



In brief:

1. North Kenyan Bank, the emerging fishery ground
2. KMFRI works to reverse climate change effects

BY: Dr JOSEPH KAMAU & Ms JANE KIGUTA
#fishproductivity #management @KmfriResearch

Huge fishery potential sits at North Kenyan Banks, KMFRI research reveals

The North Kenya Banks (NKBs) is emerging as the new national frontier for food security after research revealed high fishery potential sitting on the deep waters. The research was done onboard KMFRI's RV Mtafiti in collaboration with various national, regional and global partners, headed by KMFRI's Assistant Director Oceanography & Hydrography Dr Joseph Kamau.

According to information published in a policy brief titled *North Kenya Banks: Opportunities and Threats*, the NKBs has abundant and diverse plankton community. Phytoplankton are the foundation for aquatic food webs. They are eaten by zooplankton, small fish, and crustaceans, which are then fed on by larger fish and other marine organisms.



KMFRI's Dr Kamau and Mr Kilonzi inspect zooplankton samples onboard RV Mtafiti |Photo by Jane Kiguta



NORTH KENYA BANKS: OPPORTUNITIES AND THREATS

Prepared by the Kenya Marine and Fisheries Research Institute



Abundance of phytoplankton in the NKBs therefore signifies presence of larger fish in the deep waters, which supports artisanal and commercial fisheries.

The findings come following hydro-coustic surveys conducted by Kenya Marine and Fisheries Research Institute (KMFRI) oceanography and hydrography department headed by Dr Kamau.

Dr Kamau says it is assumed that a section of the Tana River sediments reported to be around 7 million tonnes annually settle at NKBs, which boosts fish productivity. Ocean upwelling at the NKBs enhances marine productivity by initiating massive blooms of phytoplankton with the effects cascading through marine food webs.



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Deep waters rich in nutrients are brought to the ocean surface during the North-East Monsoon (NEM) season - from January to February - enhancing marine productivity.

However, the strength, location and spatial extent of upwelling changes from year to year.

KMFRI's Dr Kamau-led team of researchers' onboard RV Mtafiti embarked on research cruises of the NKBs where water samples collected revealed trends of larval fish abundance. This implies NKBs region plays a key role in providing a favourable reproductive and nursery habitat for migratory fishes, including high-value commercial tuna and tuna-like species.

and the High Seas of the wider Western Indian Ocean (WIO) region," says Dr Kamau.

An important finding from these studies is the existence of highly admixed fish populations, suggesting the existence of single species-specific genetic populations that are interconnected with populations from other regions.

The NKBs extends to a maximum of 70km offshore. The bottom topography mainly constitutes rough coralline formations, steeping towards the deeper edges. As observed through RV. Mtafiti research cruises, the formations on the deeper steep edges are irregular suggesting a sediment deposition process.

Acoustic soundings revealed highly productive deep sea canyons with high unique fishery, opening new fishing frontiers at NKBs. The fisheries resources however have not been exploited.



A fisherman in Ngomeni, Malindi, carries a red-snapper/ Photo by Milton Apollo

Dominant fish larvae species found at NKBs during the South East Monsoon (SEM) season comprise anchovies, barracuda, snappers and jacks. High fish larvae densities of the highly migratory tunas namely yellowfin tuna, Albacore tuna, and skipjack, were recorded.

Kenya lies within the Tuna belt and is a member of the Indian Ocean Tuna Commission (IOTC).

"The studies show there is a strong oceanographic and ecological connectivity between the North Kenya Banks upwelling and neighbouring Tanzania, Somalia



KMFRI research scientists onboard RV Mtafiti retrieve acoustic data/ Photo by Jane Kiguta

There is a lot more to be done...

Following the results, the NKBs is therefore not just an emerging fishery frontier but a fishery ground with the potential of turning around the fortunes of Kenya's fisheries sector if fully exploited. The focus is now on



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the Kenyan Government to exploit the fisheries resources sitting on the deep waters of NKBs.

The North Kenya Banks potential for fishery resources was highlighted as early as 1959 in the world's leading scientific *Journal Nature*. However, progress in understanding the driving mechanisms behind the NKBs upwelling system and its significance for local marine ecosystems and fisheries has been slow.

Recent national and international research programs however brought a step change in the understanding of this critical system, and in the ability to diagnose upwelling impacts using satellite observations and numerical models.



KMFRI's AD Oceanography & Hydrography Dr Joseph Kamau with a Beach Management Unit official in Ngomeni, Malindi
/Photo by Milton Apollo

“And whereas information on fish productive zones can be availed, there lacks prerequisite capacity to effectively take advantage of the information. This may be addressed through an elaborate investment on fishing capacity and fish marketing structures,” says Dr Kamau.

“Much research is required to document fish stocks and understand their biology and the ecosystem's productivity dynamics,” he says.

Currently, local fishermen have overfished the nearshore coastal areas, with an exception of the NKBs fishing grounds which are relatively difficult to access. This calls for protection of the NKBs since it forms an important breeding area. If fishing is allowed to go on unabated, it can interfere with the recruitment patterns of the fish resulting in poor fish stocks for the future.

Malindi-Ungwana Bay, which is part of NKBs, harbours an economically important penaeid prawn resource that is targeted by both small-scale and semi-industrial trawl fishers.

The areas have a total of seven prawn species, with the Indian white prawn and speckled prawn dominating yearly catches of both small-scale and trawl fisheries. The life history of these species largely depends on both estuarine mangrove systems for feeding and offshore mud banks for breeding.

This region is therefore predicted to play a crucial role in the management of commercially important migratory species in the future.

Kenyan Blue Economy initiatives aspire to exploit marine fisheries resources throughout Kenya's EEZ and especially the North Kenya Banks. It is important to note that even though NKBs fisheries have a high fish biomass, available data on fish abundance is scarce which is detrimental to the sustainable management of the fisheries.

Continuous research is needed so that long-term trends on larval dispersal and population connectivity pattern can be established, and more so in view of the effects climate change.



Edits: Jane Kiguta & Brian Isoe #ClimateChange
#Sealevelrise @KmfriResearch

KMFRI teams up with ocean players to reverse harsh effects of climate change

Kenya Marine and Fisheries Research Institute (KMFRI) is working with like-minded organizations to beat the harsh effects of climate change. Historical sites and landmarks such as the Fort Jesus Museum, the entire Old Town of Mombasa with its numerous historical locations for example the Mandry mosque and Allidina Visram High School, the Old British Customs House, the Vasco da Gama pillar in Malindi, the Lamu Islands, and nearly all populated coastal towns along the Kenyan Coastline run the risk of being submerged due to the ensuing sea-level rise.

These historical sites are tourist destinations and a source of livelihood for the coast natives. Heritage sites have significant cultural, historical, and economic values but are at risk worldwide due to the harsh effects of climate change.

It is against this background that KMFRI is working to remedy the situation.

Long-term changes in temperature and weather patterns commonly known as climate change might be caused by natural processes or human activities. But since the 1800s, human activities caused by combustion of fossil fuels like coal, oil, and gas have been the primary cause of climate change. And with the continued human activities around the globe, the climate has been on the receiving end resulting in negative results for the world.

The rise of sea levels and ocean water acidification negatively affect the Kenyan coastline, heritage, and

the coastal community at large. Coastal residents largely depend on the ocean for livelihood, and a sick ocean puts their lives in limbo.

Thousands of families in the lowland coastal areas face the risk of being displaced by flooding occasioned by the rise of sea levels and other climate change consequences. They are forced to relocate to safer grounds.

The marine ecosystem has not been spared from adverse high temperatures that have risen by 0.14° Fahrenheit (0.08° Celsius) per decade from the year 1880 when accurate record keeping was introduced. The year 2021 was recorded as the sixth-warmest year on record, based on NOAA's temperature data.

High temperatures in the marine ecosystem lead to loss of marine life. They force migration of marine species from one habitat to another to increase their chances for survival.

Solutions to climate change



A signboard in Ngomeni, Malindi



Seawall construction



A poorly constructed seawall in Ngomeni, Malindi

Sea wall offers excellent coastal protection from erosion and coastal floods, and may save our national heritage sites. It performs flawlessly by establishing the land-sea border while giving the infrastructure next to the shores the same level of protection from the waters.

Mangrove rehabilitation

KMFRI in collaboration with coastal communities has been implementing projects to curb the adverse effects of climate change.



Mangroves in Malindi-Kilifi County.

For instance, the Institute helped develop Mikoko Pamoja project as a long-term solution to the adverse effects of climate change. Through the project,

seedlings were planted along the coastline in a rehabilitation programme aimed at restoring degraded mangroves.

The institute has been partnering with coastal communities and educating them on the importance of conserving mangroves, and encouraging them to plant more. This is being done because mangroves provide more cover that reduces wind energy and ability to erode sediments inland, which may damage seawalls.

Mangrove plants and bushes are often found in the upper and middle intertidal zones of soft sediment coastlines along tropical and subtropical coasts. They have stood the test of many hazardous environments hence in a better position to stop the rise of sea levels. They can withstand harsh climatic conditions and have a fast recovery rate when damage is done. The mangrove can reduce the severity of waves from the ocean waters, build up soils, and in the process reduce the intensity of hazards caused by the rise of sea levels toward the inland. The mangroves also play a vital role in trapping carbon dioxide from the atmosphere.

KMFRI is participating in planting and rehabilitating mangrove forests in Kwale, Vanga, and Lamu.

Coral reef restoration

Further, KMFRI is restoring degraded coral reefs by replacing them with healthy ones. Coral reefs are facing challenges from carbon emitted by greenhouses, and ocean acidification which contribute to coral bleaching. These are imminent dangers that might lead to their extinction.

High temperatures occasioned by global warming pose a major threat to the survival of these marine organisms.

Humans depend on coral reefs for their livelihoods and the impact of damaged corals is felt by people.

Reefs also provide a habitat for the marine ecosystem and thousands of species. Without them, biodiversity



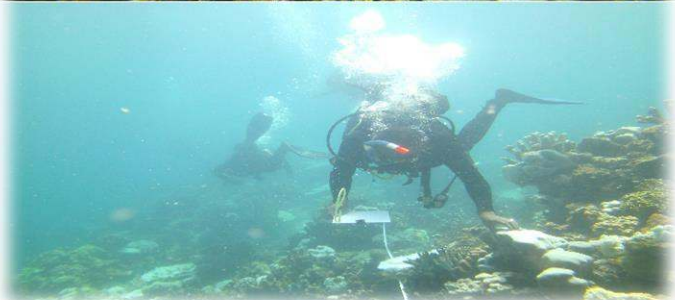
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is threatened, and hence the need to scale up restoration efforts.

KMFRI replanted coral reefs in Wasini by replenishing bleached corals and replacing them with others. The institute is keen to replicate the project in other areas to restore the reefs. This is a big step in the fight against the effects of climate change.



Top, coral reefs. Bottom, coral replantation exercise in Wasini by KMFRI research scientists.

During the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27), that took place on 20th November, 2022, in Egypt, professionals drawn from diverse fields across the globe came together to discuss ways of mitigating the harsh effects of climate change.

To achieve this, proper policies and frameworks have to be put in place and implemented to safeguard our environment. Timely and critical measures play a key role in achieving a sustainable and conducive climate.



Wasini people collect coral fragments from donor healthy coral reefs for transplanting

Some content in this article was extracted from a paper written by a Blue Economy enthusiast



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KMFR I CEO Prof James Njiru hosted a Chinese delegation from the Second Institute of Oceanography under the Ministry of Natural Resources of China (SIOMNR) which was led by their Director General, Madam Fang Yinxia. Together they discussed areas of common interest in marine oceanographic research.

KMFR I Alcohol and Drug Abuse (ADA) Chairman Dr. Peter Odote in partnership with NACADA at KMFR I Kisumu station where they facilitated a workshop for ADA Peer Trainers. This workshop seeks to train managers, and supervisors and sensitize staff to help reduce alcohol prevalence in workplaces and families, and mitigate the negative effects of Alcohol and Drug Abuse in the Institute.



KMFR I hosts University of Murang'a students at her auditorium, Mombasa headquarters, during their educational tour of the Institute. They learnt more about KMFR I's research mandate under the Ministry of Mining, Blue Economy, and Maritime Affairs.



KMFR I employees based in Kisumu Research Centre underwent a Safety and Health training facilitated by KMFR I's Mr Harrison Ong'anda and Ms Sylvia Mathu.



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Students from Chuka University pursuing a Marine Biology course during their tour of KMFR I's lab facilities where they gained practical knowledge of the lab operations. KMFR I's research experts were on hand to share information on fish culture, aquaculture, management exploitation, conservation of marine resources, deep-sea ecology, and marine species diversity.



KMFR I team Josephine Kerubo and Douglas Mandela perform filtration of water samples to analyze Total Suspended Solids (TSS) and chlorophyll. Chlorophyll is a key component for productivity as a primary provider of energy in the food chain. TSS is being analyzed because in high concentration it reduces water visibility and clogging in the fish gills hence leading to death and also prevents the penetration of sunlight in the water



KMFR I Board Chairman Hon John Safari Mumba, Chair of the KMFR I Board Scientific and Technical Committee Prof Kimani Njunge, and KMFR I CEO Prof James Njiru pose for a photo after a brainstorming session with the institute's PhD researchers on utilizing the highly skilled capacity at the institute to improve the performance of KMFR I and deliver on its mandate.



KMFR I Research Scientists Dr. Jacqueline Uku (R) and Dr. Lillian Daudi (L) delve into the topic 'Exploring the Savannas of the Kenyan Coast' during the monthly Café Science at Alliance Française de Mombasa.