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Kenya Marine and Fisheries Research Institute

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Edits: Jane Kiguta

KMFRI's significant milestone in prawn breeding at Shimoni marine hatchery

Kenya Marine and Fisheries Research Institute (KMFRI) has achieved a significant breakthrough in breeding trials conducted for the Indian White Prawn (*Fenneropenaeus indicus*) - locally known as '*Kamba Mweupe'* - in two successful spawning and larviculture runs that took place at the national marine hatchery in Shimoni, Kwale County on July 7, 2024.

Collected brooders ready for transportation.

Approximately 60,000 and 600,000 seeds released in the first and second spawning runs, respectively, were stocked in the hatchery.

Gravid Indian White Prawn (Fenneropenaeus indicus) prior to egg release or spawning in larval rearing tanks (LRTs).

Broodstock induction technique using unilateral eyestalk ablation was employed in the trials, with brooders sourced from semi-industrial prawn trawlers that operate along the Malindi-Ungwana Bay. Brooders from trawlers are considered to be of high quality, particularly their maturity status. The collected brooders were then transported in aerated PVC tanks aboard a KMFRI truck.

The selection of brooders - with all appendages intact- was based on their overall health status and the level of ovarian development, all which were visually assessed.

KMFRI Shimoni Centre was established as a coastal and marine aquaculture research centre with an aim of carrying out research for development to promote mariculture in Kenya. The hatchery has a production capacity of 6 – 8 spawning cycles, 4 – 5 million larvae annually at optimal operations.

The marine hatchery, constructed through the National Research Fund (NRF) grant, is housed at the National Mariculture Resource & Training (NAMARET) Centre complex, funded by the World Bank, through Kenya Marine Fisheries Socio-Economic Development (KEMFSED) Project.

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The hatchery, currently in its pilot phase, hubs prawns whose seeds will be distributed to the farmers after attaining mysis stage for culturing high quality prawn species. This will bridge the fish seed deficit experienced by fish farmers in the country. Further, the new facility is poised to significantly enhance the capacity for marine research and mariculture development in the region.

KMFRI's technical team from mariculture department, alongside the marine hatchery specialist under the World Bank-funded KEMFSED project, conducted the breeding trials for the Indian White Prawn, whose main objective was to improve seed supply and prawn production in mariculture to complement capture fisheries.

In the recent past, marine prawn landings have been steadily decreasing primarily due to unsustainable fishing practices and impacts of climate change on the ocean ecosystems.

This ongoing decline in prawn production raises concerns about the availability of the resource in future, which could lead to loss of foreign income, threaten the livelihoods of local fishing communities, and deprive the coastal populations in Kenya of key delicacy. A sustainable method of production of prawn will therefore guarantee adequate supply.

Induction of brooders

In the wild, female marine prawns are exposed to all the environmental cues that enable their ovaries to develop fully to the final stage.

However, in captivity, these natural stimuli are absent, and in its place, a hormone called Gonad Inhibitory Hormone (GIH) accumulates in higher concentrations in the haemolymph, which inhibits full ovarian development.

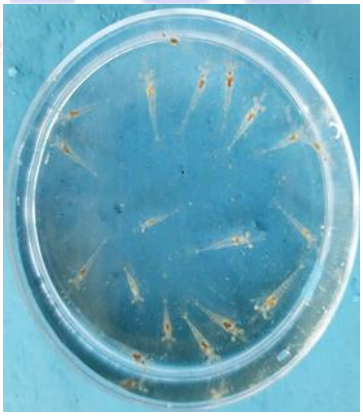
To overcome this, brooders at stages 2 and 3 of ovarian development were unilaterally ablated using hot pincers to destroy the tissue responsible for producing and storing GIH.

The Indian White Prawn eyestalk ablation to induce egg release

This process lowers the hormone levels, allowing the ovarian development in female prawns to progress to full maturation.

Spawning and harvesting

After the induction, brooders were transferred into 1-tonne plastic tanks for final egg maturation and spawning. The tanks were covered with black polyethylene sheeting to create a dark environment, a critical factor for the maturation process.



The Indian White Prawn (Fenneropenaeus indicus) nauplii and post larvae (PL) produced at the hatchery.

Spawning or egg release began on day 2 post-ablation. The eggs were left to hatch naturally, and only positively phototactic larvae were selectively harvested.

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To facilitate this, a hole was made on the polyethylene cover of the spawning tank, through which a light source, such as a torch, was positioned above to attract the larvae. Once the larvae had concentrated in the illuminated area, they were carefully collected using a scoop net.

Stocking and larviculture

Larvae were stocked in tanks at a rate of 100 nauplii per litre. Feeding began at the zoea stage, with a concentrate of *Nannochloropsis* algae and a prime supplemental diet provided twice daily at 100,000 cells/ml and 5g/feeding session, respectively. During the mysis stage, *artemia*, with supplementation, was introduced. Six days after the larvae reached the post larvae (PL) stage (PL6), only a commercial diet was offered.

Larvae from the second spawning run progressed through all the four stages of development and were stocked in community ponds for the grow-out phase.

Larval rearing tanks (LRTs) at KMFRI Shimoni marine hatchery.

Moving Forward

Following the successful trials and the challenges encountered in the process, the team agreed on the need to develop a mass culture system for diatomaceous algae to support larviculture, equip the technical team with specialized skills in feed management, live food production (Microalgae, Artemia and rotifers), aquaculture equipment maintenance, microscopy and quality control to enhance expertise and productivity.

Necessary tools, kits and equipment should also be acquired for effective larviculture monitoring, mobilize funds to scale up seed production of the Indian White Prawn, and come up with selective breeding programmes for the Indian White Prawn.

Prawn fishery potential in Kenya

Kenya's prawn fishery significantly contributes to the marine fishing industry. It is a source of foreign exchange, creates jobs and enhances food security. Wild prawn/shrimp stocks are primarily found along the Malindi-Ungwana Bay, although they have also been recorded in various creeks and estuaries stretching along the coastline.

Five species have been identified on the Kenyan side of the Indian Ocean. Among them, the Indian White Prawn stands out as one of the most significant, making up as much as 37.2 per cent of the total prawn landings. Other key species include *Penaeus monodon* comprising 26.7 per cent, *Metapenaeus monoceros* at 11.5 per cent, *Macrobrachium rude* which constitutes 11.0 per cent, *Penaeus semisulcatus* 5.1 per cent, with *Metapenaeus stebbingi* consisting 3.2 per cent. These diverse prawn species play a vital role in supporting local fisheries, and provide both economic benefits and livelihoods for many coastal communities.

Concentrating phototactic larvae for selective harvesting and stocking at NAMARET.

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KMFRI, NRT, TNC collaborate in training enumerators on mud-crab baseline data collection

COMPILED BY Dr David Mirera, Hellen Ngoa, Faith Kimanga, Chebet Mercy and Felix Kioko.

Edits: Phionalorna Nzikwa

Mud crab farming is a beacon of sustainable aquaculture, offering immense ecological and economic benefits along the Kenyan Coast. In response to the growing global demand and overexploitation of wild stocks, Kenya Marine and Fisheries Research Institute (KMFRI) in collaboration with the Northern Rangelands Trust (NRT) through funding from The Nature Conservancy (TNC), embarked on a comprehensive training program for enumerators to collect baseline data on mud crab farming in Lamu County and Lower Tana Delta, Tana River County.

The initiative involved training local data enumerators, baseline fishery assessments, and the fabrication of innovative plastic mud crab cages by five communities namely Lower Tana Delta Community Conservatory (LTDCC), Pate Marine Community Conservatory (PMCC), Kiunga Community Wildlife Association (KICOWA), Mokowe Mainland Community-Based Organization (MMCBO), and Lamu Community Forest Association (LAMACOFA).

The training aimed to empower the data enumerators by equipping them with the necessary data collection skills, utilization of the digital data collection Kobo tool to administer the questionnaire through the Enketo web interphase. The survey data collected will help to make policy decisions to transition mud crab fishers and traders to sustainable mud crab farming, and thus reduce the observed mortality when moving mud crabs within the two actors, which impacts availability of aquatic foods.

The training took place in Lamu county for two days from the 18th to 19th February, 2025, with KMFRI's Principal Research Scientist Dr. David Mirera being the facilitator.

Enumerators attending the data collection training

Participants were drawn from Amu, Faza, Kiunga, Kiwayu, Mtangawanda, Pate, and Mokowe villages in Lamu county, and Chara in Tana River county. These areas were selected for their significant estuarine ecosystems, rich traditional knowledge, and strategic importance in crab fishing and trade. A total of 22

enumerators, predominantly young males aged 26-35 years, attended in-class and field-based tarining.

The selection criteria for trainees included youth engaged in mangrove restoration, residence in crab fishing villages, gender balance, and educational qualifications.

Participants during in-class training

Key Topics Covered in the Training

The basics of data collection was among the topics covered during the training. Participants were introduced to the fundametal concepts, including the distinction between quantitative and qualitative data, and how each type requires different methods of collection.

Dr Joseph Tunje from Pwani University outlined key data collection methods, such as surveys, interviews, and observations, along with the importance of choosing the right method based on the research objectives.

The training also covered various sampling techniques like random and stratified sampling to ensure data reliability and representativeness.

Additionally, participants learned about ethical considerations, such as obtaining informed consent and ensuring data privacy. Hands-on exercises allowed participants to practice creating surveys and planning data collection strategies, giving them real-world applications of the methods discussed.

KMFRI socioeconomic researcher, Ms Faith Kimanga had an opportunity of taking participants through essential do's and don'ts to ensure the research process is effective and ethical. She enlightened them on maintaining data quality by ensuring accuracy, consistency, and completeness, while also establishing clear objectives.

Participants learnt the importance of prioritizing ethical standards such as obtaining informed consent, protecting privacy, and following relevant data protection regulations. They were additionally cautioned against compromising privacy, using biased or inappropriate methods, and collecting unnecessary data.

The need for the participants to acquire skills on ethical conduct, secure data handling, and cleaning data before analysis was also emphasized. By following these best practices, data collection can yield reliable, accurate results that support informed decision-making while safeguarding the rights of participants.

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Dr. Mirera facilitating one of the sessions

Kobo tool box/Enketo

Kobo Toolbox is a suite of tools designed for field data collection. Mr. Emmanuel Gafo guided participants through the features and effectiveness of Kobo Toolbox in gathering data. Key features of the tool include offline data collection, customizable forms, and robust data protection.

It is commonly used for both web-based and mobile data collection, especially in research and humanitarian contexts. Participants were introduced to the questionnaire to help them familiarize themselves with the questions, ensuring effective data collection.

Participants undertaking face to face role play on data collection

Why Train Enumerators

Training enumerators is essential for ensuring effective and consistent data collection. Proper training helps them to follow standardized procedures, maintain objectivity, and adhere to ethical guidelines, such as obtaining informed consent and ensuring confidentiality. Although local enumerators may be familiar with their communities, it is crucial that they are equipped with proper tools such as Kobo Toolbox and Enketo, unbiased data collection methods, and techniques to handle sensitive topics and technical challenges.

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Mtafiti Pictorials

Photos by KMFRI Strategic Communications team

Blue Economy and Fisheries Principal Secretary Madam Betsy Njagi with a delegation of CEOs and Directors from the State Department at the Nyanza International Investment Conference.

KMFRI Chairman, Amb. Dr. Wenwa Akinyi Oranga, the Board and senior managers on a familiarization tour of Sagana Aquaculture Research Centre- KMFRI.

KMFRI's research scientists from various research departments in a consultative meeting at the auditorium

Dr. Cooperman visits KMFRI's Kegati and Kisumu centres to assess progress in limnology, biodiversity, cage aquaculture, and native tilapia conservation.

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KMFRI in collaboration with Seabed 2030 and international partners host a workshop in Mombasa to accelerate seabed mapping efforts in the Western Indian Ocean

KMFRI Marine Fisheries Assistant Director Dr Gladys Okwema with senior research scientists Johnstone Omukoto and Mary Ontomwa represent KMFRI at The Octopus Fishery Technical Working Group meet.

KMFRI Ag CEO Dr. James Mwaluma with Blue Economy sectors CEOs, and key stakeholders including KMFRI Aquaculture Director Dr Jonathan Munguti convene for discussions on Kenya's fisheries and aquaculture sector.

KMFRI Kegati Centre Director Dr. Paul Orina and Limnologist Assistant Director Dr. Chrispin Nyamweya host Dr. Michael Cooperman from PlusFish Philanthropy, USA, for the Indigenous Tilapiine Species Project