

# OLONAI NEWS

Issue 1, 2018

*A quarterly newsletter on topical issues about Lake Naivasha*

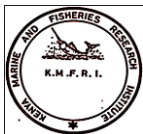


Red swamp cray fish from Lake Naivasha and when sampling



### Contents

Lake Naivasha: A national and international heritage site.....	2
Biodiversity of Lake Naivasha.....	3
The fish species of Lake Naivasha.....	5
Riparian and Macrophyte Community of Lake Naivasha.....	6
The Critical Micro- Habitats of Fish on Lake Naivasha.....	7
Management Option of Lake Naivasha Fishery.....	8
The Nature of Illegal Fishing Practices in Lake Naivasha.....	9
Recovery of the Fishery of Lake Naivasha.....	10
Nile Tilapia: From Introduction to Dominance in the Fishery.....	12
Use and Misuse of Riparian Ecotone of Lake Naivasha Ecosystem.....	14
How Do We Determine the Quantity of the Fish on Lake Naivasha?.....	15
Ecotourism potential in Lake Naivasha.....	16
Is Lake Naivasha healthy?.....	17
What is water quality?.....	17
Multistakeholder Approach to Management of Lake Naivasha.....	18
Up-Coming Events.....	20



## Lake Naivasha: A national and international heritage site.

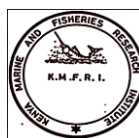
*P. Boera and G.N. Morara*  
*KMFRI, Naivasha*

Lake Naivasha is a unique freshwater ecosystem located at 0°42' - 0°50'S /36°16' - 36°26 'E on Kenya's Rift Valley floor at an altitude of 1890m above sea level. The lake covers an average surface area of about 140 Km<sup>2</sup>, but is subject to fluctuations between 110 and 189 Km<sup>2</sup> depending on durations of wet and dry spells. It has a catchment area of 2,378 km<sup>2</sup>, draining the Aberdare Mountains through its major inlet, Malewa River which has the largest catchment of 1,730km<sup>2</sup> and 90% discharge into the Lake. Gilgil and Karati Rivers, together with other surface runoff and ground seepage contribute the remainder of the total discharge into the lake. The lake has no visible outlet, but its freshness is probably maintained by the underground seepage through a system of porous volcanic rocks.

The Lake Naivasha ecosystem comprises three components namely; the main lake and two smaller lakes Oloidien and Sonachi, both located to the southern and south western part of the main lake respectively. Apart from the main lake, the two small lakes are largely alkaline with their water quality conditions varying on seasonal basis. The lake ecosystem, in general, has diverse habitats hosting a variety of fauna and flora, both aquatic and terrestrial. This includes mammals, birds, fish and vegetation (submerged, floating and emergent communities). This rich natural resource supports numerous socio-economic activities such as fishing, tourism, floriculture and horticulture; electricity generation among others.

The fishery is supported by introduced species comprising: three tilapiines (*Oreochromis leucostictus*; *Oreochromis niloticus* and *Coptodon zillii* - previously called *Tilapia zillii*); Common carp (*Cyprinus carpio*); Black bass (*Micropterus salmoides*); the African catfish (*Clarias gariepinus*) and Louisiana red swamp crayfish (*Procambarus clarkii*). Fishing is mainly done in the main Lake and Lake Oloidien, where populations of introduced fish species have established. Approximately over 4000 people are engaged directly and indirectly, with an annual fish catch of 1620 metric tonnes harvested in 2018.

Tourism is considered another important sector within the lake and its catchment areas, with numerous wildlife and birds in its rich habitats. Within the basin, there are established national and privately owned protected areas for game drives. These include Hell's gate national park; private animal sanctuaries and conservancy ranges. High end hotels are also spread along the shores of L. Naivasha. These provide a



complementary support to the flourishing tourism and ecotourism industry, with numerous employment opportunities open for the community around the lake.

Water from the lake is used for irrigation in the expansive floriculture and horticultural industry, and is estimated to support more than 250,000 people working in various farms. Notably, horticultural exports from farms around Lake Naivasha contribute significantly to the country's foreign exchange earnings. Geothermal power generation is also another human economic activity that is indirectly dependant on the lake through the underground superheated steam found to the southern and south western parts of the lake. Kenya's economy envisions to produce about 5530 MW of geothermal energy by 2030. To this end, the area around Lake Naivasha currently produces over 630 MW while plans are in place to expand the production within the next 40 months.

Despite its splendid environs, L. Naivasha ecosystem is not without ecological and management challenges. The lake environment is fragile and dynamic although it supports numerous economic activities. Its biodiversity is critically threatened due to anthropogenic factors, which include: destruction of habitats, pollution and excessive water abstraction. Rapid human population increase, currently standing at over 250,000 people, has exerted pressure on the lake resources. Wetland encroachment and conversion into farmlands, hotels and residential estates have increased in the recent past. Similarly, harvesting or burning of *Cyperus papyrus* along the edges of the lake have undermined the natural state of the lake by reducing its filtration and buffering capacity. Various research findings point out that the lake, in its current status, may not sustain further development on the scale seen over the last two decades.

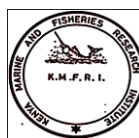
For effective management and sustainability of the lake's resources, there is need to strengthen multi-stakeholder participatory processes in management and policy decisions. This may be achieved through capacity building and information sharing, thus enhance wider understanding of the management issues.

## Biodiversity of Lake Naivasha

*By J. Ochieng<sup>1</sup> and E. Waithaka<sup>2</sup>*

*<sup>1</sup>Kenya Wildlife Services, <sup>2</sup>KMFRI, Naivasha*







The Lake Naivasha wetland supports unique and high species diversity of wildlife, a phenomenon associated with the lake's freshness and water level fluctuations. It has a Large resident population of mammals, reptiles, fish, water fowl and other wildlife found in the diverse lake habitats. The

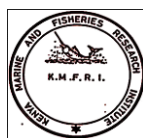




ecosystem supports a high but uneven biodiversity - rich in birds and plants but no native fish. The artisanal commercial fishery is dependent upon exotic species and is currently in severe decline due to overfishing. The lake holds over four hundred bird species, but endangered and rare species are now hardly ever seen e.g. Great Crested Grebe (critical), Maccoa Duck (endangered), African Darter, Great Egret, Saddle-billed Stork, White-backed Duck, Baillon's Crake and African Skimmer (all vulnerable).

The lake is important for riparian mammals, primarily the population of *Hippopotamus amphibious*, which are over 700 represents the largest meta-population of this species in the Rift valley of Kenya. Its numbers have remained stable for the past two decades. The Marsh mongoose and otter are rarely-seen but important predators of Crayfish in Lake Naivasha.

			
<p>Pelicans in the background with hippos</p>		<p>Commorant on a hippo</p>	
			
<p>Zebras and gazelles</p>		<p>Egyptian goose</p>	
			
<p>Flamingoes</p>		<p>Pelicans</p>	



# The fish species of Lake Naivasha

By P. Boera, E. Waithaka, A. Mutie, B. Obegi, G. N. Morara, P. Loki and A. Nzioka- KMFRI Naivasha



African Catfish



Nile tilapia



Mirror carp



Black bass



Leather carp



Common carp



Red belly tilapia



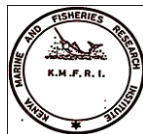
Blue spotted tilapia



Barbus



Crayfish





## Riparian and Macrophyte Community of Lake Naivasha

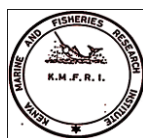
*By Ruth M Lewo Fisheries Department, Nakuru County*

Lake Naivasha, as the name suggests was not only known for its famous shiny and transparent waters in the mid 80's and 90's, but also for its diverse array of lush riparian and littoral vegetation. The Naivasha Thorn or the yellow Fever tree (*Acacia xanthophloea*) is the dominant terrestrial tree species forming woodlands around the lake. It is an important habitat for birds and other wildlife such as the African fish eagle (*Haliaeetus vocifer*), while the undergrowth provides an important buffer against erosion and helps prevent the transport of silt and nutrient to the lake.



The littoral edge of the lake is the most species rich, dominated by floating papyrus, with a blend of many other floating and shallow rooted water plants. Dominant species include *Cyperus papyrus* (papyrus), *Eichhornia crassipes* (water hyacinth)(exotic), *Pistia stratiotes* (Nile cabbage), *Salvinia molesta* (water fern)(exotic), *Wolffia arrhiza* and *Nymphaea* sp (water lilies). Submerged plants include *Ceratophyllum demersum*, *Potamogeton schweinfurthii*, *P. pectinatus*, *P. octandrus*, *Najas pectinata* and *N. caerulea*.

However, alien floating plants, such as water hyacinth and water fern whose abundance and biomass fluctuates with season and the varying lake water levels, has over the recent years dominated the lake's surface. These alien plants grow at the water surface, reproduce asexually, and are dispersed by wind and water currents. They form continuous mats in littoral areas that tend to thicken during the rainy season and may invade a significant portion of the entire lake surface disrupting fishing

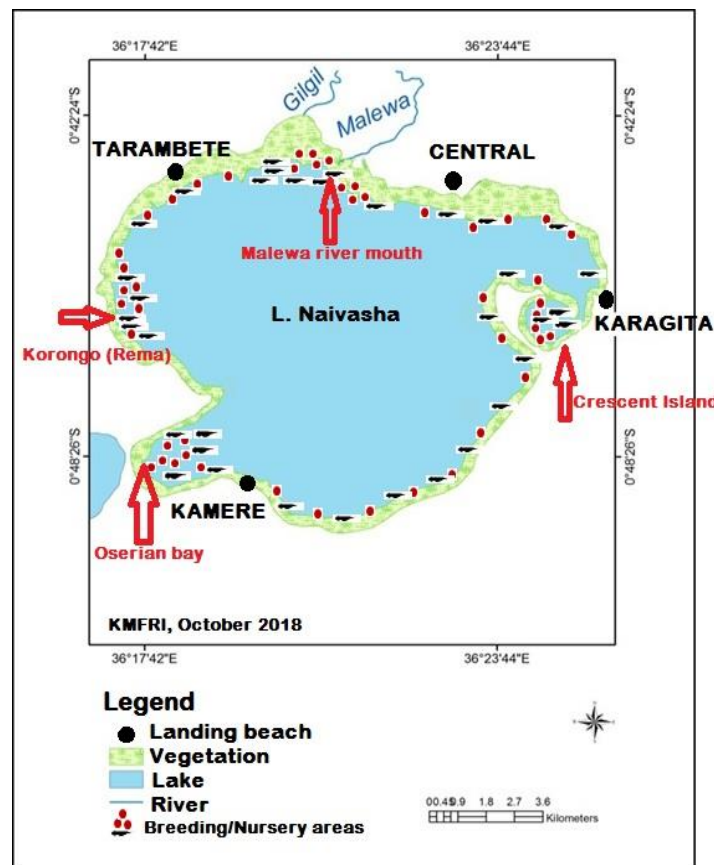


and boating activities. The diverse macrophytes community hosts a wide variety of invertebrates that form an important food chain link for the ichthyic community of the lake.

## The Critical Micro- Habitats of Fish on Lake Naivasha

*By George. N. Morara, KMFRI, Naivasha*

Following a near collapse of the Lake Naivasha fishery in 2001, mapping of fish breeding and nursery grounds for protection was recommended (KMFRI LNRP Report, 2002).



Through research, assessing fish sizes and their maturity stages, four critical fish habitats areas have since been established and recommend for protection. These are Inner Crescent Island; Malewa river mouth; Korongo bay (Rhema Islands) and Oserian bay as illustrated above. In addition, shallow near shore macrophytes areas (about 100 m) around the lake are also critical for both spawning and nursery of juvenile fish. Since 2013, through stakeholder participatory programs, these areas have been demarcated and gazetted as protected fish breeding areas. Thus, under the



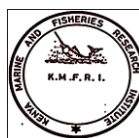
fisheries laws, fishing activities are prohibited in the designated sites. During the 2018/2019 fiscal year, KMFRI will evaluate and report the impact of these critical habitats on the fishery productivity of the lake.

## Management Options of Lake Naivasha Fishery

By P. Loki <sup>1</sup> and R. Mwangata<sup>2</sup>

<sup>1</sup>KMFRI, Naivaha, <sup>2</sup> Fisheries Department, Nakuru County

Lake Naivasha fishery is a multispecies fishery with all 8 fish species having been introduced. Due to many challenges facing the fishery several management options have been put in place for its sustainability which includes 178 boats which are licensed to carry out fishing activities. The fishery is carried out by use of ‘sese’ canoes using 10gill nets of 100metres each in the deep waters of the lake. Each gillnet used in fishing should be of 4” inch- mesh size and above to allow for capture of mature adult fish. Fishing in or along the demarcated breeding areas and along the littoral zones of the lake is prohibited. The use of unauthorized fish gears or un- licensed vessels is also prohibited. Sport fishers must obtain a license from the SDF before fishing with a maximum allowable catch of five fish per day per license. The fishing vessels or ‘sese’ canoes are required to meet the seaworthiness conditions according to the law: that is the vessel should not be leaking from any part, the vessel needs to be clearly painted and marked for easy identification on the water. Regular monitoring control and surveillance (MCS) is carried out by the department to remove illegal fishing gears and crafts in addition to ensuring breeding areas are protected from any fishing activity. MCS also ensures the lake is free from illegal fishers and that legal fishers are not using illegal fishing methods. The Fisheries Management and Development Act (FMDA) 35 of 2016 has laid down regulations and penalties that provides for the conservation, management and development of fisheries and other aquatic resources to enhance the livelihood of communities dependent on fishing. Continuous research by carrying out regular Catch assessment surveys (CAS) and water quality measurements is undertaken to monitor the fishery and the health of the lake. Annual closed seasons of three months between July-September which is the breeding season for the fish should be reinstated in order for the fishery to recover naturally instead artificial restocking





which can lead to accidental introduction of alien fish species in the lake. Lastly Co-management of the Lakes resources by all stakeholders is also in place.

## The Nature of Illegal Fishing Practices in Lake Naivasha

*By E. Waithaka, KMFRI, Naivasha*

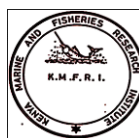
Illegal fishing is rampant in Lake Naivasha where fishermen use simple gears and vessels and operate within breeding areas. It is unfortunate that their fishing activities are having a significant impact on the lakes ecosystems due to overfishing, habitat degradation and lots of by catch of non-target species. However, there is widespread use of banned fishing gears and unlicensed boats.

Illegal, unreported and unregulated (IUU) fishing constitute about 60% of the catch and costs about 3 times the value of the legal fishery production. The progressive decrease in mesh sizes of gillnets which remain the predominant fishing gears on the lake is particularly worrying in the heavily exploited inshore waters. Banned fishing gear especially beach seines, monofilaments, hook and line, crayfish nets, use of bait pose a high risk for breeding and growth of fish and has been confirmed to catch a high proportion of juveniles, immature fish and non-target species, some of which are discarded due to their low economic value. Beach seines are dragged within shallow areas, sweeping everything that is encountered with major ecosystem implications. Specific efforts should be made to remove the illegal gears including the fishers for sustainability of the fishery.

The resulting diminishing economic returns from fishing operations threaten the livelihood of small-scale fishers and their families. Out of sheer desperation, many small-scale fishers resort to using more efficient but destructive fishing methods.

Understanding and reducing these impacts is a priority for fisheries managers and other stakeholders in the region. The challenge of managing illegal, unreported and unregulated (IUU) fishing is a common and pressing problem.

Community based monitoring, control and surveillance should be given priority and this would drastically reduce use of illegal gears and curb poaching on the lake. Alternative livelihood, such as aquaculture and ecotourism should be encouraged to reduce pressure on the lake fishery.

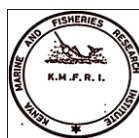




## Recovery of the Fishery of Lake Naivasha

*By G. N. Morara, KMFRI, Naivasha*

The fishery of Lake Naivasha commenced sometime in 1959, thriving mainly on three, all introduced fish species. These were: the tilapiine species (*Tilapia zillii* and *Oreochromis leucostictus*) and the large mouth black bass (*Micropterus salmoides*). A crustacean species, commonly known as the red swamp Louisiana crayfish (*Procambarus clarkii*) and a riverine cyprinid species called *Barbus amphigramma* also made significant contribution into the artisanal fishery production of the lake until the late 1990s. However, fish catches from this fishery have highly fluctuated dependent on lake levels and fishing effort variations. Between 1963 and 2000,



the highest recorded catch was 1150 metric tons (1970) while the lowest was 37 metric tons (1988). The number of licensed fishing vessels varied from 6 to 113.

Under the extremities of its exploitation, the fishery almost completely collapsed in 2000, leading to the Government of Kenya to slap a ban on all forms of fishing activities in the lake, from February 2001 to January 2002. The ban was to allow recovery of the dwindled fish stock as well as a comprehensive multi-disciplinary research that could inform management decisions on the future sustainable exploitation of the fishery. Nevertheless, this drastic measure had severe consequences on livelihoods of the fishery resource dependent community. Through research and a multi-stakeholder engagement process, the fishery was put under strict control from 2002 henceforth. The number of licensed fishing vessels was vetted and reduced to the optimal effort level of 43 boats, each with a maximum of 10 gillnets of mesh size not less than 4 inches. Additionally, closed season on fishing were introduced for three months during active spawning and recruitment period. The need to map and protect fish breeding areas was also necessary.

From the mid 2000 to-date, a new phase of Lake Naivasha fishery has emerged with the introductions of three other new fish species namely: the Common carp (*Cyprinus carpio*); Nile tilapia (*Oreochromis niloticus*) and the African catfish (*Clarias gariepinus*). These species have boosted the fisheries production with variations from 38 metric tons (2003) to about 1620 (2018). It has also seen the fishing effort increase drastically from about 50 to 176 boats in 2013 and 2017 respectively. The number of fish landing beaches as well increased from three to five (i.e. Central, Karagita, Kamere, Tarambete and Oloidien beaches). Each of these beach has organized leadership structure responsible for day to day fishery affair. A catch assessment survey (CAS) conducted by KMFRI in January 2018 found that each of the licensed boat used between 20 and 60 gillnets of various mesh size, from 3 to 8 inches. This fishing capacity, excluding the high number of unlicensed (illegal) fishers on the Lake, implies a sharp increase exceeding the recommended optimal effort by about 15 to 20 fold. Based on catch-effort data analysis and previous studies, there is empirical proof, that the fishery is being over-exploited and is quite unlikely to be sustained in the long term. Its collapse may threaten livelihoods of more than 4000 people depended on the resource both directly and indirectly. It may also undermine the national discourse on food security and employment creation initiatives.





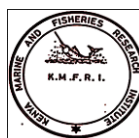
Thus, regular multi-stakeholder consultative meetings are necessary to discuss and step up management measures including: reduction and control of fishing boats, number of fishing nets; enforcement of appropriate mesh size rules; protection of fish breeding areas and strengthening the co-management approach adopted for Lake Naivasha fishery resource. Such fora dedicated to effective management of the resource must be grounded on objectivity, transparency as well as find the political goodwill of both county and national governments.

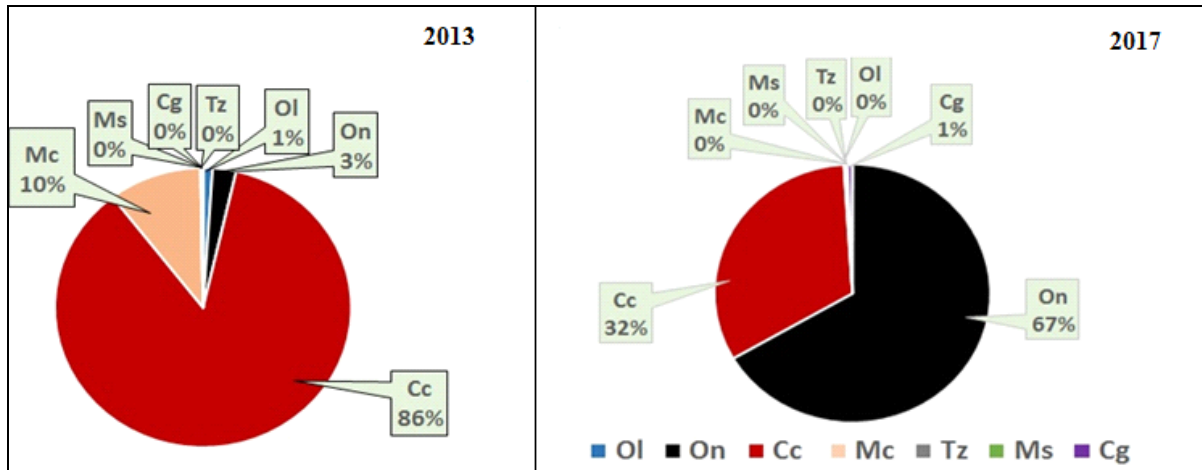
## TOPICAL ISSUES

### Nile Tilapia: From Introduction to Dominance in the Fishery

*By G. N. Morara, KMFRI, Naivasha*

The re-introduction of the Nile tilapia (*Oreochromis niloticus*) into Lake Naivasha, done from 2011 to 2014, has shown considerable success through improved fishery production. From a paltry catch of 5.9 metric tons in 2013, the species produced about 1100 metric tons in 2017, translating into 67% of the total annual fishery production during the year. The successful establishment of this species in the lake is attributable to a number of factors. First, there were thousands of fingerlings of this species deliberately and severally introduced into the lake through the department of fisheries, in collaborations with BMUs and other stakeholders. Second, Nile tilapia is known to be a resilient and fast growing species which easily adapts to new habitat conditions. Third, water levels of the lake have consistently remained high, thus provided conducive habitat for feeding, breeding and refugia for the species.

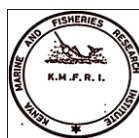




Percentage contribution of key fish species in the fishery production of Lake Naivasha. **Ol** = *Oreochromis leucostictus*; **On** = *Oreochromis niloticus*; **Cc** = *Cyprinus carpio* (**Common carp**); **Mc** = *Cyprinus carpio* (**Mirror carp**); **Ms** = *Micropterus salmoides*; **Cg** = *Clarias gariepinus*; and **Tz** = *Tilapia zillii*

However, it has been demonstrated that even where there are well-established stocks of *Oreochromis niloticus*, like many other stocks, high exploitation pressure can lead to decline of the species in its habitat. Lake Naivasha may not be an exception in that regard. Statistical records (available at KMFRI) show that the species among other key fishery species in the lake are currently being overexploited and small size landed at the all the beaches. Indiscriminate use of fishing gears and poor fishing methods are the main risks to the established population of *O. niloticus* and the various species, which may adversely affect the overall fishery production in the short term.

Notably, the fishery will most unlikely be sustained by the present number of fishing boats and uncontrolled number of gillnets. Gains made through the introductions risk being reversed, if cases of illegal fishing and poor fishing gears are not controlled urgently. For sustainability, gillnets of 4 inches and above (stretched mesh size) are recommended for use in the lake, while the demarcated breeding areas should be jealously protected by all stakeholders.



# Use and Misuse of Riparian Ecotone of Lake Naivasha Ecosystem

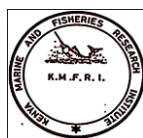
*By: Ruth Lewo, Fisheries Department, Nakuru County*

Greatest part of the land surrounding Lake Naivasha was previously protected by a border of *C. papyrus* wetlands that controlled the ecology of the lake by regulating entry of nutrients, sediments and acted as natural purifiers of water. This has supported a diverse aquatic bird community as well as the substantial population of hippopotamus. It also forms an important habitat for fish and wildlife, which use it as safe refuge and feeding area. However, lake area under papyrus has also reduced from >50km<sup>2</sup> in 1960 to less than 10km<sup>2</sup> in the new millennium attributed to decline in water level and papyrus swamp clearance for agriculture. This has potential risks in compromising its efficiency and effectiveness as a buffer area allowing entry of nutrients into the lake that contributes to the lake eutrophication.



Reduction of the swamp is attributed to direct human encroachment and clearance of the swamp to pave way for subsistence agricultural production and set up of commercial structures such as hotels, lowering of the lake waters, grazing by herbivores such zebra, buffalos and the large herds of the Masai cattle.

The riparian and littoral community continues to face a myriad of challenges that in turn governs its presence in the lake ecosystem. Of particular concern is the widespread clearance of the Acacia woodlands and the papyrus swamps around the lake; which in turn compromises the health of the ecosystem. Impacts related to these activities include high rates of sediment loading into the lake, reduction of the buffering capacity of the fringe zone and reduction of fish and bird species dependent on these plants. The wetland degradation and subsequent eutrophication of the lake will





thus further reduce suitable areas for fish to breed and replenish the declining stocks. Therefore, concerted efforts by all stakeholders at the management levels are needed in the protection and restoration of the littoral community of Lake Naivasha.

## How Do We Determine the Quantity of the Fish on Lake Naivasha?

*By A. Mutie, KMFRI, Naivasha*

For sustainable exploitation of the Lake Naivasha fishery and to satisfy the demand from increasing human population, there is need to determine the abundance and distribution of various fish species. It is also critical to assess the amount of fish being harvested, the rate of harvesting and the general trends in order to advise management decisions. Catch Assessment Survey (CAS) is one of the exercises that help in assessing the status of fish stocks. It entails collection of data on: the fishing gears, fishing vessels, number of fishermen involved, fishing period and total catch among others aspects. CAS also provides information on the market value of the fish landed. At Lake Naivasha, KMFRI periodically conducts CAS on commercial landings alongside experimental surveys to monitor changes in fish species composition and contribution into the lake's fishery. From the recent CAS conducted (January 2018), a total of 2.87 tons of fish were landed in a single day, at the 4 beaches around Lake Naivasha. These were as follows: Karagita (1.07 tons); Kamere (0.8 tons); Central (0.6 tons); and Tarambete (0.4 tons).



CAS activity by KMFRI Naivasha team at Lake Oloidien



## Ecotorism potential in Lake Naivasha

*By D. Kilo, Lake Naivasha Boat Owners Association*

Ecotourism is one type of tourism that is rapidly increasing in popularity around the globe, especially in developing nations. The Lake Naivasha ecosystem provides opportunities for ecotourism with its rich biodiversity and, with three national parks (Mt. Longonot, Hell's Gate and The Aberdares) in its vicinity. Several privately-owned wildlife sanctuaries (i.e. Oserian Wildlife Sanctuary, Crescent Island Wildlife Sanctuary, Kongoni Game Valley, Elsamere Conservation Centre and Crater Lake Game Sanctuary) provide even more opportunities. There are more ecotourism sites including Eburu sanctuary, Kinangop Plateau and the Rift valley view points

Ecotourism being natural resource-based and capital-intensive, there is need to inspire the local communities and land owners to take up ecotourism initiatives/ projects though community mobilization, capacity building and awareness creation to encourage investment in areas such as- Supply of goods and services, community campsite, craft centre, cultural centre, guest houses, lodge/ tour operation, etc



## Is Lake Naivasha healthy?

*By A. Mutie, KMFRI Naivasha*

Lake Naivasha is healthy going by favorable climatic conditions with temperature averages of 23.4 °C, salinity of 0.11ppt and electrical conductivity of 280µs/cm. The average levels of dissolved oxygen are 7.18mg/L which is a very crucial parameter in supporting aquatic life. While the pH levels are 7.80 with water transparency average 59.50cm. Chlorophyll-*a* a very important component of determining a lake's productivity is 0.3mg/L. The average water transparency (secchi depth) is 59.50cm. These levels indicate that Lake Naivasha is a healthy lake and supports aquatic life from the increased fish catches observed and growth of aquatic plants.

## What is water quality?

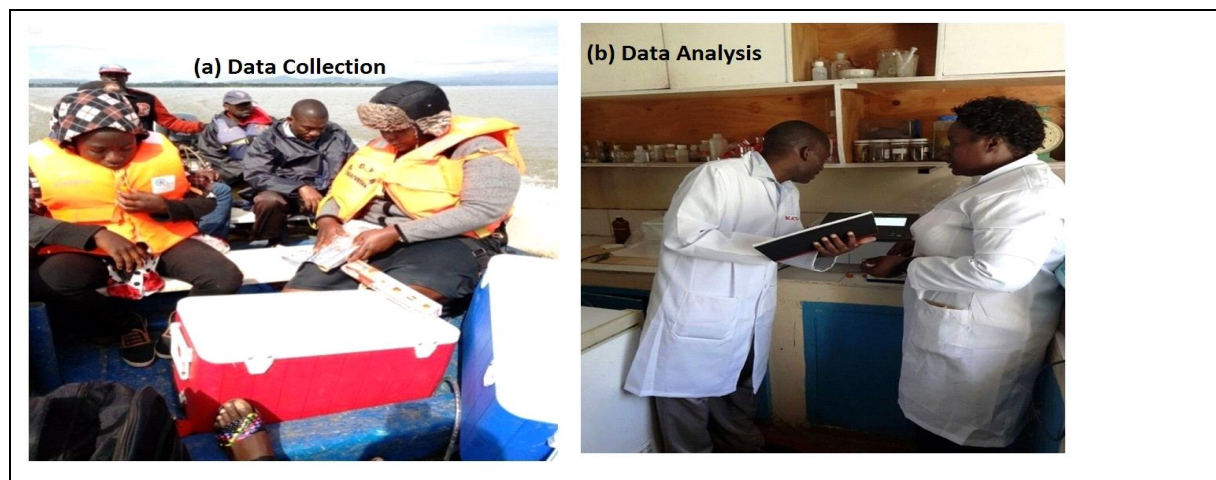
*By B. N. Obegi, KMFRI, Naivasha*

Water quality is the degree to which water is clean; whether it is suitable for drinking, for making plants grow or for fish to live. To establish the cleanness of water we look at several parameters; dissolved oxygen, water transparency, bacterial levels, and concentration of algal and other determinants such as trace metals and pesticides. The minerals that determine quality of the water are Nitrogen, phosphorous and other chemicals.

Primary productivity (photosynthesis) in any aquatic ecosystem is the basis of life. Photosynthesis requires Oxygen, Light and chlorophyll for it to take place. The amount of food (biomass) available in any aquatic environments determines the type, quantity and quality of fish.







## Multistakeholder Approach to Management of Lake Naivasha

By P. Boera<sup>1</sup>, R. Mwangata<sup>2</sup>, R. Lewo<sup>2</sup>, Judith Ochieng<sup>3</sup> and S. Chege<sup>3</sup>

<sup>1</sup>KMFRI, Naivasha, <sup>2</sup> Fisheries Department, Nakuru County, <sup>3</sup> Kenya Wildlife Service, Naivasha

In Naivasha Kenya Marine and Fisheries Research Institute (KMFRI) carries out regular fish stock assessment by looking at how much fish is caught by fishermen using the different fishing net sizes and boats as well as assessing the most efficient mesh sizes. This together with an understanding of the different fish species and their biology (maturity, feeding, breeding and recruitment) provides a basis for the regulations and options for managing the Lake. It is also important to monitor the water that is a habitat for fish by looking at the quality (DO, salinity, turbidity, circulation etc.), primary and secondary production, sources and levels of nutrients; water hyacinth and other aquatic weeds as well as mapping the critical fish habitats. The fishery of Lake Naivasha supports many and it's important to assess the economic impact normally done through household and market surveys and understand the role played by these communities on its management. As a means of providing alternative livelihoods and to reduce pressure on the resource, KMFRI is also offering quality seed and feed to fish farmers in the region and increasing the price of fish through promotion of value addition of tilapia and catfish in value chain enterprises.



The Department of Fisheries in Lake Naivasha enforces the fisheries management measures through monitoring control and surveillance (MCS), promotes co-operation among fishermen; provides arrangements for the orderly marketing of fish; infrastructure; and also stocks waters with fish. The department takes a lead role in promoting sustainable fishery through enforcement of fisheries management measures as provided by the law.

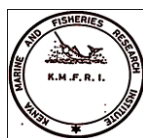
The Beach Management Units which comprise of the fishing communities on the other hand have been recognized as resource users under the BMUs regulations of 2007 and are therefore, co-managers of the fishery. Lake Naivasha has 5 BMU set –ups known as:

- Kamere Beach Management Unit landing at Kamere Beach
- Karagita Beach Management Unit landing at Karagita Beach
- Tarambete Beach Management Unit landing at Kasarani Beach
- Central Beach Management Unit landing at Central Landing Beach
- Oloidien Beach Management Unit landing at Oloidien Lake (Seasonal activities)



*Mr Raymond Mwangata, Fisheries Department addressing Karagita BMU Members.*

Kenya wildlife service being the custodian of all the Ramsar site is charged with the responsibility of protection of all Ramsar sites in the country with the guide of Management Plans of the wetland resource. Maintaining the uniqueness of these ecosystems in partnership with other agencies, and also acts the administrative authority and focal point for implementation of the Ramsar convention mission which is wise use of wetland resources and services since the mandate of KWS is to



Lake Naivasha is Kenya's second Ramsar site (a wetland of international importance) due to its peculiar ecosystem which is rich in biodiversity (animals, fish, birds and plants). KWS in partnership with other agencies is the administrative authority and focal point for implementation of the Ramsar convention mission which is wise use of wetland resources and services. The authority has a mandate to ensure the convention mission 'conservation and wise use of wetland' is implemented. The Service manages the protected wetland in consultation with the person or community who hold a legal or communal interest in the wetland and the relevant lead agencies in accordance with the Integrated Wetland Management Plan.

## Up-Coming Events

*Field day and exhibition, Kuresoi North, 21<sup>st</sup> March 2019*

*World water day, 22<sup>nd</sup> March 2019*

*Field day and exhibition, 11<sup>th</sup> April 2019*

*Field day and exhibition, Nakuru east and west, May 29<sup>th</sup> 2019*

*ASK show Nakuru June/July, 2019*

*Glow 9. An international symposium on Emerging frontiers for African Great Lakes- Promoting blue economy, food security and conservation taking place in Kisumu Kenya from 5-7 August, 2019. For more information visit <http://conferences.aehms.org/glow9/>*

All correspondences can be sent to:  
The Station Coordinator  
K.M.F.R.I.  
P. O. Box 837  
Naivasha

