JENRM, Vol. 2, No. 1, 15-23, 2015
Research Article

Achieving sustainable fisheries management: A critical look at traditional fisheries management in the marine artisanal fisheries of Ghana, West Africa

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Abstract
Sustaining fishery resources is crucial to the survival and wealth of artisanal fishers in Ghana. The artisanal fisheries sector of Ghana provides food, employment, livelihood support and socio-economic benefits to the Ghanaian economy. Fishery resources of Ghana are under stress from population pressure, increasing demand of fish and fishery products and open-access regime. Formal fisheries management practices have not yielded the desired results. There is an increasing need for traditional fisheries practices to be incorporated into formal fisheries management practices. The aim of this paper is to conduct an in-depth study on traditional marine fisheries management systems in Ghana in order to provide information to enhance the management of the artisanal fisheries.Data was collected through document analysis (between May 2014 and January 2015), field observation and questionnaire-based interview (between 26th and 30th of July 2014). Results show that the Chief Fisherman and Community Based Fisheries Management Committee are important structures in the fisheries management system of Ghana. The Chief Fisherman is the person that leads resolution of disputes and gives access to fishing in the communities. There are a number of measures such as non-fishing days, ban on landing certain fish species during festival periods to prevent overfishing. Taboos and cultural practices such as performing of rituals to 'sea gods' and consulting of oracles during certain periods of the year help to manage the fish stocks. With respect to the performance of the fishing communities, Elmina performed better with combination of various traditional practices to prevent overfishing. Fishers in Elmina also had adequate knowledge of current fishing rules and regulations than fishers in Adina, Chorkor and Dixcove. Fishers and fishing communities must be educated on the need to avoid unapproved fishing practices to help keep the fishery resources healthy for sustainable exploitation. Fishers should also be equipped with alternative livelihood jobs in order to reduce the pressure on the fishery resources. A national policy to integrate traditional management practices into formal fisheries management plans should be established.

Keywords
canoe—communities—fishers—fishing—fishery resources—traditional practices.

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Contents

1. INTRODUCTION

1.1 The Fisheries sector in Ghana

Ghana, located in West Africa, has a coastline of about 550 km (Fig. 1) and a very narrow and shallow continental shelf. The marine fishing industry in Ghana consists of three main sub-sectors, namely, small scale (for artisanal or canoe), semi-industrial (for inshore) and industrial sub-sectors. The marine artisanal fisheries are characterized by the use of several gears that are operated from dugout canoes which is carved out of a single log of wood species called 'Wawa' Triplochiton scleroxylon and 'onyina' Ceiba petandra. Gears such as purse seine (APWs), beach seine, gill net, lobster net, etc. are deployed by the artisanal fishermen. There are more than 12,700 canoes operating in 315 landing beaches and 190 fishing villages producing between 75 to 80% of the total marine fish landed ([1];[2]).

Almost all industrial and artisanal vessels operate

in the shallow areas of the coast despite existing formal regulations to the contrary. This situation has contributed immensely to the destruction of the breeding grounds and depletion of the fishery resources. The Ghanaian fishing industry, including both marine and inland fisheries, has over the last two decades contributed between 4.2 % and 0.5 % respectively to the nation's GDP, 2 to 7 % of agricultural GDP ([3];[4]). Fish supplies about 60 % of the daily animal protein intake of the average Ghanaian. It is estimated that about 75 % of total domestic fish production is consumed locally, accounting for about 22.4 % of household food expenditures. The annual per capita consumption is estimated at about 25 kg which is higher than the world and low-income food-deficit countries of 19 kg and 10 kg, respectively. Total fish production from inland, marine and aquaculture is estimated at 440,000 tonnes over the last five years ([5];[6]).

The dependence on fish and fishery products for livelihood and poverty reduction ([7]) in Ghana cannot be taken for granted. It is estimated that about 10 % of the population depend directly or indirectly on fish resource, which translate to 2.6 million people of the current population of 26 million. Men are involved in fish harvesting, undertaking the main fishing activities in the artisanal, semi-industrial and the industrial sectors while women are the key players in on-shore post-harvest activities, undertaking fish processing and storage and trade activities. Fishing communities in Ghana have limited alternative options for livelihood strategies ([8]). The artisanal fisheries are dominated by fishers who are virtually illiterate with little or no formal education, and largely unskilled besides fishing.

1.2 Current fisheries management institutions in Ghana

To derive sustainable benefits from Ghana's fishery resources, the resource base for the production of living aquatic resources must be kept in healthy, functioning order through improved management (both traditional and formal)[9]. The regulation of Ghana's fishing industry is by the government currently through the Ministry of Fisheries and Aquaculture Development (MoFAD), Fisheries Commission (FC) and its technical divisions under the Directorate of Fisheries (DOF). However, global trends and innovations in fisheries management have influenced the adoption of the co-management approach since 1997; hence the establishment and operation of Community-Based Fisheries Management Committees (CBFMC) .

Fisheries co-management' programmes are arrangements where the responsibility for fishery resources management is shared between the government and user groups [10]. Fisheries co-management programmes have been applied and succeeded in parts of South Africa, including Malawi, Mozambique and Zambia as well as parts of South East Asia including Indonesia, Malaysia, Philippines and Vietnam ([10]). Currently, Ghana's fisheries co-management management system is weak and its sustainability is seriously threatened.

1.2.1 Formal fisheries management regimes

Currently, there are two important formal fisheries management regimes in Ghana. These are:

1. Limiting fishing effort of industrial vessels (especially trawlers and shrimpers) by limiting entry into the fishery through licensing the vessels for fishing; and

2. Prescribing the mesh sizes to be used in any particular fishery in order to limit the exploitation of juvenile or immature fishes (including shellfishes and molluscs).

To conform to global fishing policy, the management regimes include ensuring responsible fishing under the aegis of FAO Code of Conduct for Responsible Fisheries (CCRF). The Fisheries Enforcement Unit (FEU) of the Monitoring, Control and Surveillance (MCS) Division of the DOF was established in 2013 to help ensure compliance to fisheries regulations and thereby attaining responsible fisheries.

1.2.2 Traditional fisheries management regimes

The traditional authorities through the following regimes regulate access to marine fisheries in Ghana and thereby contribute to conserve the fish stocks:

- In almost every fishing village, there is observed a non-fishing day in the week on which fishers maintain gear and equipment, resolve conflicts, rest and carry out other social activities.

- In some fishing communities or ethnic groups there is a total ban on fishing activities for various periods (up to two weeks) prior to and during annual festivals.

There is a worldwide perception that modern fisheries management strategies are failing to address the overexploitation of fishery resources. Stocks that are managed by both modern and traditional fisheries are improving globally ([11]). Fisheries experts now recognize that a fishery cannot be managed effectively without the cooperation of fishers to make laws and regulations work ([12];[13]). There is inadequate understanding of traditional fisheries management practices in Ghana by both the formal managers, scientists, researchers, and the general populace. This has resulted in formulation of unsustainable and ineffective policies and management plans which sometimes lead to conflicts and mistrust between fisheries officers, fishers and fishing communities. To avoid these, it is vital to conduct an in-depth study on traditional fisheries management systems in Ghana in order to provide information to enhance the management of the artisanal fisheries of Ghana.

The study will also enhance and project Ghana's adherence and interest within the framework of the CCRF. To some extent, traditional fisheries management has been successful in the inland waters of Ghana, especially, for the Ramsar sites but that is not the case in the marine sector. Accordingly, this paper aims to provide insights into the organisation, operation, and traditional fisheries management practices in the marine artisanal fishing industry of Ghana through interviews and other interactions with targeted artisanal fishers.

2. MATERIAL AND METHODS

2.1 Study Area

Four important fish landing sites representing the four coastal administrative regions in Ghana viz: Dixcove (Western), Elmina (Central), Chorkor (Greater Accra) and Adina (Volta) were selected for the study (See Fig.1). These four sites chosen for primary data collection were selected based on their importance and contribution to the marine artisanal fishing industry of Ghana as evidenced from historical catch records, large numbers of diverse gears and remarkable numbers of fishers at these sites as well as the results of Ghana Canoe Frame Survey 2013 ([1]).

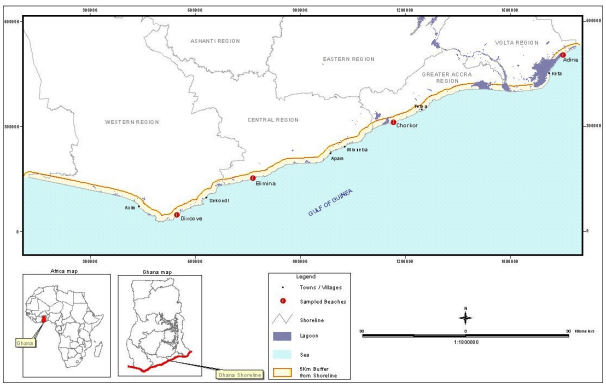

Figure 1. Map showing locations of study areas in Ghana

2.2 Data collection: Desktop survey

Desktop survey of relevant literature was conducted throughout the study period to provide the background and context of the fishery; and to support analyses of issues with respect to traditional fisheries management.

2.3 Data collection: Questionnaire-based interview

Questionnaire-based interview was conducted between 26th and 30th of July 2014. There were a total of 140 respondents consisting of 35 each from Dixcove, Elmina, Chorkor and Adina. The questionnaire was used to elicit information from artisanal fishers about the traditional fishing management practices in their respective communities. Mainly close-ended questions were verbally read to randomly selected fishers at the landing beaches in English and, when necessary, translated into a local language that both the interviewer and respondent could understand (e.g., Fante, Ga and Ewe). Records were made of spoken responses, including further explanations that helped to clarify certain issues or provided additional information on the subject. Overall, the data collected was both qualitative and quantitative in relation to fishers' perceptions about traditional fisheries management.

2.4 Data collection: Observation

Fishing activities were observed and necessary information obtained on diversity of fishing gears, canoe repairs, sharing of catch and purchasing of premix fuel.

2.5 Data Analysis

Responses from interviews were coded using the IBM Statistical Package for Social Scientist (SPSS) computer software version 20.0. (2012) ([14]) and analysed for trends in response to research questions. Data was processed and relevant tables and graphs produced.

3. RESULTS AND DISCUSSION

There was diversity of fishing gears (Table 1) in the fishing communities. Purse seining was the main fishing method at Adina, Chorkor and Dixcove (over 50 %). It was followed by beach seining (24.5 % -37.5 %) and lobster set net (5.7 %- 7.1 %). There were no trap fishing at Adina, Chorkor and Dixcove. Fishers at Elmina had APW (50 %) as the main fishing gear, followed by hook and line (25 %), lobster set netting (23.1 %) and crab traps (1.9 %).

Table 1. Occurrence of the main fishing gears employed in the communities

Fishing gear	Adina		Chorkor		Dixcove		Elmina	
	Occurrence	%	Occurrence	%	Occurrence	%	Occurrence	%
APW	-	0	+	5.7	+	5.7	+	50
Beach seine	+	37.5	+	24.5	+	24.5	-	0
Lobster set net	+	7.1	+	5.7	+	5.7	+	23.1
Purse seine	+	53.6	+	56.6	+	56.6	-	0
Hook and line	-	0	+	1.9	+	1.9	+	25
Crab traps	-	0	-	0	-	0	+	1.9
Gill net	+	1.8	+	3.8	+	3.8	-	0
Total		**100**		**100**		**100**		**100**

Note: + means Present; – means Absent. APW: "Ali Poli Wasta"

Major fishing problems encountered by the fishers are shown in table 2. The major fishing problems were: high cost of premix fuel (31.5 %), trawling (19.4 %) and light fishing (14.8 %). Fishing problems classified as others include net destruction by storms, low catches, trash fish trade, among others (34.3 %).

Traditional fisheries management practices (Fig. 2) were predominant at all the sites visited, with the Chief Fisherman being the overlord of fishing activities in the

Table 2. Problems related to fishing in the fishing communities

Fishing problems	Adina(n=35)		Chorkor(n=35)		Dixcove(n=35)		Elmina(n=35)		Total N= 140	
	N	%	N	%	N	%	N	%	N	%
High cost of premix fuel	24	33.8	29	32.6	29	32.6	20	26.6	102	31.5
Trawling	8	11.3	19	21.3	19	21.3	17	22.7	63	19.4
Light fishing	7	9.8	16	18	16	18	9	12	48	14.8
Others	32	45.1	25	28.1	25	28.1	29	38.6	111	34.3
Total	**71**	**100**	**89**	**100**	**89**	**100**	**75**	**100**	**324**	**100**

n: number. Due to multiple answers Total is higher than number (n).

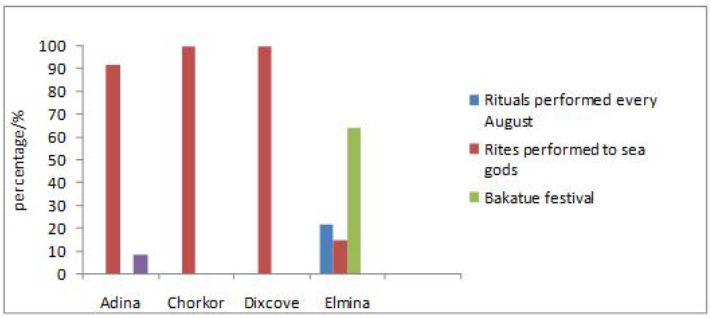

Figure 2. Traditional practices to prevent overfishing in the fishing communities

community. There were structures laid down to resolve conflicts among the fishers (Table 3). In Elmina, traditional rites were performed every August for bumper harvest and "Bakatue" festival which forbids use of the Elmina lagoon for a month. The four studied fishing communities have non-fishing days (usually Tuesday and Sunday) according to responses from the fishers interviewed. Over 80 % of the fishers responded that, there were no closed areas (Fig. 3) for their fishing grounds. There were taboos or cultural practices that aided in the conservation of fish stocks (Table 4). These include; performance of rituals (48.6 %), closed season (20.8 %), non fishing day (15.2 %), no fishing on day of festival (4.2 %), women do not go to sea (4.2%), no sex before fishing (4.2 %) and no dynamite/light fishing (2.8 %).

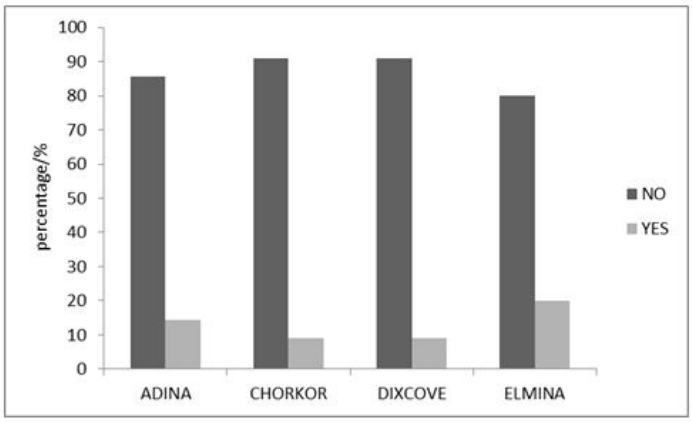

Figure 3. Existence of closed areas in fishing grounds

The fishing communities have rules and regulations that govern their fishing business with varying degree of awareness (Fig. 4 and Table 5). Important fishing rules and regulations indicated by respondents include; ban on fighting at landing sites (22.6 %), using portions of proceeds for developmental projects (19 %), and ban on explosives and light fishing (7.8 %). The Chief Fisherman

Table 3. Summary of structures that enforce rules and regulations

Structure	Adina(n=35)		Chorkor(n=35)		Dixcove(n=35)		Elmina(n=35)		Total N= 140	
	N	%	N	%	N	%	N	%	N	%
Chief fisherman	18	69.2	20	62.5	20	62.5	11	68.7	69	65.1
Chief	1	3.8	2	6.3	2	6.3	1	6.3	6	5.7
CBFMC	1	3.8	1	3.1	1	3.1	-	-	3	2.8
Chief priest	-	-	-	-	-	-	1	6.3	1	0.9
Others	6	23.1	9	28.1	9	28.1	3	18.7	27	25.5
Total	**26**	**100**	**32**	**100**	**32**	**100**	**16**	**100**	**106**	**100**

CBFMC: Community Based Fisheries Management Committee

Note: In all study sites, not all the respondents responded to the questions

Table 4. Taboos/cultural practices in aid of fish conservation

Taboos/cultural practices	Adina(n=35)		Chorkor(n=35)		Dixcove(n=35)		Elmina(n=35)		Total N= 140	
	N	%	N	%	N	%	N	%	N	%
Closed fishing season	2	10	5	27.8	5	27.8	3	18.7	15	20.8
Rituals are performed	9	45	9	50	9	50	8	50	35	48.6
Non fishing day	3	15	4	22.2	4	22.2	-	-	11	15.2
No dynamite /light fishing	-	-	-	-	-	-	2	12.5	2	2.8
No sex before fishing	3	15	-	-	-	-	-	-	3	4.2
Women do not go to sea	3	15	-	-	-	-	-	-	3	4.2
No fishing on a day of festival	-	-	-	-	-	-	3	18.7	3	4.2
Total	**20**	**100**	**18**	**100**	**18**	**100**	**16**	**99.9**	**72**	**100**

Note: In all study sites, not all the respondents responded to the questions

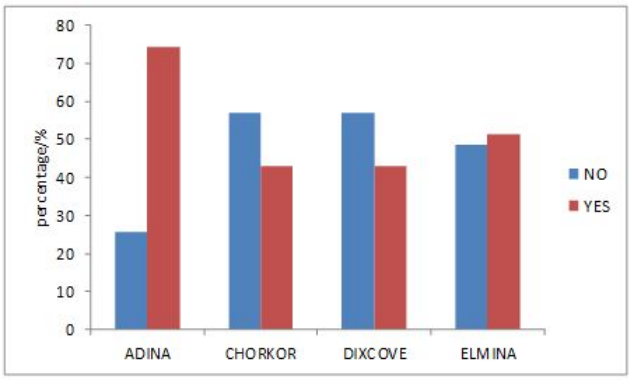

Figure 4. Fishers awareness of national fisheries rules and regulations

was the main structure that usually enforced rules and regulations. Table 6 shows fishers reasons for obeying fishing rules and regulations. Between 19 % - 30 % of fishers obey the fishing rules and regulations due to imposed infringement sanctions while 2 % - 7 % obey because of their leaders. Majority of the fishers (over 60 %) voluntarily obey the fishing rules and regulations which have not changed over the years.

Table 5. Knowledge of current rules and regulations for the fishing communities

Current rules and regulations	Adina(n=35)		Chorkor(n=35)		Dixcove(n=35)		Elmina(n=35)		Total N= 140	
	N	%	N	%	N	%	N	%	N	%
Parts of proceeds for developmental project	6	26.0	5	14.3	5	14.3	6	27.3	22	19.1
Ban on fighting on landing beach	2	8.7	10	28.6	10	28.6	4	18.2	26	22.6
Help fishers in distress	5	21.7	2	5.7	2	5.7	-	-	9	7.8
Explosives and light fishing ban	1	4.3	3	8.6	3	8.6	2	9.0	9	7.8
Others	9	39.1	15	42.8	15	42.8	10	45.5	49	42.6
Total	**23**	**99.8**	**100**	**35**	**100**	**22**	**100**	**115**	**99.9**	**100**

Table 6. Knowledge of current rules and regulations for the fishing communities

Reasons for	Adina(n=35)		Chorkor(n=35)		Dixcove(n=35)		Elmina(n=35)		Total N= 140	
obeying rules	N	%	N	%	N	%	N	%	N	%
Due to sanctions	8	29.6	5	19.2	5	19.2	-	-	18	18.8
Rules are from leaders	2	7.4	-	-	-	-	-	-	2	2.0
Voluntary	17	63	21	80.8	21	80.8	17	100	76	79.2
Total	**27**	**100**	**26**	**100**	**26**	**100**	**17**	**100**	**96**	**100**

Note: In all study sites, not all the respondents responded to the

4. DISCUSSION

The diversity of fishing gears clearly indicates that fishers target different fish species. The purse seine, APW, has the tendency of catching large quantity of fishes of the same shoal and often similar size. This is likely to result in excessive exploitation and reduced catch per unit effort of other fishing gears. Even though effort is increasing in the Ghanaian fishing industry, there is evidence of declining catches per fisher and decreasing sizes of fish caught ([15];[16]), these are indications of overfishing which need to be checked by fishers and fisheries institutions through co-management. According to the Fisheries Act 625 of 2002, all fishing crafts require a license to operate in Ghanaian waters. The canoe fleet operated under an open access regime and there are poor records of canoe registration and licensing in the country. The open access regime has resulted in excess effort, habitat degradation and over capitalization since it offered no incentive to conserve fishery resources. This trend is about to change as all canoes have currently been registered and embossment of numbers is underway as part of the activities of the West African Regional Fisheries Programme (WARFP) in Ghana. In relation to semi-industrial and industrial fleets, the limitation by licensing though enforced, leaves room for fishing with inappropriate gears resulting in over capitalization of the industry and depletion of fish stocks.

In Ghana, the Chief Fisherman is the main institution, found in West Africa, which exists in the community and aids in the management of fishery resources. Aside the Chief Fisherman, the CBFMC is another important structure. These aforementioned structures are very efficient in enforcing fishing rules and regulations. In addition, majority of the fishers co-operated with fishers from other nearby communities to manage the fish resources. This was done in order to receive help in time of need. Again, the Chief Fisherman has the power to give permission to a new entrant into the fishing business. Others like fellow fishers and leaders of canoe could give permission to new entrants but such new entrants are not always officially permitted by the Chief Fisherman. When local permission is granted the fishers accept new entrants easily. This mixed bottom up approach in modern fisheries management cannot be ignored as evident from this study. Government should not under-estimate the capacities of experience- and knowledge-based traditional and informal management systems of the Chief Fisherman and other leaders in the management of fisheries in the communities. Thus, stakeholders from the communities need to be equipped and resourced adequately to perform their duties in the management of Ghanaian fishery resources and reduce fishing conflicts. Fisheries experts now recognize that resource conflicts can be diminished and resources better managed when fishers and other resource stakeholders are more involved in management ([9]) under the ecosystem-based approach ([17]).

The culture and traditional practices, of communities visited, has an influence on the fishery, as well as the operations of the landing beach. For instance, in the Volta region (Adina), where traditional belief is predominant, most of the fishermen believe in consulting oracles and "soothe-sayers" for better catches, and the beach is relatively clean because of the perceived curses associated with misbehaviour. In the Greater-Accra region (Chorkor) however, where these beliefs are minimal, the beach is highly polluted with garbage and human excreta. In every fishing village there is a non-fishing day which is observed each week (mainly on Tuesday, but sometimes on Wednesday or Sunday), which fishers use to maintain gear and equipment, solve conflicts, rest and other social activities. Furthermore, in the Greater Accra Region, there is a ban on fishing for Dentex spp. for a period of about one month before the Homowo festival of the Ga people of Accra. In fact, to have successful strategies for fisheries management, it is critical to consider the fishery and socio-economic status among diverse groups, region, landing beaches and management types ([8];[11]).

Light fishing is of concern to fishers and fishery managers as it destroys the resource base of fish stocks. Light fishing has the tendency of attracting all sizes and types of fish in order to harvest. This illegal fishing practice, previously more prevalent in the lean fishing season, has been on the increase due to declining catches by fishers in recent times. Light fishing reduces recruitment and lower prices of fish landed. The capture of fishes off the major fishing season (where they normally are at a resting phase) naturally obstructs or impedes the biological cycle of the fish species. This could have serious repercussions on the spawning stock biomass ([2]).

Another fishing problem identified is the high cost of premix fuel. The government subsidizes premix fuel but most fishers are ignorant of government's subsidy on premix fuel. It should be noted that fuel subsidies are bad subsidies ([18]) and can lead to unsustainability of Ghana's fisheries resources. A removal of such subsidies in the fishery is, therefore, advocated to help reduce effort and therefore restore fish stocks to good health. Fishery managers need to fashion out alternative ways of rewarding fishers who are compliant with existing fisheries regulation and law.

Most fishers were ignorant of national rules and regulations governing fishing activities. Even the few who had some ideas of these rules, e.g., ban on use of monofilament net in the marine fisheries, mesh size regulation, etc., do not comply. This according to the fishers is due to declining catch and inadequate communication of fishery regulations by leaders of their fisheries associations as well as officials from the Fisheries Commission. Artisanal fishers allege that the activities of the trawlers have contributed immensely to the fall in the total biomass of fish in the sea. Hence, most fishers at Chorkor were actively using monofilament gears to harvest 'what was left'. Fishers should be better educated and motivated to heed to national fisheries rules and regulations through formation of local community fisheries associations who will better sensitise fishers. According to the Fisheries Regulations 2010 (L.I. 1968) of Ghana, trawling activities should be carried out beyond 30 m depth where artisanal fishing activities takes place. However, due to the then prevalent weak monitoring, control and surveillance by the Fisheries Commission, this rule is not adhered to by industrial fishing operators. The recent establishment of the Fisheries Enforcement Unit (FEU) and the upscaling of monitoring activities is a step in the right direction to reduce illegal, unreported and unregulated (IUU) fishing in Ghana. Again, there have been cases of recurring conflicts between artisanal fishers and industrial operators in relation to use of fishing grounds. This has the tendency to collapse the artisanal fisheries which will have severe consequence on socio-economic status of thousands of artisanal fishers and their dependants.

However, it is worth stating that, fishers voluntarily obeyed local traditional rules instituted by the fishers. This clearly indicates that both formal and traditional fishing rules and regulation should be harnessed, incorporated and jointly enforced under the fisheries management regime of Ghana to ensure sustainable fisheries management and rebuild fish stocks. Fisher participation in management can provide a wealth of local or indigenous knowledge to supplement scientific information, to help monitor the resource, to improve overall management and stop decline in fisheries ([9];[19];[20]). Alternative livelihoods such as aquaculture, crop farming and livestock rearing need to be popularized and developed in coastal and lacustrine communities. Alternative livelihoods are seen as the way to help fishers dependent on fishery resources to move away from unsustainable harvesting practices ([8]).

A fisheries management plan for the marine sector is currently being developed by the MoFAD and Fisheries Commission for 2016-2020. It is envisaged that the plan will comprehensively involve co-management; and measures to reduce bloated fishing effort, reduce the increasing conflicts, institute after scientific studies marine closed areas, and therefore reverse degrading fish resource in order to ensure that maximum benefits are derived by the artisanal fishers and sustainable management of Ghana's fisheries resources is achieved.

5. CONCLUSION

The present study reveals that fishers have adequate knowledge of traditional fishing practices in the fishing communities and must be empowered. These traditional management practices are simple, yet effective ways to improve fishery resources. There are structures and practices to ensure that the fishery resources are used and

managed sustainably. However, some fishers do not have the desire to obey national fishing rules and regulations. Traditional and formal fisheries management must be implemented as a policy hand in hand under an ecosystem based fisheries management approach to ensure that Ghana derives the maximum benefits from its fisheries resources for the current and future generations.

6. ACKNOWLEDGMENT

We wish to express our thanks to secretariat of the The Fishery Committee for the West Central Gulf of Guinea (FCWC) in Tema, Ghana, for providing some financial support for this study. Our greatest appreciation goes to the fishers who took time to gracefully share their experiences and professions with us in order to make this study a reality. We are grateful to Messrs Solomon Owiredu, Francis Adjartey, Edem Senah, Johnson Amiah, Paul Adjin-Tettey, and Kodar; as well as Missies Etornam Avornyo and Paulina Okpei for helping with the administration of questionnaire in the various fishing communities.

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