

SARDINE FISHERY IN KENYA

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ABSTRACT

This paper gives an overview on the Kenya sardine fishery as a research area for the future development and management of marine resources. The fishery is viewed in the context of an industry and the need for research into it as an ecological indicator and for commercial exploitation is emphasized.

INTRODUCTION

Fishing, fish processing and marketing are all included in the term fishery. The benefit of a fishery are the resultant balance between the output and inputs into the fishing, processing and marketing of the fish (fish used to include any aquatic resources).

Technology availability of the fish stock and capital needed are major limiting factors in the development and management of a fishery. Depending on the exploitation rate, a fishery is either commercial or artisanal; where quantities landed, vessel-gear coupling and effort employed are the most determinat factors.

SARDINES

These are small - sized fish, rarely reaching 20 cm in length. They are variously referred to as herrings, and belong to the family Clupeidae (suborder clupeoidei). All are characteristically migratory forming heterogenous (sometimes homogenous) shoals of varying sizes and densities. The shoals are only formed during migration, but are broken off during feeding, spawning and at night (in dark). The shoaling has protective advantages for these most preyed on fishes. The shoals sometimes contain larvae or younger mackerels which are also pelagic. Sardines are plankton feeders.

Of the 38 Indian Ocean clupeidae species (Whitehead 1972) 10 are represented along the East African Coast (Losse 1968). These are included in the four genera: *Sardinella*, *Harklosichtys*, *Pellona* and *Hilsa*. The *sardinella* genus is represented by six species: *S. longiceps*, *S. sirm*, *S. leiogaster*, *S. albella*, *S. gibbasa* and *S. melanura*. This last one has not been recorded in East Africa, but in the Red Sea.

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(Gulf of Aden) as *Herklotsichthys vittatus* Whitehead (1965), Losse (1968). The *Herklotsichthys* genus on the other hand has two species earlier classified as one; *H. punctatus* forms A and B. However, these have been renamed separately as *H. quadrimaculatus* (form B) and *H. spilurus* (form A).

The genus *Pellona* is represented by *P. ditchella* and Hilsa by *H. kelee*. All these species have been described and classified by various workers in the region. EAMFRO (1962) Losse (1964, 1966, 1968), Whitehead (1972) and FAO (1974).

The biology of the sardine (herrings) has also received quite a coverage, though most of the works are outside the East African waters (Blaxter Holliday 1965; Losse 1968). Losse also outlines the spartial distribution and relative occurrence and abundance of the sardines along the East African coast.

Two major sardines found off the Kenya waters are *Sardinella gibbosa* and *Herklotsichthys quadrimaculatus*. From market samples all along the Kenyan coast, the two species have been shown to dominate in the catches and seem to alternate in occurrence, but both appearing throughout the year in varying quantities. These two were therefore preferred for the on going research programme on the feeding biology, catch composition, protein content and seasonal variations on which basis, their natural histories are to be constructed.

Though, the prevalence of the two species has to be further studied to exploit any existing loopholes and ascertain without doubt which of them dominates the other. A general survey is therefore underway to study the general fishing abilities and methods employed in the sardine fishery. The dominance can otherwise be due to the selective fishing: Preference of species or fishing grounds.

RESEARCH

Very little can be said on the history of the sardine fishery. Of worth were "night time" catches made during the EAMFRO's surveys with the purse seine in 1961 (EAMFRO 1961). The catches were as high as one ton per shot (more than three tons per night at an average of three shots per night). The project was to assess the potential of the shoals and surveys were carried out at daytime. Sardines were found shoaling around the lit up near waters due to bright light from the research vessels and using the purse seine, they were found easily landed in large quantities. The catches varied with time of the year, e.g., off Zanzibar, landings were 90% sardines (*Sardinella* and *Amblygaster*) in March but dropped to 25% in the latter months of the year (EAMFRO 1961).

Other research work have since been conducted and taxonomic work have met with success though some have not been fully identified due to lack of proper taxonomic features, especially where only colouration has been used as a major distinguishing feature.

For any enterprise, the balance between the costs and the benefits is a major in determining the need for continued development, management and investment in the enterprise. It is common practise along the Kenya coast to record amounts and value of fish landed. These records, however, overlook one major aspect in fishing; the effort employed. It is difficult to evaluate the benefits of the fishery without information on the effort spent to land the fish. Efforts to get any data on this are usually frustrated since the fishermen are not willing to identify themselves.

Sardines, however, are an important resource of food to man and other fish. Improving on their fishery can cause an increase in the amount landed and give rise to a commercial activity. Their stock may also be used to improve on the fishery of, predator fish and of those fish which coexist with them, e.g., mackerels, carangids and scombrids.

CONCLUSION

Most of the Literature on the sardines is based on fisheries outside our waters. Fisheries on the Herring, *Clupea harengus* L.; Californian sardine, *Sardina caerulea* Girard; the Indian oil sardine, *Sardinella longiceps* (Val); the Japanese sardine, *Sardinops melanosticta* Schlegel, and the European sardine, *Sardina pilchardus* Walbaum, to mention but a few are good examples of various works on the great fisheries of the world.

A research programme at the Kenya Marine and Fisheries Research Institute, Mombasa, has been undertaken to study the life histories of sardines (clupeidae) of the Kenyan coast. Information on the seasonal variations (size and catch composition), is being gathered for the evaluation of the factors influencing their distribution. Taxonomic works are also being undertaken though earlier investigations as those undertaken by among others, Losse (1968) and Whitehead (1972) are acknowledged here. There is need for a deeper insight into the biology of the sardines as this would help us understand other surface schooling fish which depend on sardines for food. Of importance is the migration patterns which reflect hydrographic changes and fluctuations of fish sizes.

Stomachs of *Sardinella gibbosa* and *Herklotsichthys quadrimaculatus* are being examined for food content. The occurrence and points methods (Hynes 1950) are employed in the study of the stomach contents. The two methods were preferred due to the smallness of the stomachs and the forage organisms. By giving some arbitrary figures to the observed stomach (volume or degree of fullness and its contents analysed into specific forage organisms the time and frequency of feeding and forage organisms as relatively fed on will be determined. This coupled with data on zoo-plankton in the fishing ground are useful information. Data is also being gathered from market samples on catch compositions (by size, species, sex, age etc.).

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CATCHES

Data on sardine landings along the Kenya coast show seasonal fluctuations with drastic variations which reflect the impact of weather changes. Of particular interest is the synchrony between the abundance of sardines on the market during the November-April period when the Northeast (NE) Monsoons prevail along the coast. During the same season analysis on the primary productivity and plankton abundance have shown peaks. Low catches during the remaining part of the year show the impact of the prevailing Southeast (SE) Monsoons. It is noted that during the NE Monsoons, an upwelling develops in the northern Kenya banks which should be contributing to the productivity level during the season. Information provided by the Fisheries Department on monthly landings (for 1979 and 1980) show seasonal fluctuations in catches (figure 1, 2 and 3). Percentage of sardines landed to total landings indicate that during the good fishing season (NE Monsoons) when rains are heavy and long, the sardine landings are high. Figure 2 gives the landings in metric tonnes per month. During the SE Monsoons (May - October) when the conditions are rougher due to strong winds there is a fall in grand catches (figure 3). The low catch during the period is attributed to either lack of fish stock or difficulty of operating local craft in rough waters. The landing of sardines, therefore, depends on skilled operations: The ability (of the fisherman) to identify surround and trap a shoal is a major advantage. The EAMFRO annual report recommended the use of purse seines for shoaling pelagic fish as the only way to commercially exploit the fishery (EAMFRO 1953).

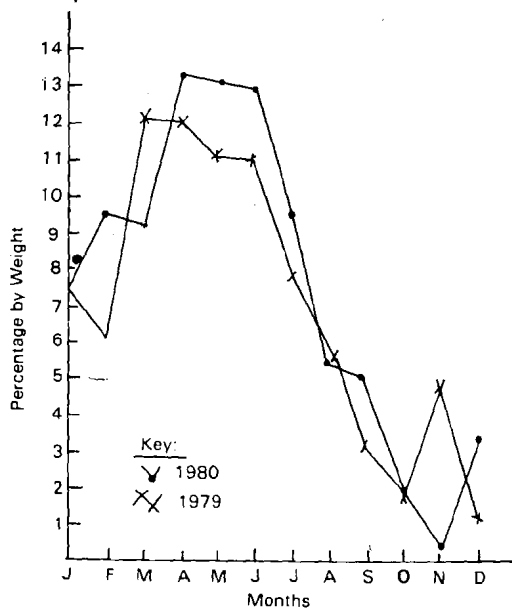


Fig. 1 A direct comparison of the sardine landings to grand total landings by months for the years 1979 & 1980. Note the peak.

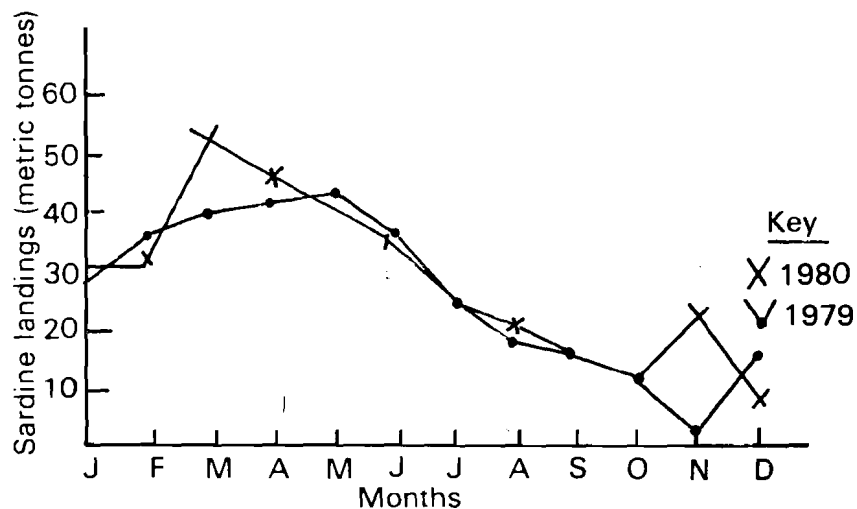


Fig.2. Sardine landings along Kenya coast in metric tonnes (1979 & 1980).

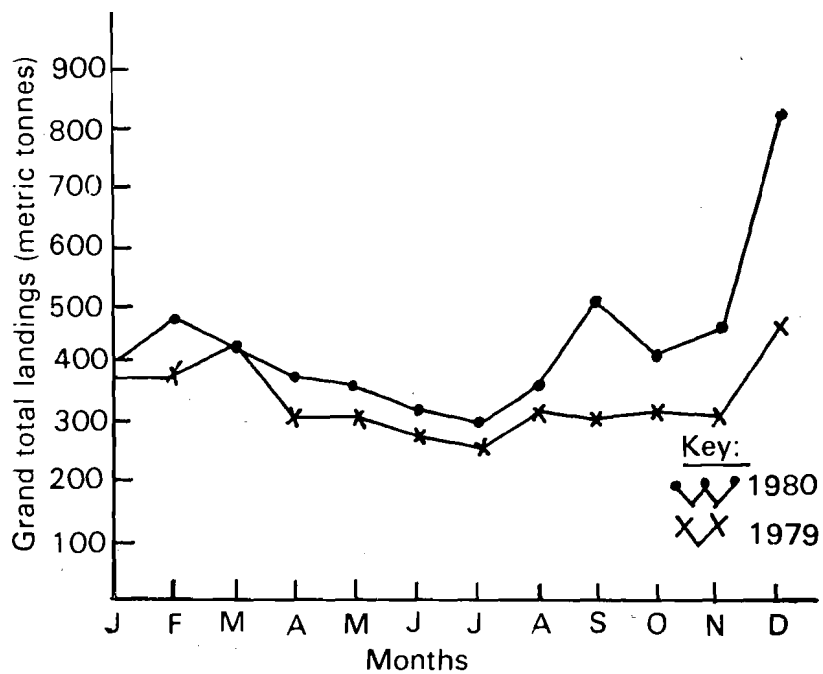


Fig.3 Grand total landings of fish along Kenya coast in metric tonnes. (1979 - 1980)