Potential Fishing Zone In Support Of Marine Fisheries Management In Tanzania

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Background
Potential fishing zones (PFZ) are productive fishing areas where fish and other organisms aggregated for food. PFZ are formed between two water masses of different water temperatures such as cold nutrient rich riverine when come across warm oceanic water or when eddy current which bring nutrients rich cold water from the bottom of the sea floor and form ocean front. This area form conducive environment of nutrients rich warmer waters that can support growth of phytoplankton and zooplankton and larvae of different marine organism. Small pelagic fish as well as large pelagic fish such as tuna and tuna like species, shark, whale sharks and whales are reported to be linked with PFZ (reference).

Fishers often tend adopt to this natural distribution of marine resources and focus their fishing effort in the most productive parts of the PFZ. Locating PFZ therefore can help the fishermen to reduce the time and effort spent in searching the shoals of fish, thus improving the profitability and hence, the socio-economic status. For decades distant water fishing fleets allocate their catch in the PFZ through the use of satellite technology. The satellite can spatially locate the PFZ as well as spotting fishing event location over a large area in the EEZ of Tanzania. Thus the use of satellite this creates a possibility to assess the spatial distribution of fishing event in relation to PFZ.

Mainland Tanzania and Zanzibar share an exclusive economic zone (EEZ) of 223000km² Management of the fish stock in the EEZ and particular for developing country like Republic union of Tanzania is a challenge.

Spatial considerations are generally not included in fishery stock assessment and management because of the lack of spatially explicit data and a poor understanding of the spatial dynamics of fish populations, especially migratory ones (Fromentin et al., 2014; Gillanders et al., 2015; Morris et al., 2014).

Therefore, spatial fisheries management is needed to adjust the local fishing activity to local fish production, thereby improving sustainability. This management involves efficient spatial location of productive fishing areas such as PFZ (Kaplan et al., 2012; Li et al., 2020; Neat et al., 2014) in order to evolve from standard stock-based management to integrated fleet-based management (Gascuel et al., 2012).

New powerful tools based on satellite-derived data, such as fishing activity at fine
spatial scales (e.g. Longline and purse seine fishing footprints, Amoroso et al., 2018) and/or sea surface fronts distribution (PFZ) have been developed over the last decades (References). These tools have opened the door for a spatialized ecosystem approach to fisheries management.

Distance Water Fishing Nations (DWFN) in the EEZ of Tanzania have been using PFZ technics for decades to exploit fishery resources like tuna and tuna-like species. There is possibility of using historical data collected from DWF tuna fisheries fleets to delineate the fisheries information which can unfold management of Tuna and tuna like fisheries in the EEZ of Tanzania. There is a need thus for analyzing the spatial distribution of fishing pressure in relation to PFZ,

This study used satellite derived sst to Determine hotspots (more PFZ) and cold spots (few PFZ). Furthermore yellowfin tuna catch information collected from purse seine vessels operated by Distant Waters Fishing Nations (DWFN) in the EEZ of Tanzania to Locate YFT vessels effort distribution in the EEZ and finally Compare YFT CPUE between Hotspots and cold spots

Method
This study was conducted in exclusive economic zone (EEZ) of Tanzania. Fisheries Data
This study used yellowfin tuna catch information collected from purse seine vessels operated by Distant Waters Fishing Nations (DWFN) in the EEZ of Tanzania. The data was obtained from the Deep Sea Fishing Authority (DSFA) and include vessel identification, fishing gear, fishing locations, time of setting and retrieval, and weight and number of fish caught by species. Furthermore, DSFA provided a dataset of length and weight measurements of individual tuna species sampled from selected sites along the coastal waters of Tanzania. Satellite derived PFZ data
Daily fronts derived from satellite sea surface temperature which serves as potential areas for fishing archived at TAFIRI e-Station were downloaded. While the e-Station contains daily, 8-days and one month, only three days composite data at one kilometer resolution covering a period between 2015 and 2020 were used to derive potential fishing zones (PFZ).

Results
1. Monthly number of potential fishing zone (PFZ) in the exclusive economic zone (EEZ) of Tanzania
2. spatial maps of monthly climatology of the potential fishing zone (PFZ) in the exclusive economic zone (EEZ) of Tanzania.
3. map showing spatial distribution of a) high and low potential fishing zone in the EEZ b) effort for yellowfin targeting vessels in the EEZ c) Clusters catch rate for yellowfin tuna in the EEZ of Tanzania
Conclusion
This study used satellite derived sst to Determine hotspots (more PFZ) and cold spots (few PFZ). Furthermore yellowfin tuna catch information collected from purse seine vessels operated by Distant Waters Fishing Nations (DWFN) in the EEZ of Tanzania to Locate YFT vessels effort distribution in the EEZ and finally Compare YFT CPUE between Hotspots and cold spots