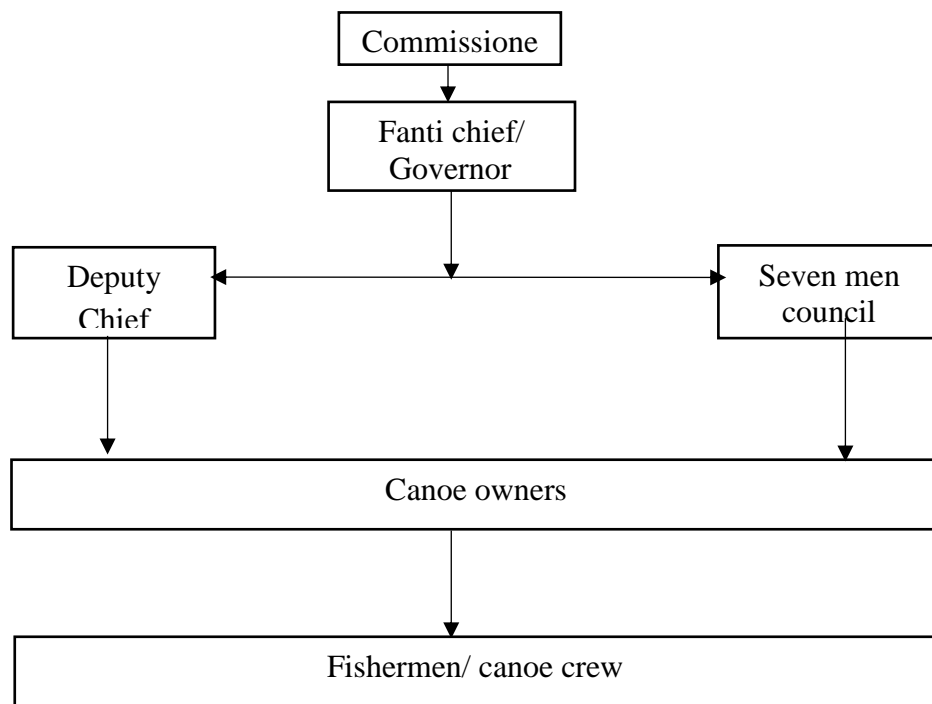
Figure 10: Fanti structure of governance

Table 20 : Members of Fanti governance structure and their importance

Members of Fanti governance structure	Role/ importance
Commissioner	Government of Liberia local administrator under the ministry of internal affairs
Fanti Governor	Head of all the Fanti community in Liberia.
Fanti sea chief	Head of Fanti fishermen in west point. He serves as the liaison between the fishermen and the Bureau of National Fisheries. He brings together all parties to discuss issues of common concerns for the overall well-being of the fishermen.
Deputy sea chief	The deputy chief is next in line in the leadership of Fanti town. He assists the sea chief in the implementation of his duties
Council of elders	Is a 7 men council that appoints the chief and serves as a team of advisors to the chief
Canoe owners/property owners	Canoes owners and/or property owners are investors within the artisanal fisheries of WestPoint
Artisanal Fishermen	These are fishermen whose livelihoods depend on the artisanal fisheries. they use dugout motorized and/or un-motorized canoes

Source: *Author, 2017*

4.8 Evaluating gears, preservation and governance in terms of sustainable utilisation

Interviews with fishers revealed that they are aware of the negative impacts of their actions on the fisheries' resources such as the use of gill net but have limited options with regard to sustainable practices. This is because of the high cost of fishing materials and low income generated from that fishing. Fishermen perceived the concept of sustainable use as the use of fisheries resources in a manner that generates income to sustain families. However, a study by

Wehye *et al*., (2017) found out that some major fish species (*p.senegalensis*) in the Liberian waters are at the risk of being over-exploited or are exploited at a rate of maximum sustainable yield. The same study revealed that other species (*P.typus)* also showing signs of growth overfishing. This is because they are caught before reaching maturity. This study discovered that these unsustainable signs are because of the used of monofilament gears and the doubling of gears to reduce the already small one and two inches nets which are abundantly in used. Nduati *et al*., (2015) reported that conservation and sustainable utilisation of fish stocks mostly depend on the use of appropriate methods and gears.

4.8.1 Gear characteristics influencing sustainable use

Findings, as illustrated in (Table 21), shows the use of monofilament gears despite its ban by the fisheries regulations. Results further showed that 41.6% of respondents used monofilament Gill nets, with the majority of the Fanti community, and 11.2% using monofilament lines. Data shows that these monofilament lines are exclusively employed in Kru town by the hooks and line fishermen. The artisanal Kru fishermen prefer this gear due to low-cost. FAO describes key environmental impacts as ghost fishing. A situation in which gears once lost or left at sea continuously fish due to the non-degradability of the fibre. Bycatch include marine mammals, sea turtles, and sharks.

Table 21: Gear characteristics

Gear characteristics	Fanti town		Kru town		overall frequency	overall percent
	frequency	percent	Frequency	percent		
Mono filament gill net	31	38%	95	43%	126	41.60%
Multifilament net	16	20%	127	57%	143	47.20%
Monofilament gill line	34	42%	0	0%	34	11.20%
Total	81	100%	222	100%	303	100%

source: *Author, 2017*

Figure 11: Monofilament Gill nets in west point

Source: *Author, 2017*

4.8.2 Mesh sizes of gears in west point

Fishermen measure mesh sizes of gears with the number of fingers that fit in a mesh. One finger is equal to one inch. Despite the ban on the fisheries regulation on the use of gears with mesh sizes less than 50 millimetres (1.9685 inches) in diagonal stretch length for multifilament gears use in set net fishing, the study revealed (Figure:10) that mesh sizes of gears ranged from 1 to 5 inches. However, the highest mesh size of gear used by fishermen ranges from 1-3 inches with most of the nets being doubled to reduce the mesh sizes. Findings showed that 2 inches of mesh were the highest in use (38.2%), followed by 2.5 inches (15.3%) and 3 inches (11.4%) respectively. The lowest meshes used in the study area range from 3.5 to 5 inches. This result reveals that except the 4 inches mesh size nets, which are used to target large pelagic species such as *Istiophorus albicans,* gears with bigger meshes are less likely to be used by fishermen compared to gears with smaller meshes.
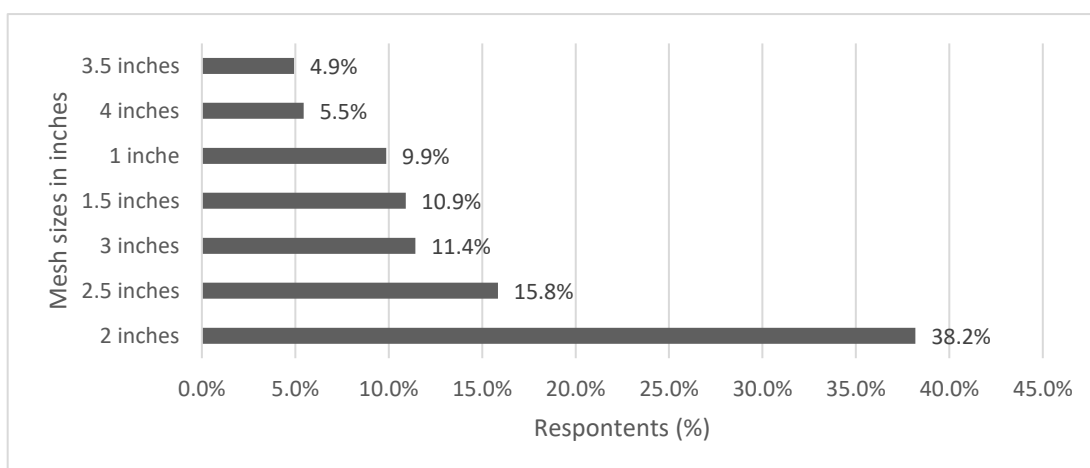
Figure 12: Mesh sizes of fishing gears in west point

Source: *Author, 2017*

4.8.3 Methods of preservation and processing

The investigation showed that wooden boxes are built into canoes. The boxes are covered with woods to reduce sunlight from directly hitting the fish and allow the seawater beneath the canoe to cool the fish to delay deterioration. Findings also revealed (Table: 22) that 90.4% of fishermen have no form of preservation with a huge proportion coming from Kru town. Only 1.7 of respondents who are mainly from the Kru fisheries used the wooden cover as their method of preserving fish at sea. On the other hand, only 7.9% of respondents all from the Fanti fisheries use ice at sea to preserve their catch from spoilage. This shows that most of the catches go to spoilage before reaching the dock.

Fish is a perishable food product when not preserved adequately. Adeyeye & Oyewole (2016) reported that about 40% of total catch by weight in Africa or 25% of total world catch go to post-harvest losses due to poor infrastructure of processing and preservation. An FAO report also indicated that about 70% of fish supply in West Africa is either smoked or dried (FAO 2017a). An increase in preservation promotes sustainable utilisation by reducing physical and economic losses and further decreasing the fishing intensity and pressure on the resource base.

FAO (2017c) stressed the need that if fishermen increase preservation, post-harvest losses will decrease along with fishing intensity while economic gains will increase promoting sustainability of the fisheries

Post-harvest handling activities such as processing and preservation provide hundreds of jobs for women in Liberia and serve as a source of livelihood for much more. Women who are mostly fishmongers and processors are the key players and responsible 100% in post-harvest fish handling. Landed catches are given or sold directly to fishmongers. The post-harvest handling of fish includes selling of fish at fresh and processing for preservation, all depending on the quality of the landed catch.The fishmongers have two methods of processing fish; Smoking and fermenting. The stages of processing through fermentation include cleaning, gutting, washing, grading, salting and fermenting in the open air with sunlight while smoking involve washing, gutting, and drying using fuelwood and drums. Interviews with fishmongers revealed that there are no other means of preserving fish contradicting a study by Emere & Dibal (2013) in Nigeria who reported freezing as the primary method of fish preservation.

Table 22: Methods of preservation

Methods of preservation	Kru town		Fanti town		Overall Frequency	Overall Percent
	Frequency	percent	Frequency	Percent		
No preservation	76	94%	198	89%	274	90.40%
Ice	0	0%	24	11%	24	7.90%
Wooden cover	5	6%	0	0%	5	1.70%
Total	81	100%	222	100%	303	100%

Source: *Author, 2017*

Figure 13: Fermentation of fish in west point

Source: *Author, 2017*

Figure 14: Smoking of fish in west point

Source: *Author, 2017*

Process value chain for Fermented fish product

↓

Receiving raw material

↓

Cleaning, gutting & Washing,

↓

Grading

↓

Salting

↓

Drying in open air (with the sun)

↓

Packing

↓

Storage

↓

Marketing
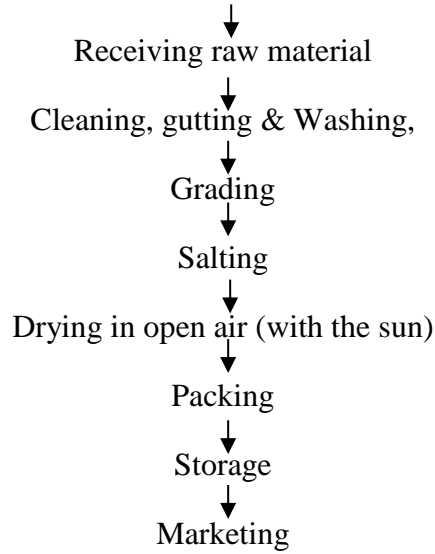
Figure 15: Value chain of fermented fish in West Point

Source: *Author, 2017*

Process Value chain for Smoke fish

↓

Receiving raw material

↓

Washing, gutting

↓

Sorting

↓

Smoking

4 days (half dry)
Low heat

7 days
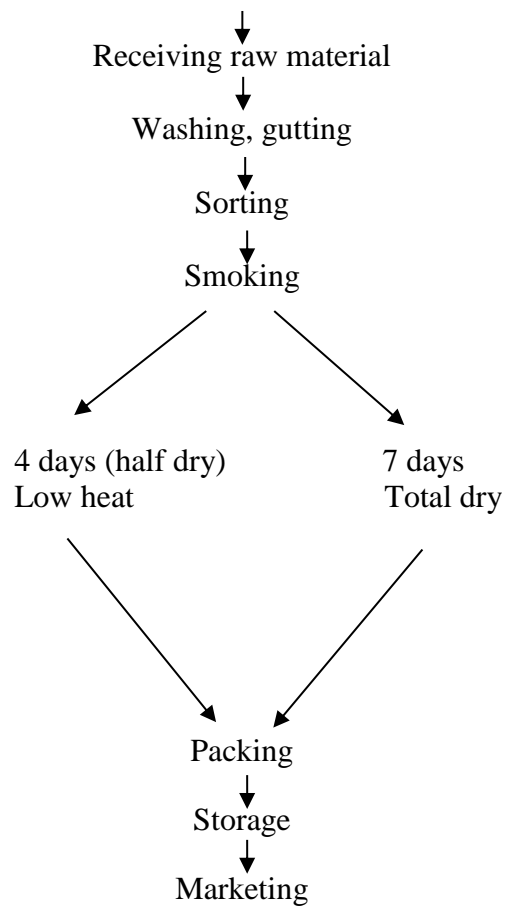Total dry

Packing

↓

Storage

↓

Marketing

Figure 16: Value chain of smoked fish in West Point
Source: *Author, 2017*

4.8.4 Governance factors

The study confirmed that the artisanal fisheries are open access managed under an informal management system. Findings also showed (Figure 9) minimum coordination among actors of the Kru governance structure and the Fanti totally showing lack of interest or concern in women being part of the governance system (Figure 10). The results further revealed low incentives in wages and insurance. The survey revealed (Figure: 5) a high level of social networking (93%) and the development of unsustainable rules (Figure: 6). Some tailored governance regime needs to be implemented for a sustainable utilisation of the commons (Hauge et al. 2009). Firstly the open access regime leads to resource collapse and the lack of incentives for users lead to overexploitation (Ostrom 2009; Hauge et al. 2009.). Hauge et al. (2009) also reported that access restrictions to the resources and incentives to users lead to sustainable utilization. Ostrom (2009) reported that these are achievable through the level of social network and the kind of rules developed. The open access regime of the artisanal fisheries in West Point leads to overexploitation and unsustainable use due to the lack of restrictions and low incentives in the form of insurance provided to fishermen by canoe owners. This study can also conclude that the high level of social network and communication among fishermen promotes sustainability through the governance system but has weakness in the development of rules that protect the resources.

4.8.5 Conflict within the artisanal fisheries of WestPoint

The study revealed that the sources of conflict within the Liberian artisanal fisheries are competition for same fish species and fishing grounds, methods of fishing confirming a study by Olomola (1998), others included stealing of fishing materials and fish at sea, rules that contravene fishermen livelihood objectives, and disunity among elders. Asare & Okyere (2012); reported that common pool resources like the Liberian fisheries operating as an open-

access regime increases high dependency and conflict and a high rate of harvest. A resource for all is a resource for none (Ostrom, 1990)).

Conflict within the sector starts from the office of the commissioner. Enforcement of rules such as no holidays and Sundays fishing are not convenient for fishermen because their livelihood depends on daily fishing activities. WestPoint is the only fishing community with such rules. Additionally, the Ghanaian Fantis dominates the artisanal fisheries in Liberia; Conflicts between the Fanti and the Kru fishermen in WestPoint arise from methods of fishing- the Fanti use more sophisticated gears and motorised canoes which destroy that of the krus. Kru gears are destroyed from what they described as bad nets fishing by the fanti, a method of fishing in which gears are deployed close to other gears. These gears (bad nets) continuously drift towards other gears. In this case, the heavy Fanti multifilament nets destroy the Kru thin monofilament nets.

As 93.1% of respondents agree that all fishermen have the right to fishing at any fishing ground, Competition for the same fishing ground and species (*ilisha Africana)* increases between Kru and Fanti fishermen especially the beach seiners and the motorized Fanti canoes with the beach seiners indicating that continuous fishing on their fishing grounds by the Fanti motorized canoes destroy their fishing ground tampering with their livelihoods. This confirms a study conducted by Olomola (1998); Ratner *et al.* (2014) on competition and conflict in artisanal fisheries. Additionally, stealing of fish and fishing equipment at sea is one of the sources of conflict as the catch report of Kru fishermen always include species that they do not target or their gears are not equipped to harvest. These species include blood fish, tuna and tuna-like species that are targeted by the Fanti.

2.8.6 A Summary synthesizing key findings of objectives

In summary of key findings of the objectives, the study established that the Fantis are more industrialized compared to the Krus. The study failed to establish the trend of the fisheries due to the lack of time series data. However, the decrease in total catch of 2013 to 2014 as established by the study was due to ebola and inadequate assessment of catch report in 2014.Findings showed that livelihood of the artisan fishers was highly dependent on the fisheries resources with most fisher folks having no alternative livelihood activities. The study concluded that stakeholders were spread out at many locations with many of them overlapping functions and that governance of the artisanal fisheries contain conflicts and rules that are mainly socio-economic; environmental rules that protect the resource base are known by few key informants and are not followed by the fishermen.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section presents the conclusion and recommendations based on the findings of the study, to inform further potential management practices, actions, programs, research, formulation and adjustment of policy for sustainable use of artisanal fisheries in Liberia.

5.2 conclusions

Based on the findings of the study, the following conclusions can be drawn:

❖ Factors affecting the sustainability of the artisanal fisheries in WestPoint included methods, gears, conflict, and the structure of local governance of the fishermen.

❖ The Fantis are more industrialized than the krus. They travel long distances, carry more crews, their canoes are motorized, and they fishing with more sophisticated gears and catch more fish.

❖ The decrease in total production of the artisanal fisheries in Liberia between 2013 and 2014 did not reflect the productivity of the resource system or overfishing but the total fish harvested by fishermen. This is due to the lack of time series data to establish the tend of the fisheries.

❖ Majority of the fishermen depend on fishing as their primary source of livelihood and have no alternative livelihood activities

❖ We conclude that the artisanal fisheries are opened accessed under an informal management system headed by a sea chief

❖ It is difficult for stakeholders of coordinate and synthesise ideas to sustainably govern the resources because they are many and spread out at different locations with their functions sometimes overlapping

- ❖ Beach seine catches are juvenile and spawning grounds are destroyed

- ❖ Beach seine is unsustainable and it is posing issues of public health because catches are drag along the heavily contaminated beaches of West Point

- ❖ There was widespread use of the non-biodegradable Monofilament gears

5.3 Recommendations

From the study, the following were recommended:

- ❖ Extension services should be established to educate fishermen of the effect of their fishing practices on the fisheries resources and also the importance of incorporating rules of reciprocities in their local rules

- ❖ Fishing activities such as beach seine and the use of monofilament gears should be banned or regulated throughout the country

- ❖ The process of selecting the sea chiefs should be through a democratic election to reflect the will of majority of the fishermen

- ❖ A marine store(s) should be opened in the country to reduce the high cost of importation of fishing materials. This will enable the fishermen to turn to the use of gears that are sustainable

- ❖ In order to apply better and more successful measures for fishery resources protection, constant monitoring and assessment of the impact of fishing gears on coastal fish and other marine environment have to be performed, especially for fishing gears that are classified as harmful.

- ❖ There should be further studies on gender and sustainable fisheries development in Liberia

❖ Further studies need to be conducted on beach seine practices and public health effects

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Questionnaire

This survey is anonymous and the results will only be used for an internal student project for the University of Nairobi. None of the responses can be led back to the Individual respondents. Please respond to the questions based on your *own experiences* rather than based on the tendencies in the WestPoint Township.

1. General Questions

1.1 Are you: Male   ☐   Female   ☐

1.2 Are you a fisherman? Yes   ☐   No   ☐

1.3 How old are you   _____

1.4 What is your highest education obtained?   Not been to school   ☐

                                                    Primary school   ☐

                                                    Secondary school   ☐

                                                    High school   ☐

                                                    Vocational school/college ☐

                                                    University   ☐

                                                    Other   ☐

                                                    If other, please specify _____

  1.5 You are

      single ☐   married ☐   Divorce ☐   widow(ers) ☐

1.6 What is the size of your household?

          1-4 ☐   5-8 ☐   9-12 ☐   13 and above ☐   others_____

2.0 Fishing characteristics   ☐

    2.1 What is your fishing method? Beach seine ☐ Set net ☐   Hook and line ☐

    Trap line ☐   float net ☐   Ring net ☐

    2.2 What is the mesh size of your gear in inches? 1 ☐   1.5 ☐   2 ☐   2.5

        3   3.5 ☐   4 ☐ others_____

    2.3 How long have you been fishing? _____

2.4 What is your canoe size?   1 to 7 meters   ☐

8 to 11 meters   ☐

12 to 20 meters   ☐

Others, please specify_____

2.5 What is your crew size? _____

2.6 your canoe is   Motorized ☐   Nonnotarized ☐   ☐

2.6.1 If motorized, what is your horsepower?_____

2.6.2 What is the tenure of your canoe? Own ☐   Lease/rent ☐   crew member

others_____

3.0 livelihood Asset and activities

3.1 What livelihood asset do you have? List your livelihood assets according to the following livelihood capitals

Natural capital E.g. natural resources	
Physical capital e.g. fishing materials houses, motor bikes	
Financial capital **e.g.** susu club, insurance,	
Human capital Skills, knowledge	
Social capital e.g. social groups, associations,	

3.2 What else do you do if not fishing? _____

3.3 What other skill do you have other than fishing? _____

4.0 Resource System and unit

4.1 What is your target species? _____

4.2 How far at sea do you get your target species?   0-3nm☐   4-6nm☐ 7-8nm ☐

others ☐

4.3 What is the depth of your fishing ground in meter (m) or Fathom (f)

0-10m (0-5.5f)☐   11-20m (6-10.9f) ☐   21-30m (11.5-16.4f?)

31-40m (16.9-21.8f)☐   41-50m (22.4-27.3f) ☐

4.4 What is your total number of sea trip per month? _____

4.5 What is your total catch per trip in the following unit?   ?   Bucket_____

Bag_____   Bunch_____   Hand_____   Piece_____   Tub_____

2.6 What is the price of your target species per unit? Bucket_____

Bag_____   Bunch_____   Hand _____   Piece_____   Tub_____

4.7 What is the number of days per sea trip?_____

4.8 What is your preservation method at sea   No preservation☐   Ice☐

Blast freezer☐   Cold hole☐   sea water☐   others_____

4.9   What   is   your   preservation   method   on   land?   No   Preservation ☐

Cold storage☐   smoking☐   salting ☐

Others, please specify_____

5.0   Governance system

5.1 Are the artisanal fishermen organize under a sea chief? Yes ☐   No ☐

Others   please specify_____

If yes to question 5.1, please continue. If no, please go to q5.2

5.2 The sea chief is   appointed ☐   Elected ☐

5.3 What is the tenue of the sea chief ?   Forever   ☐

0-5 years   ☐

6-11 years ☐

others   please specify_____

5.4 What is the criteria for becoming a sea chief

fishing experience ☐   financial influence ☐   educational level ☐

others, please specify_____

5.5 The fishermen are involved in the decision making process of the artisanal fisheries by the

sea chief   Agree   ☐

                                                   Disagree   ☐

                                                   Somehow agree   ☐

                                                   Somehow disagree ☐

5.6 list some rules governing the artisanal fishermen

1	
2	
3	
4	
5	

5.7 The fishermen are involved in decisions made at the bureau of national fisheries that

directly affect them.

Agree ☐   Strongly agree ☐   Disagree ☐   Strongly disagree ☐

5.8 communication and the sharing of information among the fishermen is

Excellent ☐ good ☐   Poor ☐   very poor ☐

5.9 Are you a member of any fisheries association Yes ☐   No ☐

5.9.1 If yes to 5.9, please select one or more if applicable: LAFA ☐

Sea men union ☐

association of fanti fishermen - AMANFU ☐

Community science ☐

others_____

5.9.2 Do all fishermen have the same rights to fishing at all fishing grounds?

Yes ☐   No ☐

6.0 List the stakeholders/actors of WestPoint fishing communities and their importance

1		
2		
3		
4		
5		
6		
7		
8		

Thank you very much for answering the questionnaire! It is a great help and important for my study!