Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

In brief:

1. *KMFRI releases 2023 tide tables for Mombasa and Lamu*
2. *New lease of life for cage farmers in L. Victoria*

BY: JANE KIGUTA & Dr CHARLES MAGORI
#OceanicTides @KmfriResearch

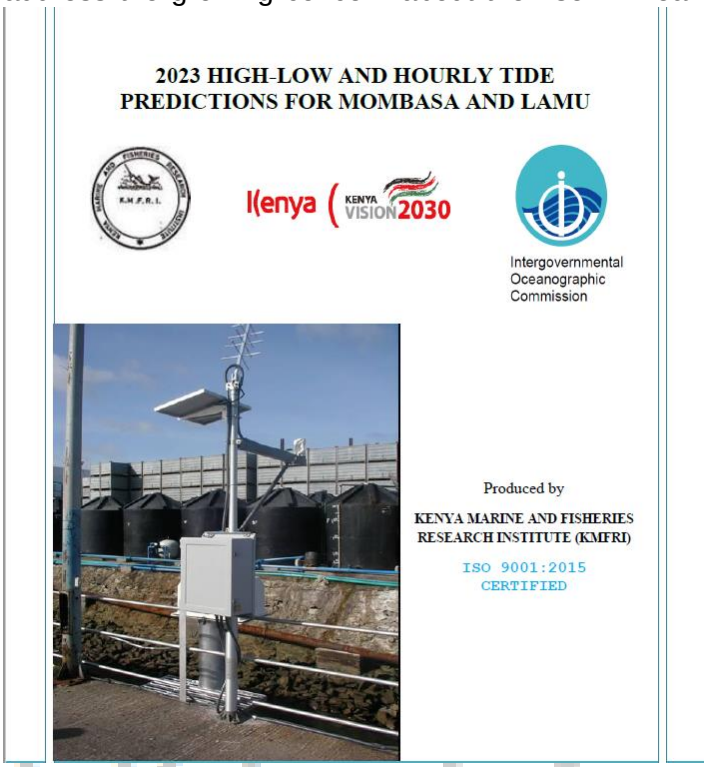
KMFRI releases 2023 tide tables for Mombasa and Lamu regions

Tide tables for Mombasa and Lamu are out!! Kenya Marine and Fisheries Research Institute (KMFRI) has released the 2023 tide tables for the two regions. The predictions are in form of high-low listings and hourly values.
Time series of sea level observations from the Mombasa and Lamu tide gauge stations were used as input data to make the predictions. The two gauges that are being managed by KMFRI are installed at Liwatoni jetty in Kilindini harbour, Mombasa and Lamu jetty respectively.

The tables were generated using a special software (T_TIDE) developed by University of Hawaii Sea Level Centre (UHSLC). The software runs on MATLAB platform.

"Both Mombasa and Lamu are principal stations on the Global Sea Level Observing System (GLOSS), a global network of tide gauges for monitoring climate change induced sea level rise. They are also dedicated components of the Indian Ocean Tsunami Warning System (IOTWS). Hourly data generated by the two stations can be used to either confirm or cancel a tsunami warning throughout the region," says KMFRI senior research scientist Dr Charles Magori.

The Intergovernmental Oceanographic Commission (IOC) of UNESCO developed a Global Sea Level Observing System (GLOSS) program in 1985 to address the growing concern about the rise in mean sea level around the globe. The objective of GLOSS was to provide high quality standardized data from which valuable sea level products can be produced for international oceanographic programmes such as World Oceans Circulation Experiment (WOCE) and regional research programmes, as well as for practical application on a national level. Kenya is one of the countries participating in GLOSS and has already received support and assistance in terms of training our specialists, and provision of equipment through IOC.



2023 tide-table booklet

What is a tide and why do we need tide tables?

The tide is the alternate rising and falling of water levels in the ocean. Tides are classified as high or low. High tides occur when waters rise and move out of the sea and form what appears like 'crests of water in the sea' and low when waters fall and move back to the ocean. The coast experiences a high tide when the waves or crests reach the highest point. Waters are

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

shallow during the low tide and deep during the high tide.

There are two types of tides namely neap and spring tides. Neap tide occurs when the sun and moon pull from opposite sides of the Earth creating a tide that doesn't change that much as they sort of cancel each other out. Spring tide on the other hand is caused by the pulling of the moon and the sun in the same direction which creates a really large pulling force and causes strong tides.

"Because the Earth rotates through two tidal "bulges" every day, coastal areas experience two high and two low tides every 24 hours. High tides occur 12 hours apart. It takes about six hours for the water at the shore to go from high to low, or from low to high." says Dr Magori.

Tide tables help ocean users to know the best time to engage in their preferred recreational and economic activities.

"Water activities such as fishing, boat riding, seaweed farming, diving in the estuarine and water transport depend on the state of the tides," says KMFRI physical oceanographer Mr Salim Athman. "Likewise, seaweed farmers go to their farms during low tides," he adds. "It's a lot of fun swimming in the ocean when the waters are deeper and fuller," said a colleague.

*Young men interrupt their swimming session to pose for a photo in Ngomeni, Malindi/**Photo by Milton Apollo***

"The best time to ride boats is when the waters are fuller because they help to propel the boat," said a maritime staff based at KMFRI.

The safest time to swim is during a slack tide when there isn't much water movement. This occurs an hour before or after a high or low tide. Swimming in waves with shorter intervals, which are calmer and less dangerous is also enjoyable.

Swimming back to shore is harder when the water is moving out of the sea because it creates stronger ebb currents.

Seaweed farmers usually wade through the above-waist waters, 350metres from the shores, to tend to the crop for a few hours, with timings depending on oceanic tides. Seaweed culture is extremely seasonal, and farmers must monitor the ocean environment and respond to changes.

In addition, recreational beachgoers and surfers need to understand the status of the tides to engage in their activities.

Aquatic creatures

Some marine organisms depend on tides to feed. Large fish found in the coastal areas feast on smaller fish that are washed ashore during high tides. At low tide, many aquatic creatures find themselves beached. They get stranded once they are out of the ocean and die due to predator attacks and oxygen depletion.

The wind and tides control the ocean's global circulation, moving its waters all over the planet and mixing up its temperature, salinity and nutrients, which affect concentration of fish in a given area. Additionally, phytoplankton and zooplankton are drifters and when waters mix it leads to high fish productivity, which make fish move to the area for food. When the tide is moving out of the sea, also referred as an ebb tide, small creatures lying on the beach or rocks are washed to the sea. This is a perfect opportunity for fish to feed.

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

At low tide, the beach is normally covered with tiny creatures, molluscs, worms and so forth. These organisms are covered with water once the high tide kicks back in and become food for the large fish.

Depending on the type of fish and depth of the water in a particular area, fish may concentrate during ebb. In some places, strong tidal currents concentrate bait and smaller fish, attracting larger fish.

Sea turtles

Sea turtles lay their eggs in the sand and during high tides they easily propel themselves ashore for spawning. Once the eggs hatch, the tiny baby turtles are washed back to the sea during low tides.

Fishing

Tides dictate the success or failure of sea fishing. It influences how the fish feeds, where fishes can be found and their likely presence at any one given time. Fish generally like running tide because it helps them feed better. Fishing from a low to high tide is easier than from high to low.
This is because the fish will be swimming towards you as they move back into the sea and as they feed on their delicacies which had been covered by waters.

Sea vessels

When a vessel is entering a harbour, inlet, a bay or an estuary to dock, a tide table is a major point of reference. In such water bodies, a low tide moors the vessel even before it can dock. A high tide on the other hand stops a vessel from docking. Therefore, a captain with tide information, will know the predicted height of the tide and navigate accordingly and smoothly to their destination.

Shipping firms and industries use tide tables to predict the trends of the marine life. For shipping businesses in fisheries trade, a low-tide prediction will help them know where certain species of fish are located since they concentrate in one area during low-tides. This will help to catch more fishes.

A tide table is an important tool for marine engineers since it helps in charting out construction stages of water-bridges and other coastal structures. Tide table data relays tide information to boats and ships which enables them to navigate to the harbour safely.

Science technologies are so advanced today which makes it possible to generate critical data that can avert natural disasters and calamities. Tide table is one of those advancements which ensures we are not caught off-guard by natural occurrences such as extreme oceanic events.

Young men help to launch KMFRI's research vessel in Kipini|
Photo by Jane Kiguta

Most fisher communities, however, still depend on indigenous knowledge and rarely bother to check the tide tables.

Real-time quality controlled sea level data is available for free at the following links:

www.ioc-sealevelmonitoring.org
https://uhslc.soest.hawaii.edu/stations/?stn=101#tidecal (*data for Mombasa - 1986 todate*)
https://uhslc.soest.hawaii.edu/stations/?stn=149#tidecal (*data for Lamu - 1995 todate*)

By: Dr Christopher Aura, Phionalorna Nzikwa, & Charity Mukabane

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

Hope for fish farmers as government reintroduces new measures to resuscitate cage aquaculture in L. Victoria

Cage farming has given the aquaculture sector a big boost both economically and socially. For intensive cage farming in Africa, the challenges might be overwhelming, but more investments are required together with a conducive economic, political and regulatory environment. Technical drivers such as the availability of feeds and seeds, as well as the construction of infrastructure and resources are essential for the production of fish capacity for cage culture in L. Victoria to minimize conflicts and enhance fish production.

Notably, the Government of Kenya through a 17-member task force of the Blue Economy has come up with new measures to bring back to life cage aquaculture in Lake Victoria following a crisis that led to about 364 million fish deaths translating to over 1.4 billion Kenya shillings.

The task force was formed to avert the losses incurred by 135 fish farmers from Ogal, Asal, Kobutho and Achuocho beaches last year from September through to November. The deaths were caused by the suffocation of fish due to lack of sufficient oxygen accelerated by increased lake-nutrient enrichment (commonly referred to as pollution from within and without). Increased nutrient enrichment caused increased algae levels, decomposing and using dissolved oxygen.

Fish mortalities at Victoria. Photo courtesy of https://thefishsite.com

Image of sample cage farm in Lake Victoria

High-temperature levels of up to 28°C emanating from climate change effects may have further catalyzed the deaths of fish in the cages as the temperatures speeded up the decomposition of organic matter originating from within the lake and land sources such as fertilizers from farms, which deprive the fish of oxygen leading to their suffocation. The existence of cages in shallow zones (less than 10.0 m, mainly in the gulf) exacerbated the fish kills and death phenomenon due to minimal cases of water circulation (to generate more dissolved oxygen) and confined cultured fish with no room to escape.

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

Sample image of cage farms at the shore of L. Victoria

Upwelling of the lake waters added to the phenomenon with pockets of this natural activity occurring in various spots in the lake (known as spotted upwelling – which is unpredictable and occurs many times and at any time).

"Upwelling occurs when (cold) bottom waters with low oxygen (or zero oxygen due to increased decomposition) replace warm surface water due to water currents. In this case, these low (or zero) oxygen waters are dispersed over a distance and the scope of which could be at a cage site that suffocates the fish which may have no room to escape."

"However, upwelling alone could not kill the fish, unless the waters experiencing turnover have low dissolved oxygen levels," said Dr Christopher Aura, Director Fresh Water Systems while addressing the media.

Therefore, the task force recommended that a national inter-agency cage farming committee be established and domiciled at the State Department of Blue Economy and Fisheries (SDBEF) to advise where and how to cage farm.

The committee shall include representatives of state and non-state actors involved in aquaculture and cage farming research and management. Farmers should be sensitized and advised on adherence and enforcement of best management practices as well as areas suitable for cage aquaculture to minimize losses and increase compensation through insurance. This meant that farmers needed to move cages to deep waters (about 10m depth) where there is more oxygen.

They also advised that the farmers are given subsidies more on the retail price of fingerlings so as to help them bounce back to their income generation activities which enhances their livelihood.

Image of a sample cage farm in Lake Victoria

To minimize Lake use conflicts and improved the citing of cages, the committee recommended that Lake Victoria spatial planning be fast-tracked in order to sharpen the suitable sites for various lake use activities and a better scheme for licensing of small-scale & large-scale fishers and cage investors.

Additionally, quarterly and continuous monitoring & surveillance and enforcement on point sources of pollution are to be done so as to spot any (sewage) contamination leaks early enough.

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

An officer conducting a water analysis to establish if there is pollution

The rollout of the Sustainable Activities in Water Areas (SAWA) project last year in Western Kenya served as a major boost to the local fish cage farmers, more so those on Lake Victoria.

Dr Christopher Aura giving a presentation during the SAWA project launch

The Gatsby-funded project is being implemented by a consortium of government institutions and led by KMFRI and spearheaded by the KMFRI Director of Fresh Water Systems, Dr Christopher Aura. The project's overall aim is to carry out spatial planning for the freshwater lake to determine its carrying capacity for the cage–based aquaculture.

Lake Victoria is fast gaining prominence in aquaculture production; this began with a pilot between Kenya Marine and Fisheries Research Institute (KMFRI) and Uganda National Fisheries Resource.

According to KMFRI CEO Prof James Njiru, Lake Victoria has the capacity to carry about 25,247 cages but currently only contains 6,000 cages covering 62,132M^2 with an annual production of 10,000 tonnes. KMFRI introduced fish cage farming in 2013, to increase both the quality and quantity of fish. Fish cage farming would enhance the sustainability of the caging system, which would help the farmers and the government reduce their loss gap.

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

PICTORIALS

Compiled By: Phionalorna Nzikwa & Jane Kiguta

PS State Department of Fisheries & Blue Economy Hon Betsy Njagi at Liwattoni Fisheries Complex flagging off seafarers going for deep-sea training

KFMRI researchers newest PHD holders Dr Charles Mitto Kosore and Dr Esther Wairimu Gikonyo during the graduation ceremony at Pwani University, Kilifi. KMFRI boasts more than 30 research scientists with doctorate degrees.

KMFRI Turkana station team during a research expedition on post-harvest losses on Lake Turkana

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

KMFRI Research Scientist Dr Peter Odote guides Deputy County Commissioner Joseph Sawe during the Solar Cooling and Drying (SOLCOOLDRY) launch at Mwazaro, Kwale County

KMFRI Scientists led by CEO Prof. James Njiru participate at the Great Lakes of the World (GLOW10) conference in Dar es Salaam, Tanzania

KMFRI staff Ms. Norah Mwangangi exhibits seaweed value-added products during the SOLCOOLDRY facility launch

Mtafiti Monthly

A PUBLICATION OF KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
@KmfriResearch

ISSUE #33
JANUARY, 2023

KMFRI Assistant Director Fisheries, Dr Nina Wambiji offering a presentation on the Billfish Frontiers at Alliance Francaise, Mombasa.

KMFRI BOM tour Mombasa station - fish ponds to understand how fish are reared to maturity.

KMFRI Research Scientist Salim Athman performing a greenhouse experiment for desalination of seawater and adaptation to climate change to curb Food Insecurity in Kadzuhoni