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Assessment of yellowfin tuna (*Thunnus albacares*) caught by artisanal fishers in Kenya between 2014 and 2015

Yellowfin tuna (*Thunnus albacares*), is one of the target pelagic species by artisanal fishers in Kenya. The main tuna fishing season in Kenya is between October and February. From the 2013 to 2016 season, the routine catches of yellowfin tuna were recorded at various landing sites along the Kenyan coastline. This paper looks at the lengths frequency and CPUE of yellowfin tuna caught by artisanal fishers between January 2014 and December 2015. The main fishing area recorded for the yellowfin tuna catches was in the Watamu banks where the catches of yellowfin tuna tuna were highest. A total of 59 fishing trips were monitored for length frequency where catches ranging between 40 and 477 kgs per boat per day. The weight was recorded to the nearest 0.5 kgs while lengths were recorded at nearest 0.5cm.The average CPUE per boat was 138.8 Kgs. On average, there were five fishers per boat. The average size in length was 78.5 cm and weighed 7.5 kgs. The main fishing season in 2014 was between September and December while the peak season in 2015 was between July and October. The main gears used by fishers while targeting Yellowfin tuna were trolling lines and handlines.

Introduction

Catch Assessment Surveys are dedicated surveys aimed at harvest sector to generate information relating to both fish catches and fishing effort. Other sources of catch data include the post harvest sector and markets, but these sources tend to be less accurate and precise and cannot provide reliable effort data. CAS design typically requires frame surveys data to raise samples to total catch estimates. Catch, effort and frame survey data are important for supporting the management process. Collection of data on the

size frequency distribution of harvested species also assists in evaluation of the status of exploitation of that particular species. Such assessments are important for helping shape policy and for development planning purposes.

The State Department for Fisheries and Blue Economy (SDF&BE) in Kenya had been operating a routine fisheries data collection system based on total enumeration, whereby all fishing trips were expected to be recorded at all coastal landing sites. Due to the staff shortages, and the costs involved the SDF recognised that, this system was no longer viable. From the perspective of the statistical validity of routine catch/effort data, full enumeration offers relatively minor advantages over a sampling approach. Furthermore, full enumeration of busy fish landing sites is practically impossible to achieve and therefore there are significant questions as to the accuracy of the data that are collected.

The current system was further challenged as the SDF&BE realised that the profile of actual information provided, i.e. total catch and value, was of relatively limited value for making useful management decisions. There was now also recognition of the need to steer the SDF&BE towards a more ecosystem-based approach to resource management, including improving the understanding the human dimension of the fisheries (social and economic issues).

In order to achieve this, the SDF therefore proposed to improve the performance of its sampling programme. The first step involved conducting training for District Fisheries Officers (DFOs) on data collection modules by the department in conjunction with FAO. After the training, KMFRI and fisheries department through the support of ReCoMaP developed a training program for data collectors. A total of 55 data collectors covering the entire coastline were trained. In the planned data collection strategy, the sampling programme was streamlined by reducing sampling effort and by modifying the sampling protocol to target between 20 and 25 landing sites along the

coast, where it is estimated that 70% of the total catch is landed. The FAO also developed pocket fish identification guides which were distributed to the enumerators.

DATA COLLECTION

The data for this report was collected in 22 landing sites along the coastline from June 2013 to May 2016. Sampling took place on ten days per month with dates selected based on the lunar cycle. Catches from boats are randomly sampled and recorded to the lowest taxonomical level possible. The total catches of tuna were reported as aggregated in some areas due to identification problems. However, some data collectors were better at species identification. These samplers were tasked to collect length frequency data for the yellowfin tuna caught by the artisanal fishers.

Yellowfin tuna catches

During the first two years of sampling, a total of 1,101 yellowfin tuna were sampled. The total catches of tuna in the year 2015 were higher than in 2014. Overall, the sampled catches in 2015 were twice those of 2014 (Figure 1).

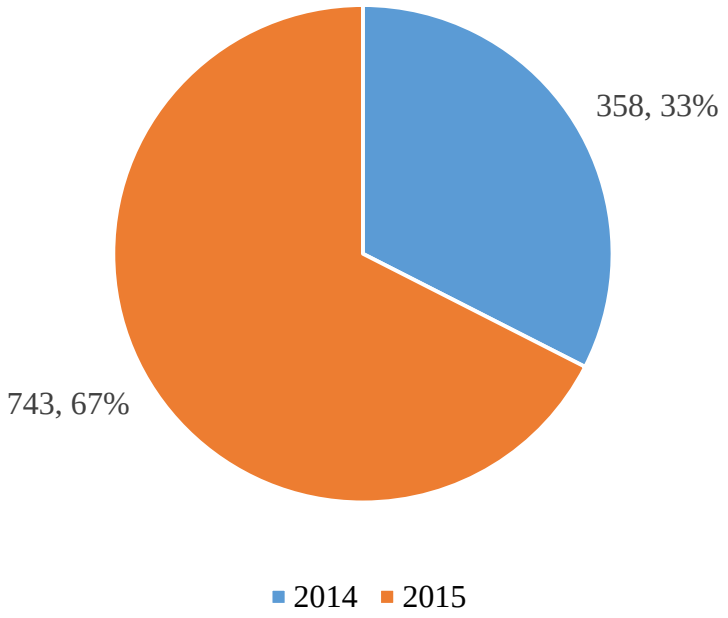

Figure 1: Number of yellowfin tuna sampled in two years

Temporal distribution of yellowfin catches

In 2015, the catches of yellowfin tuna were recorded each month with two peaks recorded in February and August to September. In 2014, there were no catches reported in January and April while the peak catches were reported in March and September to December (Figure 2).

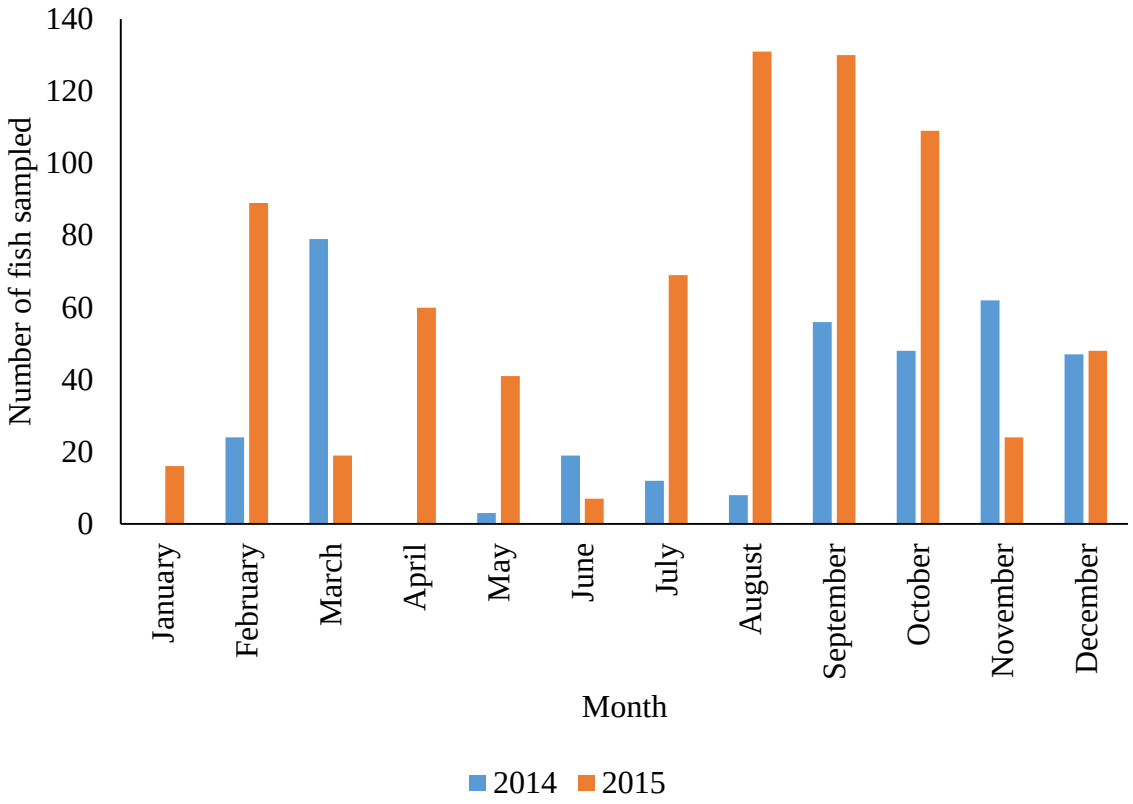

Figure 2: Temporal distribution of tuna catches

Gear contribution to yellowfin tuna catches

In 2014, a total of 2,587 Kgs of yellowfin tuna were sampled and all the catch was by trolling lines. In 2015, a total of 5,035 Kgs were sampled with the highest catch reported from trolling lines (80%) while a substantial amount landed from handline fishery (17%). Gillnet and ringnet contributed 2% and 1% of the sampled yellowfin catches respectively (Figure 3).

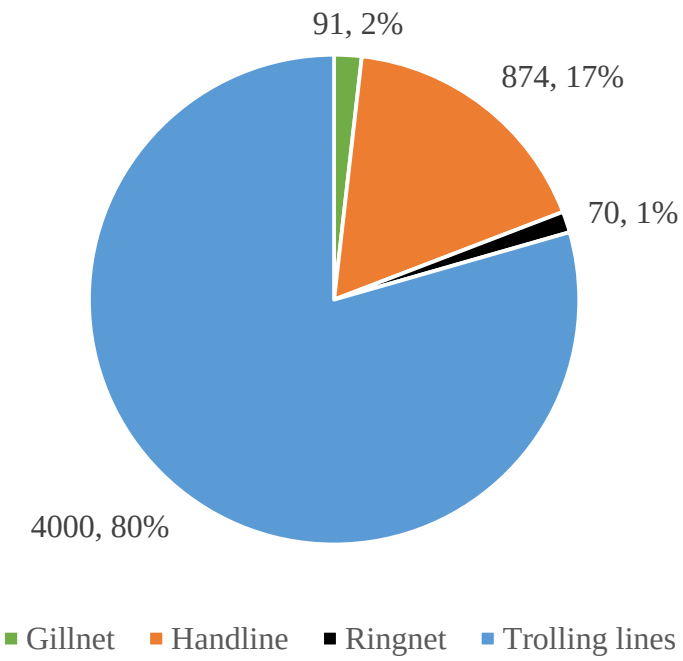

Figure 3: Sampled catch by gear type

Sizes of yellowfin tuna caught by artisanal fishers

The average weight of yellowfin tuna was higher in 2014 than in 2015. In 2014 the average weight was 7.8 (± 8.0) kgs with the fish caught ranging from 2 to 89 kgs. In 2015, the average weight was 7.1 (± 4.3) kgs with the fish caught ranging from 1 to 53 kgs. The monthly distribution of average catch is shown in figure 4 below. During the July to September period for both years, the average weight of sampled yellowfin tuna was slightly higher than those caught during the rest of the months.

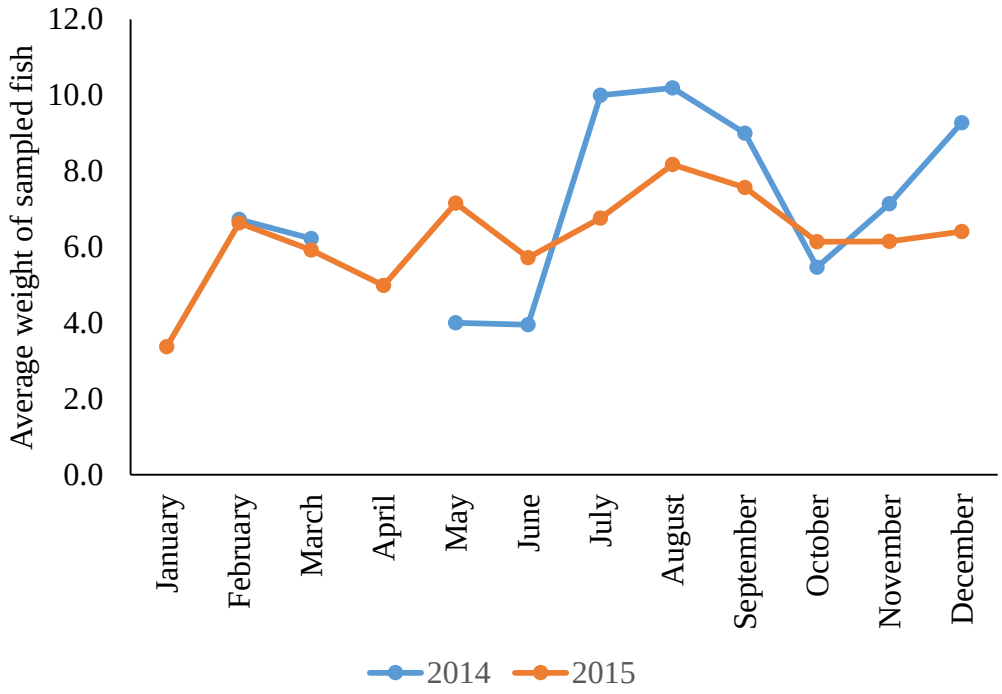

Figure 4: Monthly weight distribution of sampled catches

Length frequency of sampled yellowfin tuna

Data from the experienced samplers who could positively identify yellowfin tuna was used for length frequency distribution. A total of 492 fish were measured during the sampling period. Most of the yellowfin tuna caught by the artisanal fishers were between 70 and 85 cm forked length. There however were a few fish caught with a length of between 110 cm and 135 cm (Figure 5).

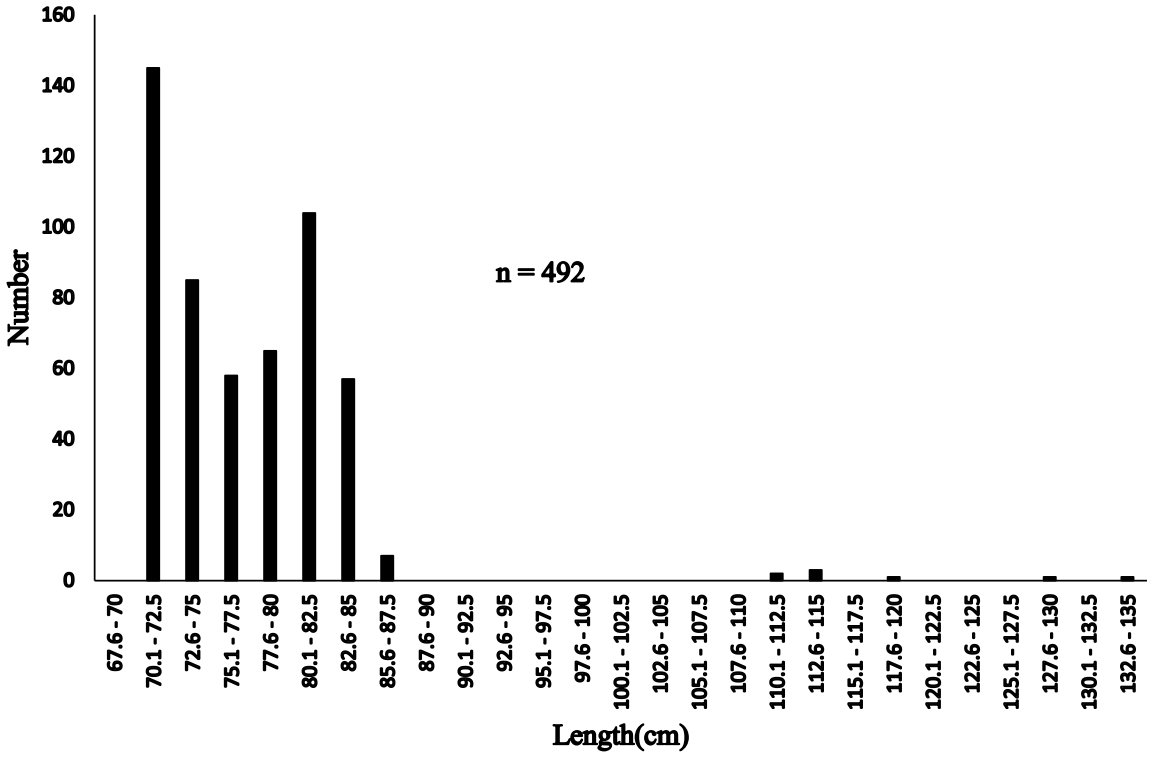

Figure 5: Length frequency distribution of sampled yellowfin tuna

The individual weight of yellowfin tuna caught by artisanal fishers mainly ranged between 6 and 8.5 kgs. A few large yellowfin recorded between 27 and 36 kgs. Most of the sampled yellowfin tuna caught by the artisanal fishers weighed 7 kgs, with few individuals weighing below 6 kgs (Figure 6). The identification of smaller yellowfin tuna was rather challenging during the sampling period.

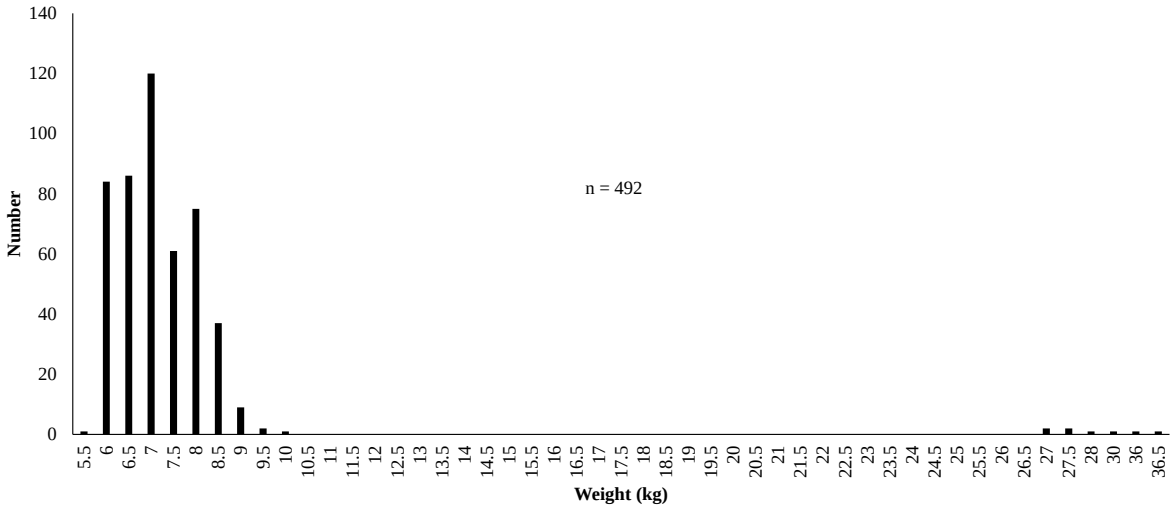

Figure 6: Weight distribution of sampled yellowfin tuna

Length weight relationship

The logarithmic form of length-weight relationship of *T. albacares* is described by the linear equation Log W = 2.4632 Log L – 3.2595 (Figure 7) or the parabolic relationship $W = 3.2595\ L^{2.4632}$.

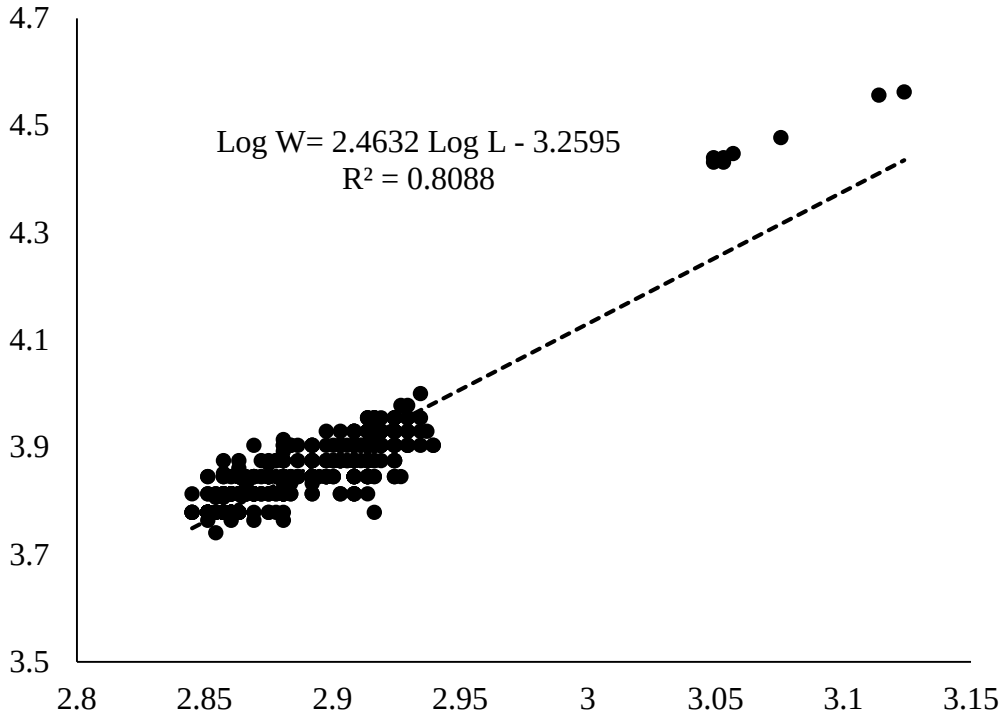

Figure 7: Length weight relationship of sampled yellowfin tuna

Observations from the artisanal tuna landings

Artisanal yellowfin tuna catches compose a large fraction of the total landings by the fleets operating in the Indian Ocean. The catches of *T. albacares* from the artisanal fleet need to be well identified and studied to improve our knowledge in the yellowfin tuna stock status the region. The main purpose of this sampling was to monitor the sizes of yellowfin tuna landings from the artisanal fishery. Previous studies in the Kenyan waters had depended on the yellowfin tuna catches from recreational fishery. The similarity between the recreational and artisanal fishery is the landing of small yellowfin tuna of fork length between 70 and 85 cms and the medium ones between 107 and 117 cms fork length. A few large samples of more than 130 cms are occasionally landed in both fisheries. In a previous study by the author, recreational fishery had an equal number of fish in both the small and medium sized fish categories.

The main gear targeting yellowfin tuna in the artisanal fishery is the trolling lines. In 2014 all the sampled catches were reported from the trolling lines. In 2015, the catches from trolling lines were the majority although the handlines landed a significant amount of tuna. The other main gears that contributed to yellowfin tuna were gillnets and ringnets. From the landed catches, there was also a substantial catch landed from the longline fishery. The landings from this fishery were large samples with some as high as 100 kgs. The main problem with these landings were due to identification challenge. The sampler who was at the main landing site where the longline catches were recorded could not identify between the yellowfin and bigeye tuna. A spot check at the landing site revealed a mixture of the two species in the longline catches and hence this data was not used for this report.

The peak season for yellowfin tuna catches by the artisanal fishers during the sampling season was between September and December and another

one between February and March. During the 2015 season, the yellowfin tuna season started earlier in July and peak catches recorded in September. The shift of the peak season for yellowfin tuna has been previously observed and is mainly based on availability of prey in the Kenyan waters. The July to September period also happens to be the time when larger *T. albacares* are caught compared to the other months. From the length frequency distribution, the majority of fish caught in the other months are between 70 and 85 cms. Majority of the fish caught by artisanal fishers are immature as the 100 cm is considered the length at which majority of yellowfin tuna attain sexual maturity. This length category has been reported missing in the purse seine fishery. In order to understand well the fishery of the Indian Ocean, it is important to include artisanal catch records in the monitoring. Most of the artisanal catches are not reported to species level thereby affecting the quality of analysis that can be undertaken for the Indian Ocean fish stocks.