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Editorial

Editorial: Kenya Aquatica Journal Vol 10(1) – *A Showcase of KMFRI's Pioneering Research in Freshwater Ecosystems*

The latest edition of Kenya Aquatica Journal, Vol 10(1) showcases pioneering research by KMFRI scientists on Kenya's freshwater ecosystems. This edition, supported by KMFRI and WIOMSA, covers ecological, socio-economic, and environmental challenges, providing valuable insights into sustainable management practices.

One notable study investigates disease surveillance and antimicrobial resistance in fish from lacustrine caged farms, emphasizing responsible antibiotic use to maintain fish health. Another study explores the impact of organochlorine pesticides on macroinvertebrates in Lake ecosystems, advocating for Rhagovelia spp. as a bioindicator for pesticide monitoring across food webs.

Research on Lake Baringo's small-scale fishery assesses the catch and effort composition, stressing the need for regulatory enforcement to avoid overfishing and advocating for capacity building among stakeholders for sustainable management. Additionally, a study on wild fish kills in Lake Victoria focuses on eutrophication and pollution, recommending integrated watershed management to protect the lake's fisheries and local livelihoods.

A comprehensive study on Lake Elementaita – one of Kanya's flamingos' sanctuaries, combines water quality, fisheries studies, and community surveys, calling for integrated watershed management, conservation, and sustainable agriculture. Research on fisheries co-management in Lake Baringo highlights the importance of local community involvement and sustained achievements in ecosystem management, despite challenges in law enforcement.

An article on the socio-economic dynamics of Lake Victoria proposes establishing a regulatory framework incorporating citizen science to manage the lake's resources for long-term sustainability. Addressing plastic pollution in Lake Turkana, a study recommends waste management solutions, public awareness, and better enforcement of regulations to tackle the issue.

The journal also features research on antimicrobial resistance (AMR), with a review exploring Kenya's aquatic biodiversity for potential novel antimicrobial agents. A genetic research study evaluates freshwater fish populations, identifying gaps and proposing future directions for conservation and management.

Lastly, the journal presents an evaluation of fish market dynamics in Lake Naivasha, recommending infrastructure development like fish markets and hatcheries to support the region's fishery sector.

This edition of Kenya Aquatica Journal provides crucial insights into Kenya's freshwater ecosystems, covering a wide range of research on sustainable management, environmental challenges, and the socio-economic factors influencing aquatic resources. The research highlights KMFRI's ongoing contributions to understanding and addressing these issues, fostering a deeper understanding of Kenya's aquatic biodiversity.

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About
Kenya Aquatica

Kenya Aquatica is the Scientific Journal of the Kenya Marine and Fisheries Research Institute (KMFRI). The aim of the Journal is to provide an avenue for KMFRI researchers and partners to disseminate knowledge generated from research conducted in the aquatic environment of Kenya and resources therein and adjacent to it. This is in line with KMFRI's mandate to undertake research in "marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography", in order to provide sci entific data and information for sustainable development of the Blue Economy.

Featured front cover picture: Researcher sampling surface plankton in the Kerio River inlet to Lake Turkana. (Photo credit: Mr. John Malala)

Featured back cover picture: Chair of KMFRI Board of Management Amb. Dr. Wenwa Akinyi Odinga Oranga (seated middle), on her right, Ag. KMFRI CEO Dr. James Mwaluma, flanked by KMFRI Heads of Sections: Front (L-R) Dr. Victoria Tarus, Ms Caroline Mukiira, Dr. Jacob Ochiewo, Dr. Irene Githaiga, Mr. Abraham Kagwima. Back (L—R) Mr. Paul Waluba, Ms Jane Kiguta, Dr. Gladys Okemwa, Dr. Eric Okuku, Dr. Joseph Kamau, Mr. Isaac Kojo, Ms Joan Karanja, Mr. Milton Apollo. (Photo credit KMFRI)

Research Vessel MV Mtafiti in the background

Market analyses of fish from Lake Naivasha, Kenya to inform its fishery's management

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Abstract

Lack of a comprehensive market analysis and information about the Lake Naivasha fishery dynamics hampers the development of appropriate policies, and investment decisions, for resource management. Without a clear understanding of the market trends, value chains, and consumer preferences, stakeholders are unable to optimize economic returns, address market inefficiencies, and implement sustainable practices that promote both conservation and economic growth. The aim of this study was to conduct a market analysis of Lake Naivasha fisheries to inform management. Structured and semi structured questionnaires were used to capture various variables of the fish market. Primary data was collected at the five landing beaches and two major fish markets in Nakuru and Nairobi while secondary data was collected from the annual fishery bulletin. The study found that the fishery is dominated by *Cyprinus carpio* (47.3%), *Oreochromis niloticus* (46.4%), *Clarias gariepinus* (6.3%), with the fishers being the largest player in the fishery at (39.9%), fish traders (35.8%) and consumer (9.9%) and other ancilliary players. Retailers played a significant role in the fishery by being the main distribution channel in the market at (38.3%), followed by wholesalers (23.3%) and fish mongers (19.3%). Tilapia is the most preferred fish species with a market share of 36%, catfish (31%) and common carp (30.3%). The major market destination for Lake Naivasha fish is Nairobi and Nakuru markets. Factors influencing market dynamics include demand/supply of the fish product, climatic variations, population growth and urbanization. The study recommends that for a viable and vibrant fish market, there is need to invest in infrastructure at the fish *bandas* and the markets, establishing a fish hatchery within the county to ensure continuous restocking and enhance the competitiveness of Beach Management Units and traders through training and facilitating market access.

Keywords: market analysis,consumption, distribution, opportunities, investment

Introduction

Lake Naivasha is a shallow endorheic freshwater lake lying at the highest elevation of the Kenyan Rift valley at 1,890 m above sea level. The lake supports a wide range of biodiversity including fish, birds, mammals, reptiles and other aquatic flora both in and around the lake. Lake Naivasha was declared a wetland of international importance in 1994 under the Ramsar Convention (LNRA, 1999) due to its unique biodiversity, coupled with threats from anthropogenic activities.

The lakes' resources have been treated as "open access" property, being exploited by each and every individual (both legally and illegally), according to their needs, and capacity (Kundu *et al.,* 2010). The dominance of the introduced species has transformed the fishery from subsistence into a commercialized arti-

sanal fishery for domestic markets, based on three major species (Nile tilapia, Common carp and Catfish.) The main economic benefits derived from the fishery include food, employment and incomes.Trade in fish from Lake Naivasha is contributing a significant proportion of protein intake for the majority of lake basin inhabitats including those in major urban centres neighbouring the lake.

Growth in fish trade has brought about incomes while fish processing for export has provided employment opportunities for those involved directly and indirectly in the fisheries sector. There are thousands of people involved in the marketing and distribution of fish and fisheries products. There are also many ancilliary services that are heavily dependent on fish trade (soft drink manufacturers, ice makers, transporters, boat builders, net menders, petroleum product sellers and packaging materials) which have led to economic growth, increase in households' incomes and poverty reduction (Aura *et al.,* 2019).

The sustainability of Lake Naivasha fisheries is under threat due to multiple factors. These include overfishing, habitat degradation, introduction of alien and invasive species, climate change, and the potential impacts of large-scale development projects such as geothermal power generation (Kundu *et al.,* 2010). The increase in prices of Nile tilapia has prompted fishers to increase fishing effort in order to maximize opportunities. New entrants in the fishery have also joined the fishery resulting in overfishing activities. Declining stocks of the target fish species threaten the sustainability of the stocks for domestic trade and population growth that is solely dependent on the fishery. The undesirable harvesting methods threaten the fisheries and are bound to have far reaching effects if not checked. Lack of sound financial advice and banking knowledge have left the fisher community with a lot of disposal income and institutions particularly the cooperatives have failed (Manyala and Gitonga, 2008).

In recent years, the demand for fish from Lake Naivasha has been rising steadily, driven by population growth and urbanization in the surrounding areas. Ensuring sustainable management practices and informed decision-making in the sector is critical to prevent over exploitation and preserve the ecological balance of the lake while maximizing the socio-economic benefits derived from its fisheries resources (Abila, 2000). This technical report aims to provide a comprehensive market analysis of the fisheries sector in Lake Naivasha, with the aim of informing management, investment decisions, and policy making to ensure the long-term sustainability and socio- economic benefits of the industry.

The fisheries sector in Lake Naivasha faces significant challenges that require immediate attention and effective management strategies (Parry *et al.,* 2012). The lack of comprehensive market analysis and information about the industry's dynamic nature hampers the development of appropriate policies, investment decisions, and resource management practices. Without a clear understanding of the market trends, value chains, and consumer preferences, stakeholders are unable to optimize economic returns, address market inefficiencies, and implement sustainable practices that promote both conservation and economic growth.

The Lake Naivasha fisheries sector lacks up-to-date market information, which hampers effective decision-making for both investment and policy formulation. Without a comprehensive understanding of the market dynamics, it becomes difficult to identify potential investment opportunities, optimize the value chain, and implement sustainable management practices (Jones *et al.,* 2012; Tanner *et al.,* 2014; Shanguhyia, 2021). Therefore, a detailed market analysis is essential to bridge this knowledge gap and facilitate informed decision-making. The current study conducted a market analysis of Lake Naivasha fisheries to provide stakeholders with valuable insights and information for effective management decisions, investment options and policy formulation.

Materials and methods

Study area

Lake Naivasha is one of the shallow freshwater bodies in Kenya and the second largest after the gulf part of L. Victoria. The lake lies on the Eastern Rift Valley floor (0º 46' S, 36º 20' E) at about 1890 m above sea level. Its surface area varies between 110 and 160 km^2 during the dry and wet spells, respectively. There are five designated landing sites around the lake (Fig.1).

Figure 1. Fish landing beaches around Lake Naivasha where data was collected (Source: Authors)**.**

Data collection

A survey was conducted by staff of Kenya Marine and Fisheries Research Institute, Naivasha station in November 2023. Data was collected at the five landing beaches around the lake namely: Central, Karagita, Kamere, Oloidien and Tarambete and the major fish markets in Nakuru and Nairobi which are major destinations for this fish.

Study population

The study targeted fishers and traders at the five landing sites who eke their living from the fishery resource and are registered BMU members. So far there are 750 registered BMU members in Lake Naivasha cutting across the five landing sites. The study also targeted fish traders in Nakuru and Nairobi markets. Purposive sampling technique was used to ensure that each player in the market had an equal chance of filling out the questionnaire.
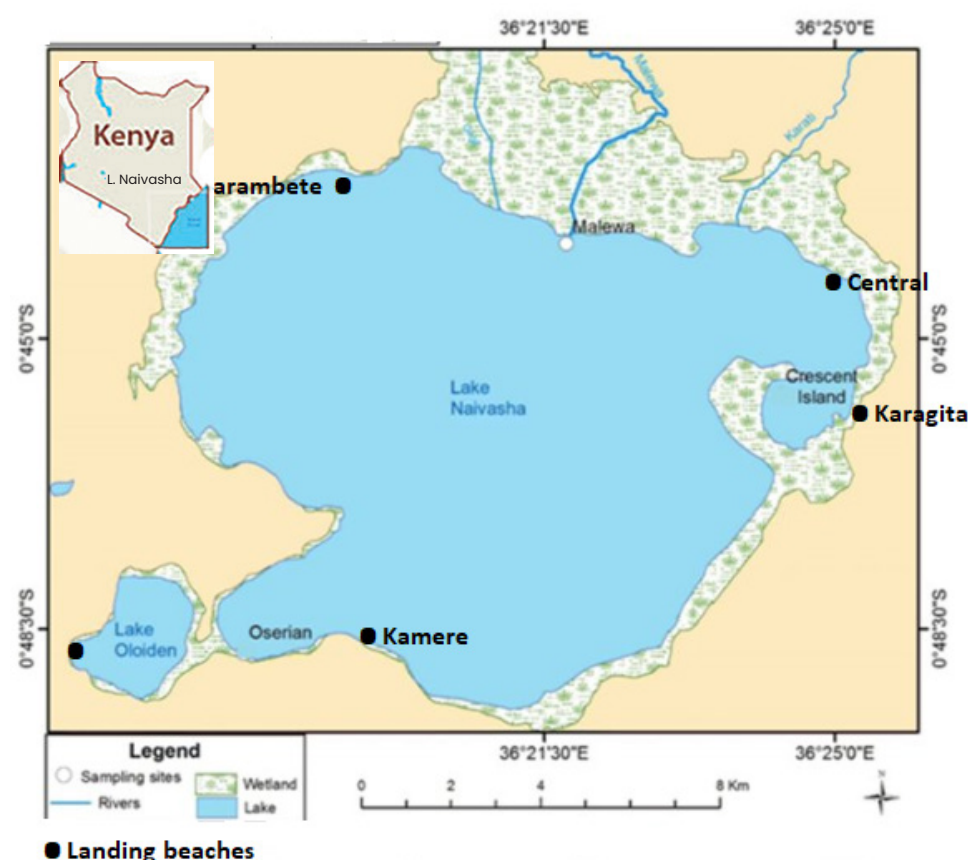
Sampling procedure and design

The study made use of questionnaires as the major tool for collecting primary data. Structured and semi-structured questionnaires capturing various variables were used. In this study, a total of 500 questionnaires were distributed at the five landings, out of which 400 questionnaires were filled and returned, representing an 80% response rate. According to Mugenda and Mugenda (2008), a 30% response rate is appropriate for analysis. The highest response was from Kamere landing beach (26.3%) followed by Central landing beach (25%), Karagita landing beach (25%), and Tarambete (23.8%). At the Nairobi main markets, 50 Questionnaires were administered while at the Nakuru top market, a total 35 administered and returned representing a response rate of (70%). A likert scale of 5.5 was used to allow for consistency and ease of answering. The collected data was thoroughly examined and checked for completeness and whether it was comprehensible.

Data analyses

Both qualitative and quantitative data analysis methods were used and the data keyed in MS Excel and organized neatly for ease of analysis. Data presentation was done using percentages, frequency tables, and figures for ease of reference and interpretation.

Results and discussion

Current state and trends of the Lake Naivasha fisheries market by volume, and value

The artisanal commercial fishery of Lake Naivasha is dependent on exotic species with introduction dating back from 1925 to 2011 for different purposes namely; *Oreochromis niloticus* (Nile tilapia), *Oreochromis leucostictus* (Blue spotted tilapia), *Coptodon zillii* (Redbelly tilapia), *Micropterus salmoides* (Largemouth bass), *Cyprinus carpio* (Common carp) and *Clarias gariepinus* (African sharptooth catfish). The riverine *Barbus amphigramma* and *Procambarus clarkii* (Red Louisiana Crayfish) have also been supporting the fishery significantly since 1980s. The Black lampeye was the only endemic species, but is now considered extinct. Two other species (*Barbus palundinosus* and *Oncorhyncus mykiss*) are natural riverine intruders

Earlier reports had estimated the potential annual fish production of Lake Naivasha at about 5000 metric tonnes/yr. However, the actual fish production realized over the last 40 years has been fluctuating between 37 metric tonnes and 3087 metric tonnes. The status of fish yield, fishing effort and catch per unit effort (CPUE) between 2013 and 2022 is summarized in figure 2.

Production of fish has been enhanced by fish stock re-introductions and restocking programs since 2011 through the economic stimulus program (ESP). Currently, there are five designated fish landing sites along the lake shore (Central, Karagita, Kamere, Tarambete and Oloidien) where daily statistics are recorded with an average annual yield of the lake being about 1625 metric tonnes. Gillnet fishing is the traditionally prescribed and gazetted method of fishing in Lake Naivasha. However, other fishing methods such as hook and line, longline and baited traps have also emerged.

Before the establishment of Nile tilapia population in Lake Naivasha, the value of fish landed from the fishery was less than KES 100 million (Fig. 3). However, between 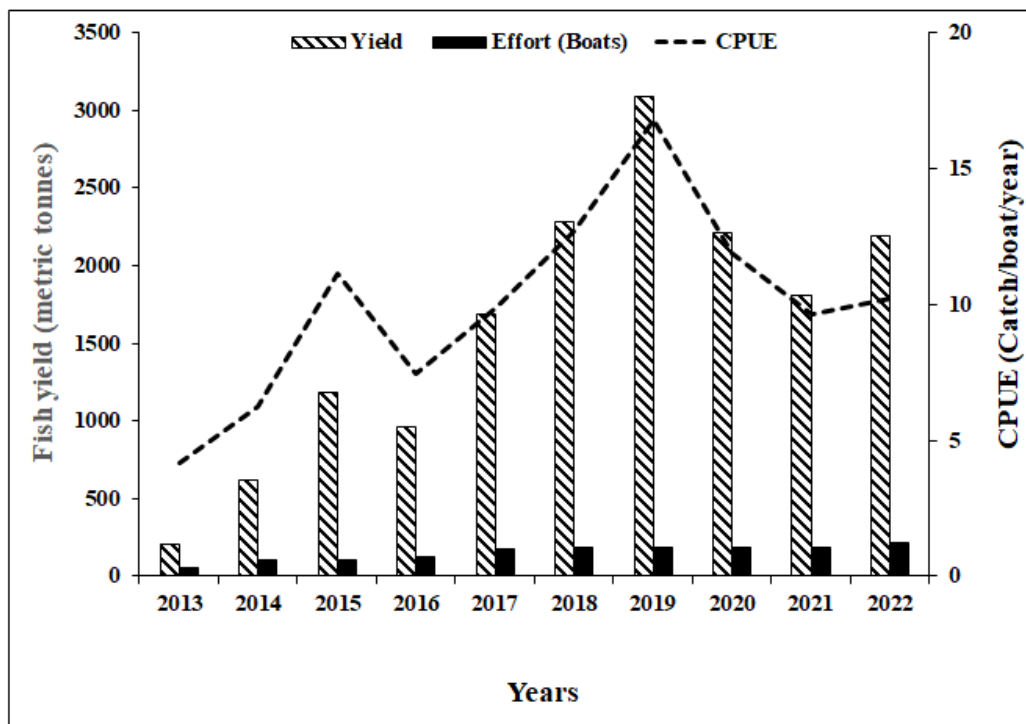2015 and 2021, the increasing trends in annual fish production parallels the rising value of fish during the period, with a minimum of KES 129.3 million and a maximum KES 409.5 million recorded during the period. These results reflect the importance and impacts of various management interventions made on the lake's fishery aimed at achieving the national objectives of Blue Economy.
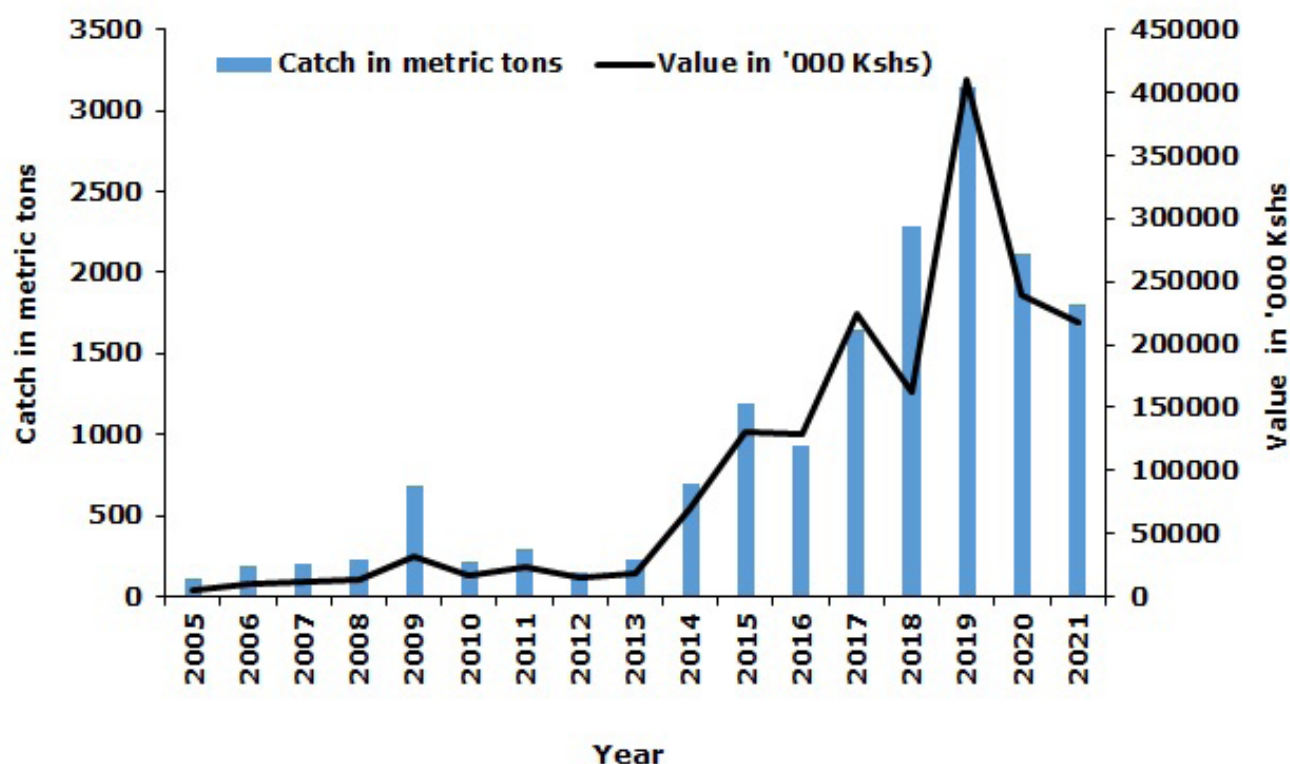

Figure 2. Status of fish yield, fishing effort and catch per unit effort (CPUE) in Lake Naivasha between 2013 and 2022. (Data source: KMFRI, KeFS and County Directorate of Fisheries).

Figure 3. Trends in annual fish landings from Lake Naivasha fishery and value (2005–2021).

Nature of players in the fish market in the Lake Naivasha fisheries market

The Lake Naivasha fishery is characterized by a unique market structure with a dominant players comprising of the fishers (39.9%), fish traders (35.8%) consumers (9.9%), transporters (5.5) and other ancilliary players (Table 1). There also many ancilliary players that are heavily dependent on fish trade (soft drink distributors, ice makers, transporters, boat builders, net menders, petroleum product sellers and packaging materials) All of whom have spurred economic growth and contributed to an increase in households' incomes and poverty reduction.

Landing sites

The fishery is characterized by a large number of new entrants who have joined the sector in the last 5 years adding pressure to an already strained ecosystem and its sustainability (Table 2). This high number could be attributed to the high levels of unemployment in the country, rural –urban migration, the profitable nature of the trade, closure of many floricultural firms etc.

Table 1. Characteristics of respondents.

Occupation	Central	Kamere/ Oloidien	Karagita	Tarambete	%
Fisher	34	44.9	27.6	53.2	39.9
Fish trader	47	33.6	37.1	25.5	35.8
Fisheries Manager	1	1.9	1.0	1.1	1.2
Ancillary players	1	4.7	11.4	2.1	4.8
Transporter	5	0.9	8.6	7.4	5.5
Consumer	10	10.3	8.6	10.6	9.9
Processor	2	3.7	5.7	–	2.9
	100	100	100	100	100.0

Table 2. Number of years in the sector.

Years	% Respondents
<5	37.7
5_9	29.0
10_14	18.7
15_19	4.6
>20	10
	100

The study found that the average weight of fish sold per day per trader (29.9%) was 20 kg, followed by 7.5 kg (27.8%) of the traders, while (26.1%) of the traders were selling more than 30 kg day^{-1}. This is indicative of the huge demand and ready market for the fish and fishery from Lake Naivasha and the rising demand for white meat (Table 3).

Table 3. Average weight of fish sold per day.

| Unit classes (kg)	% Respondents
<5	16.2
5_10	27.8
10_30	29.9
>30	26.1
	100

Contribution of various fish species

The fishery is primarily dominated by *C. carpio* (47.3%), *O. niloticus* (46.4%), *C. gariepinus* (6.3%). Species which previously dominated the fishery (*O. leucostictus, C. zilli, M. salmoides*) have contributed dismally to the total landings in Lake Naivasha. (Table 4). This situation can be attributed to factors such as fish species introductions, effect of overfishing and changes in the habitat condition within the lake (Njiru *et al.,* 2017; Waithaka *et al.,* 2019; Morara *et al.,* 2022).

Table 4. Percentage composition of fish landings from Lake Naivasha.

Species	Percentage composition (%)
M. salmoides	0.01
C. gariepinus	6.28
O. niloticus	46.42
Tilapia others	0.01
C. carpio	47.29
Total	100.00

The study established that tilapia was the most preferred species at (36%), Catfish (31%) common carp (30.3%) as shown in figure 4. The respondents extended the notion that tilapia fish is tasty and has high market demand and high economic returns.
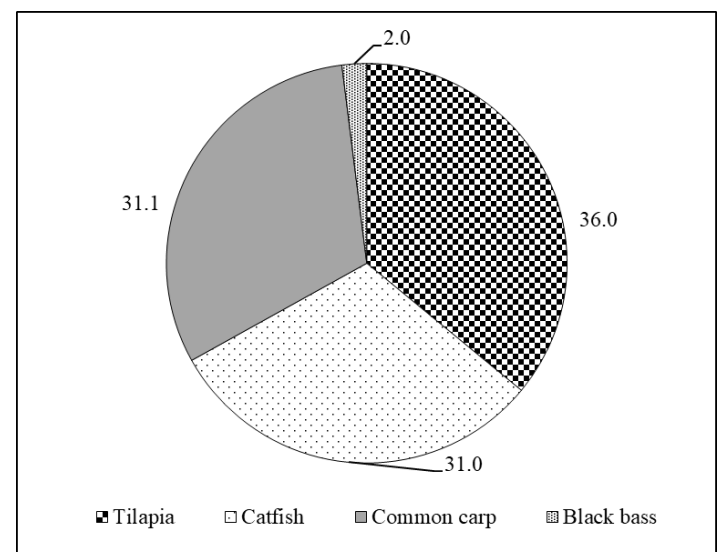
Figure 4. Most preferred fish in Lake Naivasha.

The study found that some of the factors affecting market dynamics include demand/supply of the product, climatic variations, population growth, urbanization, Competition for the resource and infrastructural limitations which affect the market trends and pricing (Fig. 5).
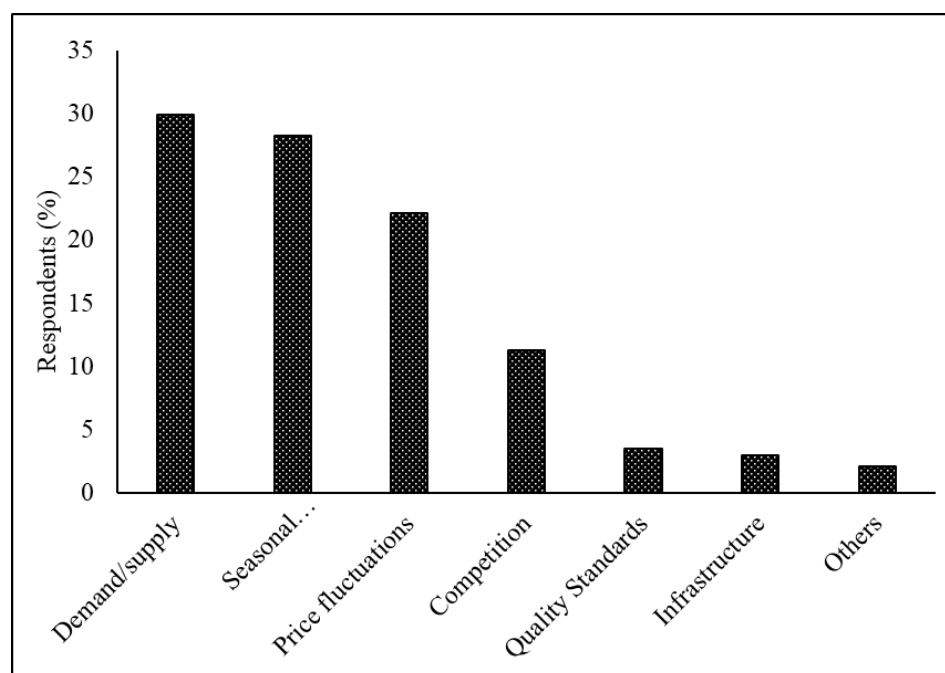
Figure 5. Factors affecting market dynamics of fish.

Small-scale traders provide an opportunity for market diversification and wider market reach. Their role in distributing of fish to various towns and facilitating regional trade contributes to food security, income generation, guaranteed livelihoods and economic development. Small scale traders (63.8%), long distance traders (32.8%) cover regions beyond the county at and the rest, respectively (Table 6).
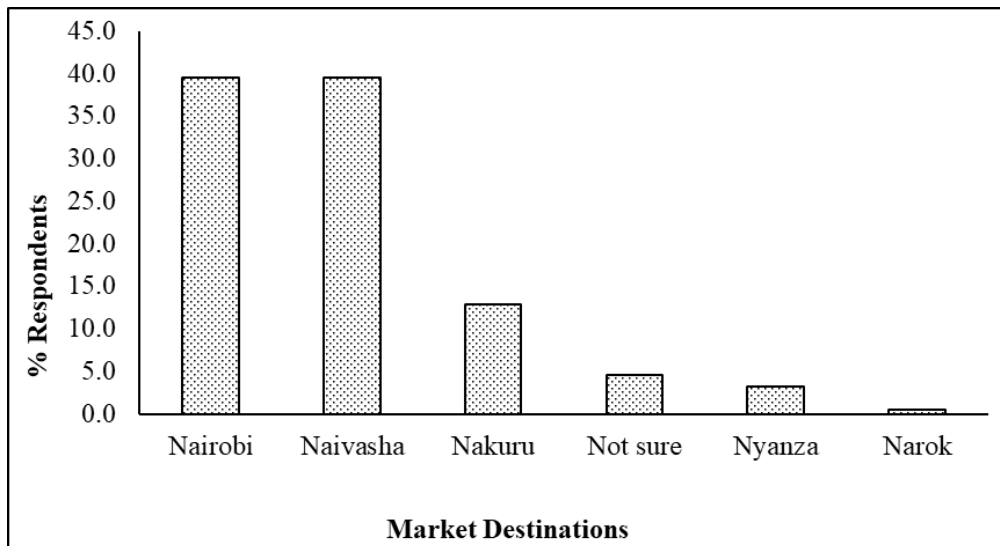
Table 6. Key distribution channels in the region.

Channels	% Respondents
Small traders	63.8
Export traders	1.7
Long distance traders	32.8
Others	1.7
	100

Current market distribution channels

Lake Naivasha fish market is controlled by a few individual players who have established themselves as almost monopolistic forces, exerting control over the market dynamics and pricing. The dominant players in the market distribution channels include retailers (38.3%), wholesalers (23.3%), fish mongers (19.3%) and the rest respectively (Table 5). The wholesalers act like middlemen between the fishermen and the retailers and fish mongers. The dominance of this few powerful players has significant implications for market dynamics. Their control over capital, and distribution channels gives them an advantage in terms of pricing, market access, and market influence.

This study established that fish harvested in Lake Naivasha is sold fresh at the five landing sites with a larger proportion being transported to market destinations like Gikomba and City Market in Nairobi, Top Market in Nakuru and Narok Main Market. Processed (deep fried) fish are destined for distance markets like Busia, Homabay among others (Fig. 6).

Challenges in the Lake Naivasha fisheries market

Challenges experienced included low supply of fish as a result of low catch, theft of fishing gears and catch, rampant illegal unreported and unregulated fishing (IUU)and low demand for non-target fish species. These need to be addressed to enhance the sustainable exploitation of the resource and maximize the socio-economic benefits for local communities.

Table 5. Main players in the fish market in Lake Naivasha.

Market player	% Respondents
Wholesalers	23.3
Restaurants	7.8
Retail	38.3
Fish mongers	19.3
Others	11.2

Figure 6. Market destinations of Lake Naivasha fish.

Opportunities in Lake Naivasha fisheries market

Investing in infrastructure improvement at the fish bandas' and the markets (cold storage chain, transportation network and internet and other market infrastructure) are key opportunities. Establishing a hatchery for fingerling production within the county to enable restocking of the lake at a reasonable cost, and enhance the competitiveness of BMUs and traders through training and facilitating market access. Implementing and promoting regulations that promote fair competition, transparency, and market access for all market participants (Table 7). Providing training and support to fishers in areas such as value addition, business management, financial literacy, and market intelligence to facilitate market access for the fish traders is an area to be looked into and can help fishers and traders navigate market challenges more effectively.
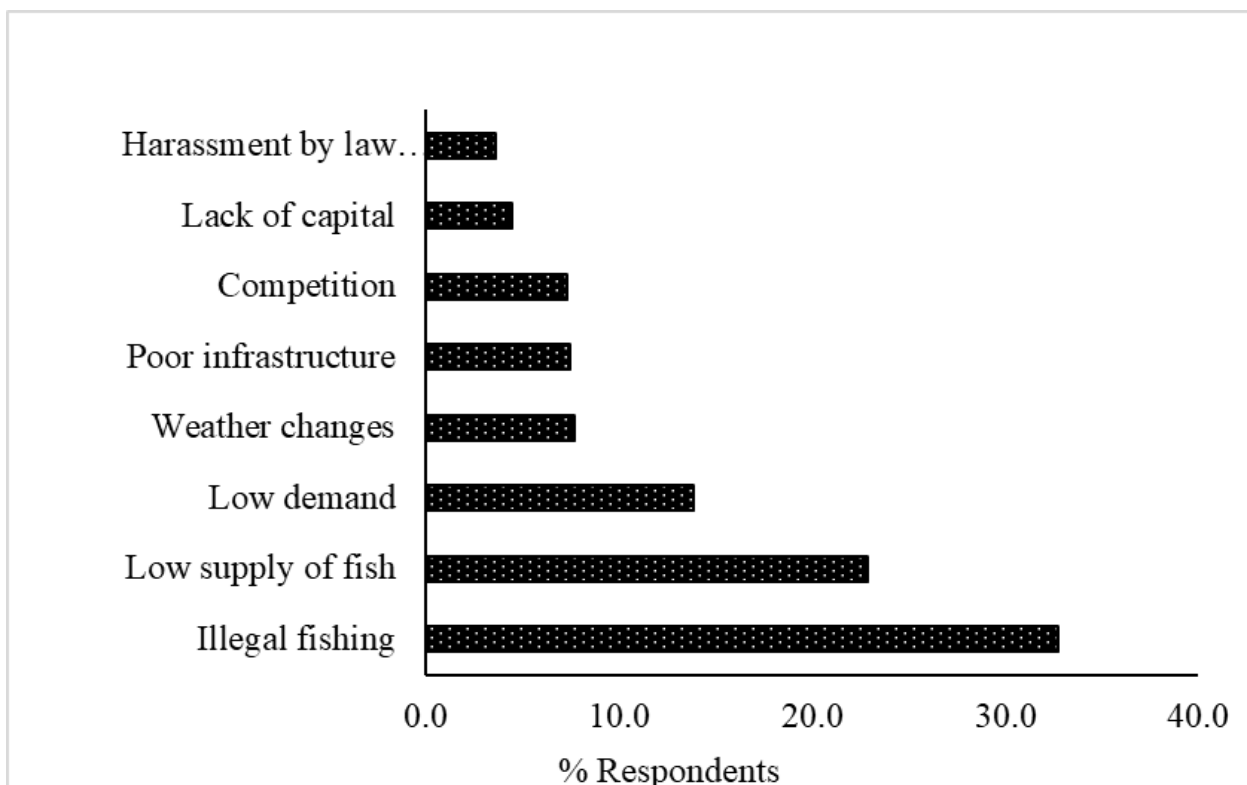
Fish sourced from L. Nakuru, which was banned is illegally harvested and floods the markets in the county. This affects the pricing of fish in the market due to the high supply and low demand effect. The fish is also mostly larger in size than the tilapia fish caught from Lake Naivasha, hence unsuspecting consumers end up purchasing it at a lower price, affecting the pricing of fish from Lake Naivasha in the market (Fig. 7).

Figure 7. Cited challenges by respondents.

Table 7. Opportunities in the fish market

Opportunities	% Respondents
Value addition	17.6
Construction of cold storage	9.9
Ecotourism	6.5
Hatchery	10.8
No idea	41.4
Improvement of infrastructure	11.1
Mobile banking	2.8

Measures to improve marketing and management of the industry

The study recommends that improvement of the following measures will improve the marketing of the fish from Lake Naivasha and strengthen the management of the resource. Some of the measures cited include strengthening monitoring control and surveillance, restocking and improvement of market infrastructure (Fig.7).

Strategies for investment and policy

Figure 8 shows some of the strategies and policies suggested by the respondents. Policies strengthening the regulatory framework and enforcing the existing policies will promote market access for all participants and fair competition. Some of the regulations to be strengthened include increased patrols, closed seasons and limiting fishing hours. Infrastructural development at the markets and fish landing sites will enhance the competitiveness of the fish sourced from L. Naivasha. These include acquisition of cold storage facilities, development of road networks and market infrastructure. Promoting value added products will create additional revenue streams, improve livelihoods and increase the competitiveness of the fish from Lake Naivasha. This therefore calls for capacity building of the fish traders for skill acquisition and exploring niche markets. Development of a clear restocking programme and lake cleanup will aid in increasing fish production, translating to increased supply and more revenues.
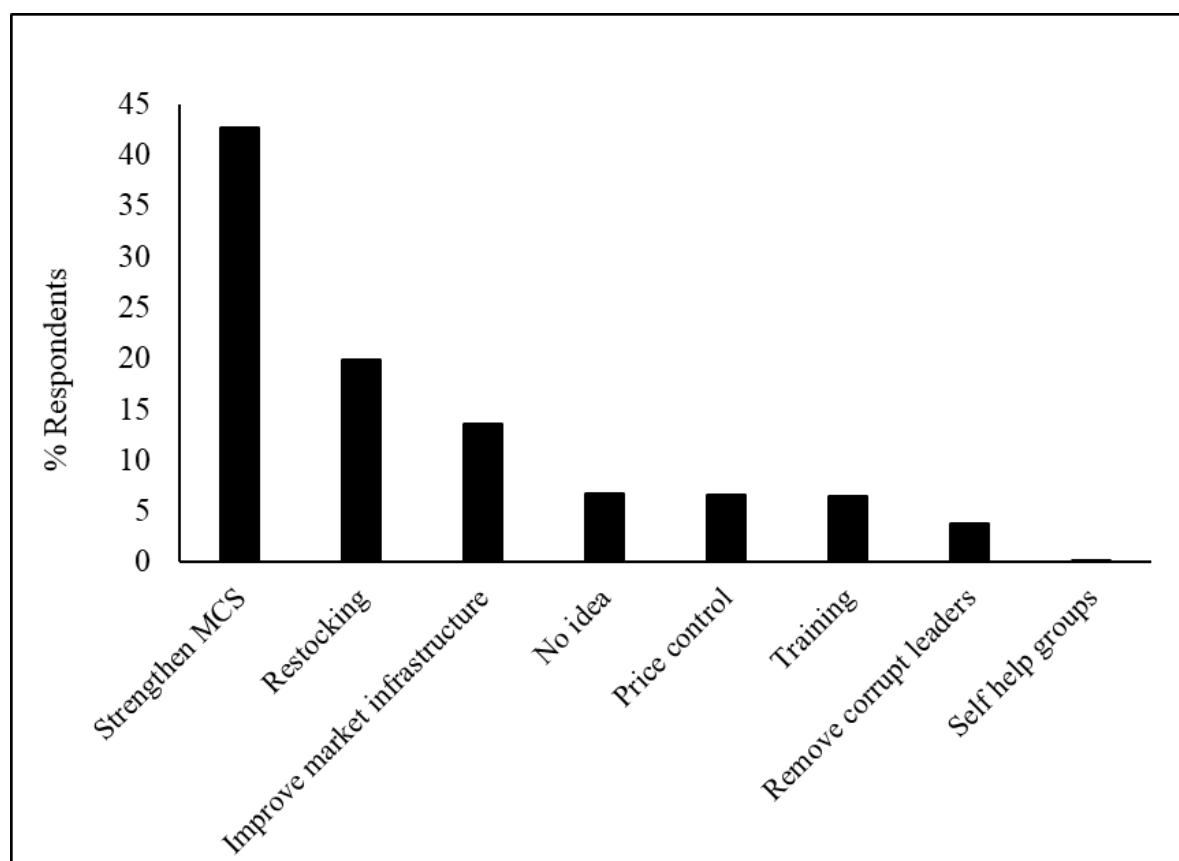

Figure 8. Suggested measures by respondents (%) to improve marketing and management of the fish industry.
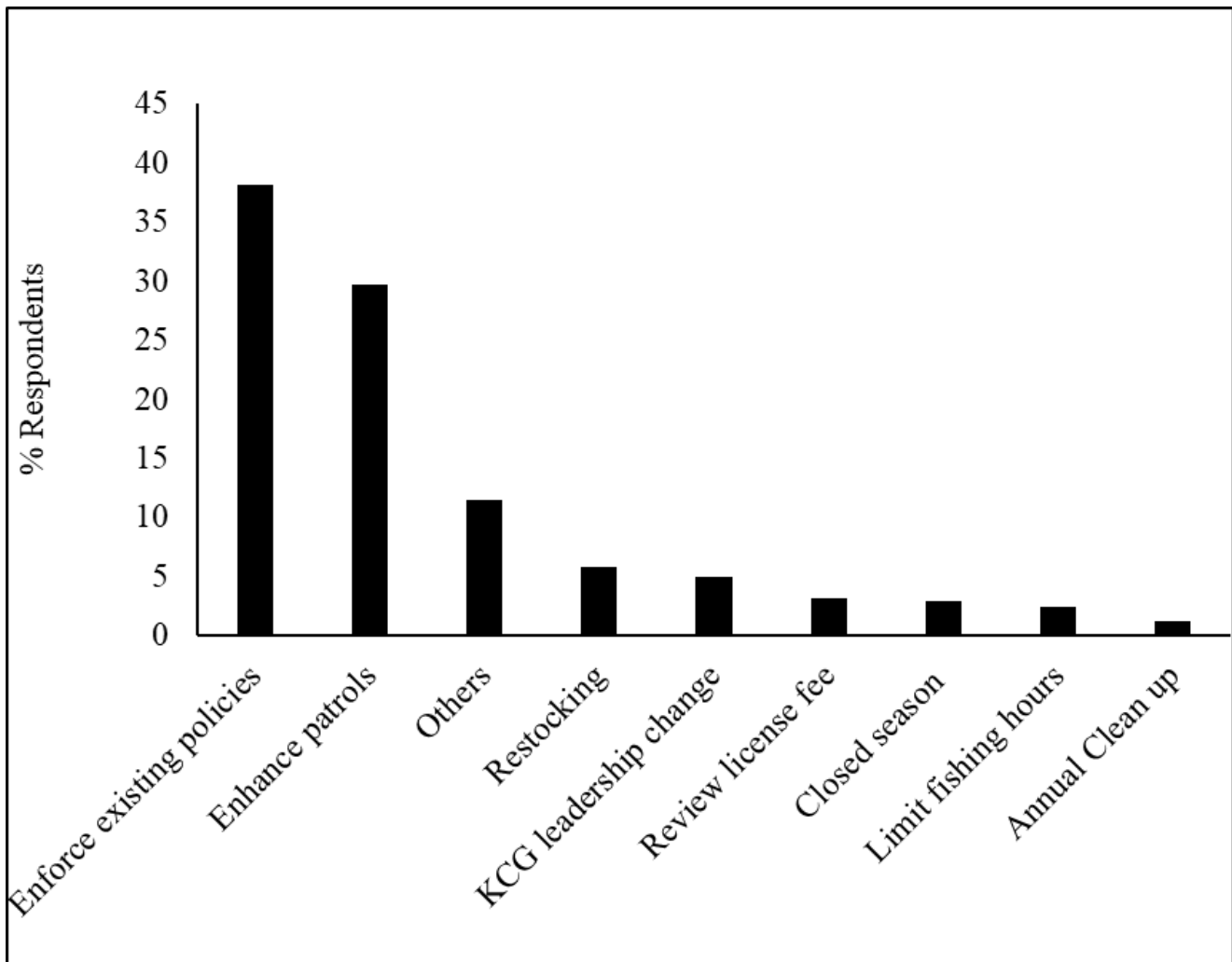
Figure 9. Respondents (%) suggested policies for review and modification.

Conclusions and recommendations

This study concluded that Lake Naivasha fishery is dominated by species like *C. carpio*, *O. niloticus*, and *C. gariepinus,* with retailers being the main players. Fish harvested in Lake Naivasha are sold fresh at the five landing sites, with a larger proportion being transported to market destinations in Nairobi and Nakuru. Major factors influencing market dynamics in the Lake Naivasha fishery are demand/supply and variation in climatic conditions. Challenges faced include infrastructural limitations, low supply of fish as a result of low catch. Some of the strategies that can be employed to improve the fisheries market are in-vesting in infrastructure improvement at the fish *bandas* and the markets, construction of hatcherfes for fingerling production within the county to enable restocking of the lake and training of BMU members and traders and   facilitating market access. Implementing and promoting regulations that promote fair competition, transparency, and market access for all market participants is also recommended to improve market performance.

Acknowledgement

References

Abila RO (2000) The Development of Lake Victoria Fishery: A Boon or Bane for Food Security. *IUCN Eastern Africa Programme on Socio-economics of the Lake Victoria Fisheries*. Report No. 8. June 2000.

Aura MC, Nyamweya CS, Njiru JM, Odoli C, Musa S, Ogari Z, Abila R, Okeyo R, Oketch R (2019) Using fish landing sites and markets information towards quantification of the blue economy to enhance fisheries management. *Fish. Manag. Ecol*, 26, 141–152

Jones E, Smith S, Wills C (2012) Women producers and the benefits of collective forms of enterprise. Gender & Development, 20(1): 13–32 [https://doi.org/10.1080/13552074.2012.663640]

Kundu R, Aura CM, Ojuok J (2010) Difficulties of fishing at Lake Naivasha, Kenya: is community participation in management the solution? *Lakes and Reservoirs: Research and Management*, 15:15-23 [https://doi.org/10.1111/J.14401770.2010.00419.X]

Manyala JO, Gitonga NK (2008) A Study on Marketing Channels of Omena and Consumer Preferences in Kenya. Second Draft Final Report Presented at Omena Stakeholders Workshop at Tom Mboya Labour College, Kisumu, Kenya

Mugenda OM, Mugenda AG (2003) "Research Methods" Acts Press, Nairobi

Njiru J, Waithaka E, Aloo PA (2017) An Overview of the Current Status of Lake Naivasha Fishery: Challenges and Management Strategies. *The Open Fish Science Journal,* 10: 1–11

Parry JE, Echeverria D, Dekens J, Maitima J (2012). *Climate Risks, Vulnerability and Governance in Kenya: A review.* United Nations Development Programme, 83pp

Shanguhyia MS (2021) Insecure borderlands, marginalization, and local perceptions of the state in Turkana, Kenya, circa 1920–2014. Journal of Eastern African Studies, 15(1): 85–107 [https://doi.org/10.1080/17531055.2020.1868195]

Waithaka E, Boera P, Morara G, Nzioka A, Mutie A, Keyombe L (2019) Trends in fishing on Lake Naivasha and their implications for management. *African Journal of Tropical Hydrobiology and Fisheries*, 17: 9-5