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BY BRIAN ISOE, DAVID MWOMA & JANE KIGUTA
#InternationalDayofMangroveConservation

KMFRI takes lead in mangroves restoration guidelines launch at global fête

This year's celebrations to mark the International Day for the Conservation of the Mangrove Ecosystem went a notch higher, with the launch of programs that support calls for sustainable management and protection of the mangrove ecosystem stealing the show.

The organizing committee of the International Day of Conservation of the Mangrove Ecosystem led by the chairperson of the National Mangrove Management Committee (NMMC), who is also a Principal Research Scientist at Kenya Marine and Fisheries Research Institute (KMFRI) Dr. Judith Okello had lined up a series of activities for the whole week ahead of the main event all geared towards raising awareness on the important role mangrove forests play in conserving our marine ecosystem.

Partners drawn from the county government of Kwale led by HE the Governor, Hon Fatuma Achani, Kenya Forest Services, World Worldwide Fund, Kenya Fisheries Services, Plan International, Big Ship CBO, and many others joined hands in planting mangrove seedlings at Mkupe-kwa Mekwekwe Nyanje Tsunza in Kwale county to commemorate the international day of mangrove conservation.

Top, KMFRI's Principal Research Scientist and NMMC Chair Dr. Judith Okello unveils mangroves documents. Bottom, World-renowned KMFRI's Chief Research Scientist Dr. James Kairo delivers remarks at the mangroves fete in Tsunza Kwale county.

In pomp and colour Dr. Okello led the delegation in launching the national mangroves ecosystem restoration

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guidelines that will be instrumental in providing a clear roadmap for mangrove planting and restoration.

Kwale Governor HE Fatuma Achani receives the launched mangrove restoration documents.

The mangrove tree nursery manual in Kenya will guide in selecting suitable sites to establish mangrove nurseries, while the national mangrove portal will be home for all data on mangrove cover, species distribution, stakeholders working in the mangroves, national documents and research papers related to the mangroves which will be made accessible to the public.

Why celebrate mangroves?

As a crucial fish and crab breeding ground and habitat, mangroves provide food for millions of coastal residents in the tropics and subtropics. Mangroves shield the coastline from hurricanes, storm surges, and wave erosion, preserving property and life. They are also an essential part of the marine food web and provide a home for various aquatic species.

The International Day for Conservation of the Mangrove Ecosystem is a holiday celebrated every year on 26 July. The holiday was established by the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2015 and was first held in July 2016. This day raises awareness of the critical role mangroves play in supporting biodiversity, acting as natural coastal barriers, and serving as effective carbon sinks.

According to current estimates, throughout the last 40 years, mangrove coverage has decreased by a factor of two prompting UNESCO to emphasize the urgency of conservation efforts. Through Global Geoparks, Biosphere Reserves, and World Heritage Sites,

KMFRI staff warm up for mangroves fun run ahead of the global fete

UNESCO is at the forefront of international efforts to save mangrove habitats. These efforts are part of a broader commitment to safeguarding blue carbon ecosystems, which are crucial for mitigating climate change and preserving the ecological balance.

The unsung heroes of our planet, coastal mangroves, are under unprecedented attack. The preservation of coastal ecosystems depends on these dense tropical forests, which are located where land meets the sea. In addition to

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preventing soil erosion and acting as natural barriers against storm surges, they are also important as marine species' nurseries.

However, these essential ecosystems are being pushed to the brink by industrial activity, climate change, and growing urbanization.

According to recent studies, mangrove forests have lost about half of their area in the last 50 years, which is an alarming rate of disappearance. Mangroves store up to five times more carbon than terrestrial forests, therefore the implications are dire: massive carbon emissions, loss of biodiversity, and greater susceptibility to natural disasters.

Around the world, conservation initiatives are in progress. It is essential to implement programs like protected areas creation, reforestation, and sustainable management techniques. Involving local populations in conservation efforts and educating them about the value of mangroves are also essential. Strict regulations and international cooperation are necessary to stop future deterioration.

Mangroves build-up activities

Various organizations on the 20th of July took part in a mangrove Fun Run Mud Bath in Mombasa County, bringing together blue economy stakeholders to raise awareness on the importance of the mangrove ecosystem. This event was a build-up to the International Day for the Conservation of the Mangroves. The fun run comprised three categories of races ranging from 2km, 5km, and 7km, which culminated in a mangrove planting exercise dubbed the 'mud bath' in the degraded areas of Mikindani.

KMFRI's Dr Judith Okello delivers remarks at the mangroves fete.

A few days later, the committee, on 25th July, held the National Dialogue on Mangrove Restoration in Kenya titled ''Demystifying Mangrove Restoration in Kenya: Lessons from Success and Failure, and Creating a Path for Best Practices" session in Diani Reef Hotel Kwale County.

This dialogue brought together diverse actors all with the same agenda of planting and conserving this gem and increasing its forest cover in the country.

Kenya boasts of around 61,271 hectares of mangrove forest along the Kenyan Indian Ocean, but Dr Okello was quick to point out that there is more to be done towards increasing the forest cover. Speaking at the dialogue, she emphasized the need to plant the right species of trees in select sites.

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Participants attending the National Dialogue in Diani Reef hotel Kwale county.

Dr Okello called upon all collaborators to work together in restoring mangroves, take charge of the initiatives, and lead by example in practising good science for better conservation efforts.

She likened the "Chornobyl" accident to the destruction of mangroves where the effects of the accident happened in a single day but are still felt to date many years later.

The NMMC Chair noted that the destruction of these mangroves is detrimental to the ecosystem, and restoration projects are key in intervening to restore degraded mangroves.

The stakeholders in unison acknowledged the need to work together and address key threats affecting the mangrove ecosystem in the country and the region at large. "We cannot sit down and watch without taking action," was the clarion call.

Planting of these mangroves is in line with the government's ambition to plant and grow more than 15 billion trees to remedy the effects of climate change and the mangrove ecosystem is one of the ways to intervene and bridge the gap of forest cover in the country.

KMFRI's Principal Research Scientist Dr. Judy Okello presenting at the mangrove dialogue.

However, Dr Kairo speaking in Kwale County during the national mangrove dialogue, expressed his concerns with the approach taken by activists concerning planting mangrove forests without adhering to set guidelines.

"We cannot practice science of the stupid and expect better results, we need to follow the guidelines in our manuals to achieve success". "This can be done through a community-based approach, planting of the same species close to where that species grows naturally, ensuring sites are protected from harmful human activities as well as livestock, and ensuring proper monitoring is done for a period not less than five years," he added.

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At the same event, KMFRI's Research Scientist and mangrove expert Dr Kipkorir Lang'at provided regional perspective on mangrove restoration covering Western Indian Ocean.

KMFRI Senior Research Scientist Dr Jelvas Mwaura, with bias in coral reefs, delivered his presentation titled 'Promoting Coral Reefs for Biodiversity Conservation and Livelihoods through Community-based Reef Restoration'. The dialogue offered a unique platform for the academia and different individuals from the mangrove committee to have discussions revolving around the best approaches and tools that would guide the management and conservation of the mangrove ecosystem.

KMFRI's research scientist Dr Kipkorir Lang'at makes his presentation at the National Dialogue.

KMFRI's senior research scientist Dr Jelvas Mwaura delivers his talk at the National Dialogue .

KMFRI's Chief Research Scientist Dr James Kairo at the National Mangrove Dialogue.

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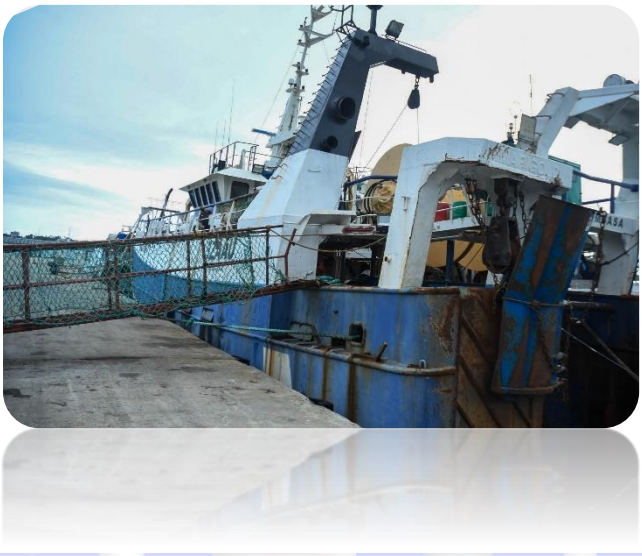
COMPILED BY Dr Edward Kimani, Brian Isoe and Phionalorna Nzikwa ***Edits: Jane Kiguta***

KMFRI among key state agencies piloting Electronic Monitoring system to boost access to fisheries data

The Kenyan government is conducting an industrial fisheries Electronic Monitoring (EM) pilot project for the maritime industrial fishing fleet through the Kenya Fisheries Services (KeFS) and Kenya Marine and Fisheries Research Institute (KMFRI).

EM is the autonomous tracking and verification of fishing activity aboard fishing vessels by the use of sensors, GPS, and onboard video cameras.

With funding from The Nature Conservancy (TNC), the initiative aims to enhance Kenya's marine fisheries transparency via electronic monitoring and support Fisheries Monitoring, Control, and Surveillance (MCS) methods. By 2030, the EM pilot project hopes to educate the Kenyan government and secure its commitment to 100 per cent transparency in all industrial fishing vessels.



Preliminary data collection ship docked at Liwatoni port in Mombasa.

In this regard, KMFRI held a 3-day workshop from 24th to 26th April 2024 at Kenya Fishing Industries Corporation (KFIC), Liwatoni Fisheries Complex, Ganjoni, Mombasa County, Kenya. The workshop was aimed at enhancing capacity for KeFS, KMFRI and partners on how to use software (MONITOR) to perform EM data with a focus on data retrieval, review, analysis, and reporting, and discuss the lessons learned from the pilot.

The workshop also served as a platform for the lead project investigators to share preliminary data results collected from the pilot study conducted in that period. This was key in showcasing the strides the electronic monitoring project is bringing in the fisheries sector. A

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clear framework and guidelines on handling data streaming was also be discussed to ensure data is preserved and accurate

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During the workshop, KeFS and KMFRI staff were trained on how to package the resultant data into tables or graphics detailing EM results. The participants also discussed and documented the process, roles and responsibilities to provide the pathway for what happens once analyzed EM data is available to the Kenya government.

The electronic monitoring members pose for a photo in front of the vessel conducting the pilot.

The rolling out of these systems in Kenya is projected to ease and fast-track data capture supported by internet, cellular and satellite connectivity for real-time data transfer. Fishing vessels in the ocean will be monitored without challenges as the cameras and sensors will be able to reflect the activities going on onboard the vessels and around the surrounding waters.

Participants analyzing preliminary data from the pilot program conducted

Data monitoring, or real-time monitoring, is an oversight mechanism that monitors and ensures the quality of data collected through the use of software that is synchronized with the monitoring gadgets that issue real-time data. This will ensure data is complete, consistent, accurate, secure, and valid.

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The participants will be appraised of the process and its user interface on the computer system.

Technology used to capture data matters

The development and industrialization of marine fisheries is a key component of the Kenya Blue Economy agenda. The marine fisheries sector worldwide loses much information during data collection from fleets carrying out fishing activities in the Exclusive Economic Zone (EEZ).

Industrial fishing vessels capture a wide range of fish whose data isn't reflected in fisheries databases due to lack of proper technology to capture accurate records of fishing operations.

Key data and information required for management include the species, quantities of retained as well as discarded catches, as well as the capture and fate of Endangered, Threatened and Protected species (ETPs). This situation renders the determination of conformity to fisheries regulations and the assessment of the health of the stocks to support management and sustainable use, by fisheries authorities very difficult.

Dr Esther Wairimu, Douglas Okemwa, Brian Isoe and Phionalorna Nzikwa *Edits: Jane Kiguta*

Prawns bred using biofloc technology record higher growth and survival rates, KMFRI study reveals

Ongoing experiments at the headquarters hatchery in Mombasa

Kenya Marine and Fisheries Research Institute (KMFRI) mariculture research scientists have released results of a study carried out in the last financial year. The experiment was aimed at assessing the growth performance and survival of *Penaeus monodon* in biofloc treatments grown with different carbon sources and reared in tanks with and without sand substrate.

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In the experiment conducted for 120 days, findings revealed ***Penaeus Monodon,*** a prawn species post-

Penaeus Monodon larvae, exposed to biofloc treatments

larvae, exposed to biofloc treatments recorded higher survival and growth rates when the sand substrate is utilized than when it is not.

And as the potential of mariculture along the Kenyan coast picks pace, KMFRI has responded by spearheading the adoption of emerging technologies such as the use of biofloc in rearing fish to increase fish consumption as well as culturing of diverse species among the communities along the Kenyan coast.

The research scientists disseminated the results in a workshop held in Kilifi County that brought together aquaculture representatives from the five coastal counties namely Kwale, Mombasa, Kilifi, Tana River and Lamu, including fisheries officers and fish farmers.

Researchers were urged to continue educating farmers on the different technologies and how they can boost fish farming in the Blue Economy space.

Penaeus Monodon is among the most significant prawn species in the world because of its commercial value in the market. It is commonly known by diverse names namely the black tiger shrimp, huge tiger prawn, or Asian tiger shrimp.

Biofloc technology in fish culture has advantages ranging from enhancing water quality management, lessening environmental impact, and raising production since flocs provide an additional protein-rich food source for the shrimps.

From previous interventions in the aquaculture industry, the use of biofloc has shown to be a promising technology that promotes the retention of waste and its conversion to microbial flocs used as natural food for fish in the aquaculture system.

Aquaculture has become one of the fastest-growing sectors in the food industry, supplying more than 50 per

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cent of global fish demand, and it is against this background that KMFRI swung into action.

Methodology

In this study bioflocs were developed using molasses and cassava as carbon sources in shrimp rearing tanks with and without sand substrate to assess their growth and survival rate.

Molasses and cassava flour were introduced into the water to stimulate the growth of heterotrophic bacteria. Also, urea and calcium hydroxide were added to the tanks as sources of nitrogen and phosphorous. Regular monitoring of water quality parameters such as ammonia, salinity, turbidity, temperature, pH, and dissolved oxygen levels was done as it is essential throughout the biofloc development process.

Penaeus monodon under study was introduced into the developed biofloc culture system where microorganisms, including bacteria, algae, and protozoa, formed aggregates known as bioflocs.

The cultured organism utilizes these bioflocs as a natural food source, which in turn remedies the expenses required to purchase external feed inputs and increases biosafety in aquaculture.
To promote microbial growth, the biofloc system usually works by supplying a high-protein feed source to the cultured organism.

Excess nutrients in the water, including phosphorous, carbon and nitrogen, are absorbed by the microorganisms and transformed into biomass that the cultured species can eat.

Through the reduction of trash buildup and the promotion of a healthy habitat for aquatic species, this technology aids in the maintenance of appropriate water quality.

In this study, researchers used broodstock from the wild in Sabaki Kilifi County, which was supplied by fishermen who use trawlers. Collected prawns were then transported to KMFRI headquarters under keen observation with an aerator installed in all tanks to ensure no mortalities occurred.

The study was undertaken at the institute's headquarters marine hatchery with different parameters under close observation including water quality, the stocking measurements of weight and the length of the shrimps at their initial stage before conducting the experiment.

The collected broodstock were quarantined upon arrival at the marine hatchery. After being observed for 3 days, the stable prawns were put in separate tanks for acclimatization and further feeding to enhance maturation. Feeds such as *polychaete* worms, clams and tuna eggs were used and given to the broodstock at least 4 times per day. Upon maturation and moulting,

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ripe specimens were selected from the stock and breeding induced using the eyestalk ablation technique.

The broodstock were then paired at a ratio of 1 male to 3 females and put in separate tanks to facilitate mating. Close observation was done to check the female prawns with fertilized eggs which were then put in separate spawning tanks. After spawning, the fertilized eggs were carefully managed to enhance hatching and survival. After hatching the larvae were fed live feed such as algae and artemia, and water quality in the nursery rearing tanks was closely monitored.

Why biofloc technology?

This technology is also important in reducing dependency on outside feed by minimizing the need for expensive protein-based feed and improving the growth rate as well as the survival rate of the organisms, making it cost-effective and sustainable in the long run. Nevertheless, to guarantee ideal circumstances for the growth of microorganisms as well as microbes, there is need for close observation to ensure the accuracy of results.

Why is *Penaeus monodon* called Black tiger shrimp?

Because of its distinguishable characteristic black stripes carved on its shell. Its maximum length is usually 33 cm (13 inches).

The Indian and western pacific oceans, together with the Indo-Pacific area, are home to this species and are mostly found in the coastal region covered with mangrove forests and estuaries.

Coast region aquaculture and mariculture farmers during the dissemination of the report in Kilifi county

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Phionalorna Nzikwa, Mary Joseph & Maliki Fumbwe ***Edits: Jane Kiguta***

Change of Guard: KMFRI welcomes a new head as the former exits

It was a sweet and sad moment as immediate former Kenya Marine and Fisheries Research Institute (KMFRI) Chief Executive Officer Prof James Njiru handed over the office to the incoming Ag Director General Dr James Mwaluma, who is also a Chief Research Scientist, after an illustrious career at the Institute spanning 23 years.

Prof Njiru started as an assistant research officer in 1990, and over the years climbed up the career ladder, which saw him serve KMFRI for 13 years in various positions. He then left for further studies, only to return as the Institute's head in 2016 with vast experience and knowledge, enabling him to skillfully steer the organization for 8 years.

At his handing-over ceremony which took place on the 5th July 2024 at the institute headquarters, Prof thanked all the staff for giving him what he termed "maximum cooperation" during his tenure and asked them to accord similar support to now the acting Director General Dr. Mwaluma.

KMFRI has over time morphed into a World Class Centre of Excellence in innovative research for Sustainable Blue Economy and Fisheries development.

The institute's current funding through grants stands at Sh300 million, a significant increase from Sh30 million 10 years ago. Prof Njiru attributed the massive growth in financing to his persistence in urging researchers to craft bankable proposals.

The institute currently has eleven inland stations spread

KMFRI former CEO Prof Njiru officially hands over to the incoming Ag CEO Dr James Mwaluma

across the country which includes Shimoni on the South Coast of Kenya, Mutonga in Tharaka Nithi and Naivasha in Nakuru County.

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KMFRI Kisumu Research Centre Administration Block

KMFRI Kisumu fresh water research centre now has acquired a new four-storey administration block from where the operations of the centre will be run.

The institute now boasts 19 new vehicles; an addition from the existing fleet that support research activities.

The Mombasa Headquarters Laboratory got a facelift as the institute invested in lab equipment valued at around one billion shillings. This massive investment has in a great way amplified research services offered at KMFRI.

KMFRI Mutonga Centre Main Entrance

"From the South of Sahara and North of River Limpopo, KMFRI has the best lab equipment," said Prof Njiru during the handing-over ceremony held at KMFRI Mombasa Headquarters boardroom.

The KMFRI Board of Management Chairman, Canon, Hon John Mumbai who was also present at the handing over ceremony, stated that he has seen the impact of the former CEO's work and the development he brought to the institute.

He urged the incoming CEO to pick up from where the former left off for more advancements.

He stated that the institute has for three consecutive years scored "Very Good" in the Performance Contracting targets, thanks to Prof Njiru's efforts.

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"I want to ask you to do your level best in wherever position you are, not for a reward, but for the good of yourself and those you are serving. Do it for humanity, and do it for God," concluded Prof Njiru as he bid KMFRI fraternity farewell.

KMFRI Ag. CEO Dr. James Mwaluma's Profile

KMFRI Ag Director General Dr James Mwaluma

Dr James Mwaluma is a seasoned Chief Research scientist with massive experience spanning decades in marine research with a bias in marine zooplankton and fish larvae.

He has participated in numerous multidisciplinary research within the institute and other institutions including universities, national and international research institutions through the development of joint research initiatives and partnerships to enhance the uptake of research activities on the Kenyan coast and the country at large.

Administratively, he will be involved in the implementation of the institute's management and policy documents including terms and conditions of service, scheme of service, research policy development, intellectual property rights, as well as ICT policy. He will also lead the institute in interpreting government guidelines and circulars through consultations to align the institute's policies to national and international standard.

As he gears up for the new role, Dr Mwaluma appealed to KMFRI fraternity to accord him support as they did with the former CEO to take the institute to greater heights.

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Trainers and trainees from central region posing for a photo after undergoing training on aquaculture characterization in the country.

Dr Okello delivers her keynote speech during the National Dialogue on Mangrove Restoration in Kenya dubbed 'Demystifying Mangrove Restoration in Kenya.

Dr. Casper van de Geer provides vital insights into the ecology of sea turtles utilizing the nesting beaches of Watamu.

National Mangrove Management Committee (NMMC) chairperson with KMFRI staff pose for a photo displaying the launched mangrove restoration guidelines.

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Dr Kipkorir Langat from KMFRI taking part in mangrove planting during the international day of mangrove conservation.

Ocean literacy stakeholders and artists pose for a photo during their one-week workshop at the institute.

Students on attachment in the socio economics department present what they learned during their 3-month stay at KMFRI.

Kisii County Governor H.E. Simba Arati on a guided tour of the KMFRI exhibition stand, conducted by the KMFRI Kegati Station Director Dr Paul Orina at the Southern Kenya ASK show, Kisii County.