ASSESSING THE EFFECTIVENESS OF CO-MANAGEMENT IN THE ARTISANAL FISHERIES OF SIERRA LEONE

Alhaji Lamin Daboh
Ministry of Fisheries and Marine Resources
Sierra Leone
daboh2005@gmail.com

Supervisors:

Professor Dadi Mar Kristofersson: dmk@hi.is
Dean of School of Social Sciences, University of Iceland
Alvin Slewion Jueseah: asj56@hi.is/alvinjueseah@yahoo.com

ABSTRACT

This study examined the effectiveness of community level fishery co-management organizations called Community Management Association (CMAs) along three coastal regions in Sierra Leone: the Southern, Northern, and Western regions. CMAs were established to ensure sustainable fishery management through increasing the level of community participation in the administration of fisheries laws and regulation by the fishers. Data were collected from 10 CMAs along 4 Marine Protected Areas. Descriptive and inferential analyses were performed using excel and R statistical package. The results indicate that CMAs are successful in formulating bylaws, resolving conflict among fishers and sensitization meetings on hygiene promotion at the wharfs. It was evident that fishers and processors are aware of fisheries bylaws. Nevertheless, high violation rates were observed in some regions, suggesting some CMAs have limited impact on fishers' decisions to comply with regulations. Analysis suggests the failure to comply may be due to lack of adequate financial and logistical support for MCS operation, making them unable to control illegal fishing in their areas of jurisdiction. The results also suggest that the formation of CMAs have ensured successful implementation of co-management in the three regions. CMAs are successful in activities that are social in nature, but most have performed poorly in functions related to enforcement of illegal fishing and generating sources of revenue.

This paper should be cited as:
Daboh, A.L. 2020. *Assessing the effectiveness of co-management in the artisanal fisheries of Sierra Leone.* UNESCO GRÓ Fisheries Training Programme, Iceland. Final project.
http://www.grocentre.is/ftp/static/fellows/document/Alhaji19prf.pdf

CONTENTS

List of Figures

List of Tables

ACRONYMS

CMA- Community Management Association
MPA-Marine Protected areas
TURF- Territorial use rights in Fisheries
SLRE- Sierra Leone River Estuary
SRE-Scarcies River Estuary
Y B – Yawri bay
SHRE-Sherbro River Estuary
ISFM- Institutional Support for Fisheries Management Project
WARFP-West Africa Regional Fisheries Programme
MFMR-Ministry of Fisheries and Marine Resources
GDP- Gross Domestic Products
EEZ- Exclusive Economic Zone
IEZ- Inshore Exclusion Zone
IUU- Illegal Unreported and Unregulated Fishing
SLAFC-Sierra Leone Artisanal Fishermen Consortium
LC – Local Councils
MCS- Monitoring Control and Surveillance
Std 1-3 – Standard 1-3
Std-3-5- Standard 3-5
KII- Key Informant Interviews

1 INTRODUCTION

1.1 Background information

Sierra Leone is located on the west coast of Africa and north of the Equator. It is bordered to the north and east by the Republic of Guinea and to the southeast by Liberia (Fig.1). Off the southwest is the Atlantic Ocean. Sierra Leone's landmass consists of a mainland and four offshore islands: Yeliboya, Banana, Turtle and Sherbro islands. It has an area of 71,000 km^2 with a continental shelf of about 120 km wide in the north at Yeliboya tapering to only 13 km wide at Sulima in the south. The length of the coastline is about 560 km with extensive mangrove swamps. The Exclusive Economic Zone (EEZ) covers 205,611 km^2 (MFMR, 2016). Sierra Leone has a population of approximately 7 million with a per capita income estimated at 380 US$.

Figure 1. Map of West Africa showing Sierra Leone

The fisheries sector plays a crucial role in Sierra Leone poverty reduction, food security, livelihood provision and revenue generation (MFMR, 2016). The sector currently produces about 150,000 tonnes of fish per year and contribute 10% to the GDP and is the most important activity along the coastline (MFMR, 2016). About 80% of catch landed is produced by the artisanal fisheries, which helps to underpin the livelihoods and food security of thousands of coastal communities. Several foreign industrial vessels operate under agreed licences, mainly exporting their catch to Asia, often involving trans-shipment at sea. Both inland fisheries and aquaculture are relatively underdeveloped in Sierra Leone, but also have considerable potential.

Despite the current diverse array of fisheries activities, there are also serious concerns about the long-term sustainability of the benefit flows. The fisheries operate largely under a regulated open access regime, with minimal control of fishing operations. It also suspected that there is

significant illegal, unreported and unregulated (IUU) fishing taking place within the EEZ and offshore. Although information is very limited, the annual value of the IUU catch is estimated at USD 30 million (MFMR, 2016). Because of this, substantial risks to future economical and biological overexploitation exist resulting to a significant reduction in the overall benefit stream to Sierra Leone.

Sierra Leone has productive fish stocks, which have the potential to generate an increased flow of national wealth and benefits for the people of Sierra Leone. Direct benefits could be generated through increased employment and livelihoods for coastal communities. Indirect benefits (for citizens outside the sector) would include the re-investment of wealth, extracted by government as taxes on fishing enterprises, in other parts of the economy. Overall, this will depend on better management of the existing fisheries and new fisheries being identified and developed, including both offshore and onshore components.

1.2 Marine Protected Areas (MPAs)

Marine protected areas (MPAs) are designated areas where communities have exclusives rights and control for the purpose of conserving the resource. The Scarcies River, Sierra Leone River, Sherbro river and Yawri bay were proposed as MPA in Sierra Leone since 1972. However, these were not officially declared, or gazetted as such, until 2012, during the implementation of West Africa Regional Fisheries Project in Sierra Leone.

The need for community-based management of the fisheries resources in Sierra Leone was identified during the Implementation of the Institutional Support for Fisheries Management project. This Project through the Ministry of Fisheries and Marine Resources supported the organization of coastal communities adjacent to the designated 4 MPAs into Community Management Associations (CMAs) as guided by the MPA establishment and management strategy.

At the core of this strategy was a recommendation for the organization of coastal communities into clusters of CMAs that would be charged with the responsibilities of managing the MPA through a co-management process (participatory management approach). The four (4) proposed MPAs were officially declared by the Ministry of Fisheries and Marine Resources in 2012. These MPAs have been anticipated to eventually evolve into Territorial use Right Fisheries (TURFs) by the end of the project where they would have demarcated an area in coastal marine space, adjacent to their communities' full access right for resource exploitation and management responsibilities.

1.3 Historical Management Role and Structure of Fishing Communities

In Sierra Leone, each Chiefdom is headed by a Paramount Chief, who is elected by members of Tribal Authorities (called Chiefdom Councillors) following the death or resignation of their predecessors. Chiefdoms are geographical units, and each contains tribes Sherbro, Mende and other, minority ethnic groups (Southern region), Temne and Susu, (Northern region) and Temne and other ethnic groups in the Western region. One Chiefdom Councillor is elected by every twenty taxpayers (all those 18 years and over). A candidate must be a member of, and selected by, one of several dynastic ruling families found within respective chiefdoms.

Ruling families tend to be the Chiefdom's larger landowners and they are often decedents of "founding members" of settlements. The Paramount Chief is supported by a deputy (Chiefdom

Speaker), the Court Chairman and an administrative wing headed by the Chiefdom Treasury Clerk, who is appointed by the Local Council. Each Chiefdom is divided into sections, govern by a Sectional Chief. They are selected upon the death of a predecessor by the members of the Tribal Authority in the relevant section. Candidacy is restricted to "indigenes" of the section. Each settlement within a section elects a Town Chief. All taxpayers are given the right to vote for candidates from the ruling families of the town and the elected Town Chief serves for life. The current and historical formal management roles of the chiefs mostly centre on maintenance of laws and order as well as dispute resolution.

The more serious the dispute, the further up the hierarchy it ascends for resolution. Chiefs also organise the collection of the local tax, an annual payment made by every adult in the chiefdom that is shared between the Native Administration and the Local Authority. Other taxes that are collected vary by chiefdom, but they can include levies on burials, land transactions, building projects, livestock and fishing boats. In practice, chiefs take on several other roles, including transmitting messages to their people from local and central government, organising religious and other cultural activities (including a close relationship with secret societies) and receiving visitors to the chiefdom.

All these roles have a bearing, to some degree, on local fisheries management. Most communities explicitly identified chiefs as the authority used to resolve fishing disputes. For instance, when fishermen are found fishing in MPAs, they are brought to the Town Chief. If he refuses to pay a resulting fine, he will be sent to the Paramount Chief. This is done even if the infringement was made by a visitor from another chiefdom. The cultural roles of traditional authorities are also important in this process. With the formation of CMAs, they are now enshrined in the management structures within local communities as the town chiefs and sectional chiefs are ex-officio members of the CMAs (Fig 2).

They are expected to fully support the implementation of fisheries bylaws, since all chiefdom authorities including the Paramount Chief have endorsed it. The local councils have also legalised fisheries bylaws, but the CMAs are expected to renew their registration with councils annually. The chiefdom administration collaborates with the local councils in tax collection and one representative from the council of paramount chiefs within the district is chosen as a member of the local council committee. The Chiefdom authority structure is shown below (Fig 3).

Figure 2. CMAs within pre-existing Government structure

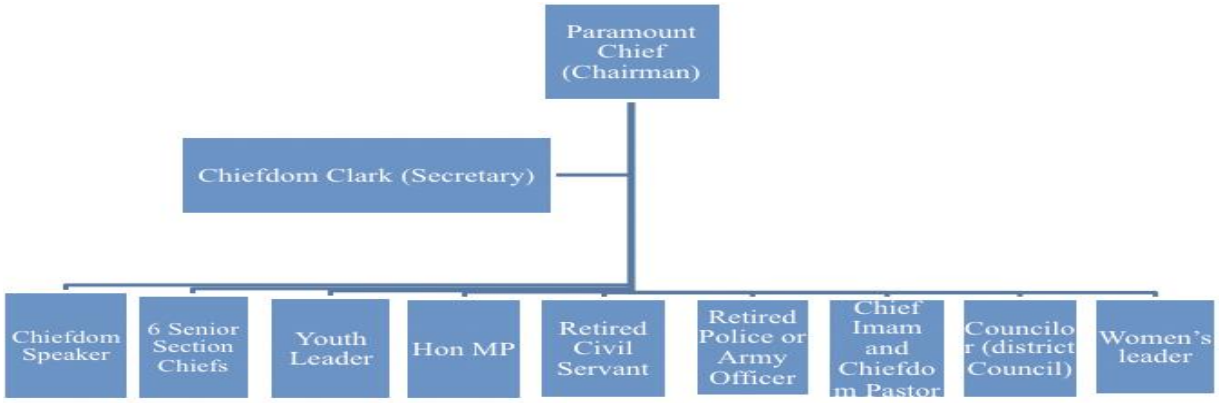

Figure 3. Chiefdom development committee

1.4 **Community Management Associations (CMA)**

CMAs are community structures set up purposely for the management of fisheries and other coastal resources at the community level. The CMAs are groups of communities residing in an area adjacent to fisheries waters that have exclusive rights of access and responsibility for the management of resources in that area. In Sierra Leone, communities were organised into clusters based on proximity to the four (4) declared MPAs and shared resources. The CMA comprises fishers, processors, boat owners, wood cutters, harbour masters, master fishermen and traditional authorities.

The management structure was proven successful in many parts of the world and was proposed as best practice during intensive fisheries stakeholders consultations at a time when the Ministry of Fisheries were implementing the EU- funded project, *Institutional Support for Fisheries Management* between 2007 - 2010 (MFMR, 2011). Initially, during the formation process, each community was expected to nominate between 5 to 10 members to represent them in the CMA. These nominees would then contest for executive positions within the CMAs. CMA executives included a chairman, vice chairman, secretary general, financial secretary, treasurer, public relation officer, women's leader, auditor and advisers. In most cases, the traditional authority is one of the advisers to the CMA executives. The tenure of each executive is five (5) years, after that, they are expected to conduct election for the various positions.

A total of 37 CMAs were formulated with elected executives in areas adjacent these 4 MPAs. They have constitutions and have officially registered with local councils and the Ministry of Social Welfare as a community-based organisation. They have also developed and legalised fisheries bylaws at chiefdom level for the management of the fisheries resources. They have formulated the following committees as shown below in the flow chart (Fig 4). These CMAs have constituted three committees namely; Monitoring Control and Surveillance, Beach Management Committee, and Fish Quality Management.

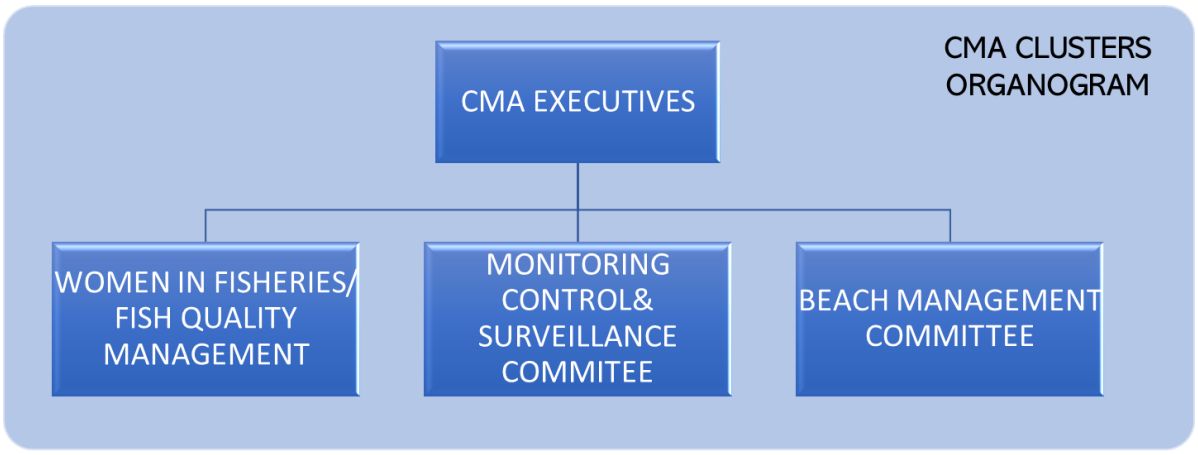

Figure 4. CMA flow chart Illustrating the various committees

The Monitoring Control and Surveillance committee deals with the enforcement of fisheries bylaws related to the use of destructive fishing practices, while the Fish Quality Management Committees ensures that fish is not placed on the ground during landing, instead on a plastic or tarpaulin. The Beach Management Committee ensures the beaches are kept clean by enforcing the sanitary bylaws. The functions of the Community Management Association are as follows:

- To organise fishers and other stakeholders in the fisheries into associations, to facilitate
    - information flow,
    - communication,
    - group action
- To utilize the indigenous knowledge in the community for a better management of the fisheries resources
- To develop, legalize and implement community fisheries bylaws under the overall objectives of the respective MPA.

- To actively participate in higher level decision making.
- To establish a network for fisheries management information exchange with neighbouring communities as well as with the higher level
- To identify small pilot projects to be supported through the "Incentive for Change" programme.

1.5 Co-management as a Fisheries Management tool

The concept of co-management is a participatory kind of management system that devolve ownership and the responsibility of enforcement to local fishers thus creating a linkage between communities, public and the government. The objectives of the MPA are to:

- ❖ Conserve wildlife in the respective Marine Protected Areas
- ❖ Protect fish breeding and nursery grounds as well as fish migrating from and to these grounds
- ❖ Develop alternative livelihoods for fishing communities affected by the fisheries management measures in the respective MPA with the aim to reduce fishing pressure

Generally, management of natural resources is co-management, comprising an authority to manage the resources and a resource user to be managed (MFMR, 2011). The actual management regime depends on the resource, e.g. whether limited or renewable and the mandate and policies of the managing authority (MFMR, 2011). Emphasis in fisheries management is on the sustainable use of the resource to secure fish for 'generations yet unborn'. Fisheries management focuses on the management of the resource user, i.e. the fishers, their fishing practices and how they exploit the resource. Lack of communication with fishing communities is seen as one obstacle in establishing an effective fisheries management framework in the artisanal fisheries sub-sector. The decentralisation of government functions, including the licensing of small fishing canoes, to Local Councils without proper training and without staff assigned to this task, has further distanced artisanal fisherfolk from the mainstream fisheries management developed and implemented by the Ministry of Fisheries and Marine Resources (MFMR, 2011).

This is one reason why the Ministry adopted the co-management approach in its Fisheries Policy, which was endorsed by cabinet in 2010. Under objective two, the Fisheries Policy aims to **"**increase co-management through committed, informed and involved stakeholders.**"** This provides a clear mandate to enhance community participation in the fisheries management process. In addition, the policy document also identifies the following strategies:

- ❖ Development of policy and legal framework supportive of co-management
- ❖ Improve Ministry of Fisheries and Marine Resources working relationship with stakeholders through informed communication and consultation processes
- ❖ Pursue actions that allow stakeholders to take greater responsibility for managing fisheries to ensure their sustainability
- ❖ Enhance voluntary compliance based on partnership with industry and fishers' organizations (MFMR, 2010)

1.6 Legal Framework for Fisheries Management in Sierra Leone

In 2003, the Ministry in consultation with stakeholders developed its first Fisheries Policy (Seisay, 2006) and was later reviewed in 2010 (MFMR, 2010).The Fisheries and Aquaculture Act 2017 create provisions for the management, conservation and development of the fisheries of Sierra Leone. The Fisheries Policy 2016, Fisheries Development Strategy 2016, and the National Plan of Action to Deter, Prevent, Eliminate, Illegal Unreported and Unregulated

Fishing, provide statutory guidance complimented this act. All these fisheries management instruments are geared towards the implementation of biological control measures by area restriction, closed seasons, economic control measures, limiting the number of licenses issued, input control through gear restriction and mesh size regulation, and subsequent enforcement of fisheries regulation by imposing penalties for violation of the laws.

These measures have not been successful in the artisanal fisheries sector, which remain an open access fishery characterised by destructive fishing methods (Mawundu, 2011). With the enactment of the Local Government Act 2004, the management and development of the artisanal fishery sector in Sierra Leone has been devolved to the local councils. The 2004, the Local Government Act gave authority to the councils to collect license fees of fishing canoes (Krue , standard 1-3 and standard 3-5 boats) that fall within the artisanal fishing crafts according to the latest reclassification of fishing vessels and use the economic rent to develop their local communities in accolade to government support for local development (Jalloh, 2009). It is hoped that the devolution of this responsibility will promote community-based management of the resources at all levels. It also shifts the responsibility of management of the artisanal fisheries to the local councils. Within the same Act, the standard 5-10 and Ghana boat were classified as semi-industrial fishing vessels and supervision of these remain the responsibility of the central Government through the Ministry of Fisheries and Marine Resources (Jalloh, 2009).

In 2019, the artisanal fishermen in Sierra Leone formed one umbrella union called Sierra Leone Artisanal Fishermen Consortium (SLAFC) that works in collaboration with CMAs and the Ministry to promote responsible fishing practices. The union together with the CMAs have been instrumental in enforcing the one-month close season held in April 2019 and fishing gear regulations to mitigate the high incidence of juvenile exploitation.

1.7 Artisanal fisheries in Sierra Leone

Artisanal fisheries in Sierra Leone refers to small scale or commercial fishing where the owner is directly involved in the day to day running of the enterprise. The artisanal fishery is a significant source of employment and is characterized by diverse fishing vessels and gears making fishing the major livelihood activity in the coastal communities. Generally, artisanal fishers in Sierra Leone conduct their fishing operations under an open access fishery (Jalloh, 2009). The artisanal fishery sub-sector which contributes about 80% of the total marine fish landed to support local markets in Sierra Leone have been operating with minimum or no control measures.

Catch and effort data are inadequate and the local councils responsible for licensing of some canoes do not regulate or enforce the licensing system as the crafts operating with illegal fishing gears are also issued licenses. The major gears deploy by the artisans include driftnet, ring net, and beach seine. They most target species are the small pelagic (herring and Bonga shad) and inshore demersal species.
Total numbers of artisanal vessels have increased from 10,000 in 2012 to over 12,000 in 2018 (MFMR, 2018). To prevent overexploitation of coastal fish resources due to fishing pressure, a co-management approach to regulate and ensure sustainable use and conservation of the fish resources was deemed necessary by the Ministry of Fisheries. This is important for the sustainability of the entire fisheries of Sierra Leone, since most fish stocks breed in the inshore areas of fishery waters.

2 RATIONALE

The small-scale fisheries of Sierra Leone have been experiencing a decline in fish production primarily due to increased number of fishers and canoes in the sector (MFMR, 2012). Some important target fish species in the artisanal fishery such as Sardinella species (herring) and Ethmalosa fimbriata (Bonga shad) are either fully exploited or overexploited (MFMR, 2012). There is also growing use of illegal fishing gears in the artisanal fisheries sector including the use of under sized mesh nets such as beach seines and other gillnets catching juvenile fishes that could be allowed to recruit and form the next breeding population.

It is against this backdrop that CMAs were formulated to help co managed the MPAs and other associated resource by enforcing community fisheries bylaws. But it seems as if some CMAs were unable to fully enforce some of their bylaws. This study aims at assessing the functionality of CMAs in executing their roles in resource management in the artisanal sector and better come up with recommendations that will help enhance their performance.

2.1 Research Objectives

This study will assess the CMA performance with focus on successes and challenges of the CMAs in managing the resource, the role of Ministry of Fisheries, CMA formation process and the life span of their elected executives.

2.2 Specific Objectives

- Assess how the present management practices under the Community Management Association (CMA) incorporate locals.
- Evaluate the functionality of selected CMAs set up for the management of fisheries in coastal Sierra Leone.
- Highlight challenges and expectation of CMAs and assess what can be done to improve participation in the management of coastal fisheries.

2.3 Limitation of the study

The time allocated for data collection in this study was short and limited the scope and scale of data collection and analysis. Further, isolating the effect of management methods from other sources of change is difficult. Therefore, the study mainly focuses on the perception of interviewees.

3 LITERATURE REVIEW

3.1 Co-management in Africa

The basic task of co-management is the reforming of government thinking to institutionalize collaboration between administration and resource users in order to end unproductive situations where they are opposed against one another as antagonistic actors (Baland, 1996). Devolution of some power to manage fisheries away from central administrations to user groups may be one of the most difficult tasks of co-management (Raakjaer Nielsen, 1996). Government resource managers are often reluctant to share their authority or even part of it (Kuperan etal, 1998). Population growth in fishing communities, market integration and technological innovations in gear and crafts as well as corruption and other patterns of human behavior can weaken co-management arrangements (McCay, 1996) In addition, co-management is

associated with high program design costs required to ensure effective participation (Hanna, 1995) and these may outweigh the expected benefits (Kuperan etal, 1998).

On the other hand, long-term costs for monitoring and enforcement are minimal (Hanna, 1995) as many recurring costs to government, such as patrols, record keeping and facilities maintenance, can be transferred from the central government to user groups. In addition, user participation draws upon the experience and expertise of fishers and increases the likelihood of compliance with rules and regulations (Jentoft, 1995). The institution of co-management regimes has reportedly helped improve small-scale fishing communities by increasing community solidity and an elevation of pride in cultural identity and optimism about the future (McGoodwin, 2001) might add up in Africa. Nine case studies were selected, representing a range of both inland and marine co-management systems. Below are some of the case studies of co-management in Africa.

3.1.1 Benin: Lake Nokoue (Atti-Mama, 1997)

The fishing area covers an area of about 12,000 ha, with a population of 13,500. Many types of fishing gears are used to catch a wide variety of species. Access to the resource is shared with inadequate compliance with regulations from the users. Lack of fishery data, high fishing pressure, and weak enforcement are the major management problems. The Department of Fisheries and the Center for Regional Rural Development administer fishery regulations with the local administration. The establishment of fishery committees with the local fishermen, in consultation with the formal institutions, strengthened resource use and management. One of the principal benefits of co-management in Lake Nokoue was the sensitization program, aimed at training and education of fishers in the principles of fishery management. This has yielded improved compliance with fishery regulations, and enhanced sustainability of the fishery.

3.1.2 Cote d'Ivoire: Aby Lagoon Complex (Kponhassia, 1997)

This is a multi-species coastal fishery with a population of approximately 3,000 fishers. The Lagoon complex extends over an area of 424 km^2, which is a common property with territorial rights limiting access to certain areas. Fishing boats are 8 to 12m long but poorly mechanized. This is a low value fishery, targeting species with a varying market, but generally low market value. Disputes over access rights are common. High fishing pressure and lack of reliable stock assessment are other major problems. The Directorate of Fisheries in partnership with the local administration has tried to control the high fishing pressure on the resource. A co-management structure, the Consultative Fishery Surveillance Committee, has been encouraged to regulate and enforce government policies. Education and sensitization programs for greater user participation have been organized and have led to better compliance and resource conservation.

3.1.3 The Gambia: Central River Division (Njie, 2002)

This is a multi-gear and species riverine fishery on the Gambia River used by 314 poorly mechanized fishers. There is a huge influx of migrant and foreign fishermen with arbitrary gear use and subsequent environmental degradation. Human and technical constraints are evident, with inaccessibility of landing sites being a key management problem. The Department of Fisheries in consultation with the local traditional authority (village head and council of elders) and local Community Fisheries Management Committees devised a number of co-management approaches to common problems, which include the lack of fishery data, poor implementation of government policies, weak enforcement of rules, and conflicts among resource users. Since the advent of co-management, there is greater user participation and better enforcement.

Participatory control and surveillance have enhanced resource conservation as have the implementation of new seasonal and area closures.

3.1.4 Malawi: Lake Malombe (S.J, 1996)

This fishery is with an area of about 390 km^2 and with a fishing population of about 2,300 and open access rights with slight mechanization within the industry. Input cost is rather high, with a flexible market structure, and poor technical facilities for fish processing and transportation of fish products. Management challenges include unregulated access, limited control and monitoring by the regulatory authority and over exploitation. The Department of Fisheries administers fishery regulations and has, in consultation with the local village authority and fisher associations, developed a co-management approach. Entry and gear restrictions have now been implemented, along with seasonal closures. Co-management has generally led to better compliance from resource users and greater participation.

3.1.5 Mozambique: Angoche District in Nampula Province (Lopes, 1997)

This is a coastal marine fishery with a surface area of 3,600 km^2 and a fishing population about 200,000. Although the fishery is weakly developed, the open access and common property nature of the resource makes it highly vulnerable to over-exploitation. Moreover, the lack of alternate livelihood activities within the community has been steadily increasing the number of fishers and conflicts among them. Poor processing and other marketing infrastructure limit the profitability of the fishery. From the point of view of management, stock assessment, regulation of effort and overexploitation are key problems. The Marine Fisheries Administration, the Ministry of Finance and the Fisheries Secretariat undertake fishery management and regulation. This top-down structure has been strengthened through consultation with traditional local authorities and a council of Chiefs together with community associations to co-manage the fishery. Consultative committees from both formal and informal institutions have been formed to address common fisheries problems and to manage the fishery resource in terms of regulation and encouraging compliance by users.

3.1.6 Nigeria: Lake Chad (Nieland, 2000)

This is a mono-gear (basket) fishery with entry restrictions. Consequently, the fishery yields high catches and profits per unit area. However, high fishing pressure, poor fishery data, unclear property rights, and environmental degradation are increasingly common problems. The Department of Fisheries, together with traditional authorities have formed a Monitoring Unit that seeks to ensure compliance with management measures aimed at ensuring sustainability. User participation has improved, but capacity building and better legal structures are still required.

3.1.7 South Africa: Arniston (Hutton, 1997)

This is another multi-gear, multi-species coastal marine fishery with a small level of boat mechanization. The biggest issue here is racial segregation and the absence of harbors.
Conflicts are common, with illegitimate rules and fishery regulations left over from the Apartheid era. A Sea Fisheries Committee oversees fishery management and regulations under the Ministry of Environmental Affairs and Tourism. One of the greatest tasks is competition between industrial and artisanal fisheries, leading to high fishing pressure and problems with control and monitoring. However, consultations within the local fisher's forum, and amongst the local Community Trust and the Sea Fisheries Committee have yielded good results using a joint co-management approach. One of the most important outcomes of this is the formation of co-operatives and community organizations with a high degree of participation and legitimacy,

which have been able to implement fishery regulations and the increase the sustainability of resource use.

3.1.8 Zambia: Lake Kariba (Sen, 1997)

Lake Kariba is one of the largest man-made lakes in the world with 5,500 km^2 surface area, 300 km long and 40 km at its widest point. It is a multi-gear and multi-species fishery with open access, although inclination is given to certain ethnic groups like Valley Tonga people. The fishermen often have conflicts with other non-fishing resource users like Safari operators and illegal cross-border traders. This coupled with a variable market structure, post-harvest spoilage and poor returns, make dangerous the high investment costs. Multiple and destructive fishing gears like explosives, chemicals, poisons, jigging and illegal nets have the potential to overexploit the resource. The lack of consistent catch and effort data hinders management initiatives. The Department of Fisheries regulatory structure has been augmented with local traditional institutions and committees in a joint participatory and consultative approach that has reduced disputes. In addition, more consultation and participation on the part of the resource users has led to improved compliance with regulations.

3.1.9 Zimbabwe: Lake Kariba (Sen, 1997)

As is the case for the Zambian part of the lake, the Zimbabwe fishery on Lake Kariba is a multi-user resource, with the fishermen competing with other users for access. The fishing population is about 1,240 with a form of government regulated access, but disputes are common with other stakeholders. The fishery is weakly mechanized, with minimal economic returns, huge post-harvest spoilage and fixed market prices. One company is the largest single buyer and, therefore, virtually determines the price of fresh fish. The company frequently provides fishers with nets and some foodstuff on credit. Payments are usually made with fish. Fishing is generally regarded as dangerous due to the presence of game scouts, crocodiles, and hippos. The use of destructive fishing gear and a high fishing effort is unsustainable. This is compounded by unreliable fishery data. The Department of Fisheries, Parks and Wildlife, in discussion with the Lake Kariba Fisheries Research Institute, is responsible for administering fishery regulations. Concurrently with traditional local authority and fishery development committees, a new co-management approach has led to the formation of exclusive fishing zones and closures and has gone a long way in resource conservation. There is now greater user participation, with trust and cooperation between the resource users and the fisheries staff, which has led to acceptability and conformity with fishery regulations.

3.2 **Advantages and Disadvantages of Co-Management**

Pomeroy and Rivera-Guieb (2006) highlight the following as potential advantages and disadvantages of co-management. The advantages of co-management are that it may lead to a more transparent management process between the government and the fisheries user groups. It may lead to a more democratic and participatory governance of fisheries resources. In the future, it has economic advantages compared to centralized management, since it reduces the administration cost and enforcement of rules and regulations that usually become the biggest cost components of centralized management through the involvement of the user groups, resource users become more responsible; and co-management maximizes the contribution of local knowledge and scientific information to resource management.

However, there are also disadvantages associated with co-management, namely: co-management may not be suitable for all fishing communities because there is a wide range of capabilities among the user groups. Initiating a co-management approach requires a substantial

investment in the form of time and human resources in the short term. Poor leadership and a lack of community organization may reduce the effectiveness and sustainability of co-management. Changes in fisheries management strategy can be high risk for some of the fisheries stakeholders. In some areas, it is difficult to share responsibility between the government and the local people (Berkes et al. 2001; Pomeroy and Rivera, Guieb, 2006).

3.3 Co-management in Artisanal Fisheries

This classification defined by Nielsen further distinguishes the five (5) types of Co management (Nielsen, 1996). These include:

- Instructive: Information exchange between end users and government is minimal. This type of co-management regime centralised management is the principal instructor as it relates to policies and laws. Government transmit information to users towards the end of the planning process.
- Consultative: Consultations are done among stakeholders through mechanism such as public hearing and advisory boards, but final decisions are taken by government.
- Cooperative: Users and government cooperate as equal partners in decision-making.
- Advisory: In this type of co-management, end users decide and advice government on the most appropriate. when feasible government endorses decisions
- Informative. All decisions making are done by end users. Once it is decided government is formed

As seen in Figure 5, fisheries management involves many parties, such as fishers, government, non-governmental institutions, academics and other fisheries user groups (traders, boat owners, etc). An understanding of their needs and interests is crucial. Co-management is an approach that encourages links between different parties and between human and natural systems. It recognizes the need for a management approach that addresses these links, as well as the needs of various fisheries stakeholders

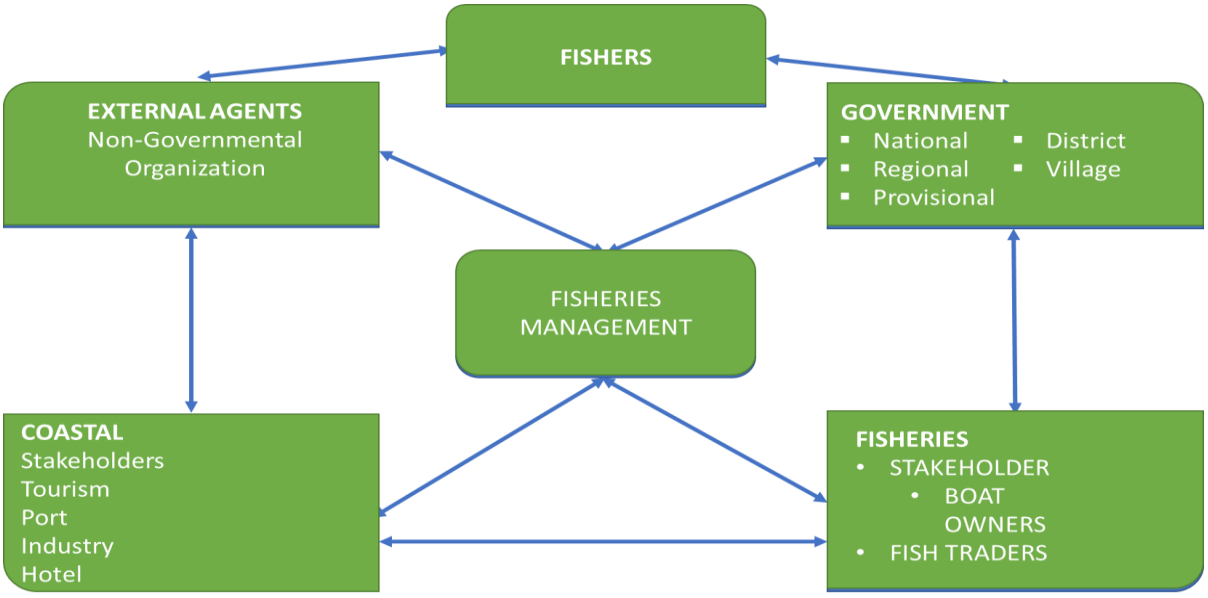

Figure 5. Co management institutional flow chart (Berkes etal, 2001)

4 METHODOLOGY

4.1 Study area

This study was conducted in three major areas across Sierra Leone namely Northern (Konakridee, Bailor, Yeliboya), Western (Tombo, Mammah beach, Goderich) and Southern (Shenge, Tisana, Bonthe, Mania) regions (Fig 6). Primary data and information were collected from CMAs between December 15th -31st, 2019 in ten CMAs areas across Sierra Leone. The sampled CMAs are representative of active and less active CMAs locations in Sierra Leone and consist of boat owners, fishers, processors, wood cutters, and traders. Data and information were collected to assess the performance of the CMAs and ascertain whether the CMAs across regions in Sierra Leone were different in their performance.

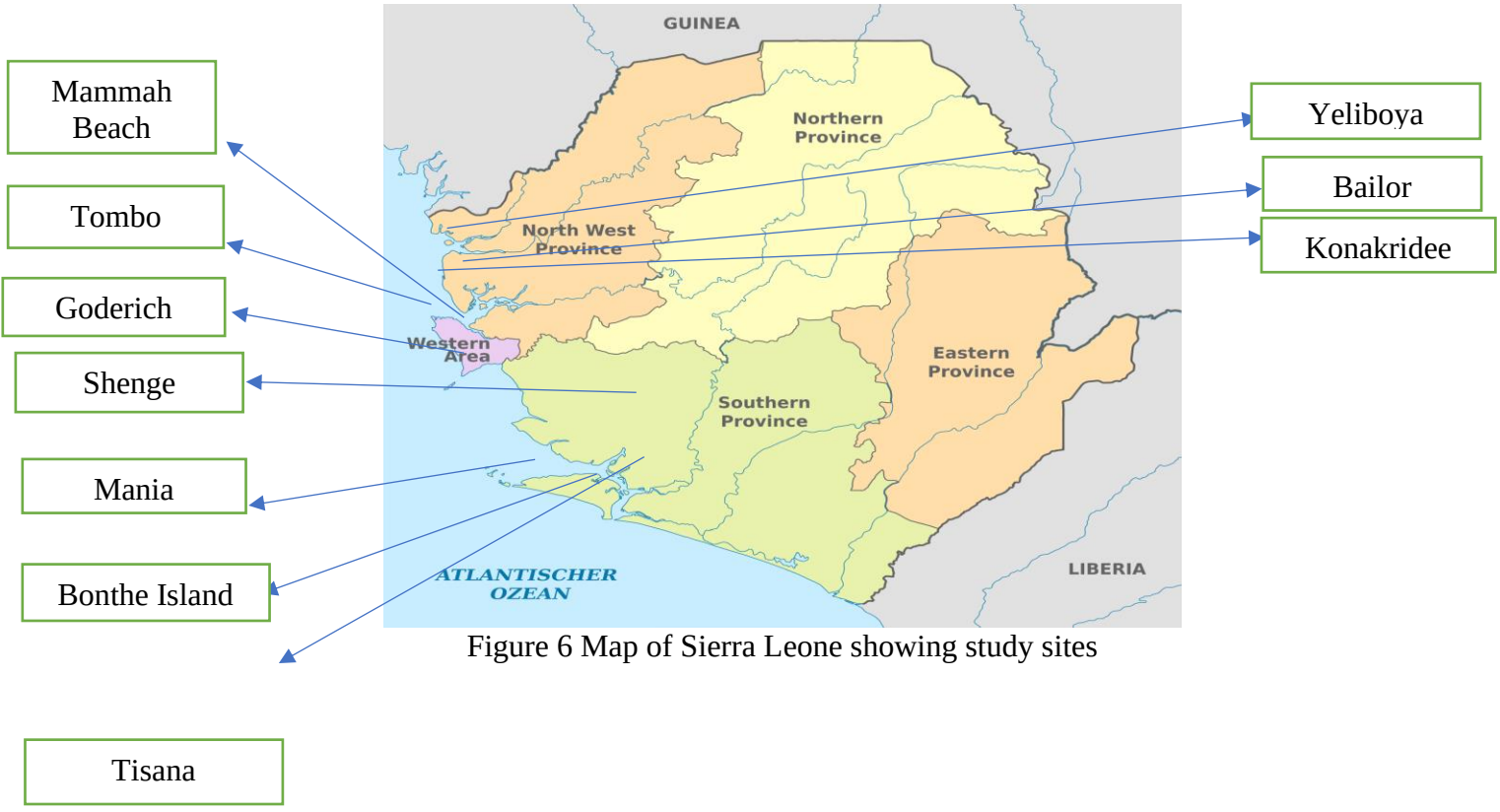

Figure 6 Map of Sierra Leone showing study sites

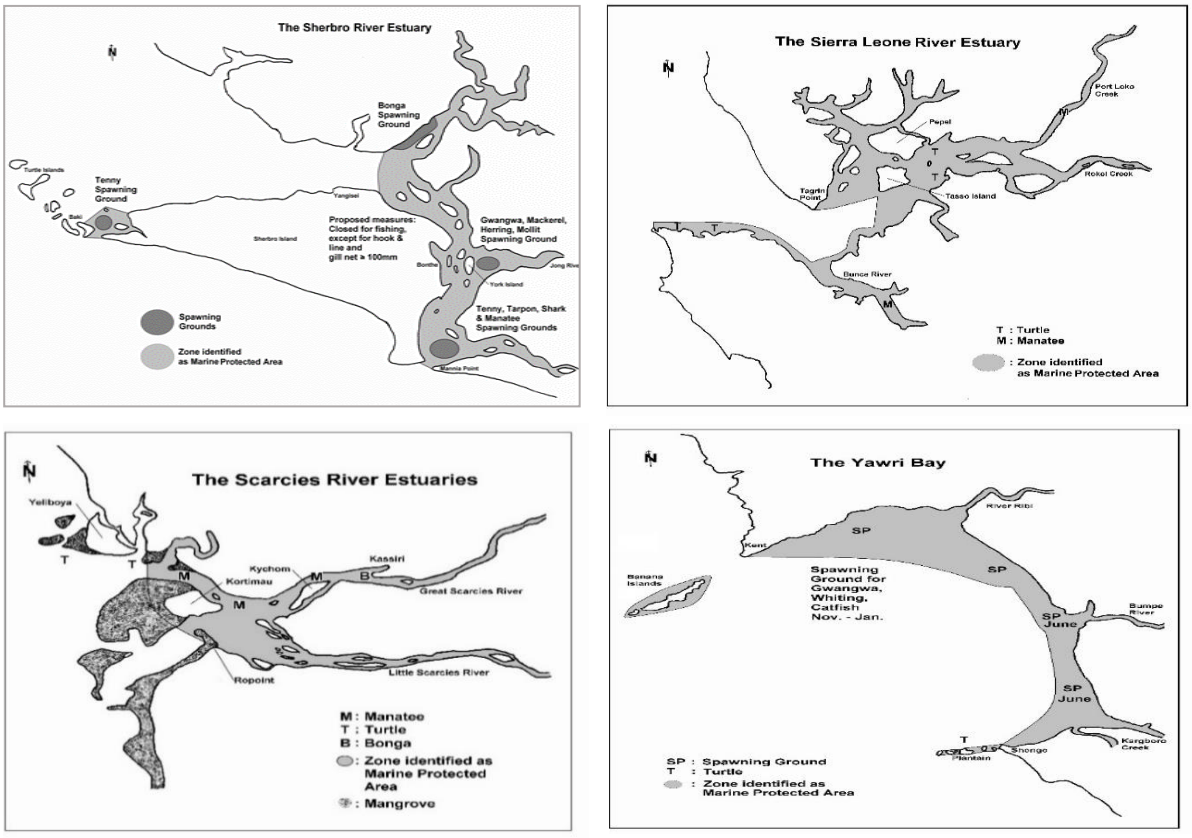

Figure 7. Map of Marine Protected Areas (MFMR, 2011)

4.2 **Data collection**

Primary data collection for this project was done in two ways; using structured questionnaires and key informant interviews. Structured questionnaires were administered to fishers, processors, CMA members, traders. Key informants' interviews were limited to CMA leaders and Fisheries Officers attached to the various locations. Prior to the survey, to determine suitability of the structured questionnaires used in this study, a pilot (pre-test) of the questionnaires was conducted in 2 CMA locations. The final survey questionnaire was prepared and sent out to the three regions co-management team who worked along with staff from the Ministry of Fisheries and Marine Resources to collect the data within the study areas.

Those targeted were all resource users that are directly involved in fishing activities as they were best equipped to understand the reality of the situation. The purpose of targeting different respondents (fishermen, processors, traders, CMA's) was to obtain an independent and balanced assessment as regards the CMA performance and the implementation of the co-management policies. Collaborations were effective amongst fishers that were at home, processors at the various stations, as well as the fishers that were met at the various landing sites. However, non-cooperative posture was exhibited by some traders as they were in a rush to make purchases of the landed catches and therefore did not give much attention to the interview.

Thirty people (fishers, processors, CMA's members, boat owner etc) responded to questionnaires (Appendix 1) each lasted for about 40 minutes and 3 CMA leaders and three Fisheries Officers were interviewed (Appendix 2).

Both random and non-random sampling techniques were used. Random sampling was used to select respondents for the structured questionnaires whiles non-random was used to target CMA leaders and fisheries officers attached to the three regions. This was regarded necessary to target those individuals with the best knowledge of the topic. The data collection lasted for two weeks. Secondary data were obtained from government documents, archival material, published studies, and consultant reports on co-management in Sierra Leone and Africa also provided additional details.

4.3 **Data processing and analysis**

Completed questionnaires were recorded, input to Microsoft Excel and coded for further analysis. Quantitative data were analysed using excel, summaries of the data were generated as frequencies, means, percentages and presented in tables and charts. More detailed statistical analyses of variable responses were done for selected data (or questions/responses), using mainly cross tabulations.

For the KIIs, content analysis method was used to analyse qualitative information, particularly taped dialogues which were broken into meaningful themes or tendencies. Responses on the assessment of CMA performance on fisheries management activities (from structured questionnaires) were subjected to further analyses using a chi-square (χ^2) test, to examine whether there were significant difference between the expected frequencies and observed frequencies and also to assess whether there is a significant difference between CMAs in undertaking the activities. This is essential because chi-square tests enable the testing of formal hypothesis about independence of probabilities for different categories of respondents. The null hypothesis is one of the statistical independences. Statistical significance in this case implies that the differences are sufficiently unlikely to be due to chance alone, but instead may be indicative of systematic factors, i.e. the probabilities are dependent on categories.

Ordinal probit regression model is used to analyse ordered categorical variable, (Pfarr etal, 2010) Many of the results from the study are measured on ordered scales, such as not effective to very effective. They are based on 5-point Likert scale (Joshi etal, 2015) categorical variables with 1 indicating not effective and 5 very effective respondents reported opinions on the CMAs in Sierra Leone. The dependent variables that allowed for ordered probit analysis were the use of MCS patrols, fisheries data collection, illegal gears confiscation and levying fines. Following this, independent variables are regressed against the dependent variables in a stepwise regression analysis. The stepwise regression approach is a variable selection procedure for independent variables and consists of a series of steps designed to find the most important independent variable to include in the ordinal probit regression model.

Several properties of the CMAs and the respondents were included in this analysis. The result supported variables representing CMA properties as important explanatory factors. As a result, only three sets of independent variables remained i.e. dummy variable for development support and CMA size and dummy variable for locations i.e. DW and DN representing CMAs in the Western and Northern regions of Sierra Leone is employed. The variable used in the ordinal regression analysis and labels are summarized in Table 1.

Table 1. Variables used in the ordinal probit regression models

Variable names	Label	Type of Variable
MCS_patrol	Opinions of respondents on conduct of MCS patrols 1=not effective, 5 = very effective	Categorical Dependent variable (model 1)
Gears_confiscation	Opinions of respondents on conduct of MCS patrols 1=not effective, 5 = very effective	Categorical Dependent variable (model 2)
Data collection	Opinions of respondents on conduct of MCS patrols 1= not effective, 5 = very effective	Categorical Dependent variable (model 3)
Levying_fine	Opinions of respondents on conduct of MCS patrols 1= not effective, 5 = very effective	Categorical Dependent variable (model 4)
Development support	1, if CMA receive development support, 0; otherwise	Numeric independent variable (model 1-4)
CMA in Western region	1, if CMA is in the western region, 0; otherwise	Numeric independent variable (model 1-4)
CMA in Northern region	1, if CMA is in the northern region, 0; otherwise	Numeric independent variable (model 1-4)
CMA size	Ranges from 40 to 80	Numeric independent variable (model 1-4)

5 RESULTS AND DISCUSSION

The following sections present analyses and discussions of the CMAs in Sierra Leone based on results of the field survey conducted by this project. The analyses and discussions mainly focused on the CMAs performances, challenges faced by CMAs and whether there are differences between CMAs in Sierra Leone.

5.1 **Demographic characteristics of respondents**

Males represent 84% of the total respondents interviewed in the ten CMA areas sampled. While age of the female respondents varied from 40 to 63 with mean age 51, the mean age of male respondents was [46 ± 8] (Tab 1). Across the three regions sampled, about 40% of the respondents are CMA members (Table 2), whereas 33% of the interviewees are boat owners.

Table 2. Summary Statistics of respondents

Sex	Percentage (%)	Mean Age	Boat owner (%)	Trader (%)	Processor (%)	Fishermen (%)	CMAs (%)
Male	84	46 ± 8	33	0	0	17	34
Female	16	51± 8	0	7	3	0	6

Table 3. CMAs targeted by regions

CMA regions	No. of CMA's targeted	% of regional CMA surveyed	No. of Respondents	% of respondents by region
North	3(14)	21.4	9	30
West	3(9)	33.3	9	30
South	4(14)	28.6	12	40
Total	10(37)	27.0	30	100

Note: number in parenthesis () is total number of CMA's per region

The study reveals that 21% of the CMAs in the Northern region were targeted, while 33% were targeted in the Western and 29% in the Southern region. Also 30% of fishers responded to questionnaires in North, 30% in the West and 40% in the South (Table 2). A total of 27% of CMAs were targeted across the three regions.

Evidently fishers are fully aware of the existence of CMAs in their various communities (Table 3). All respondents reported that the CMAs regularly popularize the content of their bylaws among them. However, only 50% of respondents reported that these bylaws are fully operational. About 70% of respondents indicated CMAs receive support from projects and the Ministry. The key informants interviewed confirmed that CMAs received support in the form of capacity building, cleaning tools and some fishing gears from the Ministry (Table 3).

Table 4. Fishers responses to various issues relating to Co-management

Questions	Yes (%)	No (%)
Do you Know about the CMA	100	0
Do you have CMA	100	0
Is Co-Management an effective approach	100	0
Are you working with your CMA	100	0
Is the CMA in your community collaborate with others	100	0
Does CMA's popularise the content of their bylaws among	100	0
Do you know if the bylaws are fully implemented?	50	50
Do you get any support from Development Partners such as WARFP	70	30

Education plays an essential role in the sustainability of a natural resource; the development of a society is highly reliant on the human resource capacity of its people being educated. In most artisanal fisheries especially in developing countries, there exist a lack of educational status among the resource actors. In this instance management purpose becomes a bit tough. The results indicate that most of the CMA members targeted in the Southern region have acquired secondary and tertiary education, higher when compared to other regions (Figure 8).

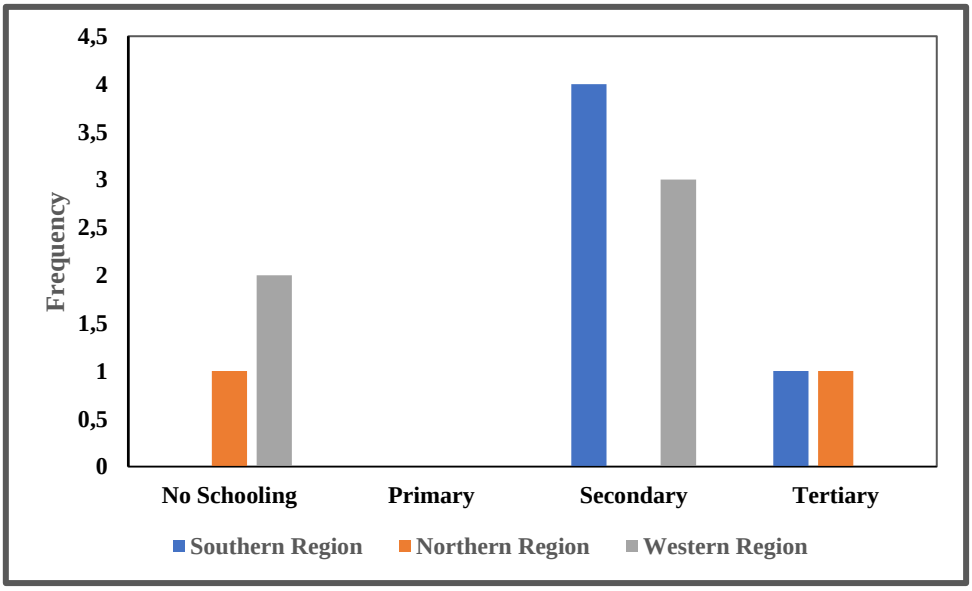

Figure 8. Educational level of CMAs across regions

An important factor is years of fishing experience has the tendency to provide information on the history of the fishery that would support labor force that are productive; thus, enabling stakeholders and managers to make informed decisions for a sustainable fishery. Roughly 57% of respondents reported that they have been fishing for over 20 years (Figure 9). This implied that fishing is a major livelihood activity that characterized them as CMA members.

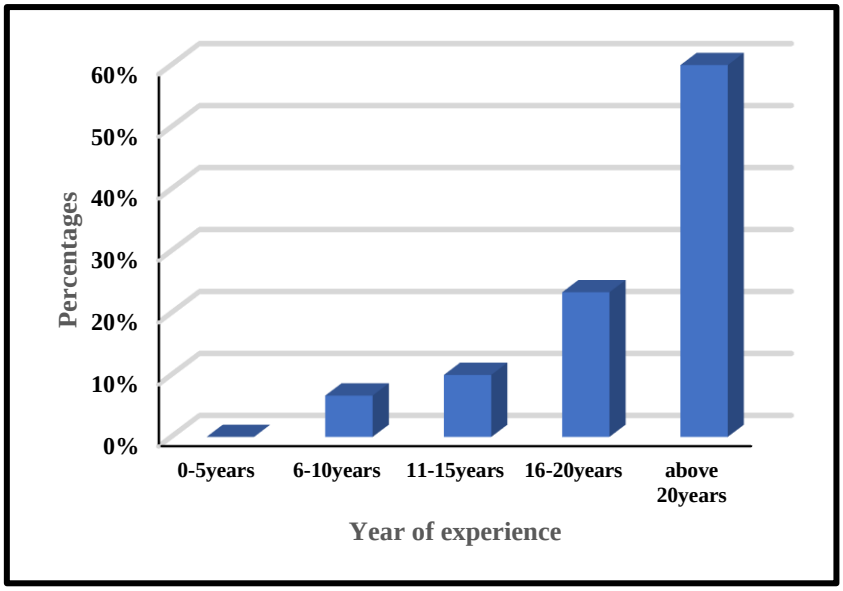

Figure 9. Fishing experience of CMA members

5.2 CMAs effort in managing the resource

The CMAs in Sierra Leone have been effective in performing most of their core activities ranging from popularising fisheries bylaws, conducting monthly meeting, patrolling fishing grounds, sensitization on hygiene promotion, resolution of conflicts among fishers. However, some CMAs were not effective in confiscating illegal fishing gears, data collection and generating sources of revenue.

Survey results indicated that CMAs performance was different across regions. This was also evident in the chi-square test performed to examine whether the variable responses of the respondents were independent or not (Table 4). This was further supported by the key informant interview that CMAs in the South has been taking the lead in Community surveillance patrols and illegal fishing gears confiscation. This affirms that CMAs in the Southern region were performing reasonably better than those in North and West.

This was primarily due to the size of the CMAs, and literacy rates. CMAs clusters in the south have fewer communities to govern and coordinate with and so it becomes more easier for them to conduct regular sensitization meeting. Also, the literacy rate among the inhabitants in this area is high and so it is presumably easier for them to comprehend and implement policies relating to fisheries management compared to those areas were the literacy rate is low.

In managing the fisheries resources the CMAs are expected to have in place a mechanism that supports the sustainable utilization of the resources and poverty alleviation through improved planning and resource management. About 83% of the respondents acknowledged that CMAs have bylaws they use to regulate fisheries. Conflict resolution and regulating illegal fishing are the major reasons why fishers think that CMAs have formulated rules, as detailed in figure 10.

This is also supported by responses from key informants, indicating that CMAs have managed to make some achievements through formulating bylaws, controlling illegal fishing and improved hygiene conditions at landing sites**.** Despite having this in place, the fishers indicated CMAs are by lack of enough working tools and equipment, inadequate capacity to enforce measures and lack of support from other stakeholders (Table 5).

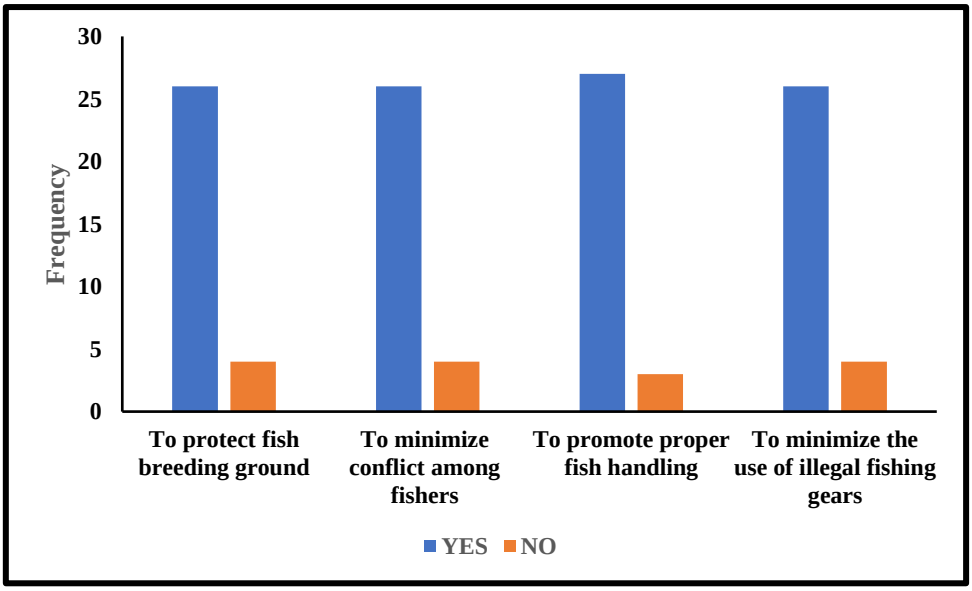

Figure 10. Respondent perception on CMA bylaws

5.3 CMAs performance assessment

Between 55% to 70% of the respondents stated CMAs were effective in formulated fisheries bylaws, conduct surveillance patrols, conducting monthly meetings, conflict resolution among fishers, sensitization meetings on hygiene promotion at the landing sites. Nevertheless, CMA ratings were low in fishing gear confiscation, data collection, fines and revenue collection (Table 5).

5.4 Does CMA partake in Community Surveillance patrols?

There was variation in the responses of interviewees across CMAs areas sampled regarding the activities of the CMAs (Table 5). About 10% of the respondents reported that community surveillance patrols activities of the CMAs were very effective, while 43% said it was effective and 33% reported it was less effective (Table 5). This was supported by the key informant interviews that there have been regular surveillance patrols.

5.4.1 Have CMA confiscated illegal fishing gears before?

On the confiscation of illegal gears, fishers indicated that 26% effective, 26% neutral and 48% less effective. This was supported by KIIs where it was reported that between 100-150 fishing gears had been confiscated in Southern region. This illustrated that some CMAs were not effective in gear confiscation primarily because of lack of alternative livelihood scheme as shown in table 4.

Table 5. Fishers rating on CMAs performance and chi square calculations

Activity	NO	Very effective (%)	Effective (%)	Neutral	Less effective	Not effective	p-value for perception	χ^2 p-value CMAS
Conduct Community Surveillance patrols	30	10	43	13	30	3	0.203	-
Confiscating illegal fishing gears	30	3	23	27	37	10	**0.008**	-
Conduct Fisheries data Collection	30	7	27	40	23	3	0.821	**0.050**
Levying fines	30	7	37	23	13	20	0.351	0.513
Sources of Revenue	30	3	3	13	60	20	**0.022**	-

5.4.2 Does CMA partake in fisheries data collection?

From the survey 27% of the respondents reported that fisheries data collection by CMAs was effective ,40% reported neutral and 23% reported less effective and 4% reported not effective (table 4). This was supported by the KII that data collection is only operational in the Western and part of Northern region as CMAs were collecting catch and effort data from fishers using android mobiles phones.

5.4.3 Sources of income

Fishers were asked about the main source of income for their household and 86% indicated fisheries, 13% farming and 1% petty trading. This also corresponds with responses from KIIs indicating that main income activity is fisheries. Also, the only source of income generation highlighted by the CMAs were through registration of new membership and monthly contribution. From the survey 80% indicated that CMAs have limited sources of income, 13% remain neutral and 7% said they have few sources of incomes (Table 4). This was supported by KII that CMAs from Western and Northern regions received monthly incentive for data collection exercise from the Ministry.

The chi-square test performed to test for independence regarding CMAs activities such as community surveillance patrols, data collection by CMAs and fine against defaulters showed there was insignificant difference (p-value > 0.05) in the opinions of respondents across the sampled CMAs regions. This indicates the opinions of the respondents across the CMAs areas were not independent suggesting that there are no differences in CMAs activities across regions in CMAs areas across Sierra Leone.

For confiscation of illegal fishing gears and sources of revenue test results revealed significant difference in opinions of respondents (p-value < 0.05). This means for the three regions there are differences in activities across regions in CMAs areas. This was supported by the KII that CMAs in the southern region were effective in confiscating illegal fishing nets as compared to the other two regions. Also, CMAs in the North and West had more sources of revenue as they participate in fisheries data collection as compared to those in South.

5.4.4 CMAs Formulate Fisheries bylaws

Fisheries bylaws formulation is one of the conditions for effective performance of CMAs. The co management strategy specifies the importance of formulating CMA bylaws. It serves as a management plan for CMA to enforce the laws embeded in every location.This study indicates that 83% of CMAs has formulated bylaws that could be used to manage the resource, while

17% stated neutral (figure 11). This was supported by KII that CMAs have formulated, popularised and endorsed their bylaws among fishers and community stakeholders .

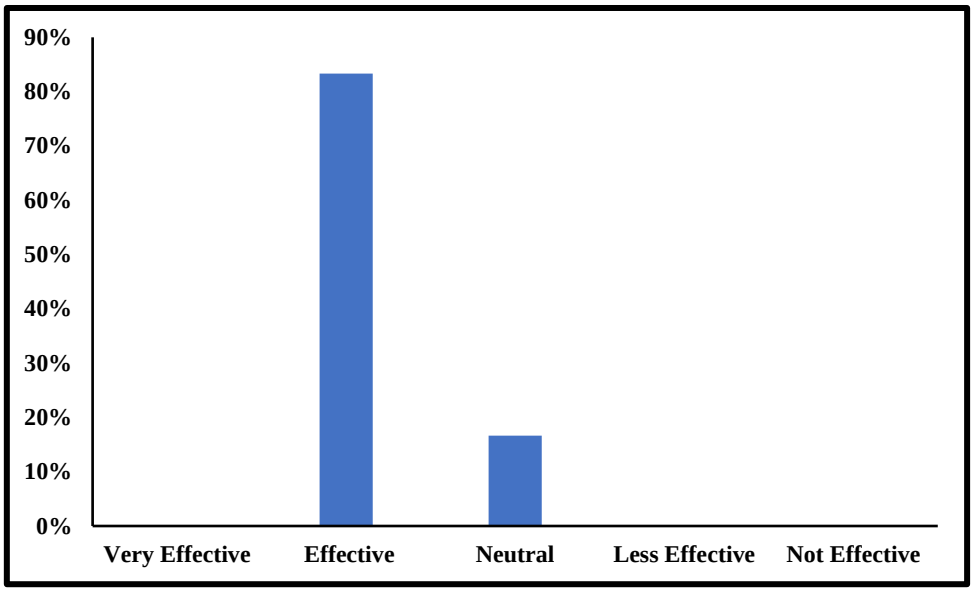

Figure 11. Fisheries bylaws formulation

5.4.5 Conflict Resolution among fishers

100% of respondent indicated that CMAs were very effective in resolving conflicts among fishers (figure 12). This was supported by KII that the major types of conflict encounter were thefts and destruction of fishing gears. It was also reported that the incidence of conflict among fishers has decreased drastically because of the fines associated with it.

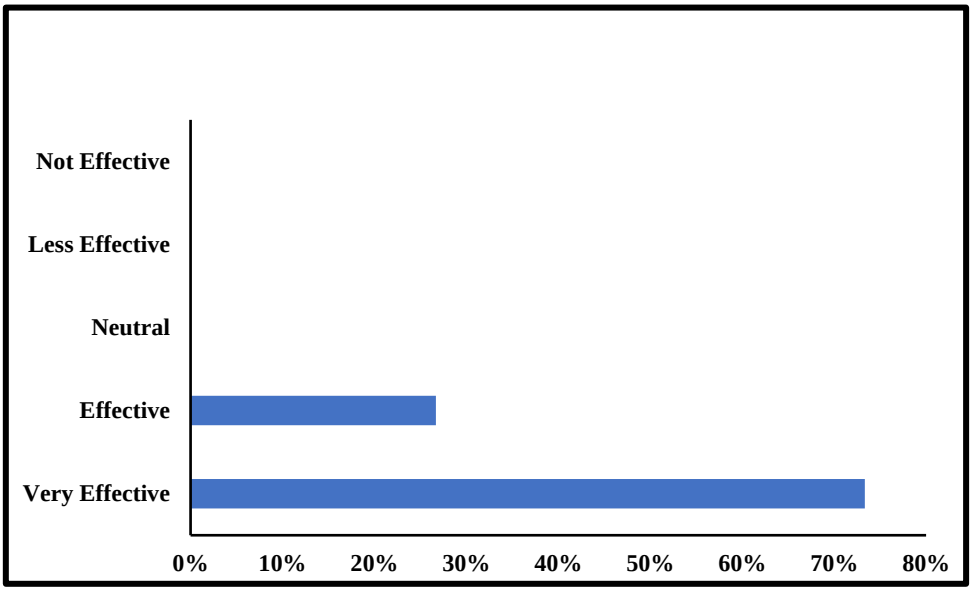

Figure 12. Conflict resolution among fishers

5.4.6 Monthly Meetings

The survey indicated that CMAs were highly effective in convening monthly meeting among members as shown in the figure 13 below.

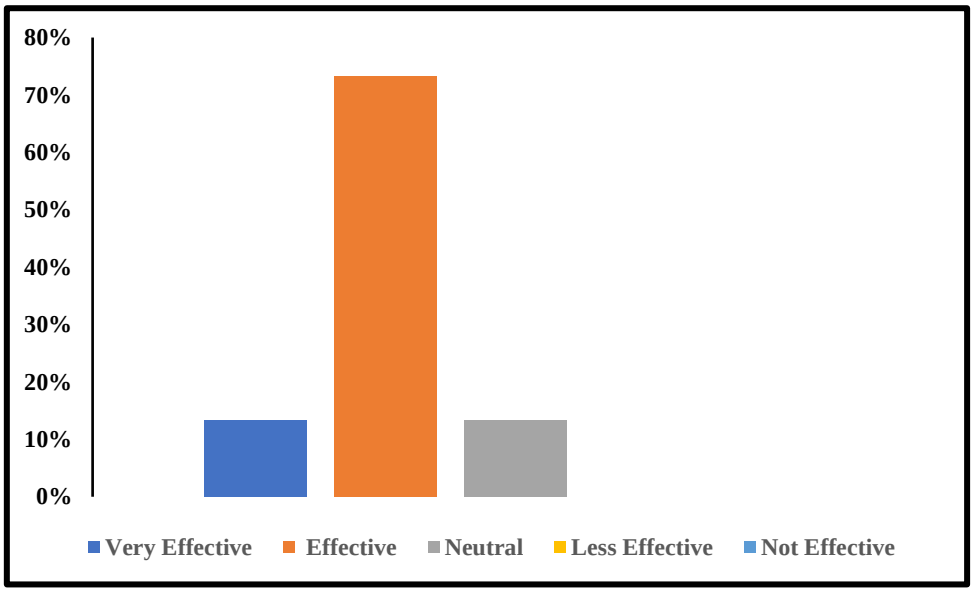

Figure 13. Monthly meetings

5.5 CMAs achievement in the fishery

The study examined CMA achievement in the area of management of fisheries resources. It was revealed conflict resolution among fishers, improved hygiene at the landing sites and partake in frame surveys as the activities undertaken most by the CMAs (83%) as shown in Figure 14 below. These were followed by fisheries data collection, reduction in illegal fishing, formulate and enforced bylaws and protection of the MPA by allowing passive fishing methods (50%). However, it was revealed that most CMAs could not establish a revolving funds among members (67%) as shown in the figure below.This was as a result of the fact that most CMAs lack source of revenues.

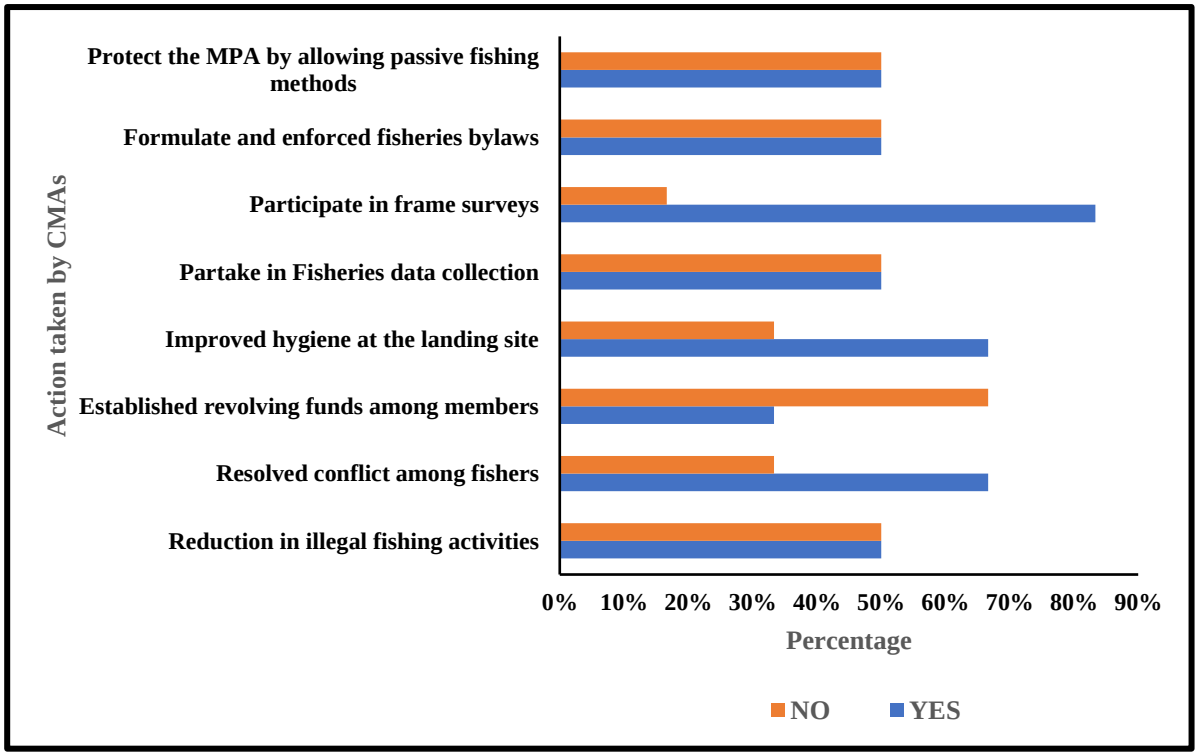

Figure 14. CMA achievement in fisheries management

For the ordered probit model, four (4) activities were considered: MCS patrols, gear confiscation， data collection and levying fines against defaulters. Statistical analysis for the different outcomes between the CMAs indicates that there is a negative relationship between getting external support and some of the outcomes, that CMA size has a positive effect on the effectiveness of patrols, and that CMAs in the South are better at gear confiscation than CMAs in the North. However, due to the small sample size these should be seen as indicators for further analysis (Table 6).

Table 6. Estimates of the ordinal probit regression models

	MCS PATROLS	GEAR CONFISCATION	DATA COLLECTION	LEVYING FINES
Variables	**Values**	**Values**	**Values**	**Values**
External support	-2.32*** (0.746)	0.203 (0.857)	-1.19(*) (0.653)	0.3509 (0.649)
West	1.79* (0.861)	−0.817 (0.791)	-0.383 (0.765)	−0.826 (0. 789)
North	1.14 (0.789)	5.043*** (0.0654)	-1.14 (0.739)	−1.45(*) (0. 756)
CMA_size	0.0778** (0.0283)	−0.0554(*) (0.0288)	0.00235 (0.0238)	-0.0206 (0.0248)
Intercepts	**Values**	**Values**	**Value**	**Value**
1|2	1.056 (1.599)	-5.042 (2.24)	-	-2.019 (1.57)
2|3	3.062 (1.708)	-3.208 (1.88)	−2.208 (1.53)	-0.443 (1.53)
3|4	3.708 (1.746)	-2.095 (1.85)	−0.719 (1.505)	- -
4|5			0.637 (1.49)	
AIC	66.44	60.22	77.7	66.5
log Lik value	-26.2	-23.1	−31.8	−27.2

Note: '***','**','*',(*), denote statistical significance at the 0%, 1%, 5% and 10% levels

5.6 Challenges faced by CMAs

The research considered the challenges confronted by the CMAs in implementing co-management. The following was found:

- most CMAs lack support from stakeholders
- inadequate capacity to enforced measures,
- lack of logistics on their own to conduct regular sea patrols and
- lack of source of revenue (table 7)

This is due to the fact that they lack budgetary allocation from local councils at the district level and the Ministry, making them inefficient to carry out their core functions.This was supported by the KIIs. Most CMAs appear to lack tools and office space, and this makes it difficult for donors to easily locate them.

Table 7. Challenges faced by CMA

CMA Challenges	No. of Respondents	Extremely high%	High %	Neutral %	Low %	Extremely low%
Lack of support from stakeholders	30	3	43	40	13	0
Inadequate capacity to enforce measures	30	3	67	27	3	0
Poor Knowledge of the resource	30	0	7	3	67	23
Lack of logistics to conduct frequent sea patrols	30	3	57	20	20	0
Lack of source of revenue for CMAs	30	3	63	13	20	0

6 DISCUSSION

Fisheries co-management is an approach that has been accepted internationally in response to the apparent failure of centralized management of fisheries in averting the decline of fish stocks and the lack of capable government agencies to effectively manage fisheries resources and tackle socio economic issues arising from the fisheries (Njaya, 2007). On the CMA performance, it is evident that they have enacted by-laws to manage the fisheries. According to fishers' perceptions, the CMAs have achieved some impact in regulating fisheries such as popularizing their bylaws, resolution of conflicts among fishers, and improving landing sites hygiene. This perception of fishers is also supported by findings of hypothesis testing which revealed that the CMAs are effective in carrying out some activities. This also differs between CMAs across regions. These findings support (Ogwang' etal, 2009) that there are some achievements by CMA but contradict findings that co-management has not been effective in fisheries management (Hara etal, 2003). It is therefore evident that though they may be unable to perform effectively in every activity as stipulated in their bylaws, but this cannot be generalized as a total failure by all CMAs in implementing fisheries policy.

Moreover, it is worth noting that co-management should not be seen as a single strategy to resolve all problems of fisheries management, but rather a method of resources management that matures, adjusts, and adapts to changing conditions over time (Pomeroy etal, 2011).

The major reason for establishing CMAs was to improve community participation in surveillance, management of the resource, and to reduce injurious fishing practices such as using illegal gears and destructive methods. The present study finds that CMAs have inadequate resources for intensive monitoring, control and surveillance (MCS) operations and that most CMAs are yet able to successfully control illegal fishing in their areas. Despite the efforts of many CMAs to improve compliance with fishing rules, most CMAs have been unable or unwilling to undertake regular MCS activities because of a lack of patrol equipment such as boats and engines, high fuel cost, inadequate funds to pay patrol team. While fishers interviewed in the study seem to have good knowledge of current fisheries regulations concerning the minimum mesh size of nets and the slot size of fish to be landed, most fishers do not adhere to or comply with these regulations.

The present study suggests that knowledge of the rules has little impact on fishers' behaviors. Thus, there is a high degree of regulatory defiance regarding the MPA and other resource. These data suggest more resources are required for MCS operations if successful co management is to take place through the CMA organizations. Monitoring, control and surveillance must be strengthened to enforce the implemented rules, and there must be higher political will for the laws to be fully implemented to curb illegal fishing activities in the artisanal sector.

The overall impression of monitoring and enforcement in the MPAs is that it suffers from a combination of problems. First, conviction of offences results in a very low fine. Second, illegal gear and juvenile fish are often kept and traded by fishers, despite being outlawed. Third, those with the capacity to control such unsustainable practices are discouraged and unmotivated, resulting in their culpability in this activity.

Many CMAs still perform poorly in the area of financial management. Sustainable financing of CMAs is essential for the sustainability of the organization and their effective operation. The present study indicates that revenue generation capability of CMAs has been modest, likely attributable to limited income powers, reduced direct support from donors and other financial institutions to fishers.

7 CONCLUSION

This study assessed the performance of CMA with focus on successes and challenges of the CMAs in managing the resource, the role of Ministry of Fisheries, CMA formation process and the life span of their elected executives. Based on the results it is evident that the CMAs have formulated by-laws, implements some aspects of their bylaws and fishers are also aware of the importance of these regulatory measures to the management of the fishery. However, some of these measures have not been implemented and this is expected given the fact that co-management process is fundamentally adaptive and relies on systematic learning and progressive knowledge accumulation for improved fisheries management.

The study also reveals that CMAs were formed based on proximity of coastal communities adjacent to the MPA and have a five (5) year life span before another election. The role of the Ministry is to provide capacity building for CMAs through training and empower them with logistics to man the resource. However, based on responses from KII this has not been fully achieved. We also find out that there are differences in CMAs performance across regions based on the chi square test for respondents and CMAs.

8 RECOMMENDATION

The following recommendations arise from fisheries officers and CMA leaders from the present study:

i. **Sustainable funding scheme**- a major challenge facing CMAs is lack of sustainable funding mechanism for their day to day operations. Sustainable fisheries management organizations require that CMAs become financially independent. Reducing the issue of lack of finance might be accomplished through partnerships with established financial

institutions that provide education, loans and training in financial management. CMA financial independence however relies on numerous variables, including the CMA ability to collect tax and fines with little or no interruption from higher levels of authority.

ii. **Improved governance measures**- The Ministry and CMAs must conduct regular, robust and efficient surveillance patrols. All MCS activities should be carried out in partnership between government entities (Ministry of Fisheries) with the CMA leadership in order to ensure legitimacy is preserved at the community level. Priority should be given to enforcing existing legislation on gear restrictions, including the ban on beach seine, monofilament net, "channel" net and the use of undersize meshes. Increased collaborative MCS activities should lead to increased compliance with fishery regulations.

iii. **Continuous collaboration**-The CMAs relies on the need for continuous collaboration with other stakeholders within the sector such as local councils, NGO, Government, chiefdom stakeholders, fishers, processors etc. Information and communications must be facilitated through appropriate mechanisms and should include meetings, public awareness campaigns and educational programmes.

iv. **Support to CMAs to sell legal fishing gears**- CMAs should be supported with legal fishing gears as a way of eradicating the illegal gears and they should be consulted before such procurement for them to identify the prefer types.

v. **Further Research on CMAs**-However, further research is required to cover many CMAs and other co-management stakeholders(respondents) in order to have a holistic view not covered by this study. The focus should be on both science and governance to strengthen scientific data collection.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks and gratitude to my Supervisor, Professor Dadi Mar Kristofferson, Dean of School of Social Sciences, University of Iceland for his excellent professional and technical guidance for this study. I am especially grateful to the Director of the UNESCO Fisheries Training Programme Mr. Thor Asgeirsson and Deputy Mary Frances Davidson for their support, guidance and hospitality in Iceland. My special thanks to Stefan Ulfarsson, Tumi Tomasson, Julie Ingham and Beata Wawiernia for their kindness and understanding. My gratitude to Alvin Slewion Jueseah my co supervisor, for using an extra eye to see the completion of my work.

To my fellow colleagues of the 2019 UNESCO-FTP especially my Policy and Management classmates, I appreciate your support and understanding. Special thanks to Anthony, Lanre, Huixia, Leanne Grace, Happiness, Doris, Ruth, Foibe, Mohamed, Sahr and so many more who gave me support, encouragement, friendship and camaraderie. You guys made my stay in Iceland a memorable one. Finally, I would like to thank my wife Dusuba and my children Aisha, Saccoh, Fatmata and Abubakar for their courage and understanding during my absence from home. You have my unending admiration.

References

Atti-Mama, C. (1997). Trends in the management. *regional workshop on fisheries comanagement research* , (pp. 1-20). Mangochi,.

Baland, J. a. (1996). Halting degradation of natural resources; is there a role for rural communitiesFAO and Claredon Press, Oxford, UK. .

Berkes etal, R. P. (2001). Managing Small scale Fisheries- Alternative Direction and Methods.

Hanna, S. (1995). . Efficiencies of user participation in natural resource management. , p.59-67. .

Hara etal, M. a. (2003). Experiences with fisheries co-management in Africa. In J. R. D.C Wilson, The Fisheries Co-management ExperienceAccomplishments, Challenges and Prospects. *Kluwer Academic Press, Dordrecht.* .

Hutton, T. a. (1997). Opportunities for Co-Management: the Application of a Research Framework to Case Study from South Africa. *Paper presented in a regional workshop on fisheries co-management research in Malawi.* Mangochi.

Jalloh, K. (2009). *THE ECONOMIC POTENTIAL AND FEASIBILITY OF A LANDING.* Reykjavik: UNU -FTP.

Jentoft, S. a. (1995). User participation in fisheries management: lessons drawn from international experience. *Marine Policy*, 19(3):227-246. .

Joshi etal, A. K. (2015). Likert Scale: Explored and Explained.". *British Journal of Applied Science & Technology 7*, 396-403.

Kponhassia, G. a. (1997). *The traditional management of Artisanal Fisheries- Case of Aby lagoon Ivory Coast.* Mangochi, .

Kuperan etal, K. N. (1998). Transaction cost and fisheries comanagement. pp. 13:103-114.

Kuperan, K. N. (1998). Transaction cost and fisheries comanagement. *Marine Resource Economics*, 13:103-114. .

Lopes, S. E. (1997). From no management towards co-management? A case study on artisanal fisheries in Angoche district. *Paper presented in a regional workshop on fisheries comanagement research.* Mangochi.

Mawundu, S. (2011). *ARTISANAL FISHERIES STATISTICS IN SIERRA LEONE,.* Reykjavik: UNU-FTP.

McCay, B. a. (1996). From the bottom up: participatory issues in fisheries management. Society and Natural Resources. 9:237-250. .

McGoodwin, J. (2001). Understanding the culture of fishing communities: a key to fisheries management and food security. *FAO Fisheries Technical Paper* , 401:1-287.

MFMR. (2010). *Revised Fisheries Policy.* Freetown: Ministry of Fisheries and Marine Resources .

MFMR. (2011). *MPA Management Strategy.* Freetown: Ministry of Fisheries and Marine Resources.

MFMR. (2012). *Artisanal Fisheries Management Plan.* Freetown: Ministry of Fisheries and Marine Resources.

MFMR. (2016b). *Fisheries Development Strategy.* Freetown: Ministry of Fisheries and Marine Resources.

MFMR. (2018). *Canoe Registration Data* . Freetown: Ministry of Fisheries and Marine Resources.

Nieland. (2000). Traditional management systems and poverty alleviation in Nigeria. *Paper presented in seminar on livelihoods and inland fisheries management in the* . Ouagadougou.

Nielsen, S. (1996). Fisheries co-management: A comparative analysis. Marine Policy. . *Marine Policy*, 20(2), 405418.

Njaya, F. (2007). Governance Challenges for the Implementation of Fisheries CoManagement: Experiences from Malawi. *International Journal of Commons,* , 1(1), 137-153. .

Njie, M. a. (2002). A Case study of Comanagement in inland fisheries -Gambia., (pp. 228-239). Banjul.

Nunan, F. (2006). Empowerment and Institutuions . *World Development*, 1316-1332.

Ogwang' etal, V. N. (2009). Implementing Co-management of Lake Victoria's Fisheries. *Africa Journal of Tropical Hydrobiology and Fisheries,,* 12, 5258. .

Pfarr etal, C. S. (2010). "Estimating Ordered Categorical Variable using Panel Data: A Generalised Ordered Probit Model with an Autofit Procedure. *Social Science Research Network.*

Pomeroy etal, S. R. (2011). Conditions for succesful Comanagement: Lessons Learned in Asia, Africa, the Pacific and WIder Caribbean. In R. S. Andrew, Small Scale Fisheries Management-Frameworks and Approaches for the Developing World. *London: CAB International,* (pp. 115-131.

Raakjaer Nielsen, J. S.-J. (1996). Analysis of fisheries co-management arrangements: a research framework. *ICLARM and IFM Fisheries Co-management Research Project working paper . Manila, Philippines.*

S., N. (1996). Fisheries Co Management - A Comparative analysis. . *Marine Policy*, 20(2),405-418.

S.J, D. (1996). The Management of Artisanal Fisheries in Lake Malombe. *Participatory Fisheries Management Programme.* Mangochi.

Seisay, M. (2006). *Defining a Strategy for Fisheries Sector Support in Sierra Leone.* Freetown: DFID.

Sen, S. P. (1997). An analysis of emerging co-management arrangements the Zambian and Zimbabwean inshore fisheries of Lake. 20(5):405-418.

APPENDIX

Appendix 1: Structured quesionnaire

INTRODUCTION:

The researcher is conducting an assessment on the effectiveness of community management associations (CMA) in executing their roles in resource management (MPA) in the artisanal sector and better come up with recommendations that will help enhance their performance. Your response is critical in strengthening the performance of CMA's in enforcing fisheries bylaws consequently leading to sustainable fisheries Management (successful management of the MPA).

Name of Study site…… ……. Date ……

Name of respondent…….

DEMOGRAPHIC CHARACTERISTICS

1. Age of respondent……

2. Gender of respondent [1] Male [2] Female

3. Marital status [1] Single [2] Married [3] Divorce/separated [4] Widow [5] Widower

4. Major occupation in the fishery [1] Boat owner [2] Fisherman [3] Fish Monger [4] Fish Processor [5] CMA member

5. What is your level of education [1] No schooling [2] Primary [3] Secondary [4] Tertiary [5] Other specify…….

6. How many years have you been involved in fishing related activity……

[1] 0-5years [2]6-10years [3] 11-15years [4] 16-20years [5] above 20years

7. Which fish species do you target [1] Bonga Shad [2] Herring [3] Snapper [4] Croakers [5] others specify……

FISHERIES MANAGEMENT MEASURES

8.Have you heard about the Community Management Association (CMAs) in your communities?

Yes……. No…….

9. Do you have one? Yes…… No……

10.Can you rate the performance of CMA's in the following activities?

FUNCTION	**Very Effective**	**Effective**	**Neutral**	**Less Effective**	**Not Effective**
Have CMA Formulated fisheries bylaws?					
Does CMA partake in Community surveillance patrols?					
Have CMA confiscated illegal fishing gears before?					
Have CMA's being Levying fines against defaulters					
Have CMA being Conducting monthly meetings?					
Does CMA partake in Fisheries Data collection?					
Have CMA being actively involved in conflict resolution among fishers?					
Does CMA have sources of Revenue e.g Harbour fees?					
Does CMA conduct Sensitization meetings on hygiene promotion at the landing sites?					

11. How many illegal fishing gears has been confiscated? ( ) for the past 1-2years ( ) 3-5years ( ) 5-10 years

…….

12. Do you think co-management is an effective approach in managing the fisheries resources?		
YES	WHY	
NO	WHY	

13. **What** is/are your contribution(s) towards the management of coastal resources?
.....
14. Are you working with your CMA in your community? Yes……. No……
15. Is the CMA in your community collaborating with other CMA's? Yes…. No….
16. What is the strength of your CMA on working with communities?
Excellent……. Very good……. Good……..…. Poor……..... Very poor……...

17. What are the current challenges faced by CMA's in your community? Tick as applicable

No	**Challenges of CMA**	**Extremely high**	**High**	**Neutral**	**Low**	**Extremely low**
1	Lack of support from stakeholders					
2	Inadequate capacity to enforce measures					
3	Poor knowledge of the resource					
4	Lack of logistics to conduct sea patrols					
5	Lack of source of revenue for CMA					

18. Why has the CMA's developed by-laws?

REASON	**YES**	**NO**
To protect breeding and nursery ground for juvenile fish (MPA)		
To minimize conflict among fishers		
To promote proper fish handling and processing		
To minimize the use of illegal fishing gears in the sector		

19. Do you know if the bylaws are fully implemented? Yes… No….
20. Does CMA's popularise the content of their bylaws among fishers? Yes… No….
21. **How** can someone become a member of the CMA?

22. **How** often do they meet?

…….

INCOME/ECONOMIC ASPECTS

23. Do fishers pay harbour fees before going to sea to CMA's?

Yes……. No…….

If **Yes** how much approximately per day …….

24**.What** is the main source of income for CMA's?

[i]…….

[ii]…….

25.Do you get any support from Development Partners such as WARFP project, NGO, ? Yes ……. No…….

26**. If** yes is the support in terms of fund, working tools or training?

.....

…….

THANK YOU VERY MUCH

Appendix 2: Key informant interviews

INTRODUCTION:

The researcher is conducting an assessment on the effectiveness of community management associations in performing their roles in resource management (MPA) in the artisanal sector and better come up with recommendations that will help enhance their performance. Your response is critical in strengthening the performance of CMA's in enforcing fisheries bylaws that will lead to sustainable fisheries Management (Successful management of MPA).

Name of interviewee……. Occupation…….

Date……. Landing site……

1. **How** many years have you lived in this village/ town?.....
2. Main source of income for majority of people at the village ( ) Fishing ( )Farming ( ) Livestock keeping ( )Business ( ) Others specify……

3. What group of fisheries stakeholders are the poorest among the following? ( ) Boat owners ( ) Fishers ( ) Fish Monger ( )processor ( ) Other specify…….
4. What development programs and projects have the CMA's initiated

Development Programmes	**YES**	**NO**
Established income generating activities		
Runs a credit and savings schemes for fishers		
Established fines and other charges for fishers and offenders		
Creates awareness among fishers on fisheries bylaws		
Other specify……		

5. What achievements have the CMA's had in fishery since its formation?

NO	**ACHIEVEMENTS**	**YES**	**NO**
1	Reduction in illegal fishing activities		
2	Resolved conflict among fishers		
3	Established revolving funds among members		
4	Improved hygiene at the landing site		
5	Partake in Fisheries data collection		
6	Participate in frame surveys		

7	Formulate and enforced fisheries bylaws		
8	Protect the MPA by allowing passive fishing methods		
9	Others specify		

6. What are the initiatives/ support done by the Ministry for CMA improvement?

NO	**SUPPORT**	**YES**	**NO**
1	Capacity building		
2	Provide tools for hygiene promotion at the landing sites		
3	Logistics for community surveillance patrols		
4	Distribution of fishing gears to CMA's		
5	Facilitate exchange visits for CMA's to other neighbouring countries		
6	Provide funds for CMA to undertake Fisheries data collections		

7. Does the CMA participate in revenue collections? Yes ……. No……

8. **How** much does fishers pay before going to sea?.....

9. **Are** there other sources of income for the CMA's? please explain

   ……..

……..

10. How long have you been in fishing related activities ? ( ). 1-5years ( ). 6-10years ( ) 11-15 years ( ) 16-20 years ( ) above 20

11. How many times in a week do you go out fishing? ( ) 2days ( ) 3days ( ) 4days ( ) 5days ( ) Others specify

12. **What** is your estimated catch per day (Kg or tons) ?.....

13. How much do you earn from fishing related activities per day? ( ) Le 300,000-500,000( ) Le600,000-800,000 ( )Le 900,000-1,100,000 ( ) 1,200,000-1,400,000 ( ) Above Le 1,500,000

14. **How** many fishing boats/ vessels do you have in this community?.....

15. **What** are the challenges faced by CMA's?

……
……
……
……
……
……
……
……

16. **How** many illegal fishing gears has been confiscated in the past five (5) years?

17. Do you think fishers follow the rules when fishing in the MPA? Yes…… No …….

18. I**f** No, why not?.....

19.Do you know if CMA 's get any support from Development Partners such as WARFP project, NGO? Yes ……. No…….

20**. If** yes is the support in terms of funds, working tools or training please explain?

.....

……

……

……

……..

21.**How** can CMA performance be improved?

……

……

……

…….

……..

……..

……..

…….

……..

…….

THANK YOU