



# Policy briefing

Issues for sound decisions in fisheries

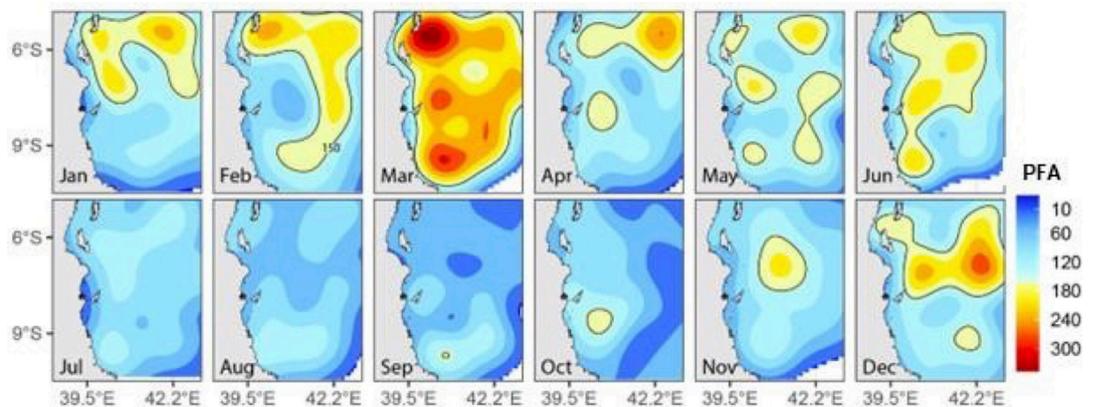


## Application of satellite technology for economic fishing operations

This brief describes the findings from a recent study conducted by the Tanzania Fisheries Research Institute (TAFIRI) on using satellite technology to improve the livelihoods of coastal communities while increasing the contribution of fisheries to the national economy. The study used fisheries and satellite-delivered data from 2015 to 2020 recorded from 21 districts in the United Republic of Tanzania (URT) to validate the usefulness of the satellite technology in assisting fishers in accessing productive fishing areas (potential fishing areas, PFAs). The study finding revealed that fishers now will no longer hunt. The technology can assist fishers in planning when and where to fish but also predict areas with an assurance of high catches. Through the technology fishers can increase income by reducing the time and the effort spent for searching for the schools of fish at sea. We recommend that the potential fishing zone technology should be adopted and scaled-up to be used by all fishers in the entire coastline of URT. It is further recommended that PFAs should be used as a proxy for managing fisheries resources in the Indian Ocean.

### Key messages

1. Locating profitable fishing areas is a challenge to artisanal fishers
2. The use of satellite technology helps fishers to locate potential fishing areas (PFAs)
3. PFAs are productive fishing areas where fish and other organisms aggregate for food
4. The potential fishing area can be used as a proxy for the management of fisheries resources



**Figure 1:** Spatial distribution of the Potential Fishing Areas (PFAs) in the marine waters of the United Republic of Tanzania.

Marine fisheries in Tanzania are mostly artisanal with more than 95% catches landed by artisanal fishers using traditional fishing techniques to access fishing areas. The fishing for pelagic fishes can be correctly said to be mostly hunting rather than target fishing. This random hunting is a challenge that makes the fishers use more resources in terms of time and fuel, which may not necessarily equate to good returns. TAFIRI has developed a method of identifying productive fishing grounds, or potential fishing areas, using satellite technology to empower fishers and avoid time wasting and reduce fuel consumption while fishing at sea. The technology complements the existing traditional techniques used by artisanal fishers, targeting pelagic species. The Searching for fish using Satellite technology is based on the principle

of identification of fish feeding grounds where fish tend to aggregate, also termed as potential fishing areas (PFAs). Satellite-derived Sea surface temperature (SST) or chlorophyll (Chl-a) fronts often are used as indicators of areas with high biological productivity and hence a high probability of finding fish.

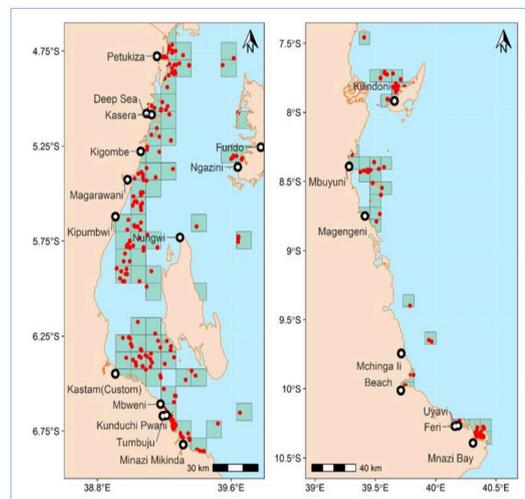
Potential Fishing Areas (PFAs) are productive fishing locations where fish and other organisms aggregate for food. They are formed between two water masses of different water temperatures, which satellite sensors can detect. The satellite technology can be used by artisanal fishers and can be beneficial to commercial fishers in Tanzania. Similar technology for identifying potential fishing areas has been successively used in other countries, including the USA, Spain, and India. In Africa, Ghana, the

partner country under the continental project Global Monitoring of Environment Security (GMES) and AFRICA, uses the technology to control illegal fishing in their EEZ and monitor the safety of artisanal fishers in territorial waters. Fishermen will be given access to PFA information via a mobile device that is currently under construction by TAFIRI and is about 90% complete.

The use of satellite technology in fisheries development aligns with targets set in the Third Five-Year Development Plan (FYDP III 2021/2022 – 2025/2026), TDV 2025, CCM Manifesto 2020- 2025, AU Agenda 2050, Blue Economy agenda and SDGs 1, 2, 8 & 14. The technology will consequently enhance food security, livelihood, economic growth, and availability of raw materials for fish processing industries.

### Methodology

The location-based fisheries data and satellite-derived SST fronts from 2015 to 2020 in 21 coastal districts of the United Republic of Tanzania (Figure 2) were used to derive the potential fishing zones (PFAs). The satellite-derived data were downloaded at a ground station located at the Tanzania Fisheries Research Institute (TAFIRI) in Kunduchi, Dar es Salaam. The fisheries data were obtained from trained and experienced ring-net fishers

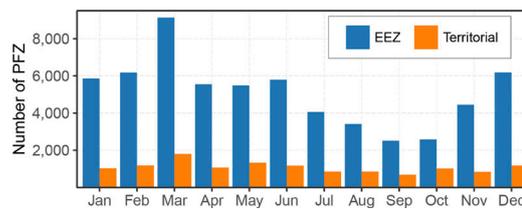


**Figure 2:** A study area map showing the landing site and fishing areas where fish catch information was obtained. The left and right panels represent the Northern and Southern parts, respectively, of the territorial waters of URT.

### Results

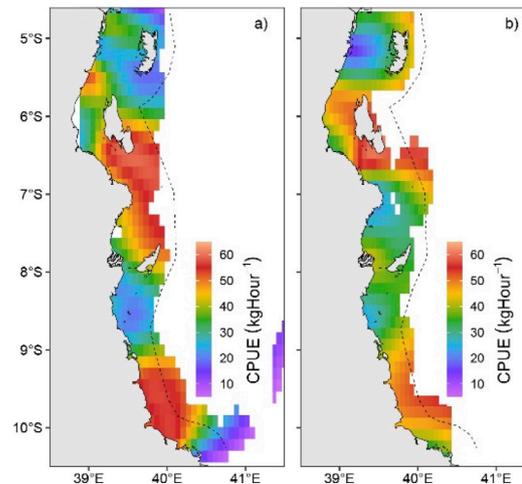
Potential Fishing Areas (PFAs) are found both in the territorial and Exclusive Economic Zone (EEZ) waters of the United Republic of Tanzania throughout the year (Figures 1 & 3). PFAs are found more during the North East Monsoon (NEM) season (November to April) than during the South East Monsoon (SEM) season (May to October).

High fish catch rates obtained during the northeast monsoon season coincide with a

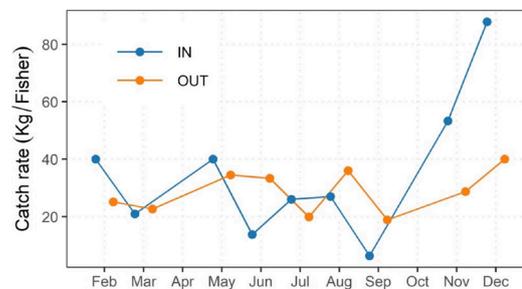


**Figure 3:** Monthly number of Potential Fishing Areas (PFAs) in the marine waters of the United Republic of Tanzania.

high number of PFAs in the territorial waters (Figures 4 and 5). Fishers get higher catch rates when they fish within the PFAs than outside PFAs during the NEM season (Figure 5).



**Figure 4:** Ring-net catch rates during a) North East Monsoon and b) South East Monsoon seasons in territorial waters.



**Figure 5:** Monthly ring net catch rate (Kg/fisher/day) in and out of the PFAs in the territorial waters.

### Conclusion

1. Satellite technology identifying PFAs allows fishers to plan where and when to fish. This technology has several benefits to fishers such as reducing the time and effort spent in searching for schools of fish, thus improving the livelihood of fishers through increased incomes and self-sufficiency in food and thus addressing the goals set in the SDGs 1, 2, 8 & 14.1, 14.4, 14.7, 14 a, b;
2. A reliable and timely generation of PFAs will provide information that is useful for the sustainable management of marine fish resources;
3. Identification of significant hotspot areas derived from PFAs will assist in planning and

“ Random fish hunting is a challenge that makes the fishers use more resources in terms of time and fuel, which may not necessarily equate to good returns.”

prediction of areas that have an assurance of high catches;

4. Furthermore, areas that need attention for monitoring, control and surveillance (MCS) can easily be identified, and proper action plans are deemed necessary for the PFAs;
5. It is now a call for policymakers, particularly from the Ministry of Livestock and Fisheries (MLF) – Tanzania Mainland and Fisheries and Blue Economy – Zanzibar as well as the Ministry for Regional Administration and Local Government (LGA), to enhance fishers' welfare by adopting and scaling-up the satellite-based technology to locate more PFAs.

### **POLICY IMPLICATIONS AND RECOMMENDATIONS**

For the successful adoption of the technology, this policy brief recommends the following:

- The Ministry of Livestock and Fisheries (MLF) and the Ministry of Regional Administration and Local Government (MRLAG) to support the adoption of the technology to fisheries stakeholders through training of the BMUs in all coastal Districts of the Mainland Tanzania on how to access potential fishing areas.
- The Deep Sea Fishing Authority (DSFA) to adopt this technology to manage deep-sea resources to minimize the cost of monitoring, control, and surveillance in the EEZ.
- The Ministry of Livestock and Fisheries to financially support TAFIRI to integrate the satellite technology with mobile phone-based technology to facilitate its accessibility to local community.

### **Acknowledgement**

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### **Further reading**

Ruling Party (CCM) Manifesto of 2020 - 2025

Tanzania Fisheries Act of 2003

The Fisheries Regulations of 2009, as amended by GN 492 of 2020

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