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Compliance to Fishing Regulations in the Use of Water Resources by Beach Management Units and Fishing Communities Adjacent to Lake Victoria

Moses Mugimba Muhumuza[1], Betty Mbolanyi[2], Dr. David Mwesigye Tumusiime, Dr. Nelson Turyahabwe[3]

[1]College of Agriculture and Environmental Sciences, Makerere University, Kampala, Uganda
Corresponding Author Email: *mmugim[at]gmail.com*
+256772332108

[2]Ministry of Water and Environment, Uganda
Email: *bmbolanyi[at]yahoo.com*

[3]Makerere University, Kampala, Uganda

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Abstract: ***Over the years, Lake Victoria has continued to experience increasing and considerable pressure from a wide variety of interlinked human activities despite the environmental services it offers to the riparian communities. An assessment to ascertain compliance to fishing regulations in the use of water resources by riparian communities was done in the period of nine (9) months consecutively. The objective of the study was to determine the existing compliance regulations for fishing communities and Beach Management Units in use of Lake Victoria. Qualitative data collection method was deployed and literature reviewed to generate information on existing fishing methods and knowledge about fishing compliance measure. The study area was purposively selected and covered five districts of Kampala, Wakiso, Mpigi, Masaka and Jinja with a total of 265 respondents interviewed. The study found that majority of the respondents are aware of the existence of fishing regulations and compliance measures that include payment of annual operating license, use of legal fishing gears, having fish movement permits, and having boats marked with a water line. However, awareness and implementation of certain regulations and compliance measures differ from district to district, for example, regulations requiring fishing during day time only is only known in Kampala, while regulations requiring use of refrigeration apply only in Wakiso and Kampala districts.***

Keywords: Regulations, Compliance, Lake Victoria, Fishing, Beach, Water resource

1. Introduction

In the last five decades, world fish food supply has outpaced global population growth, and today fish provides more than 4.3 billion people with about 15 percent of their intake of animal protein (FAO, 2012) [1]. Stimulated by higher demand for fish, world fisheries and aquaculture production is projected to reach about 172 million tonnes in 2021 (Alder *et al.,* 2014) [2], with most of the growth coming from aquaculture. Overall, including ancillary activities (e. g. processing and packaging) and dependents, the sector supports the livelihoods of 10–12 percent of the world's population. Promoting sustainable fishing and fish farming can provide incentives for wider ecosystem stewardship. Enabling mechanisms include the adoption of an ecosystem approach to fisheries and aquaculture with fair and responsible tenure systems.

Uganda accounts for 4% of the global inland fish production (FAO, 2010) [3], fish accounts for 6% of the total export earnings and 2.3% of GDP, and is the 2nd most important non - traditional export. Most of the fisheries in Kenya, Uganda and Tanzania are in Lake Victoria. About 35 million people live within the Lake Victoria basin and the population is growing at about 3% per year, of which population density in the basin is higher than the national average (UNEP, 2005) [4]. Since 1960 population growth within 100 km from the shores of Lake Victoria has grown from 60 to 246 inhabitants per km which is faster than the continental average for Africa that grew from 9 to 38 inhabitants per km ([4]; EAC, 2007 [5]).

Whereas there have been some policies, rules, laws and regulations put in place, ensuring compliance with these regulations in the use and management of fisheries resources is a significant policy challenge for the relevant authorities worldwide (Abila *et al.,* 2000) [6]. A study by Elena and Jan, (2011) [7] observed that implementation of environmental policies proves to be challenging worldwide, especially in developing countries. In Uganda, Beach Management Units (BMUs) are community fisheries management institutions, legally empowered and registered with the Department for Fisheries Resources. Fishers are required to be registered with BMU in order to be allowed to work in fisheries. The Statutory Instrument, the Fish (Beach Management) Rules 2003, provides legal empowerment of BMUs for fisheries planning and management in partnership with Local Governments. The objective of the study was to determine the existing compliance regulations for fishing communities and Beach Management Units in use of Lake Victoria.

Effective management of fisheries resources in Lake Victoria has been a challenge facing East Africa (Uganda,

Kenya and Tanzania) for decades (Litzow, 2011) [8]. Along the shores of Lake Victoria, co - management has been operationalized through the introduction of Beach Management Units (BMUs) at every landing site on Lake Victoria (LVFO, 2005) [9] and other water bodies including Lake Kyoga (NEMA, 2008) [10]. Fishers are required to be registered with BMU in order to be allowed to work in fisheries. A total of 355 BMUs have been established on Ugandan landing sites on Lake Victoria since the concept of co - management was introduced in the region in the late 1990s (Odongkara, 2009) [11].

Lake Victoria has endured multiple stresses over the past century including population growth, increased cultivation of land in its catchment, meteorological variability, resource extraction, intensive fishing, introduction of exotic species and climate change (Hecky, 1993) [12]. Although there is a legal framework in place, which empowers BMUs to enforce compliance, the fisheries management on Lake Victoria faces constraints which have directly slowed the lake water resource development. This may be attributed to among others lack of awareness of regulations by both the BMU management and the fishing communities. This study therefore identified the existing fishing compliance regulationson Lake Victoria.

2. Material and Methods

Location

Lake Victoria is the largest fresh water body in Africa and the second largest in the world. It is a shared water body measuring about 68, 800km^2 (Crul, 1995) [13], shared among Kenya (6%), Uganda (43%) and Tanzania (51%). The basin area in Uganda is 59, 858km^2, out of a total of about 181, 000 km^2 (LVEMP, 2001) [14]. The study encompassed Beach Management Units on the Ugandan side of Lake Victoria (*Figure 3.1*), covering the districts of Kampala, Jinja, Wakiso, Mukono and Masaka. These districts were chosen due to their uniqueness and differences in terms of location, market, access, proximity, presence of landing sites, human population and level of development. Kampala district was chosen because of its proximity to a highly demanding market for fish supply to the capital city, thus likely to influence the intensity of fishing activity from a high demand driven fishing community. Wakiso has a wider interface with the Lake Victoria shores, thus people more likely to access the lake from different points. Wakiso district also has a high level of commercial activity with peri and urban population that could influence fish demand. Jinja, Mukono and Masaka districts were selected due to their vast interface with the lake and also having a greater portion of rural - urban population that derive likelihood from fishing.

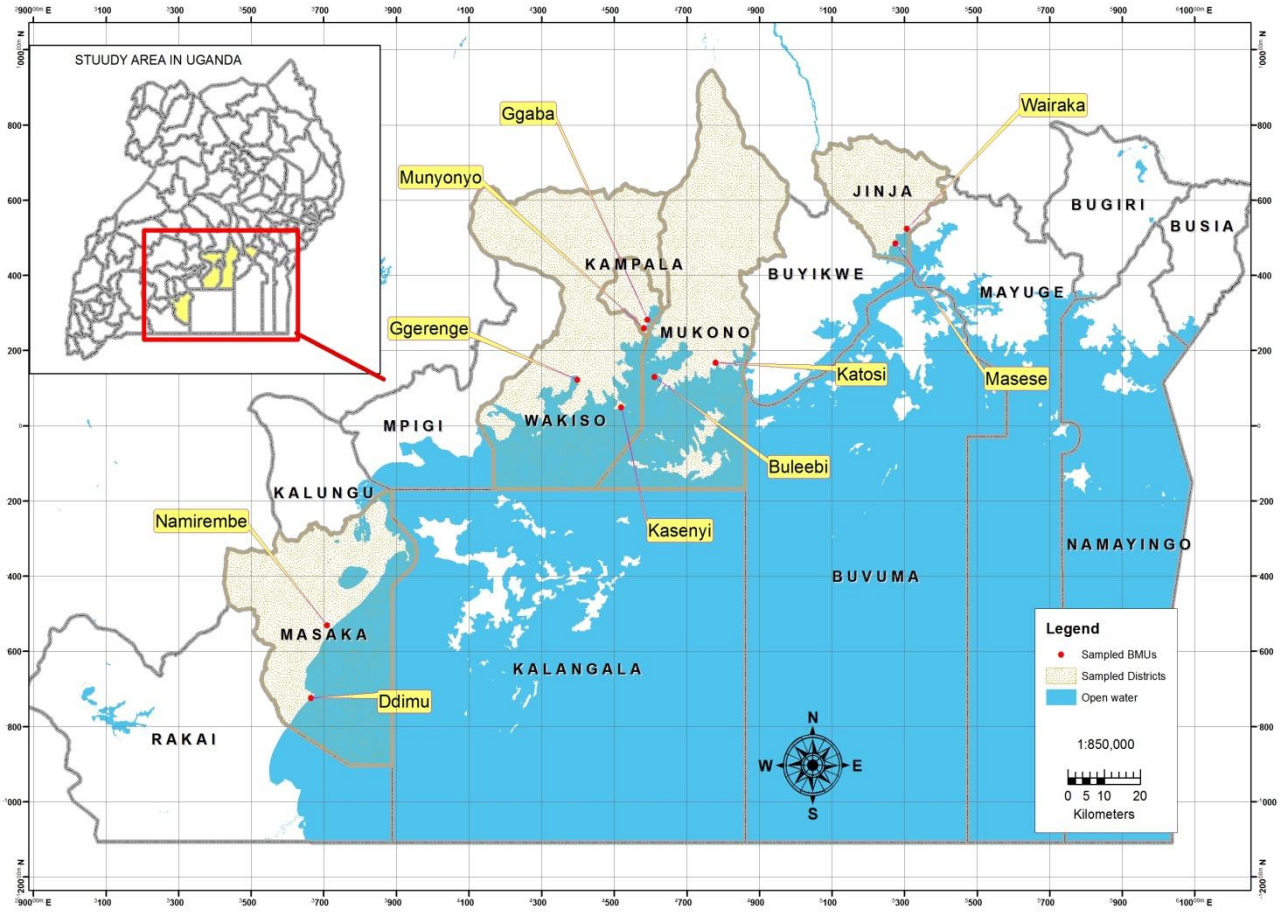

Figure 3. Error! Unknown switch argument.**:** Location of study area showing the sampled districts and the BMUs (NFA, GIS Lab)

Socio - economic contribution of Lake Victoria

Lake Victoria is Africa's largest inland water fishery sanctuary hosting more than 300 endemic fish species (NBI, 2001) [15]. The fishery resources from the Lake are, directly or indirectly, a source of livelihood to local communities engaged in subsistence, artisanal and commercial fishing. The Lake also provides water for domestic, agricultural and industrial use and it serves as a climate modulator. According to LVB (2011) [16], the gross annual economic product from Lake Victoria was in the order of US$3–4 billion, and it supports an estimated population of over 25 million at per capita annual incomes in the range US$90–270. The lake catchment therefore provides for the livelihood of large populations of Kenya, Tanzania and Uganda, and about one third of the combined gross domestic product. The large size of the Lake makes it vital for weather and climate modulation in the region. The convergence of winds over the lake, twice a year, for instance, accounts for heavy rainfall amounts in the western and northern shores of the LVB (World Bank, 2005) [17]. This is partly responsible for the socio - economic environment around the lake such as the crops grown and where they are grown the animals kept, the patterns of settlement among others.

3. Methods

Research design

The research design adopted in this study was household survey for socio and economic indicators for opinions and trends. This study generated both primary and secondary data sets. It involved collection of socio - economic data from fishing households and the management of Beach Management Units (BMUs) in the districts of Kampala, Jinja, Wakiso, Mukono and Masaka. Primary data were collected using a semi - structured questionnaire that was administered to individual household heads. Interview guides were used to collect information from key informants and Focus Group Discussions among fishing communities and BMU management. Secondary information was obtained from available national legal and policy documents, BMU guidelines, regulations and BMU bye laws. The questionnaire was chosen as the main instrument because the study was descriptive and it was an effective method of data collection since it gave an opportunity to capture information on socio - economic, demographic characteristics and perceptions of compliance measures.

Sampling procedure

The target population for this study were the fishing communities and BMU management in the districts of Kampala, Jinja, Wakiso, Mukono and Masaka. A list of BMUs in each of the 5 (five) selected districts was obtained from the office of the District Fisheries Officer and from the list, 2 (two) BMUs were randomly selected from each district (Table 3.1). This is because some of the districts such as Kampala had only 3 (three) BMUs and yet there was need to randomise the sample. In each BMU, 20% of the BMU members were randomly selected and interviewed.

Table 3.1: Landing sites and BMUs from which a sample was taken

District	No. of landing sites	No. of BMUs	Beach Management Unit (BMU) selected	Total number of BMU members	No. of respondents (20% of BMU members)
Masaka	21	14	Namirembe BMU	120	24
			Ddimu BMU	116	23
Wakiso	38	27	Gerenge BMU	133	27
			Kasenyi BMU	150	30
Kampala	7	3	Ggaba BMU	128	26
			Munyonyo BMU	178	36
Jinja	13	6	Masese BMU	105	21
			Wairaka BMU	145	29
Mukono	247	138	Katosi BMU	112	23
			Buleebi BMU	132	26
Total Number of respondents					265

Data Collection

Semi - structured interviews with BMU members

Prior to the main data collection process, a reconnaissance was conducted to guide development of a work plan, test and validate the data collection tools. Enumerators were identified and trained on how the required data were to be collected in the specified time. Structured questionnaires were used to collect data from household heads. Semi - structured interviews using a questionnaire were held with the help of local enumerators who translated the questions into Luganda, a local language spoken at all the sample landing sites. Interviews were conducted with BMU members to generate information on the existing fishing compliance regulations to fishing communities and Beach Management Units in use of Lake Victoria.

Key informant interviews

Key Informant interviews were held with the executive members of the Beach Management Units, District Fisheries and Environment officers to generate information on existing fishing compliance regulations to fishing communities and Beach Management Units around Lake Victoria. The police were also interviewed to collect information on cases reported. The BMU executives, District fisheries and environment officers were interviewed because they are mandated by law to oversee implementation of compliance measures and therefore had experiential knowledge on their suitability and applicability. They are also believed to have special knowledge on institutional and legal frameworks, mandates and performance.

Focus group discussions

One focus group discussion (FGD) comprising of BMU members and executives was conducted in each district to

generate information on illegal fishing gears and methods. Focus group discussions also generated information on existing fishing compliance regulations in use of Lake Victoria. The group had 8 - 15 people and an interview guide was used to guide the focus group discussions. The members were identified by their registration at the BMU offices

Secondary data sources

Secondary data sources were reviewed to generate information on the state of world fisheries, global and national threats to the fisheries sector, and existing global and national fisheries legal and policy frameworks. The sources included policy documents, global treaties and conventions, including sources obtained from libraries, ministries and government agencies.

Data Analysis

Data from individual interviews were coded and entered in a Statistical Package for Social Scientists (SPSS version 16) computer programme, cleaned and analysed. Data on the existing fishing compliance measures by fishing communities and Beach Management Units of Lake Victoria were summarized in frequency tables to examine respondents' awareness of the existing fishing regulations. Chi - squared tests were conducted to establish whether there were differences in levels of awareness on existing fishing compliance measures among respondents from different districts. Logistic regression analysis was used to show the influence of socio - economic characteristics such as age, gender, income level, education and family size on local people's willingness to comply with fishing regulations.

4. Results and Discussion

Socio - demographic characteristics of the respondents

Majority (80%) of the respondents were males (Table 4.1). Most were aged between 25 - 34 years. About 60% were married and only 8% had attained tertiary education. Half of the respondents depend on fishing as their main occupation. Most household had a 3 - 5 people size and a monthly income of less than USD 27.

Table 4.1: Socio - demographic characteristics of the respondents

Variable (s)	Response (%)
Sex of the respondent	
Male	80.4
Female	19.6
Marital status	
Single	28.7
Married	63.4
Divorced	3.0
Widowed	4.9
Age	
<25 years	17.4
25 - 34 years	34.0
35 - 44 years	30.2
>44 years	18.5
Household size	
< 3 people	12.5
3 - 5 people	37.7
6 - 8 people	22.6
>8 people	27.2
Education level	
None	23.0
Primary	47.2
Secondary	21.9
Tertiary	8.0
Monthly income (Uganda Shillings)	
<100, 000	37.4
100, 000 – 200, 000	25.3
200, 001 - 300, 000	18.5
>300, 000	18.9
Main Occupation	
Fishing	49.4
Crop cultivation	18.1
Shop/business	13.2
Livestock Keeping	12.0
Teacher	4.2

Awareness of existence of fishing regulations and compliance measures

Fishing regulations

When asked whether they were aware of any existing fishing regulation, all the respondents in Masaka, Wakiso and Kampala were aware of the existence of fishing regulations (Figure 4.1). However, only 44% of the respondents in Jinja were aware of the existence of fishing regulations.

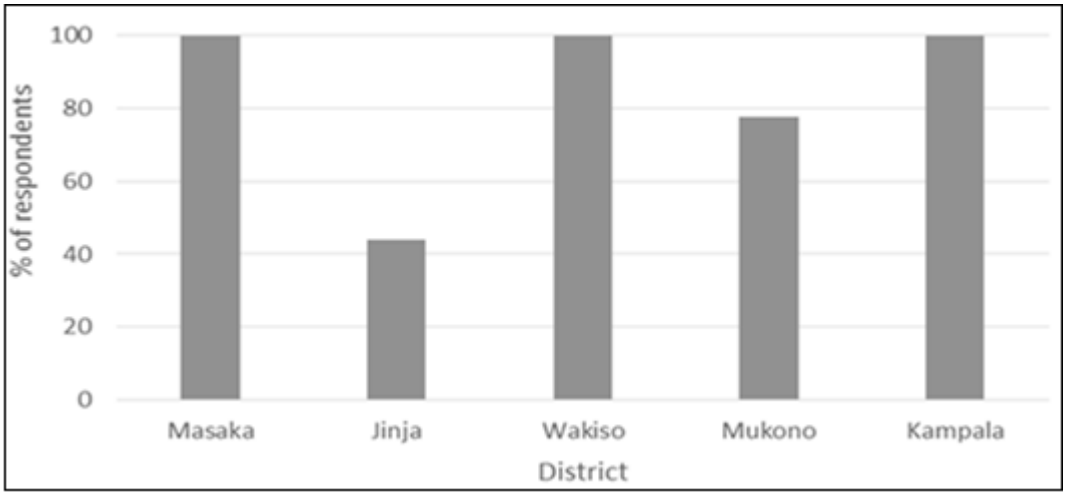

Figure 4.1: Respondents that are aware of existence of fishing regulations

Most of the respondents were aware of the existence of regulations prohibiting fishing Tilapia and Nile perch with net size below 7 inches (Table 4.2).

Table 4.2: Awareness of existence of fishing regulations by fisher folks from Beach Management Units (BMUs) in districts around Lake Victoria

Fishing regulations that respondents are aware of	Masaka (%)	Jinja (%)	Wakiso (%)	Mukono (%)	Kampala (%)	Total (%)
Regulating fishing Tilapia and Nile perch with net size <7 inches	78.7	85.0	91.2	57.9	64.5	75.0
Maintaining good sanitation at the lake and BMU environment	42.6	0.0	73.7	55.3	48.4	50.4
Prohibiting fishing in fish breeding grounds/ lagoons	31.9	65.0	24.6	7.9	27.4	27.7
Paying of annual license fee to BMUs	4.3	0.0	24.6	18.4	21.0	16.1
Use of life jackets while fishing	10.6	0.0	5.3	28.9	12.9	12.1
Refrigeration of fish	0.0	0.0	19.3	0.0	8.1	7.1
Use of boats of length 24 feet for fishing	14.9	10.0	0.0	5.3	4.8	6.2
Prohibiting Tycooning while fishing	17.0	0.0	0.0	0.0	4.8	4.9
Having vessels clearly marked with water line	4.3	0.0	0.0	7.9	9.7	4.9
Prohibiting carrying passengers on fishing boats	0.0	15.0	7.0	5.3	0.0	4.0
Fishing to be undertaken only during day time	0.0	0.0	0.0	0.0	1.6	0.4

Regulations prohibiting tycooning and use of boats of length <24 feet were the least known regulations. Regulations requiring fishing during day time were only reported in Kampala, while regulations requiring use of refrigeration were only reported by respondents from Wakiso and Kampala.

Fishing compliance measures

Majority of the respondents (91%) were aware of the fishing compliance measures prohibiting the use of illegal fishing gears (Table 4.3). Although all the respondents in Masaka and Jinja were aware of the regulation regarding payment of an annual operating license, less than 25% were aware of the regulation against falsification of documents. A chi - square test shows that awareness of regulations requiring fish movement permits significantly differed among districts (χ^2=80.01, df=4, P<0.05). More respondents in Jinja were aware of fish movement permits than respondents from Masaka, Wakiso, Mukono and Kampala. Awareness of other fishing regulations also significantly differed among the five study districts.

Table 4.3: Awareness of fishing compliance measures by the fisher folks in the districts around Lake Victoria

Compliance measure (s)	Masaka (%)	Jinja (%)	Wakiso (%)	Mukono (%)	Kampala (%)	Total (%)	$\chi^2_{df=4}$
Use of illegal fishing gears							
Yes	98.0	90.0	95.0	78.0	94.0	91.0	14.97 (0.005) *
Payment of annual operating license							
Yes	100.0	100.0	74.0	69.0	84.0	85.0	32.10 (0.001) *
Having fish movement permits							
Yes	28.0	100	90.0	74.0	79.0	75.0	80.01 (0.001) *
Falsification of documents							
Yes	15.0	24.0	56.0	63.0	64.0	46.0	44.36 (0.001) *
Having boats with water line marked							
Yes	54.0	88.0	72.0	53.0	48.0	37.0	24.94 (0.001) *

**P - value in parentheses, significant at 1% significance level*

5. Discussion

Awareness of existence of fishing regulations and compliance measures

The result shows that all the respondents in Masaka, Wakiso and Kampala were aware of the existence of fishing regulations (Table 4.2). However, only 44% of the respondents in Jinja were aware of existence of fishing regulations. This maybe attributed to the large expanse of the area covered by one Beach Management Unit in Jinja, compared to other study districts. Discussions with the BMU management revealed that while Jinja has only 6 BMUs, Mukono has a total of 138 and Wakiso has 28 BMUs. Having large areas leads to ineffective sensitization of BMU members about the fishing regulations by the responsible institutions and departments (LVEMP, 2001) [14]. However, the high level of awareness of existing fishing regulations did not translate into compliance to the regulations. For example, regulations prohibiting tycooning and use of boats of length <24 feet were the least known regulations by the respondents.

Regulations requiring fishing during day time were only reported in Kampala, which was due higher levels of education and the higher frequency of monitoring by the fisheries department on the BMUs, while regulations requiring use of refrigeration were only reported by respondents from Wakiso and Kampala, which was attributed to the diverse fish customers requiring refrigeration of fish that include the processing industries mainly in Wakiso District. This is in agreement with FAO (2010) [3] that Informing and educating fishing communities on the dangers of illegal fishing to be a feasible option for controlling effort and it was felt that these actions have led to a reduction of illegal fishing and reduction in the catching of undersized fish. This was indicated by the fact that fishers were apparently changing from using gill nets with five - inch mesh (~ 125 mm) to six or seven - inch (~ 150 - 175 mm) nets. The finding further shows that institutional absence from especially very remote areas leads to insufficient scientific knowledge and a lack of awareness by fishers and consumers and is a major obstacle for improving policies and management, and changing the behaviour of consumers and producers.

Chi - square test shows that awareness of regulations requiring fishermen to have movement permits significantly differed among districts. This implies that sufficiency of knowledge requiring them to have the permits differed among these districts. More respondents in Jinja were aware of fish movement permits than respondents from Masaka, Wakiso, Mukono and Kampala. This may be due to more institutional presence and emphasis of the permit than any other especially for revenue collection enforcement. Although the compliance measures are well documented in the BMU guidelines, they are rarely adhered to by the fishing communities. The Statutory Instrument, the Fish (Beach Management) Rules 2003, provides legal empowerment to Beach Management Units (BMUs) for fisheries planning and management in partnership with Local Governments. The instrument delegates legal power to local people for fisheries planning and management and provides for the fishing compliance measures on the use of all fisheries resources in Uganda. This means that fishers who fail to join a BMU cannot operate legally in fisheries. It is envisaged that the participation of fishing communities in the management of the fisheries at all levels, will lead to greater awareness and compliance (Ogwang et al.2009) [18].

6. Conclusion

Based on the findings for this study, majority of the respondents are aware of the existence of fishing regulations and compliance measures that include payment of annual operating license, use of legal fishing gears, having fish movement permits, and having boats marked with a water line.

Awareness and implementation of certain regulations and compliance measures differ from district to district, for example, regulations requiring fishing during day time only, is only known in Kampala, while regulations requiring use of refrigeration apply only in Wakiso and Kampala districts.

There is need for empowering the fishing communities around Lake Victoria through sensitization on the management measures and statutory obligations as the first step towards effective management and consequently sustainable utilization of fisheries resources. There is need to harmonize all the fisheries statutory instruments to avoid inconsistencies.

Conflict of Interest

There is no conflict of interest of any form.

Ethical Approval

Informed consent was obtained from all individual participants included in the study.

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Author Profile

MSc. Natural Resources and Env't Mgt, B. Arts of Environment Management, Bachelor of Laws (L. L. B), from Makerere University Kampala, Diploma in Legal Practice. Moses has over 20 years of Legal, Environment and Natural Resource Service Practice and Consulting for both the public and private sectors. He started off as a Volunteer Programme and Sponsorship support staff at Plan International Uganda, Mulago Area and is currently a Partner at M. Mugimba &Co. Advocates, a Lead Consultant at Green Impact and Development Services Ltd. (GIDS) both housed atSocial Security House, Plot 4, Jinja Rd, and is a fellow of Green Rights Organisation (GRO).