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SEASONALITY AND SIZE FREQUENCY OF KAWAKAWA CAUGHT BY ARTISANAL FISHERS IN KENYA

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ABSTRACT

The State Department of Fisheries (SDF) in Kenya had been conducting routine fisheries data collection based on total enumeration. In order to improve the data collection a Catch Assessment Survey (CAS) was undertaken aimed at facilitating and assisting in the generation of important fisheries indicators useful for developing, evaluating policies and fishery management plans for the small scale fisheries. 22 primary and secondary landing sites were selected and among the target species whose length frequency data was to be collected was *Euthynus affinis.* The paper looks at the seasonality and length frequency of the species during the one year and compares with the other years data from sports fishing clubs which was also collected at species level. During the sampling period, a total of 1,622 fish were measured. The November to March happened to be the peak season for the species while the average length was 35.8 cm with a length range of between 9 and 96 cm.

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. If catch data is combined with information on fish prices, it can be used to estimate the gross value of production (GVP). This provides an indication of the economic importance of the fishery relative to other fisheries or sectors. This is important for helping shape policy and for development planning purposes.

The Department of Fisheries in Kenya has been operating a routine fisheries data collection system based on total enumeration, whereby all fishing trips are expected to be recorded at all

coastal landing sites. Due to the staff shortages, and the costs involved the Department has recognised that, this system is 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 is further challenged as the Department realises that the profile of actual information provided, i.e. total catch and value, is of relatively limited value for making useful management decisions. There is now also recognition of the need to steer the Department 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 Fisheries Department 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.

The Department has also investigated the potential of including spatial data for the modified system to facilitate the understanding of the use of fishing grounds by fishers. This type of data is important for management planning, especially where local co-managed areas are established or being proposed, as well as for future stock assessment work. In this regard, a relational database was developed in MS-Access to manage some routine catch and effort data, but the Fisheries Department wishes to further develop this system to incorporate GIS functionality as well as the coastal frame survey data.

Catch Assessment Surveys may also be used together with Frame Surveys (FS) to generate important information required both for management planning purposes and for helping design Fishery assessment surveys by providing the sampling framework. Frame Surveys involve direct enumeration of all fish landing sites on a regular or ad hoc basis to provide information on:

1. Important landing sites, their location, patterns of fish distribution.
2. Numbers and types of fishing crafts including details of their size, propulsion, gear types…etc
3. Fishing activity and landing patterns of different fishing craft-gear combinations including seasonal, diurnal and geographical operations
4. Supply centres, infrastructure and markets
5. Fish distribution routes, utilization, processing centres and methods…etc

The information recorded in the frame survey helps to identify primary and secondary sampling sites, and appropriate sampling strata for the CAS. Information relating to the total numbers of sampling units (fishing crafts belong to each fishing craft-gear types, VG) is also used to raise sampled catch rates to provide estimates of total catch along the entire coast or at different spatial scales. CAS is also used to provide important information for formulating management plans and for policy and development planning purposes. In common with management plans, CAS typically draw upon data collected and assembled from a variety of sources including population census, maps, rural appraisals, consultations with local resource users, or dedicated frame surveys. Frame survey information is usefully presented in the form of a thematic map or chart.

General objective of the CAS

The general objective the catch assessment survey is to generate data for monitoring trends in fish catches, fishing effort, and economic value for use in management planning, policy formulation and decision making

Specific Objectives

The following are specific objectives to be addressed:-

1. To estimate annual total catch by weight of different fishing craft- gear types
2. To estimate spatial and temporal trends in fish catch rates (catch per unit effort) by gear type of the different units of fishing effort
3. To estimate spatial and temporal trends in the species composition of fish catches by family for the different fishing craft-gear types
4. To determine the impact of different gears on the population structure of selected priority species
5. To estimate the value of the fisheries in terms of ex-vessel price/kg, total value for key species

The Catch Assessment Survey Design

The CAS employs a two-stage sampling design. Within each county/district, a sample of Primary Sampling Units (PSU), in this case landing sites is first selected, and then, at each PSU, samples of Secondary Sampling Units (SSU) (fishing craft gear) are selected based on total number of fishing crafts per landing site, within the creeks and in the open sea. Lastly, the spatial distribution along the coastline is also considered.

A total of twenty two landing sites were chosen from the six districts namely Lamu, Tana River, Malindi, Kilifi, Mombasa and Kwale as shown in fig. 1 below.

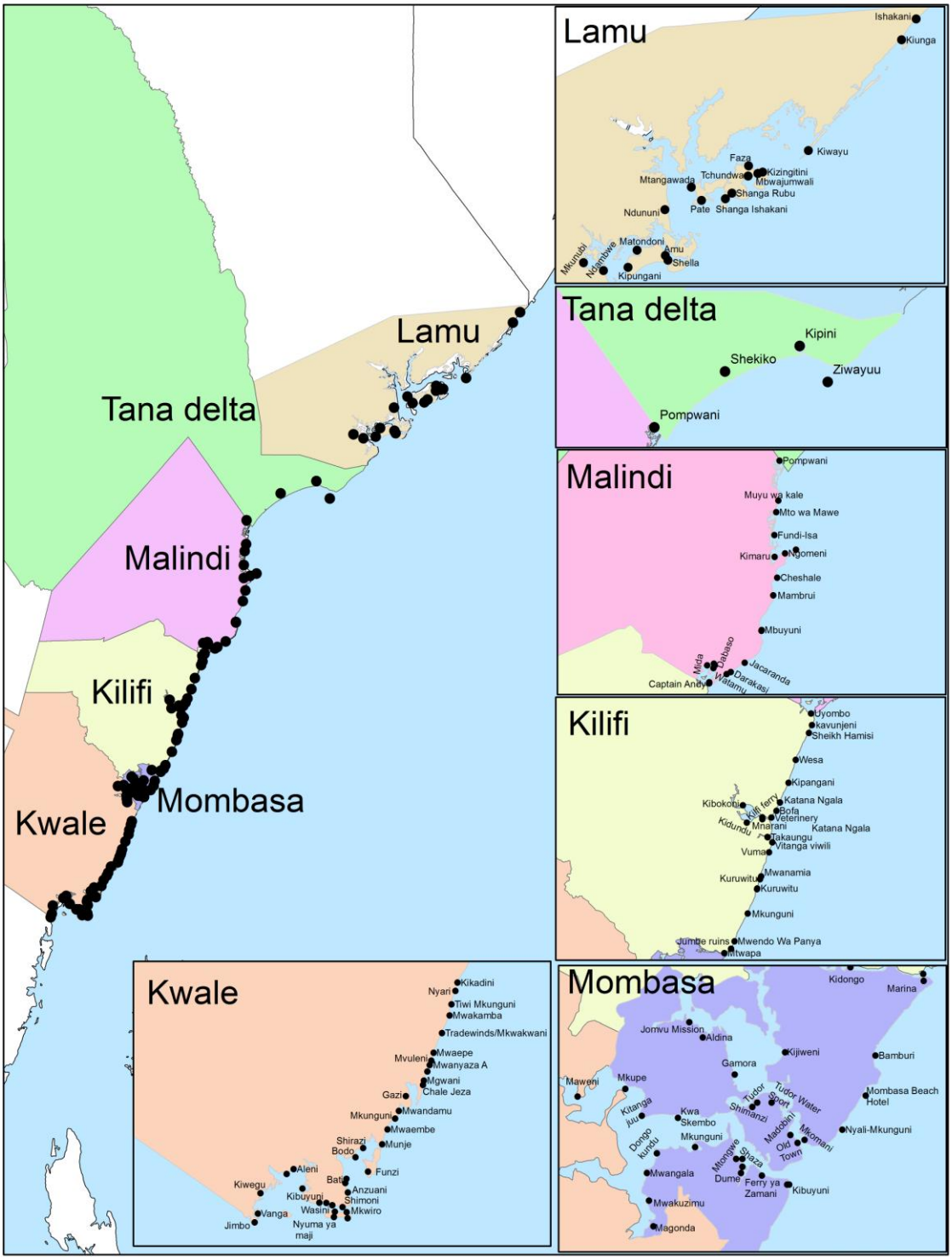

Figure 1: Landing Sites along the Kenyan coastline

Based on the number of landing sites per district, a total of 22 landing sites were selected as per table 1 below.

County/District	Total number of landing sites	10% CAS landing sites	10% + CAS landing sites
Lamu	19	2	3
Tana River	4	1	1
Malindi	31	3	4
Kilifi	29	3	4
Mombasa	31	3	4
Kwale	46	5	6
Total	**160**	**17**	**22**

Table 1: Distribution of Landing sites by district

Sampling Period; The official sampling period was selected as 06:00- 18:00.hrs. However, enumerators are encouraged to make arrangements to ensure that most of the catch is sampled beyond these hours as influenced by the tidal cycles.

Sampling days; sampling days shall be determined every beginning of the month according to the moon phase and tidal cycles. Ten sampling days are allocated every month.

Data collection

Although the CAS data collection is carried out at family level, 14 species among them Kawakawa (*Euthynus affinis*) were selected for data collection at species level. During sampling, individual lengths of kawakawa are recorded at all the 22 CAS landing sites. The data in this report was collected over 10 months period from late May 2013 to March 2014 in the 22 selected landing sites where 1,622 fish were sampled as shown in table 2.

Results and Discussion

Average size

Month	No.	Mean L (cm)	Max L (cm)	Min L (cm)
May	34	59.8	93	24
June	41	65.2	93	25
July	57	73.2	98	44
August	27	51.1	96	31

September	118	47.2	90	13
October	68	44.6	88	18
November	102	45.9	90	20
December	461	31.5	84	9
January	408	31.2	77	10
February	260	34.8	78	14
March	46	53.0	76	24

Table 2: Monthly length distribution of the sampled fish

The mean length of the fish caught varied by the months. The sizes of fish caught were noted to have larger mean sizes during the May to July season ranging between 59.8 and 73.2 cm Table 2. The large sized samples were caught in the deeper waters away from the coastline. They were mainly caught using the handline and trolling methods. The lowest mean sizes were recorded between December and February with the average length being between 31.2 and 34.8 cm. The period when the small sized fish are caught also coincides with the highest catches recorded in the Kenya waters. Most of the fish caught during this season are mainly within the reef areas and also inside the creeks. Majority of the kawakawa catches during this season is composed of juveniles. The juveniles are caught using illegal gears such as beach seines. As a management measure, it is important to remove the illegal gears from the waters so as to safe the juveniles.

Temporal distribution of the catches

The number of samples measured per month is shown in figure 2 below;

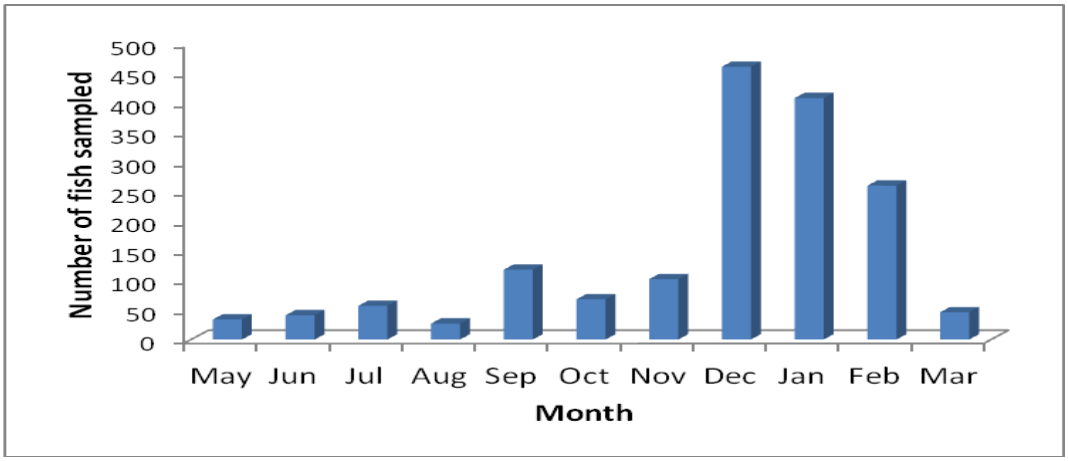

Figure 2: Number of fish sampled per month

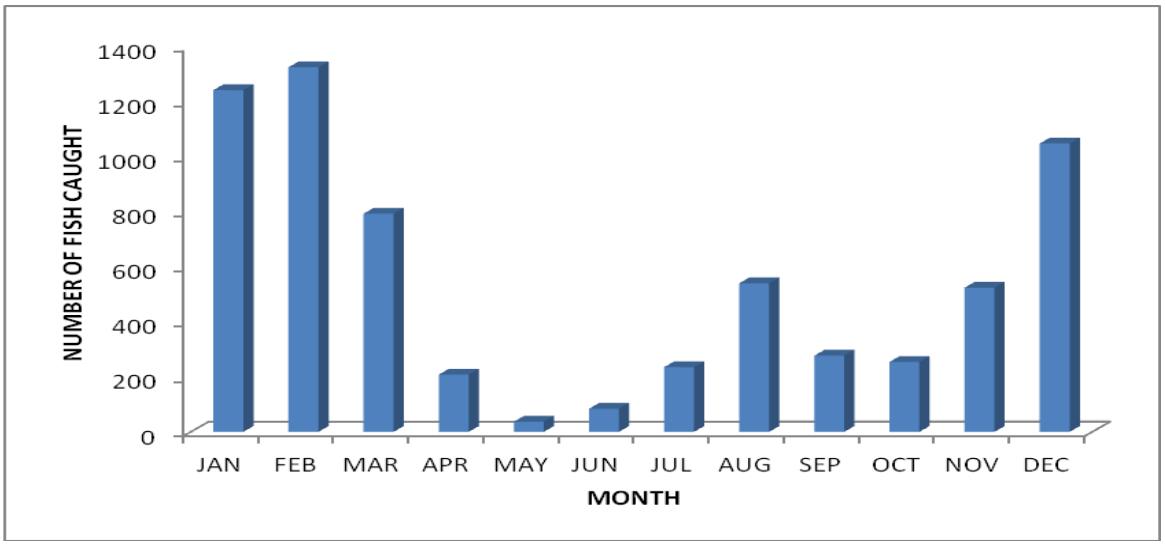

Figure 3: No. of kawakawa caught from sports fishing between 1994 and 2013

During the sampling duration from May 2013 to March 2014, the recorded catches of kawakawa were highest during the months of December to February (Fig.2). A similar distribution of kawakawa catches can be noted from an accumulated 20 years catch data from the Kenyan sports fishing (Fig 3). This shows that the peak season for kawakawa in the Kenyan waters is between December and February.

During the sampling, a total of 1,622 fish were measured. From the length frequency distribution, the most abundant length class was 19 to 28 cm (Fig.4). There were few samples with a length above 68cm. The range between 29 and 68 cm was relatively constant. The smaller sized fish were caught using the beach seines while the larger ones were from trolling.

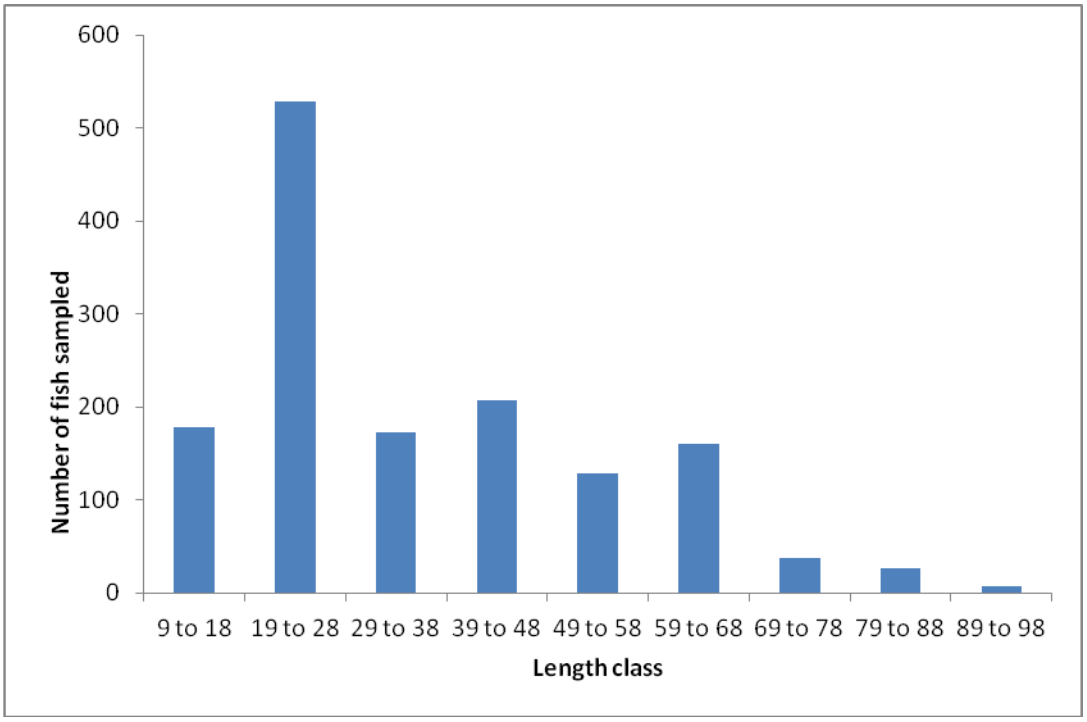

Figure 4: Length frequency distribution of the catch

Conclusion

Wherever possible, total enumeration of fish catches can provide the best fisheries data. However, due to shortage of manpower and resources set aside for data collection, sampling of catches can give a good indication of the trends in a fishery. The sampling undertaken during this catch assessment survey exercise where both the fisheries personnel and fishers from the selected landing site were involved provided the fisheries management with better data than the previous total enumeration. Collection of size frequency data also showed a clear exploitation pattern by the different gears used by the fishers. The beach seines were landing immature fish from the creeks mainly during the December to February. The fisheries enforcement team should undertake more surveillance during this season to remove the beach seines from the waters. Measurement of length from the landed catch should be extended to other neritic tuna species to improve the management of the fishery.