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Policy Brief

Enabling Sustainable Exploitation of Kenya's Artisanal Tuna Fishery: Research Highlights and Key Recommendations

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Introduction

Tuna and tuna-like species play a vital role to the food security and livelihoods of coastal communities in the Western Indian Ocean (WIO). The tuna fishery in the WIO region is becoming increasingly important as coastal nations endeavor to expand small-scale fishing fleets into offshore ranges as a blue economy development strategy. This is more so because small-scale tuna fisheries produce the bulk of fresh tuna that is supplied to local markets demonstrating their importance in supporting food security and local livelihoods.

Tuna fisheries exploit a number of economically important species including Yellowfin tuna (YFT) *Thunnus albacares*, Bigeye tuna (BET) *Thunnus obesus*, skipjack tuna (SJT) (*Katsuwonus pelamis*), Kawakawa (KAW) (*Euthynnus affinis*), Frigate tuna (FRI) (*Auxis thazard*), Narrow barred Spanish mackerel (COM) (*Scomberomorus commerson*) and Wahoo (*Acanthocybium solandri*) (Figure 1).

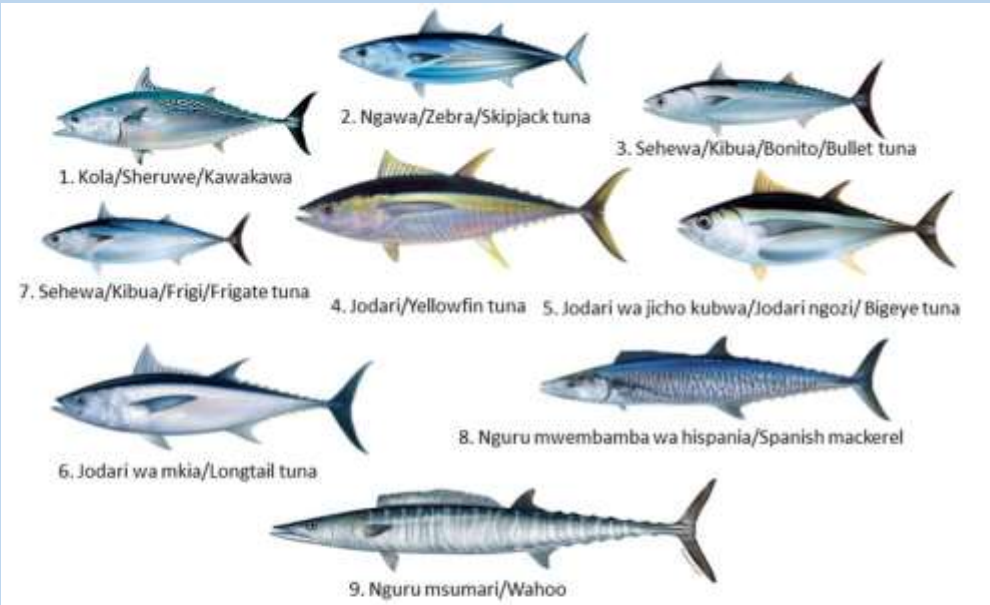

Figure 1. Tuna and tuna-like species caught by artisanal fishers along the Kenya coast. Image sources: 1-8, FAO (2018); 9, NOAA FishWatch.

The Indian Ocean Tuna Commission (IOTC) is the regional fisheries management organization that oversees the management of tuna and tuna-like species. Some of the species in the IOTC area of competence such as the yellowfin tuna (YFT) and Spanish mackerel (COM) are currently reported as overfished and subject to overfishing; hence the need to closely monitor and assess the status of exploitation at national scales.

Accurate estimation of total catch production and status of tuna fisheries in Kenya has been challenging due to lack of species-disaggregated catch data and information in sufficient spatial and temporal scales.

This policy brief provides a summary of highlights of research findings of various studies conducted by the Kenya Marine and Fisheries Research Institute (KMFRI) with funding support of donor partners towards addressing information gaps on the small-scale tuna fishery. We further highlight key recommendations for research and monitoring.

Our Research Highlights

1. Characterizing gear-based exploitation patterns of Kenya's artisanal tuna fishery

We assessed catch data collected at eight landing sites in three counties over a 6-year period (2014 to 2020), representing 1960 fishing trips and 192 mt of fish to explore spatial and temporal patterns in species composition, catch rates, and length distribution of tuna and tuna-like species landed by artisanal tuna fishers at the Kenyan coast.

Tuna and tuna-like species constituted 55% and 38% respectively of the sampled catch. The most common gear types that caught these species were trollinglines, ring nets and handlines representing 82% of the sampled fishing trips. Longlines, drift gillnets and trollinglines caught the highest proportion of tuna when compared to the other gear types (Figure 2).

Gear use varied between the study sites with a high preference for ringnets southwards from Kilifi to Vanga and a high preference for trollinglines from Watamu to Lamu. Over 75% of tuna landings was by ringnets at Vanga and Gazi (Kwale County), while trollinglines landed over 90% of tuna at Mbuyuni and Watamu (Kilifi County), and from Amu and Kiwayu (Lamu County) (Figure 2).

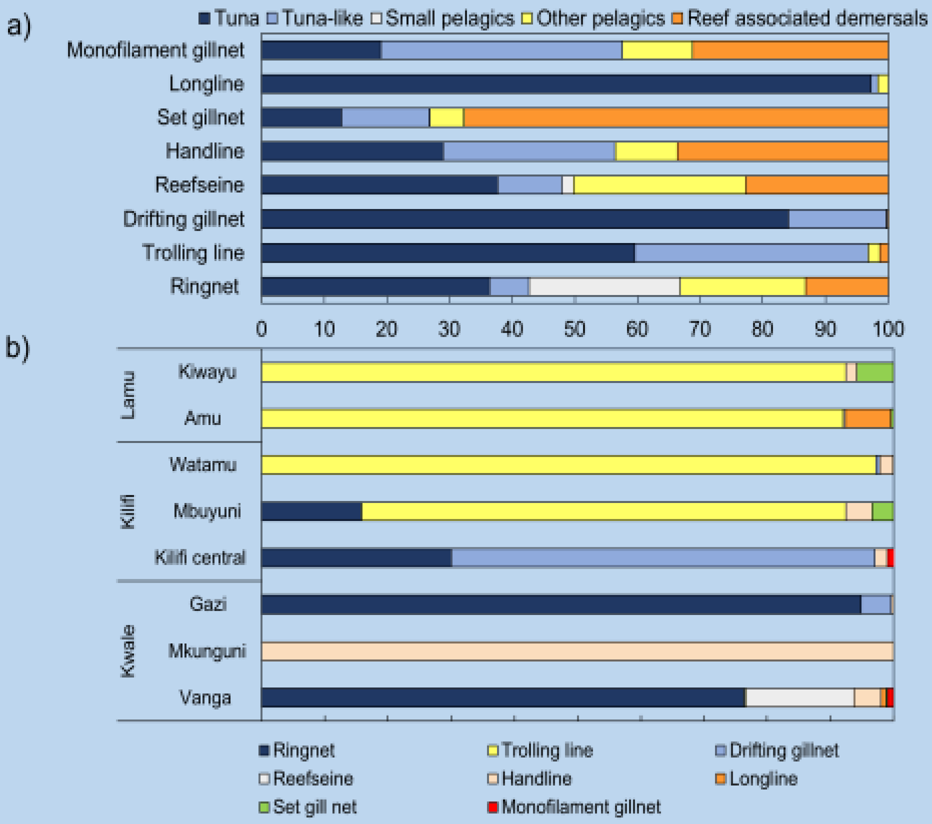

Figure 2. Composition of the sampled catch for 8 fishing gear types that landed tuna, and (b) the proportional contribution of gear types to tuna landings at 8 study sites along the Kenya coast

The overall mean catch per unit effort for tuna was 78.5 ± 7.7 (SE) $kg \cdot trip^{-1}$; while that for tuna-like species was 35.2 ± 1.9 (SE) $kg \cdot trip^{-1}$. Ring nets had the highest catch rates of tuna averaging at 547 ± 99.3 $kg \cdot trip^{-1}$ while handlines had the lowest (12.6 ± 1.4 $kg \cdot trip^{-1}$).

Kawakawa (*Euthynnus affinis*), Bigeye tuna (*Thunnus obesus*), and Yellowfin tuna (*Thunnus albacares*) were the most common and most abundant species occurring in 73% of the sampled fishing trips by weight. Tuna was landed year-round; however, we observed species-specific and gear-wise variations in catch rates between seasons. Catch rates for tuna were higher during northeast monsoon season (November to March), likely due to increased catchability.

Majority of tuna species were within size ranges above the reported size at first maturity (L_{50}), except for Yellowfin tuna and Bigeye tuna which were dominated by individuals below L_{50}. These findings provide new insights on the catch composition and exploitation rates of tuna by small-scale artisanal fisheries in Kenya.

2. Assessing interactions between artisanal and industrial fishing on yellowfin tuna in Kenyan waters

We evaluated size selective interactions between the industrial pelagic longlining and artisanal trolling fishery on yellow fin tuna. We collected catch data between April 2019 and April 2021 and measured 3,138 yellow fin tuna.

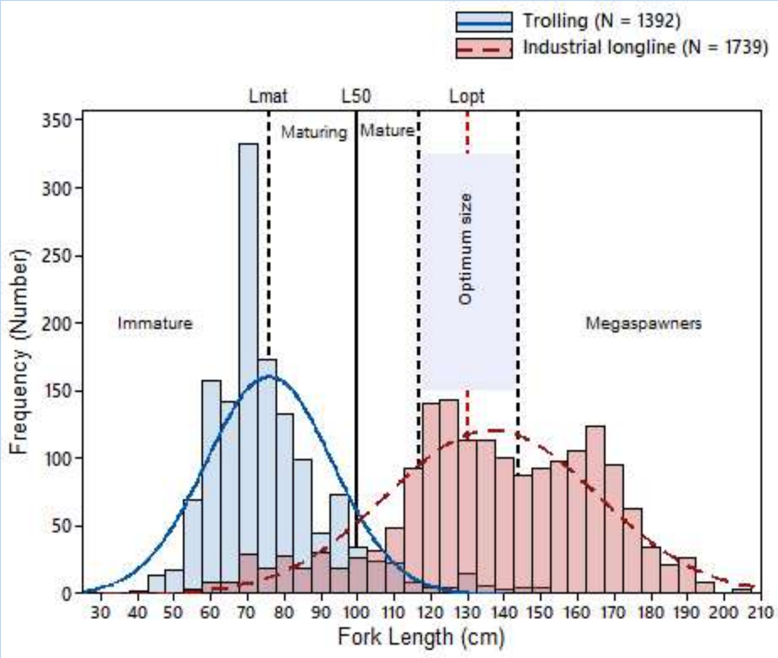

Figure 3. Length frequency distribution for yellow fin tuna caught by the artisanal trolling and industrial longline fishery along the Kenyan waters between April 2019 and April 2021

The overall length distribution of ranged from 32 - 204 cm Using a suite of length-based indicators, we observed that the two fisheries selectively capture distinct life stages of yellow fin tuna.

Mature individuals (above 100 cm) constituted 90% of the industrial longline catch, of which 56% were mega-spawners; while 92% of the yellow fin tuna targeted by artisanal trolling catch were immature with no mega-spawners (Figure 1).

Length ratios for artisanal trolling were all below expected values indicating poor conservation, yield and MSY outcomes due to the selective capture of immature sizes (Table 1). On the other hand, the ratios for the industrial longline were all above expected values indicating sustainable outcomes on spawning potential. Notably, when the data was combined, conservation outcomes for immature and mega spawners remained below expected values.

Table 1. Summary of the indicator ratios for the traffic lights system for yellowfin tuna caught by artisanal trolling and industrial longline. Cells shaded in green are above the expected value and those shaded in red are below expected values

Management outcome	Indicator ratio	Expected value	Artisanal trolling	Industrial longline
Conservation of immature fish	L_c / L_{mat}	> 1	0.47	1.05
	$L_{25\%} / L_{mat}$	> 1	0.86	1.50
Conservation of mature individuals	$L_{max5\%} / L_{inf}$	> 0.8	0.65	0.95
	P_{mega}	≥ 0.3	0.01	0.43
Optimal yield	L_{mean} / L_{opt}	≈ 1	0.48	0.72
MSY	$L_{mean} / L_{F=M}$	≥ 1	0.87	1.10

3. Evaluating the artisanal value chain for Skipjack and Kawakawa along the Kenya coast

Development of Kenya's tuna fishery requires in-depth knowledge of the tuna value chain to inform quantification of the economic value of the fishery and identification of areas of investment. The term 'value chain' refers to the range of activities and processes involved in production of fish. This includes fishing, handling, processing, value addition, distribution and marketing of the fish and fish products.

During 2021, we interviewed tuna fishers, fish processors (*mama karangas*), and fish traders to map the value chain of two neritic tuna species, *Euthynnus affinis* (Kawakawa) and *Katsuwonus pelamis* (Skipjack) at three landing sites (Vanga, Kilifi central and Watamu) along the Kenya coast.

We documented five major steps in the value chain from the fisher to consumer as shown in Figure 4. We also noted that the value chain was similar for Skipjack and Kawaka.

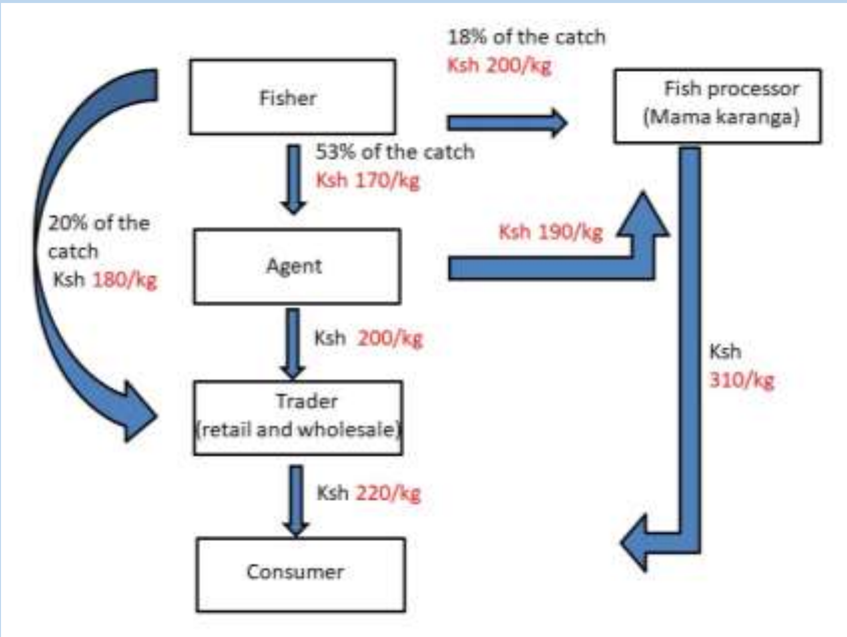

Figure 4. The chain of custody and actors along the tuna value chain. Red font shows the average unit value (price/kg) for Skipjack and Kawakawa as the fish moves through the chain during 2021-2022

For every 1kg of tuna sold, processors added on average value of Ksh 124 which was five times the value added of traders (Ksh 24). In terms of profit margins, processors earned a gross and net profit margin of 41.0% and 29.5% respectively, while traders earned a gross and net profit margin of 11.5% and 4.8% respectively (Figure 3). Processors sold an average of 1,134 kg in a year while traders sold an average of 3,168 kg.

4. Mapping artisanal tuna fishing grounds

Information on fishing grounds for tuna fishers is Kenya is very scanty as most of the time scientists rely on fishers to provide arbitrary names of the fishing grounds, which sometimes cover a wider area. In this context, we equipped some active tuna fishers with tracking devices, and continuously monitored their activities at sea for ten days over a period of four months at Vanga, Gazi (South) and Kilifi, Watamu, Malindi (North).

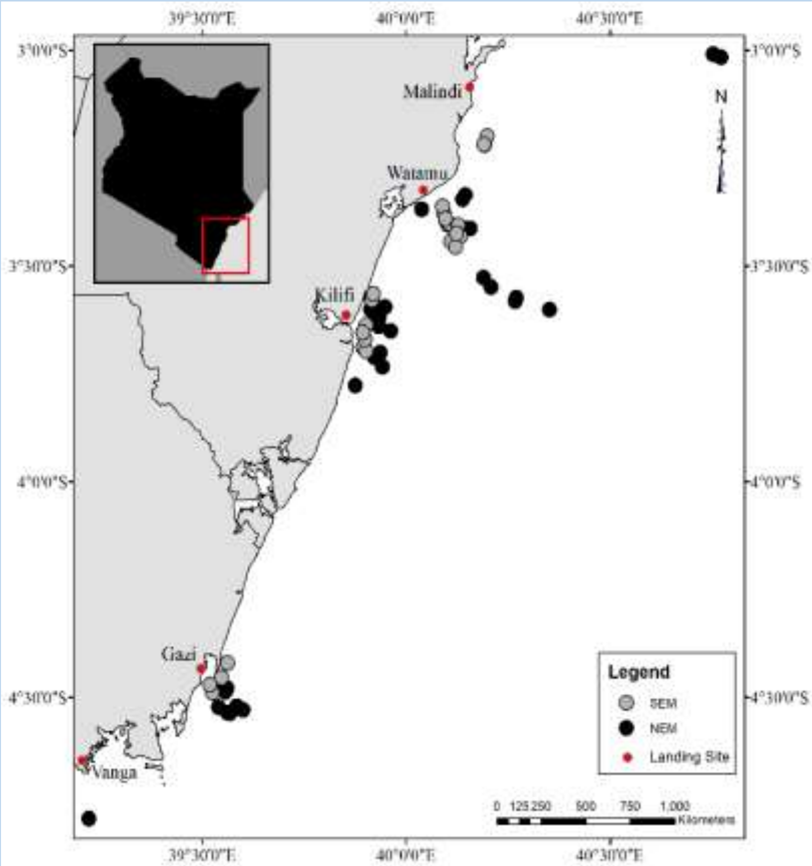

Figure 5. Map of tuna fishing grounds accessed from four landing sites (Vanga, Gazi, Kilifi central and Watamu) along the Kenya coast.

Artisanal fishers mainly concentrated in near shore fishing grounds during the rough southeast monsoon (SEM) season and travelled further offshore to target yellowfin and bigeye tuna during the northeast monsoon (NEM) season. It was evident that the calm sea conditions during NEM provide optimum conditions for fishing tuna in distant fishing grounds. Fishers in Malindi travelled farthest averaging a distance of 83.8 km, while fishers in Kilifi and Gazi travelled for about 13 km.

5. Implications for research and monitoring

Research and monitoring	• Train beach management units (BMUs) in species identification, catch and biological monitoring to improve data quality • Increase data collection frequency and coverage to facilitate accurate estimation of biological parameters and annual catch production of tuna and tuna-like species • Incorporate regular tracking of artisanal tuna fishing effort to better understand spatial distribution and utilization of fishing grounds to inform marine spatial planning • Assess the contribution of tuna fisheries to food security and nutrition
Value addition and marketing	• Identify and pilot opportunities for value addition and marketing of tuna fishery products • Train tuna fish processors (mama karangas) on tuna handling and quality control to minimize post-harvest losses. • Conduct market surveys to identify opportunities to tuna fishery products • Establish a market information system for tuna and tuna-like species

6. References

FAO (2019) Identification of tuna and tuna-like species in Indian Ocean fisheries. 28pp.

NOAA FishWatch: http://www.fishwatch.gov/seafood_profiles/species/wahoo/species_pages/atlantic_wahoo.htm

7. Acknowledgements

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