

A STUDY ON THE TREND OF SPORTS FISHERY OF MAFIA ISLAND (TANZANIA) ALONG THE EAST AFRICAN COAST FROM 1961-1972

By

S. A. H. Abidi*, B. N. Desai, S. N. Dwivedi**
and
P. K. Varshney

(National Institute of Oceanography)
Regional Centre, Bombay-400 061
INDIA

* Formerly Ag. Director of Fisheries, Govt. of the United Republic of Tanzania, Dar-Es-Salaam.

**Director, Central Institute of Fisheries Education, (ICAR), Versova, Bombay-400 061.

ABSTRACT

Mafia waters in the western Indian Ocean on the east coast of Africa is a natural attractive area for fishing. It has extensive coral beds which harbour good fish life and attracts sport fishery in the area. About 12 commercially important fishes listed are caught by sports fishermen. The data indicates that this area can become an attractive centre for sports fishery almost throughout the year with peak, season from November to February. Long-term planning of the fishery is necessary. The conservation measures should be evolved and gan fishing, dynamiting or and other kind of distructive fishing should be prohibited once for all. This area has natural potential to become a sports fishing centre in future also and a great attraction for tourists and angler.

INTRODUCTION

Mafia island about 80 miles south of Dar-Es-Salaam (Tanzania) on the continental shelf, has long been reputed to be one of the best fishing spots on the East African coast. Over the years anglers have made the trip and come back with tales to torment the stay-at-home.

Adrian Conan Doyle son of the creator of Sherlock Holmes, is one of the many who have fished there, his 75 lb dolphin (*Coryphaena hippurus*), locally known as Felusi was a world record which has only recently been surpassed.

The island, not only has some of the most exciting big game fishing in the world, but also an ideal holiday setting for those seeking perfect peace of an island in tropical beauty. In fact it is one of the few remaining "Paradise islands" in the world.

The island is situated between latitude $0.7^{\circ} 32.4'S$ to $0.8^{\circ} 00'S$ and longitude $39^{\circ} 30.5'E$ $40^{\circ} 00'E$ in the Western Indian ocean on Tanzanian coast of East Africa, (Fig. 1). The main island is fringed with attractive palm clad beaches, and there are many other islets and some of the most fascinating coral reefs in the world, which attract scores of deep sea divers every year. But most of the visitors to Mafia come for fishing. Virtually unfinished water abounds in a rich variety of fish of tremendous size and weight many of them great fighters.

The popular sports fishes of the area are Rock Cod (Kiswahili name Chewa), *Epinephelus* sp., Dolphin (Kiswahili name Faloosi, Panje), *Coryphaena hippuras* (Linnaeus), Wahoo, Kingfish (Kiswahili name Nguru, ngaziga), *Acanthocybium solandari* (C.V), Barracuda (Kiswahili name Mzia), *Sphyraena barracuda* (Walbaum), Striped marlin (Kiswahili name Nduaro), *Tetrapterus autex* (Philipi), Sailfish (Kiswahili name Mbassi, nsulinsah), *Istiphorus gladium* (Bloch), Sword fish, *Xiphias gladium* (Linnaeus), Skipjack (Kiswahili name Sehewa), *Katsuwonus pelamis* (Linnaeus), Yellow fin Tuna (Jodari in Kiswahili), *Tunnus albacares*, Karambesi, *Caranx ignobilis* (Forsk), Kole Kole, *Caranx melampygus*, Bonito, *Thunnus pelamys*. Red snapper, *Lutjanus johni* and others.

Best season for angling is from December till March, Particularly for reef fish. However, during most of January and part of February the north east monsoon blows so hard that fishing is difficult and late February is the safest time for fishing. May to August is the off season when only a few kingfishes could be expected. During September to November the monsoon begin to change back to north when kingfishes appear in plenty.

No earlier published information seems to be available on the sports fishery of Mafia island except longline fishing survey for Tuna off the coast of East Africa, 1958 to 1960 which covered some parts of Mafia island at a distance of 30 miles from the shore (Williams, 1963). Also some earlier

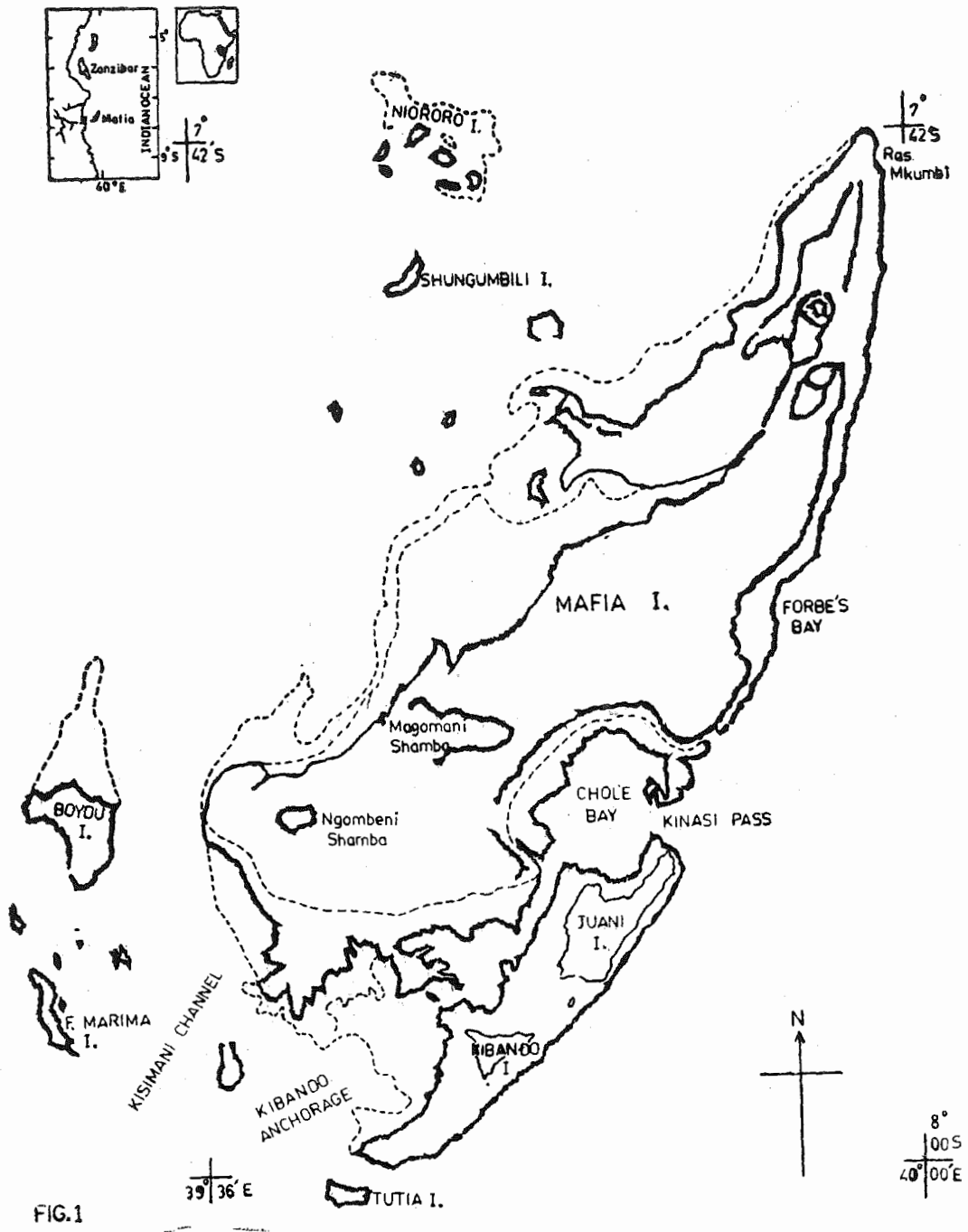


FIG.1

Map showing the location of Mafia Island (Tanzania).

studies on the hydrographic conditions along the East African coast from southern border of Tanzania to the northern border of Kenya (Newell, 1957 and 1959). Abidi *et al* (1975) undertook hydrographic study of the Mafia channel and demonstrated high productivity. Sports fishery for sailfish at Malindi (Kenya) on the same coast for the period 1958-1968 was reported by Williams (1970).

IMPORTANT FISHING AREAS

Most of the sports fishing was done in Mafia island waters in a radius of about 40 km from the lodge like Forbes bay, Tutia reef, Kinassi pass, Chole bay, Rass Mkumbi, Fungu sefu, Tunny bay, Okuja islands, Nyuni off Juani, Jibondo gap, Kibondo island, off sheikh yusuf, off Miewi islands. But the best fishing ground was said to be Tutia reef (Fig. 1) Fishing at a maximum depth of 100 fathoms was reported in the area.

MATERIAL AND METHODS

Records of important data such as date, type of catch, number of fishermen involved; area of fishing, weight of each fish caught from 1961 onwards was maintained by the then Mafia Island Fishing Club Manager Mr. John Glenn and then 1972 onwards by the Manager Mafia Island lodge run by the Tanzania Tourist Development Corporation.

The data was very kindly made available to one of the authors (SAHA) for scientific analysis by the Manager, Mafia Island Lodge.

OCEANOGRAPHIC CONDITIONS OF THE AREA

It is an established fact that the fishery of any particular region or area is dependent on the oceanographic conditions prevailing in the area.

Oceanographic conditions of East African waters as a whole in the area of which Mafia Island is also dotted have been investigated throughout the year and reported by Newell (1957, 1959) and partially summarised from a biological standpoint by Morgan (1959). Abidi *et al* (1975) undertook hydrographic study of the Mafia channel and demonstrated high productivity.

Major features of the water masses as observed by earlier authors are as follows:

The north flowing East African Coastal Current (EACC) forms the whole of the surface mass throughout the year in the area surveyed. This current is derived from the South Equatorial Current (SEC), being the northern deflection of that current and formed where it impinges on the African coast in the area of Lat. $10^{\circ}30'S$, (the southern deflection forms the south flowing Mozambique Current). The actual point of division of the South Equatorial Current (SEC) varies according to the time of year, moving north and south in phase with the movements of the sun. Although permanently north-flowing, the physical and chemical characteristics of the EACC vary considerably from one monsoon to the other.

In the South East Monsoon the prevailing wind (SE trade wind extension) helps to increase the speed of the surface current which flows at 2-4.5 knots along the whole East Africa coastline while in the North East monsoon the speed of the EACC is sharply reduced, averaging 1-2 knots (Newell, 1957). The depth range of the EACC is considerably reduced during the North East monsoon and may be only 30-40 fathoms.

Records of oxygen content, pH, inorganic and total phosphorus indicate that a seasonal phytoplankton cycle occurs in the surface waters. The outburst of growth commences during North East monsoon, the actual date being dependent upon the length and strength of the preceding South East monsoon. Maximum phytoplankton growth appears to be in March, and the surface waters reach their maximum fertility from June to September. In the North East monsoon the closed circuit pattern of the current system would tend to congregate plankton in the area. There is also the possibility of some of the nutrient rich Somaliland Current water being brought into the East African circulation system. The speed of the current, depth of the water mass and temperature constitute a typical environment and a suitable habitat for a particular sport fishery. For example it may be seen (Williams, 1963) that the maximum fishing period varied from December-March with peak in February. However, the variation — the fishery can be perhaps related to fluctuations in the current characteristics and oceanographic parameters of the area.

In the south east monsoon, however, plankton accumulation would be unlikely because of the rapid dispersal of organisms both vertically and horizontally (Newell, 1959).

The two layer system of the Pacific Equatorial current can be correlated with the upper two water masses of the East African area, namely the East African Coastal Current (EACC) and Arabian Sea Water (ASW). The three mechanisms of transfer are (i) upwelling (ii) current interface shearing and (iii) eddies and wakes. The stratification of the sea off East Africa exists right upto the fringing reef and it is possible that submarine banks, islands and promontories which stand in the path of the various water masses may cause a break-up of flow and create local eddies and wakes with resultant vertical mixing like areas in Mafia Island etc. Therefore, although upwelling does not occur on this coast, a certain level of local enrichment may take place due to vertical mixing caused by other mechanism (Williams, 1963).

In this part of the world, seasonal differences are clearly marked by wet and dry seasons rather than by the conventional spring, summer, autumn and winter. There are two rainy season associated with NE and SE monsoon. North East monsoon (October-March) and South East monsoon (April-September).

A study of current speed, productivity and solar radiation appear to stabilise for maximum production with the change of seasons. The maximum phytoplankton production starts occurring in March. This productivity cycle continue, and fades. However, this is preceded by active ingress of offshore and distant waters of specific environment which support sports fishery in the area. Scattered information in support to this theory was also given by Macumana, (tuna, 1972) when he indicated that sports and migratory fishes thus moves in different watermass. The present study also shows association of sports fishery with different current and water masses.

A detailed study of water mass and the associated fishery can be very rewarding in this area.

RESULTS AND DISCUSSION

At Mafia Island Fishing Club in nine fishing seasons from 1961 to 1972 except in 1964, 65 and 69, a total of 5754 sports fishes with the total weight

of about 34,968 kg. were landed. These fishes were caught principally within a radius of 40 km of Mafia. The highest catch recorded was during 1963 (1067 nos) and lowest in 1967 (373) numbers). An analysis of the catch and distribution of few important sports fishery is dealt here as under:

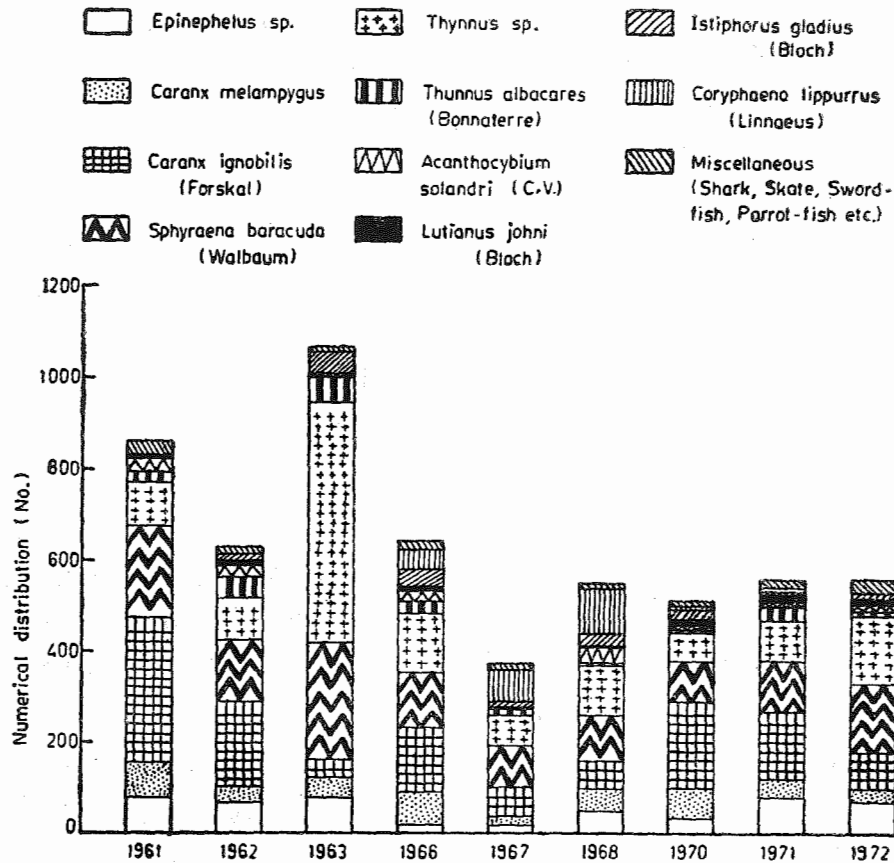


Fig. 2 Numerical distribution of various sports fishes at Mafia Island during 1961-1972.

1. Yellowfin Tuna: *Thunnus albacares* (Bonnaterre) 1788:

This fish is very common around Mafia island on the East African Coast. A detailed study in respect of Fishing, morphometry and other biological aspect of this species has been dealt earlier by Williams (1963). From the catch statistics analysed it is observed that the highest catch was during 1963 and the lowest 1967, 68 and 70 (Fig. 4). It will be seen from the Fig. 6

that yellowfin is available in the Mafia island almost throughout the year but it is abundant during Jan. Feb. May and August. Williams (1963) during his longline fishing for Tuna off the East African Coast observed highest daily rates of 9.2, 7.2 and 6.2/100 hooks in the stations were found to be closed to 100 fm. Williams (1963) found that yellowfin tuna have only been taken in the SE monsoon when the EACC is coldest occupies its greatest depth range and is relatively isothermal from the surface to the EACC/ASW thermocline at 60-70 fm. From our results it is not in agreement with the observations of Williams and it is found to be in both the monsoon but more in SE monsoon.

It is considered unlikely that the apparent abundance of subsurface yellowfin at any point on the East African coast such as Mafia are, could be caused by local enrichment (Williams, 1963). The abundance of subsurface yellowfin during the south east monsoon may be due, therefore, to a biological phenomenon such as spawning peak, specially in view of the fact that yellowfin obviously spawn in the area during this period. However its concentration in surface layers can also be affected due to the movements of the thermocline. Small yellowfin of 5-20 lb are seen in large shoals in the East African coastal area throughout the year (Williams, 1956; MS. 1962) but are most abundant in the NE monsoon, whilst juveniles of 1 lb, are also seen in large numbers at this time. The above observation of (Williams, 1963) concur with our observations that yellowfin tuna is available through both the monsoon seasons. The occurrence of 1 lb tuna are also indicate existence of breeding grounds in the adjoining areas.

2. *Thunnus* sp. (Tuna):

This group comprises mostly of Skipjack *Katsuwonus Pelamis* (Linnaeus) 1758 (Swahili it is known as Sehewa), and a few catch of Albacore *Thunnus Alalunga* (Bonnaterre) 1788.

During the longline survey by Williams (1963) only two specimens of skipjack were taken by longline. Little information is available on *K. pelamis* in East African waters even though it forms a fairly high percentage of surface shoals of tuna at present not exploited in the area (Williams, 1963). In the same cruise a single specimen was taken on longline at a station approximately 5 miles east of Rs Mkumbi in Mafia Island.

It will be observed from our data that the highest catch of this group of tuna was in 1962 (950 numbers) and lowest in 1967 (65 Nos) and 1970 (65 Nos).

3. Sailfish: *Istiphorum glaatus* (Bloch) 1793.

In local kiswahili language it is commonly known as Mbassi or nsulinsuli. A detailed study on the fishery of this species has been dealt by Williams (1963) and the sports fishery of sailfish *I. platyterus* at Malindi (Kenya) from 1958-1968 (William, 1970). The catch rate of sailfish was highly seasonal and only one specimen was caught outside the period of NE monsoon. Seasonal catch rates were SE monsoon 0.01/100 hooks and NE monsoon 0.31/100 hooks (Williams, 1963). They also found that the species was available along the entire coastline in depth 100 fm. Our catch data reveals that the maximum catch was in 1963 (50 numbers and minimum in 1961 (3 numbers). The yearly catch also showed that majority of the catch are made in November to February. The sailfish is carnivorous and on fish and squids are the major constituents of its food.

4. Dolphin: *Caryphaena hippurus* (Linnaeus) 1758:

Commonly known in swahili as "Faloosi", or Panje. During the longline fishing cruise specimen collected had a minimum weight of 13 lb and maximum 32 lb of both the sexes during the month of Nov. and December (Williams, 1963).

From the catch data of Mafia it is observed that most of the fish was caught during the months of Feb. and March. Maximum catch was recorded in 1968 (101 Nos) and 1970 showed the minimum when only one specimen was caught.

5. Wahoo *Acanthocybium solandari* (C.V.):

Locally in swahili language it is known as "Nguru ngaziga". It will be observed from our catch records that this species is available in Mafia waters throughout the year round except in June, with maximum in November to

March. It is also seen from the Fig. maximum catch was in 1968, 1961, 62 and 66. The fluctuation in catch may, because of variation in the catch efforts by the sportsfishermen. The same variations are also applicable in the catch efforts for other fishes too. Apart from sport fishery Wahoo is a commercially important fish and is available and quite popular in the commercial catch of fishermen on the east African coast and it is more abundant in Tanzania.

6. Red Snapper: *Lutianus johni* (Bloch):

This is a very common fish available in the rocky shore of east Africa and easily caught on the line. Its attractive colours thrill the sportfishermen at the time of its catch. The fish lives in and around the coral and reef area and is caught round the year. Maximum catch is during NE monsoon.

7. Barracudas *Sphyraena barracuda* (Walbaum) 1792

Commonly known in swahili as Mzia. It is also very common fish of the Mafia water and generally for the east African coast. It is surface shoaling fish and as such very commonly caught by the sports fishermen on their line. Almost available throughout the year but concentratively from October to Jan. The highest catch of 252 numbers and lowest of 90 was recorded in 1963 and 1967 respectively.

8. *Caranx melampyqus*

This fish was also available throughout the year in the Mafia waters. It is observed from our data that maximum catch of 75 was recorded in the year 1961 and minimum of 22 in 1967.

9. Rock Cods: *Epinzphelus* sp.:

This species is mostly found in the shallower waters upto a maximum depth of 100 fm. The fish lives below the EACC/ASW thermocline (Williams, 1963). Its abundance from November to March but it is caught occasionally in other months also. The highest number (81) was recorded in 1961 and 62 while lowest (20) in 1966.

10. *Caranx ignobilis*:

This particular fish is locally known as Karambesi and very popular food fish on the Tanzanian coast. This fish was available throughout the year with a little fluctuation during monsoon months. The maximum recorded catch from our data was 321 numbers in 1961 and minimum of 40 in 1963.

11. Miscellaneous species:

This included mostly sharks and skates, *Rachycentron*, Parrot fish (*Siganus sp.*), *Nemipterus sp.*, *Trachysurus sp.* etc. The maximum catch of these miscellaneous fish was observed in 1972 and minimum in 1977.

Monthly percentage of sports fishery

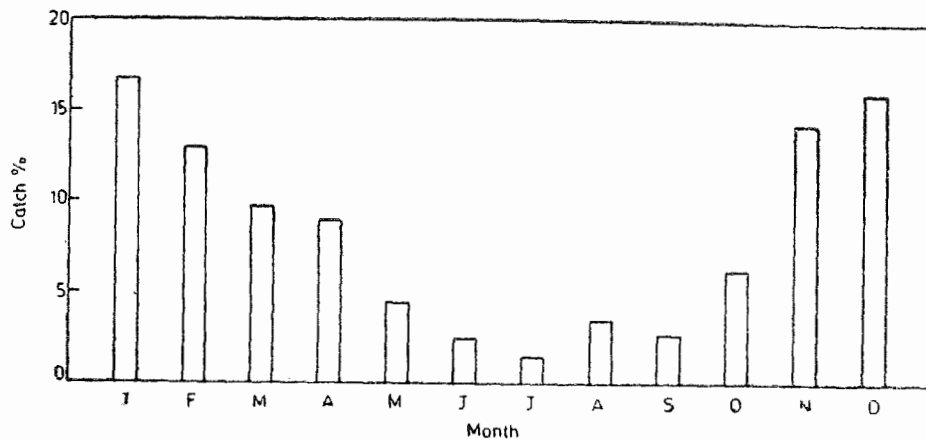


Fig. 3 Total catch percentage during different months of the year..

It can be seen from the Fig. 3 that the percentage of catch varies significantly from one season to another. It could be seen that there is a catch decline from May to September and increase from Sept. onwards with peak in November to February of the year. This clearly shows that the NE monsoon months are more productive and favourable for the sports fishing in Mafia-waters on the East African Coast.

This is the season of high productivity and abundant food. The sea conditions becomes stable and thermocline moves up in coastal areas. Perhaps these and a few other not well-understood facts — results in congregation of the migrating sports fishes in surface waters in Mafia channel and in the East African coast.

Catch and Manpower efforts relationship

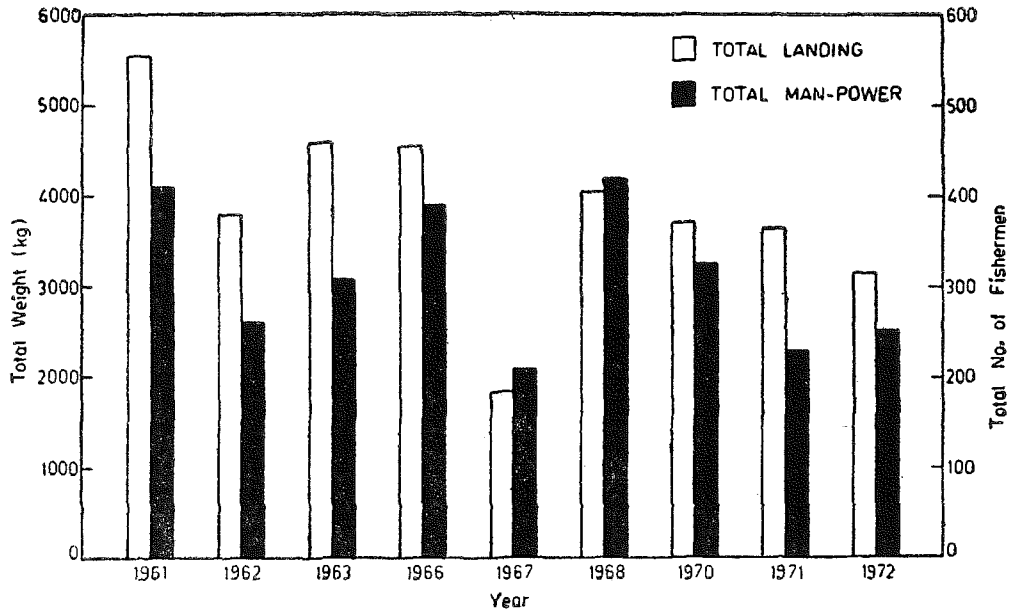


Fig. 4 Relationship between total weight of sports fishes caught and manpower involved.

From Fig. 4 it can be observed that the catch rate is directly proportional to manpower efforts, except in 1967 and 1968 when there is less catch in relation to manpower efforts. This difference may be due to some localised conditions. It is, thus, seen that it is a potential area for sports fishery and development of the infrastructure facilities for sports fishery can make the area an attractive centre for sports fishery in the region.



Fig. 5 Average weight of fish caught during 1961-1972.

From Fig. 5 the graph indicates that the sports fishery has been very erratic from the year 1961 to 1968. From 1968 to 1972 it is also seen that there is a tendency in reduction of the average weight of fish caught. This situation is likely to have arisen because of the erratic migration of the stock, which could have been caused due to the change in the environmental conditions of the area and moving away of larger oceanic stocks. The other possibility is that, as a result of commulative factors and selective overfishing, the average catch has gone down.

Irrespective of the above hypothesis it is evident that there appears to be a regular reduction in the size of the sports fishery and a detailed study to determine effect of the contributory factors like environment, movement of the offshore stocks, actual area of fishing, the different kinds of fishery, the different kind of fishing methods used and the inter and intra specific variation in the catch needs the study in greater depth.

The above study would broadly indicate the future line of action for conservation and development of sports fishery in the area.

General discussion and Conclusion:—

The waters washing the coastal waters of Tanzania are strongly influenced by the East African Coastal Current, which is northernly branch of the South Equatorial Current that divides off the northern tip of Madagascar, and the Arabian sea waters which penetrates south as far as Tanzanian waters. Fishery of the area is very much dependent on the oceanographic condition in that year.

Morris (1974) based on Cushings method of productivity calculations has calculated the Mafia channel of 825,600 hectares area to have zooplankton production in NE monsoon as 60 mg|m³ and SE monsoon 30 mg|m³. Thus the tertiary production per metric tons during NE monsoon was calculated to be 31,000 and for SE monsoon to be 16,000 tons.

The production figures calculated by Morris (1974) for Mafia exclusively is much more than for the whole Tanzanian coast itself. However, all these studies indicate that the area is productive.

Keeping in view the catch records of the sports fishing in Mafia during the last nine seasons for about a dozen of fish varieties and the productivity calculations of Morris (1974) indicate that Mafia is definitely a productive pocket from fishery point of view on the Tanzanian coast. Because of the extensive coral bed (*Acropora sp.*), the bulk of the demersal fisheries concentrate on these sheltered area. The pelagic fishes are mostly migratory in their nature and most of them are available in the course of the NE monsoon during which the productivity of the water increases and the availability of the food is more. In such circumstances no commercial fishing project could be undertaken in the area inspite of its richness. But a more detailed programme and scientific approach to establish the Mafia as Sports Fishing and holiday island could be undertaken. The Tanzania Tourist Development Corporation has already established a lodge for the comforts of the tourist but further, more availability of the facilities of fishing equipments on hire and availability of silvery type and other artificial and live fish baits should be arranged by the management which will be of great help in the enjoyment.

The use of fishing guns should not be encouraged and only line fishing and angling be allowed. Since the use of harpoon guns etc will hit and destroy the corals which are the sheltering places for the demersal fishes and attraction of pelagic and migratory fishes during the NE monsoon when the productivity of the water increases.

The study thus indicate that Mafia water (Latitude 0.7° 32.4's to 8.0 00'S and longitude 39° 30.5'E to 40.00'E) in the western Indian Ocean on the east coast of Africa is a natural attractive area for fishing. It has extensive coral beds which harbour good fish life and attracts sport fishery in the area. About 12 commercially important fishes listed above are caught by sports fishermen. The data indicate that this area can become an attractive centre for sports fishery almost throughout the year with peak season from Nov. to Feb. Long term planning of the fishery is necessary. The conservation measures should be evolved and gun fishing, dynamiting or and other kind of destructive fishing should be prohibited once for all. This area has natural potential to become a sports fishing centre in future also and a great attraction for tourist and anglers.

Acknowledgements

The authors are grateful to Dr. S. Z. Qasim, Director, National Institute of Oceanography (presently Secretary, Department of Environment, Government of India) for very kindly going through the manuscript of this paper and to Kum. Prabha Gore for help in drawings and to Shri P. B. Nair for typing. One of us (SAHA) is grateful to the Manager, Mafia Island Lodge, Mafia (Tanzania), for providing the data for this paper.

REFERENCES

- | | | |
|--|------|---|
| Abidi, S.A.H.,
V. S. Bhatt and
R.M.S. Bhargava | 1975 | Hydrographic conditions of Mafia channel (Tanzania) along the East African Coast. <i>Journal. Indian Fish. Assn.</i> 5:123-130. |
| Morgan, J.F.C. | 1959 | The Sea We Fish, <i>E. Afri. agri. J.</i> , 25 (2) : 91-96. |
| Morris, R.E. | 1974 | Priorities in Development of Shelf Fisheries, <i>Proc. International Conf. Mar. Res. Dev. East Africa</i> , April 4-9, 1974. |

- Newell, B.S. 1957 A preliminary survey of the Hydrography of the British East African coastal waters. *Fish. Publ. London*, 9.
- Newell, B.S. 1959 The Hydrography of the British East African Coastal Waters Part II. *Fish. Publ. London*, 12.
- Williams, F. 1963 Longline Fishing for Tuna off the Coast of East Africa 1958-1960, *Indian J. Fish*, 10 : 233-390.
- Williams, F. 1970 The Sports Fishery for Sailfish at Malindi Kenya, 1958-1968, with some Biological Notes, *Bull. Mar. Sci.* 20, 830-852.