

The Impacts of Co-Management Towards Sustainable Development and Utilization of Fisheries Resources in Lake Naivasha, Kenya

Waithaka E^{1*}, Boera P¹, Obegi B¹, Mutie A¹, Morara G¹, Loki P¹, Nyamweya C², Aura MC², Outa NO³

¹Kenya Marine and Fisheries Research Institute (KMFRI), Naivasha Station P.O. Box 837 Naivasha, Kenya; ²Kenya Marine and Fisheries Research Institute (KMFRI), Kisumu Station P.O. Box 1881 Kisumu, Kenya; ³Department of Fisheries and Natural Resources, Maseno University P.O. Box PRIVATE BAG, Maseno, Kenya

ABSTRACT

This paper presents an assessment of co-management from its inception, implementation, and establishment in Lake Naivasha. This study was prompted by the many challenges encountered in the management and utilization of the lake's fisheries resources. The study was conducted at the four designated landing beaches around the lake. The aim was to assess the impact of co-management on Lake Naivasha fishery towards sustainable fisheries development. A mixed-method research design was used in the collection of the socio-economic data. A total of 633 respondents participated in the study. Of these, 28% were female and 72% were male. The majority (59%) were of the age group 20-34 years. The crew/fishermen were the majority at 47% followed by traders at 30%. Boat owners, net repairers and transporters comprised 7%, 3% and 4% respectively. Of those interviewed, 79% acknowledged that BMU has been successful, while the rest felt that the concept has failed. The study found that the impact of co-management on the lake's fishery varied among the landing sites. Positive impacts of co-management were reported in all the beaches. Corruption and mismanagement of the resource were ranked highest as some of the negative impacts of co-management of the fishery (42% and 22% respectively). Recommendations for effective co-management included, improvement of BMU management and coordination, development of beach infrastructure and training of BMU members (21%, 15% and 13%) respectively. Co-management, as a strategy for implementation of fisheries management policies in Lake Naivasha has been regarded as generally successful.

Keywords: Co-management; Fisheries management; Stakeholder; Sustainable utilization; Lake Naivasha

INTRODUCTION

Lake Naivasha is a shallow freshwater lake situated 80 kilometers North-West of Nairobi in the Kenyan Rift Valley. The lake originally contained only one species, the endemic *Aplocheilichthys antinorii* (Vinc) which was last recorded in 1962 and is believed to have disappeared from the lake. Since 1925, there have been numerous (over 10) introductions of various fish species, both of commercial and non-commercial value. A comprehensive history and chronology of species introduction is provided by [1,2]. Presently, only nine species occur to support a fishery in the lake. These include: Nile Tilapia (*Oreochromis niloticus*); the Blue-spotted tilapia (*Oreochromis leucostictus*); Red-bellied Tilapia (*Coptodon zillii*) (formerly *Tilapia zillii*); largemouth

bass (*Micropterus salmoides*); Louisiana red swamp crayfish (*Procambarus clarkii*) river cyprinid *Barbus paludinosus*; common carp (*Cyprinus carpio*) and the African sharp tooth catfish (*Clarias gariepinus*).

Lake Naivasha fishery plays an important role in the local economy of Nakuru County and the neighboring urban areas, by providing food and nutritional security, generating employment and income for more than 4,000 people [3]. An active commercial fishery started in 1959 using gill nets for tilapias and rod and line in sport fishing for the largemouth bass. *Oreochromis leucostictus*, *C. zillii* and *M. salmoides* were the major fishery fish species landed between the 1970s and 2000 [4,5]. However, towards the late 1990s, poor fishing methods resulted in the

*Correspondence to: Edna Waithaka, Kenya Marine and Fisheries Research Institute (KMFRI), Naivasha Station P.O. Box 837 Naivasha, Kenya, Tel: 0721206953; Email: ewaithaka@yahoo.com

Received: January 14, 2020; Accepted: May 13, 2020; Published: May 19, 2020

Citation: Waithaka E, Boera P, Obegi B, Mutie A, Morara G, Loki P, et al. (2020) The Impacts of Co-Management Towards Sustainable Development and Utilization of Fisheries Resources in Lake Naivasha, Kenya. *Poult Fish Wildl Sci* 8:209. doi: 10.35248/2375-446X.20.8.209.

Copyright: © 2020 Waithaka E, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

decline of fish stocks to unsustainable levels, leading to collapse of the fishery by 2000 [6]. A total fishing ban was therefore imposed on Lake Naivasha in 2001, after stakeholder consultative meetings, to allow for fish stock recovery.

Afterwards, the fishery was re-opened in 2003 with a maximum allowable number of 43 boats. Each was only allowed to have three crew members and a fleet of 10 gillnets of not less than 4-inch mesh size per fishing trip. Sport fishers were only allowed a maximum of 5 fish per day using the hook and line, while fish traders were required to be in possession of daily fish movement permits from beaches to markets. It also necessitated the formation of the Beach Management Committees (BMC's). These measures were geared towards restoration and sustainable management of the fishery. However, significant changes have since occurred in the fishery of Lake Naivasha. These changes have prompted a paradigm shift in the management style of the lake from top down approach to that which saw the involvement of resource users. This was necessitated by the gazettelement and enforcement of the Beach Management Units (BMU) regulations in 2007 by the Government of Kenya and the first units established in Lake Victoria beaches. This approach is what is commonly known as co-management, which recognized the need to include resource users and managers in both the formulation and implementation of the fisheries management measures.

Co-management is an arrangement where resource users and the government share responsibility in the management of fishery resources [7]. It is a management system that employs two or more groups of stakeholders in the management of a resource base and in which all the stakeholders have equal opportunity to make decisions. The concept of co-management is in line with the FAO general principles of Code of Conduct for Responsible Fisheries (CCRF) (FAO 2009). The principle of co-management is based on the good will and cooperation between all partners (government and the user communities) having a stake in fishery resources. This promotes a sense of ownership as all partners have equal opportunity of governing using the best approach to manage the resources based on current and past experiences.

The objective of the study was to assess the impact of co-management on Lake Naivasha fishery towards sustainable fisheries development. This included identifying the characteristics of players in co-management, evaluating fishers' perception on the concept, and gathering data on the fishers' recommendations for improvement of co-management of the fisheries of the lake.

MATERIALS AND METHODS

The study was conducted at the four designated landing beaches of Lake Naivasha namely: Central, Karagita, Kamere and Tarambete. It was conducted jointly by staff from Kenya Marine and Fisheries Research Institute (KMFRI) and the State Department of Fisheries. A mixed-method research design-key informant interviews, semi-structured questionnaires, focus group discussions and direct observation were used in the collection of the socio-economic data. A sampling frame was obtained from each Beach Management Unit (fisher

community) and a random sample of respondents derived from it. Focus group discussions and direct observation were used to draw upon the rich and varied lived experiences of the participants vis-a-vis the current impacts of co-management. The sample size for these surveys was determined once information on the exact number of members of the Beach Management units in Lake Naivasha from the four designated landing beaches was provided. Data entry and analysis was done using Microsoft Office Excel (version 2013) and IBM SPSS version 14.

Study area

Lake Naivasha is in the Eastern arm of the Great Rift Valley, located at a latitude of 00°46'S and longitude 36°22'E and lies at an altitude of 1890 m. It is a small endorheic (145 Km²) lake with a maximum depth of 9.5 m with some variations. The Crescent Island has a depth of 7.7 m and is in a closed basin. It has remained a fresh-water lake in a water deficit area. The freshness has been attributed to water and salt loss by underground seepage (Figure 1).

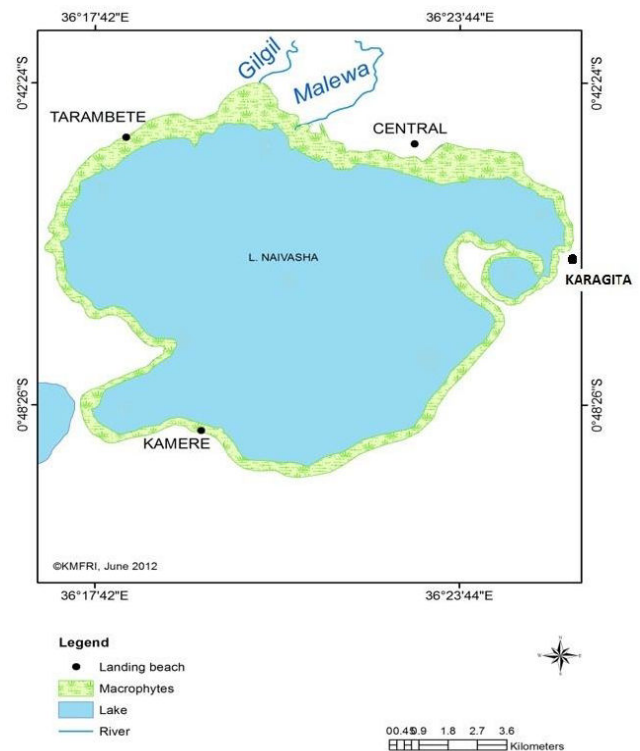


Figure 1: Map of Lake Naivasha showing the main landing sites along the lake.

RESULTS

Characteristics of players in co-management of Lake Naivasha fishery

The number of respondents was 633; 30% from Kamere and Karagita each, 20% from Central and 20% from Tarambete. Of these 28% were female and 72% were male. The majority were

of the age group 20-34 years at 59% followed by 35-45 years at 27% and the least being greater than 60 years at 1%

Table 1: Summary of demographic data from players involved in the co-management on Lake Naivasha.

Characteristics	N	Proportion (%)	
Gender	Female	28	
	Male	72	
n	605	100	
Age	<18	3	
	20=34	59	
	35=45	27	
	46=60	10	
	>60	1	
	n	587	100
	Education Level	None	3
Primary		42	
Secondary		47	
College		6	
University		3	
n		592	100
Occupation	Traders	30	
	Crew	47	
	Boat Owners	7	
	Boat/net repairer	3	
	Transporters	4	
Others	9		
n	594	100	

The crew/fishermen were the majority at 47% followed by traders at 30%. Boat owners, net repairers and transporters accounted for 7%, 3% and 4% respectively. Others interviewed comprised of hoteliers, photographers, eco-tourists, M-PESA agents, cleaners and shopkeepers totaling 9%. From the survey, 42% of the respondents have attained primary education, while 47% have acquired secondary education, 3% have been to university and 6% to college. Most of the respondents (59%) have been in the fishery for less than 5 years while 27% have been in the fishery for between 5-10 years. Of the people

interviewed, 73% were married, which shows the level of maturity and responsibility in utilization of the resource while 22% were single, widowed/or divorced, separated at 2%, 2% and 1% rest respectively (Table 1).

Of the total number of respondents, 92% percent were members of a BMU. The highest membership was recorded in Kamere and Karagita 30% and 29% respectively (Figure 2).

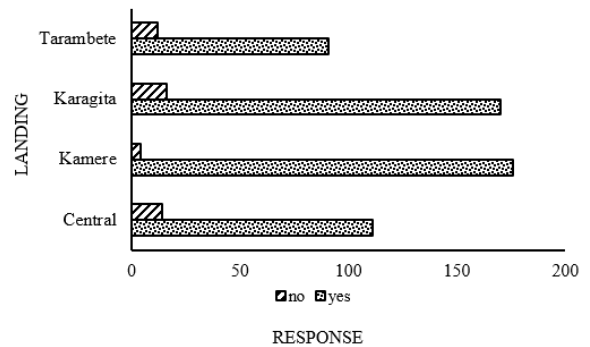


Figure 2: Number of BMU members in each of the four landing beaches on Lake Naivasha.

Fishers perception on the success of co-management

Of those interviewed, 79% acknowledged that BMU has been successful, while the rest (19%) felt that the concept has not succeeded (Figure 3).

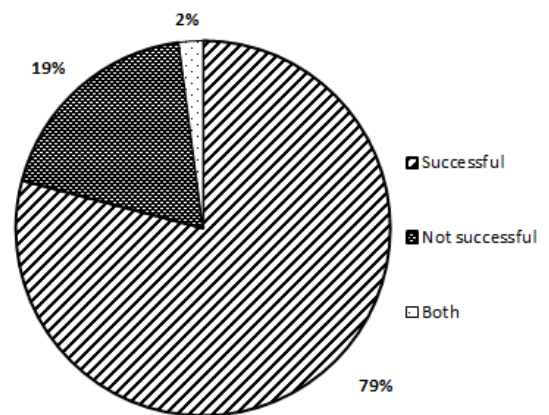


Figure 3: Fisher perceptions on the status of Co-management.

Impact of co-management on Lake Naivasha fishery

The study found that the impact of co-management on the Lake Naivasha fishery varied among the landing sites. It also established that the attributes to the impacts widely varied among the respondents. Positive impacts were reported in all the beaches ranging from 14-25% of the respondents (Figures 4 and 5).

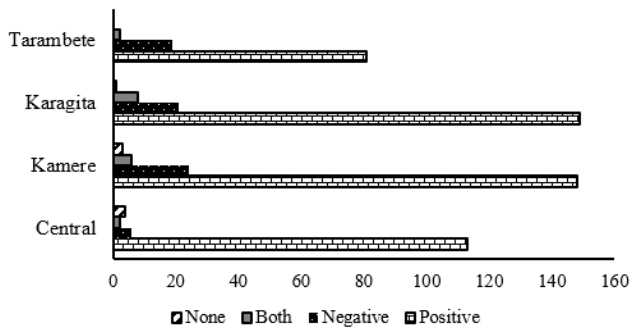


Figure 4: The impacts of Co-management in Lake Naivasha.

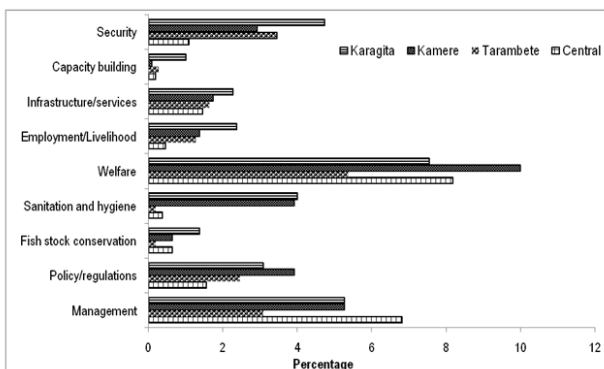


Figure 5: Positive impacts of Co-management in Lake Naivasha.

Fishery production trends

Fishery production trends show improvements from 2007 compared to the previous years. Highest recorded production was 576 metric tons in 1983. However, after 2007 increased production of up 1620 metric tons have been recorded (Figure 6). In addition to the increased production the number of boats has equally gone up from 50 boats in 2012 to 176 in 2017.

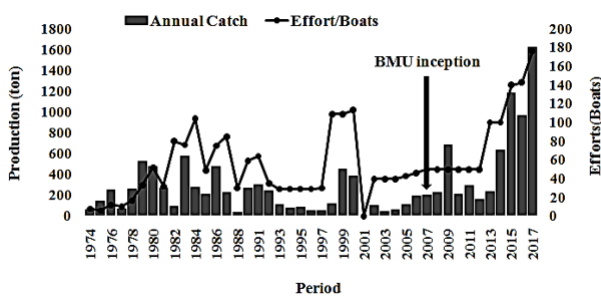


Figure 6: Annual catch and effort trends in the fishery of Lake Naivasha from 1974–2017 (KMFRD).

Corruption and mismanagement of the resource were ranked highest as some of the negative impacts of co-management of the fishery (42% and 22% respectively). These were followed by lack of law enforcement and poor infrastructural facilities at all the landing beaches, both at 7%. Insecurity, inadequate sanitation, and hygiene were also among the negative impacts of co-management on the fishery mentioned by the respondents (Figure 7).

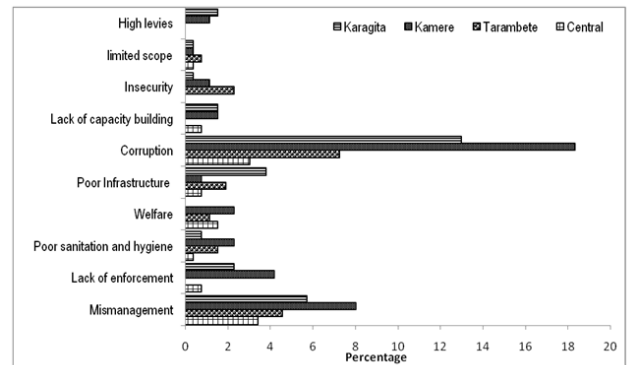


Figure 7: Negative impacts Co-management in Lake Naivasha.

Respondents' recommendations for improvement of co-management

For effectiveness and successful implementation of co-management concept, several recommendations were provided by the respondents (Figure 8). Improvement of BMU management and coordination, development of beach infrastructure and training of the BMU members were cited as the most prominent recommendations 21%, 15% and 13% respectively. These were followed by the need to change the current leadership (11%), improve member's welfare at (11%), and strengthen 0 and enforcement of laws (10%) and increased transparency and accountability among the office holders (9%).

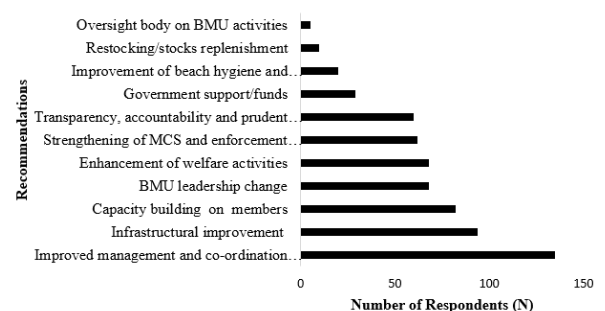


Figure 8: Respondents recommendations for improvement of co-management in Lake Naivasha.

DISCUSSION

Lake Naivasha is characterized by a young dynamic and evolving fishery. The population is dominated by male youths between the ages (20-34 years) at 72% who have attained secondary level of education (47%) [8]. Attribute this to the fact that fishing requires energy and physical strength which comes with the youthful age. They observed that historically, this has been the case in Lake Victoria and many other fisheries. Moreover, fishing unlike other professions does not require high level of formal academic training as the trade can be learnt by copying from the experienced crew members. The dominance of male youth in the fisheries depicts the role of gender in the utilization and management of the resource. It is a male dominated sector. This agrees with studies by Waithaka et al. [3]. Most of these are new entrants with less than 5 years in the fishery trying to earn a living primarily to get income on the short term, food, and the

hope of a better opportunity. This can also be attributed to the high unemployment rate in the country and the 'open access' nature of the fishery resource. Such argument has been fronted by Ogello et al. [9] in their review on the management of the fisheries and ecology of Lake Victoria. They argue that the open access nature of the fisheries and the common property debate has led to the mismanagement of fisheries resources of the lake. This they argue, is since many people around the lakes see fishing as an easy way out of poverty. This can only hold if the fisheries resources are well managed and sustainably utilized. This according to the current study can only be achieved by involving the fishermen (resource users) themselves in the management of the fisheries resources. This emphasizes the need for co-management in the development and utilization of Lake Naivasha fisheries for the benefit of the youth who are the most affected by unemployment within the country.

Since the inception of co-management in Lake Naivasha in 2008, it has had measured success. This is evidenced in the increased number of people registered in BMUs (increased membership) at 92% and acceptability and compliance at 79% as observed in the various BMU records. Additionally, each BMU has been allowed legally to craft their own bilaws which has enabled them to domesticate the concept thus making it more acceptable to the local community and resource users. The concept of co-management entails regulations and limitations, which influence the decision on the number of boats, nets, fishing areas, fishermen and the quantity of stock. This control and guidelines enhance the resource management and may also positively influence the relationship between fishermen and buyers and thus market dynamics along the value chain. Community based resource management especially in the fisheries was embraced in 1997 when it became internationally recognized that the traditional top-down approach in the management of the fisheries resources were not suitable for the highly dispersed fishers hence, promotion of the co-management approach which was globally considered a better way of organizing and management of the resources. (LVFO, 2001:37).

In Lake Naivasha, one of the achievements of co-management is increased cooperation and cohesion among user groups with the aim of successful fishing, marketing, and settling internal disputes. Other achievements include mechanisms of conflict resolutions, improved sanitation, reduced illegal gears, improved catches and fish sizes and reduced theft of gears. For most of the BMU members the benefits exceed costs, since what members give as registration fee and the annual subscription fee is much smaller than the gains in terms of income. This has brought in some level of ownership with most people/fishers wanting to be members of a BMU.

Improved welfare and general management of the beaches were key positive impacts from the survey. Members were happy with the role of the BMU in ensuring their needs were catered for during bereavement, ailment, licensing, as well as the unity and inclusivity. Conflict resolution, market opportunities and, orderliness at the beaches were some of the attributes of positive impacts. Results show that although the fishery production has fluctuated widely over the years, a steady increase in production

has been witnessed in the period after the establishment of co-management. This may be attributed to the general involvement of the community in manning the resource through decision making, restocking, patrols, protection of breeding areas, and control of illegal fishing gears. Membership is clearly defined with members being registered in only one BMU. This is an advantage since the group is generally homogeneous (kinship, ethnicity, religion etc.) with a common interest. In this study, a co-management unit (BMU) is recognized as dynamic and thus has been allowed, even as they operate on set regulations to develop by-laws specific to each unit/beach as a way of domesticating the concept and increasing adaptability and acceptability.

However, in terms of co-management, many challenges such as, corruption, nepotism/tribalism, harassment of members and discrimination still exist which are rampant in the landing sites and threaten these achievements and the capacity to manage the resources. Other challenges noted include mismanagement by office bearers, biasness in mandate execution, laxity in law enforcement, poor infrastructure, inadequate sanitation/hygiene and insecurity.

According to Kateka [10] co-management experienced many challenges in Lake Victoria as the priorities of the communities are to solve their day-to-day problems including poverty, livelihoods and health-related issues and not only to address top-down-decided control measures in the fishery that they do not necessarily believe in or agree with.

Kolding and Zwieten [11] extended the notion that while the national/regional management institutions see the BMUs primarily as their new implementation tools for centrally decided harmonized regulations adopted from elsewhere the fishers see them as fora for solving local problems and conflicts, and particularly as instruments for reducing theft and piracy (which is rampant and increasing around the lake).

Medard, 2010 further argued, that BMUs are seen as institutions for securing access to shared fishing grounds, for ensuring fair and transparent price and enumeration systems, for facilitating access to markets and government financing and lending schemes, and, not for curbing corruption. Much as BMUs have been gazette, they have no clearly defined boundaries/jurisdiction of operation; members have random access to the entire lake. Leadership may also be weak in the communities such as Kamere and Tarambete; some calling for oversight from a higher external authority. There is a lack of political and social will among the stakeholders to manage the fishery in a sustainable manner. Some user groups e.g., Tarambete and Kamere beaches seem to lack the capability to undertake enhanced fisheries management responsibilities such as MCS, enforcement of the laws and taking care of the welfare of the members [12-17].

Future successful implementation of the co-management concept on Lake Naivasha will depend on various recommendations provided by the respondents. These include improving BMU management and coordination; continuous development of beach infrastructure; sensitization and training of the BMU members (including the executive). Other aspects

that need to be considered are current leadership change, improvement of members' welfare, stepping up MCS and law enforcement. Increased transparency and accountability may enhance social cohesion, good will, among the members and foster effective implementation of co-management.

CONCLUSION AND RECOMMENDATIONS

Co-management, as a strategy for improving Implementation of fisheries management policies in Lake Naivasha has been regarded as generally successful under the community-based management regime. Willingness has been shown by the communities in the management of their resources and the existing local institutions have provided a platform for their participation. Co-management is already provided for in law and the existing local groups. Several suggestions/recommendations were given to improve co-management; this includes training of committee members fisheries management and leadership skills, improved hygiene and sanitation in the landing beaches, increased security, and appointment of oversight authority to oversee the activities of BMUs.

ACKNOWLEDGEMENT

This research was funded by Kenya Marine and Fisheries Research Institute (KMFRI) under the Government of Kenya seed fund.

REFERENCES

- Baticados and Agbayani. Co-management in marine Fisheries Island, Central Phillipines. 2000.
- Hickley P, Bailey R, Harper DM, Kundu R, Muchiri M, North R, et al. The status and future of the Lake Naivasha fishery, Kenya. In *Hydrobiologia*. 2002;488:181-190.
- Hickley P, Muchiri M, Gichuru N, Britton R, Harper D, Adams C, et al. Habitat degradation and subsequent fishery collapse in Lakes Naivasha and Baringo, Kenya, *Ecology Hydrobiology*. 2004;4(4):503-517.
- Hickley P Britton JR., Macharia S, Muchiri SM, Boar RR. The introduced species fishery of Lake Naivasha, Kenya: ecological impact vs socio-economic benefits. *Fish Manag Ecol*. 2015;22:326-326.
- Kateka AG. Co-management challenges in the Lake Victoria fisheries: a context approach. *Acta Universitatis Stockholmiensis, Stockholm Studies in Human Geography* No. 19. Stockholm. 269. 2010.
- Kolding J, Zwieten PAM. The tragedy of our legacy: how do global management discourses affect small-scale fisheries in the South? *Forum for Development Studies*, 2011;38:267-297.
- LVFO. Lake Victoria Fisheries Management Plan. Technical Document. LVFO, Jinja, Uganda. 2011;64.
- Medard M. Co-management for the Lake Victoria's fisheries resources in Tanzania: potentials, obstacles and sustainability. Eldoret, Kenya, Moi University. 2002;163.
- Muchiri SM and Hickley P. The fishery of Lake Naivasha, Kenya. In: Cowx, I.G. (Ed.): *Catch effort sampling strategies: their application in fresh water fisheries management*, Oxford: Fishing News Books, Blackwell Scientific Publications. 1991;382-392.
- Mungai D, Outa N, Obama P, Ondemo F, Ogello E. The status of research on Lake Victoria fisheries: Historical and current data on fisheries and the lake environment. 2019.
- Njiru J, Waithaka E, Aloo PA. An Overview of the Current Status of Lake Naivasha Fishery: Challenges and Management Strategies. *Open Fish Sci J*. 2017;10(1):1-11.
- Ogello EO, Obiero K, Munguti JM. Lake Victoria and the Common Property Debate: Is the Tragedy of the Commons a threat to its Future? *Lakes, Reservoirs and Ponds*. 2013;7:101-126.
- Ojuok J, Njiru M, Mugo J, Morara G, Wakwabi E, Ngugi C. Increase dominance of common carp, *Cyprinus carpio* L: the boon or the bane of Lake Naivasha fisheries? *African J Ecol*. 2008;46:445-448.
- Outa N, Mungai D, Keyombe J. The impacts of introduced species on lake ecosystems: A case of Lakes Victoria and Naivasha, Kenya. 2019.
- Ostrom E. *Governing the commons. The evolution of institutions for collective action*, Cambridge University Press, Cambridge, UK. 1990.
- Pomeroy RS, Katon BM, Harkes I. *Fisheries Co-management: Key Conditions and Principles Drawn from Asian Experiences*. Dlc, dlib. 1998.
- Waithaka E, Mugo J, Obegi B, Keyombe JL. Socio-economics of the re-introduced *Oreochromis niloticus* in Lake Naivasha (Kenya). *Int J Fisheries and Aquatic Stud*. 2015;2(5):142-146.