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**Status and Trends of Tanzania's
Marine Artisanal Fisheries.**

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1. Introduction

Worldwide fishery is of immense importance and most of the coastal people depend on fisheries for their livelihood. About 95 per cent of the fishery in Tanzania is artisanal using traditional boats and gears. These are boats, dhows, outrigger canoes and canoes. The gears include nets, movable traps (*dema*), hooks-and-line, fixed traps (*uzio*). Total catches range from 48,300 mt to 56779 mt for the Tanzania mainland and 21,632 mt in 1984 to 10062 mt in 1998 in Zanzibar (Jiddawi and Ngoile, 1999).

The continental shelf is narrow, about 4 km offshore, with the exception of the Zanzibar and Mafia channels where the shelf extends for approximately 60 km. According to FAO (1988), the area of the shelf to the 200 m depth contour for both the mainland and Zanzibar combined is 30000 sq km. This is the area most commonly used by the artisanal fishermen.

The inshore fishery recently has been showing signs of being overexploited. This can be seen especially in Zanzibar where the trend in annual catch is showing a decline trend. The same can also be heard from the elder fishermen who claim that, in the past, they used to catch much more and bigger fish in near-shore waters than is currently the case and they have to travel farther to obtain these catches.

The high seas within the exclusive economic zone continues to be unexploited and the resource potential is still not known. However, the area is rich in migratory species such as tuna, sailfish and marlin.

Most of the fish caught in inshore waters by artisanal fishermen are mostly demersal species (*Lethrinidae*, *Serranidae*, *Siganidae*, *Mullidae*, *Lutjanidae*), followed by large and small pelagic species (*Carangidae*, *Scombridae*, *Clupeidae*, *Engraulidae*). Others include sharks and rays, crustacea and octopus and squids.

Most of the fishing practices are still destructive and have caused significant damage to the reefs. The most common destructive methods are dynamite fishing, dragged nets (*juya la kigumi*) and spears. Also, collection of marine

products such as *bech de mer* is conducted without size limitations. The problem still persists due to lack of control, monitoring and surveillance.

Fisheries research in Tanzania has been conducted since the beginning of the century, though at a slow pace. Research increased in the early 1940s with the establishment of the EAMFRO Organisation . Subsequently, FAO played a key role in conducting research directed towards the development of fisheries in Tanzania. However, most of the research in the country is currently conducted by the Tanzania Fisheries Research Institute (TAFIRI), the Zoology and Marine Department, and the Institute of Marine Sciences (IMS) of the University of Dar es Salaam. Recently, the International Union for Conservation of Nature (IUCN) in Tanga and the Frontier Organisation in the Southern part of Tanzania have also played an active role in marine research.

The main industrial fisheries in Tanzania are conducted by Tanzania Fisheries Cooperation based in Dar es Salaam, mainly fishing for prawns and the African fishing company based in Zanzibar mainly fishing pelagic fish in the deep sea.

2 Importance of the resource

Tanzania, with its 850 km stretch of coastline and numerous smaller islands including Zanzibar, is rich in fishery resources along its banks and coral reefs. Fishing plays an important role as a source of cheap protein and employment. The number of full time fishermen operating in Zanzibar is 23,000 fishermen (Lymo *et al.*, 1997) and there are about 15,00 fishermen along the coast of Tanzania (Haule and Kiwia, 1999). The per capita consumption is 25-30 kg/person (Jiddawi and Stanley, 1999). The contribution of fishery to the GDP varies between 2.1-5.0 per cent in Tanzania mainland and 2.2-10.4 per cent in Zanzibar, mostly from export of fishery products (Jiddawi and Ngoile, 1999). Tanzania exports marine fishery products amounting to around US\$ 7652,700 for the mainland part and US\$598,203 for Zanzibar (Jiddawi and Ngoile 1999). These products are shrimp, *beche de mer*, shells, lobster, crabs, squids, octopus, sardines, and fish offal and aquarium fish.

Coastal communities depend on fishing as their main income activity and 95 per cent of the fish landings in Tanzania is from these fishermen (Haule and Kiwia, 1999). Some of these resources such as shark fins and sea cucumbers are

exported to the Far East (Barbett, 1997). The trade for these resources has been present in Tanzania for centuries, Shark meat is widely consumed although it is not very popular in comparison to other species of fish. Shark jaws and teeth are sold to tourists.

Some fish is exported fresh overseas and foreign exchange is available through the export of these products. Most of the export revenue comes from shrimps. The two main fishing grounds for shrimp are around Bagamoyo/ Sadani and the Rufuji Delta in South of Tanzania where about five species of shrimps are caught (Semesi and Ngoile, 1993)

3. Condition of the resource

The fishery resources have reached the upper level of exploitation. This is believed to be due fishermen fishing in the same areas since time immemorial due to the limitation of the range of their fishing vessels, which are not powered by motor engines. It is also due to a lack of proper management strategies. Interviews with fishermen also confirm that catches are declining. Increase in fishing effort will not increase catch rates. The total annual catch in Zanzibar was about 20, 000t in 1988s but currently it has dropped to less than 13000t per annum This reduction in fish catch can also be observed in some localised areas such as in Chwaka bay (Jiddawi, 1999b) and for specific facers such as the reef fisheries of Zanzibar (Jiddawi, 1998).

There are some resources, which have been affected more than others. For example in the Zanzibar the small pelagic fisheries, the catch has also seen a drastic decline from 600 tonnes in 1986 by the Zanzibar fisheries cooperation boats to 91 tonnes in 1997 (Jiddawi, 1999a). The history of the purse seine fishery has been documented in a video produced by Jiddawi (1996) under the Marine Education and Extension Development Unit at the Institute of Marine Sciences, Zanzibar.

Fish resource assessment surveys conducted in the 1970s (Birkett, 1978) and in the 1980s (Iversen, *et al.*, 1985) gave estimates of the standing stocks for coastal water ranging from 94,000t to 174,000t. Annual yield estimates for demersal species was 38,000t/year and about 23,000t for pelagic species (Ardill and Sanders, 1991).

Sea shells and sea cucumbers are overexploited along the whole coast due to rampant collection. There have been no population studies of any of the commercially exploited species. (Horrill and Ngoile, 1991). However, the traders claim that the sizes of some of the sea cucumbers have reduced tremendously, but they still continue to buy due to competition among traders.

The long line fisheries in most parts of the region including Tanzania, the catch rate, in numbers and weight, has declined drastically (Ardill, 1984). Shark fin trade has also declined and some fish species are rarely seen now in Tanzania waters (Barnett, 1997; Jiddawi and Shehe, 1999)

4. Type of data/ information gathered in Tanzania

Much research work reveals that there is a lot of work which has been conducted in Tanzania on fisheries covering a range of subjects from general fisheries information based on fishery constraints, development and management issues. Fisheries surveys have used scuba and snorkeling techniques mainly in coral reef areas along the coast of Tanzania and Zanzibar. Fisheries statistics data collected from landing sites through monitoring programmes in areas such as Matemwe and Mkokotoni in Zanzibar, Tanga and Bagamoyo.

Of the 334 references, which pertain to fisheries in Tanzania, 40 per cent are baseline studies. Most of these have been conducted in the 1990s.

There are less than 10 MSc and PhD studies which have been conducted. These studies have been mainly based on providing information on specific fishery topics such as on the biological aspects of Siganids and their mariculture potential in Tanzania (Mziray, 1983), the food and feeding habits of Indian mackerel from Zanzibar, (Ndawula, 1985), the reproductive biology of the squid in the coastal waters of Zanzibar (Mhitu, 1997), dynamics of the trap fishery in the coastal waters of Zanzibar (Mgimwa, 1998) and the population dynamics of the small pelagic fishery in the Zanzibar channel (Jiddawi, 2000).

4.1 Observational studies

Only 0.9 per cent of the studies were of observational nature. These involved under water visual surveys in Fumba Peninsula (Horrill, *et al.*, 1994), also observational studies were conducted in seaweed growing sites on the East coast of Zanzibar to observe the distribution and abundance of inshore fish assemblages (Svanson and Bergman, 1998).

4.2 Experimental studies

Experimental studies are more related to gear development and usage (Losse, 1966, Mahika, 1992). and experiments related to aquaculture such as preferential settlement of oyster spat settlement on different substrates in Zanzibar (Jiddawi, 1989, 1997). Another important aquaculture study is the integrated fish farming model that was developed in Israel and tried at Makoba in Unguja island by the Institute of Marine sciences in collaboration with the Prison department (Mmochi *et al.*, 1996, 1999)..

4.3 Applied studies

Applied studies are related to the experimental studies and these were also very few accounting for 2.7 per cent of all the studies. Mostly they were related to aquaculture experiments such as the cage culture of *Siganus* spp. (Bwathondi, 1981), the aquaculture of rabbit fish and milkfish in ponds at Makoba (Mmochi *et al.*, 1996, 1999).

4.4 Review studies

Most of the fisheries reports (41 per cent) were of review nature mainly presenting general information on fisheries in different parts of the country and the West Indian ocean region (Cushing, 1985, Maembe, 1988; Jiddawi *et al.*, 1992, 1994, Mhando and Jiddawi, 1998), Several reports discuss fisheries development in the country and priorities for fisheries management (Boerema, 1981, FAO, 1982, Ardill, *et al.*, 1991).

4.5 Other type of studies

Fishery resource surveys have been grouped in this category and forms 12 per cent of all the studies. All the fish resource surveys conducted by Research Vessels in Tanzania waters and the region falls under this category. These surveys include the surveys conducted by Dr Fidjitof Nansen in the 1990s (Anon, 1982a, Iversen *et al.*, 1985) and the survey by R.V Prof Mestyasev

(Birkett, 1978, Venema, 1984), the surveys conducted by Mbegani fisheries Institute through its research vessel MV Mafunzo (Van Nierop, 1987b, Msumi, 1986, 1987, 1988). These surveys provided an insight on the fishery potential and stock abundance in the Tanzanian waters.

4.6 Publications/Grey literature

Out of 331 references listed about 70 per cent are grey. Only 52 of these reports are in international journals (Hatchell, 1938; Morgan, 1959, Losse, 1964; Merret, 1968; Bwathondi and Ngoile, 1982, Ngoile, 1982, Gaudian *et al.*, 1995). The rest of the reports appear as seminar proceedings (Ardill and Sanders, 1991; Muhando and Jiddawi, 1998, Jiddawi and Stanley, 1999; Mgaya *et al.*, 1999), Institute reports (Darwall, 1995, Mmochi, *et al.*, 1997, Jiddawi *et al.*, 1994) consultancy reports (Horrill, 1992, Killango, 1984, Barnett, 1997), student reports (Knox, 1999, Meyers, 1999). Some are Msc and Phd thesis (Mhitu, 1997, Mgimwa, 1997, Jiddawi, 1999) which can be retrievable in the University main Library.

4.7 Age of information (old/recent)

About 45 per cent of the references were written in 1990s especially those connected with projects such as from Tanga (Makoloweka *et al.*, 1997a, from Mafia (Darwall *et al.*, 1996a), from Mtwara (Guard, 1998), from Bagamoyo (Semesi and Howell, 1999) from Matemwe and Mkokotoni in Zanzibar (Jiddawi and Stanley, 1999). About 36 per cent of the reports have been written in 1980s and the rest between 1920 and 1970s. The earliest reference which we were able to come across with dates back to 1929 on the survey of marine fisheries of Zanzibar Protectorate (Bonde, 1929).

The earlier research papers aimed at looking at how fisheries could be developed in the country these were followed by research on gear technology and species availability. Although lately there appears to be more fisheries papers than before (Fig.1) yet most of these are short term and aimed at providing baseline information. All reports have assisted in one way or another in addressing scientific and management issues.

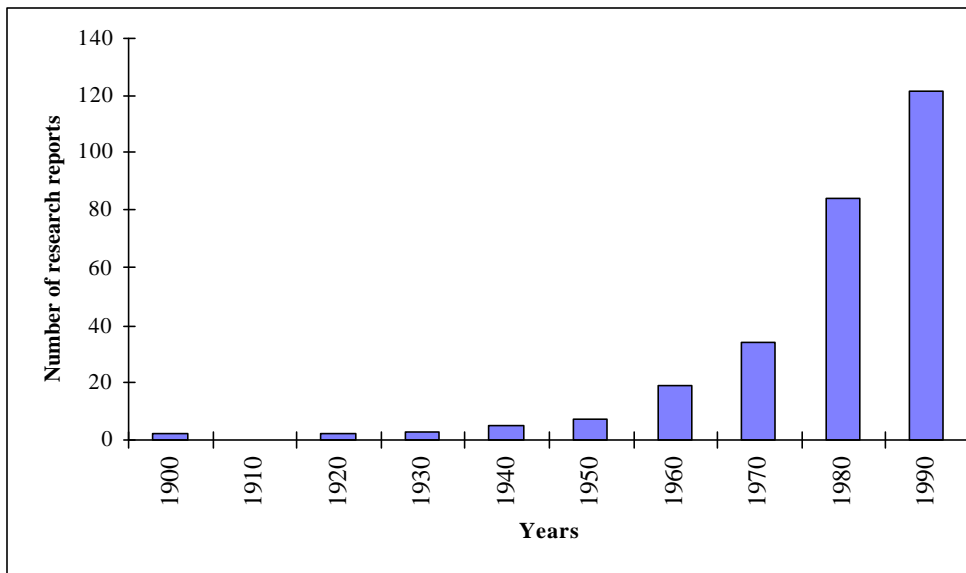


Fig. 1 Trend in fisheries research in Tanzania

4.8 Geographic coverage

Although fisheries seems to be widely studied yet several gaps exists. Most of the studies are conducted in areas where the research institutions exists or where there are projects. A majority of the reports come from Zanzibar, Mafia, Mtwara, Tanga, Dar es salaam and Songosongo. A few are from Rufiji , one from Pemba and one from Ruvu. Many areas are still not studied due to lack of any institution in those areas or lack of an existing donor assisted projects (Fig. 2).

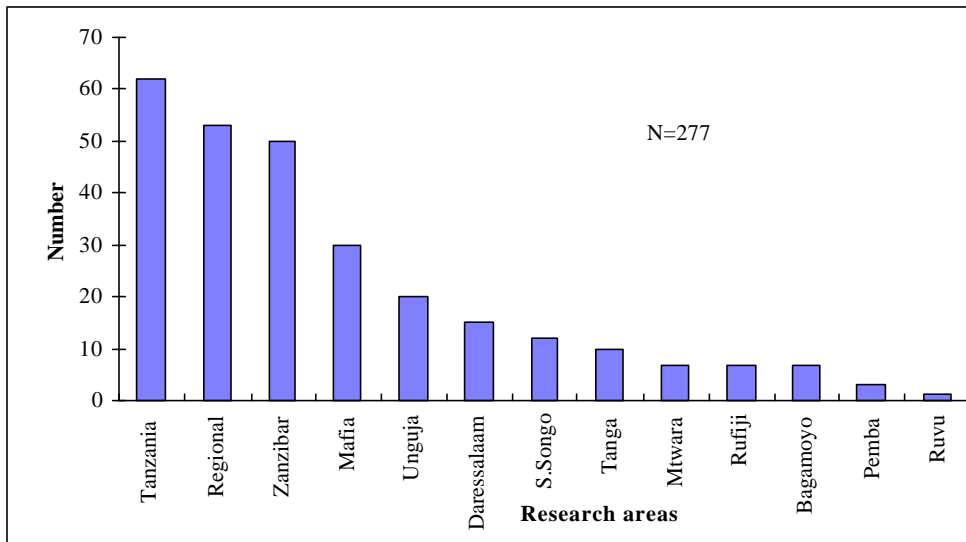


Fig. 2 Areas in Tanzania where fisheries research has been conducted.

4.9 Subject coverage

Most of the reports discuss on the general fisheries perspective in Tanzania (62). Several discuss the biological aspects of fish (28). About 47 references present information on specific fisheries such as the shark fisheries or the demersal fisheries in Tanzania. About 10 references present information on socio economic aspects of fisheries. Fisheries development is included in about 15 references. Conservation issues, marine parks and integrated management of fisheries is discussed in 67 references (Fig 3). There is a lot of repetition on these subjects so the huge number of references should not be misleading .

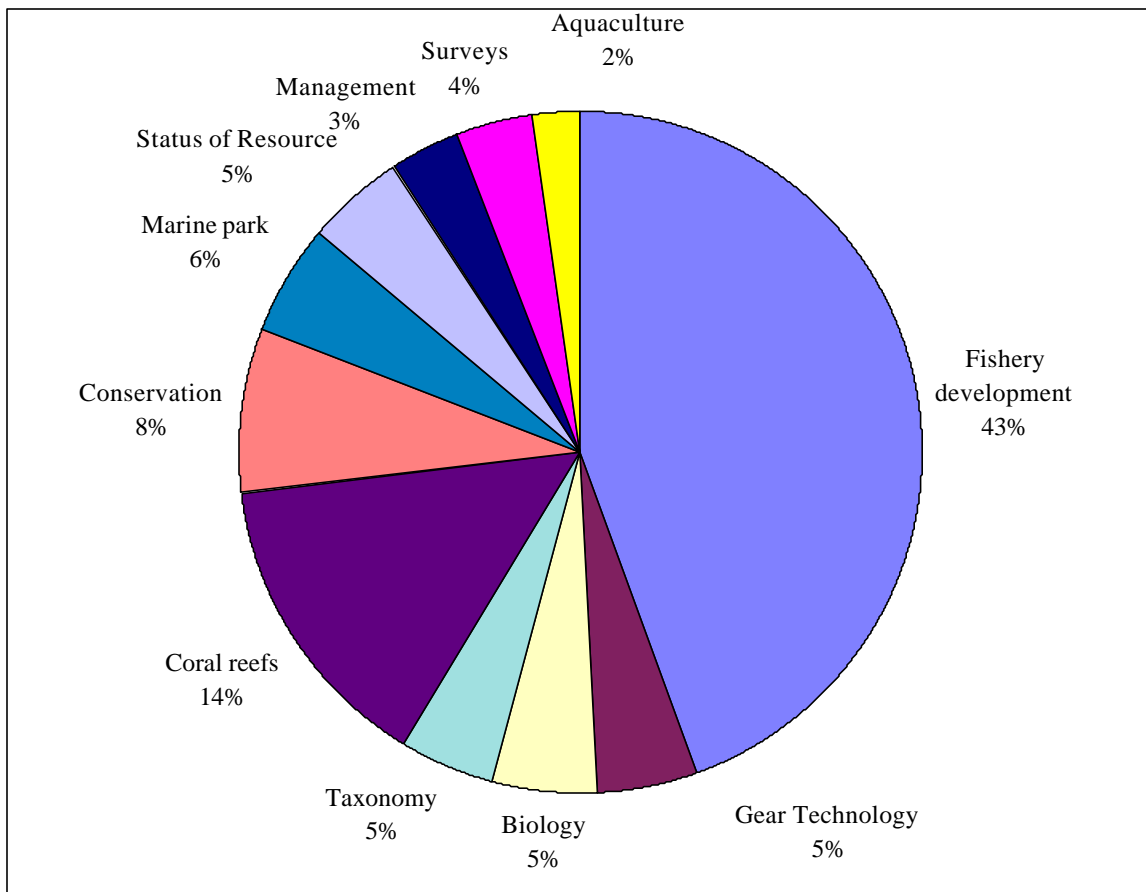


Fig. 3 Subject categories in fisheries research

4.10 Duration of studies

Most of the studies were of short term . There is a need to repeat these studies for a longer duration. The only long term study which is still ongoing is the Matemwe and Mkokotoni fish monitoring study..

4.11 Age of studies

There are several new studies, however, most of these new studies are of short term and have been conducted by students geared at giving them grades in their subjects. They are not geared at problem solving. However, a lot of surveys which were quite useful were conducted in the 1980s. Ever since that time no surveys have been conducted,. Also some of the useful studies have been conducted in the early 1960s and 1970s under the East Africa marine fisheries organisation.

4.12 Information accessibility

Almost 50 per cent of the information is difficult to access as it is in the form of unpublished reports. Therefore despite the presence of a huge number of reports yet their accessibility is very difficult. In most cases only one copy of the report exists and it is based with the author. (Fig. 4)

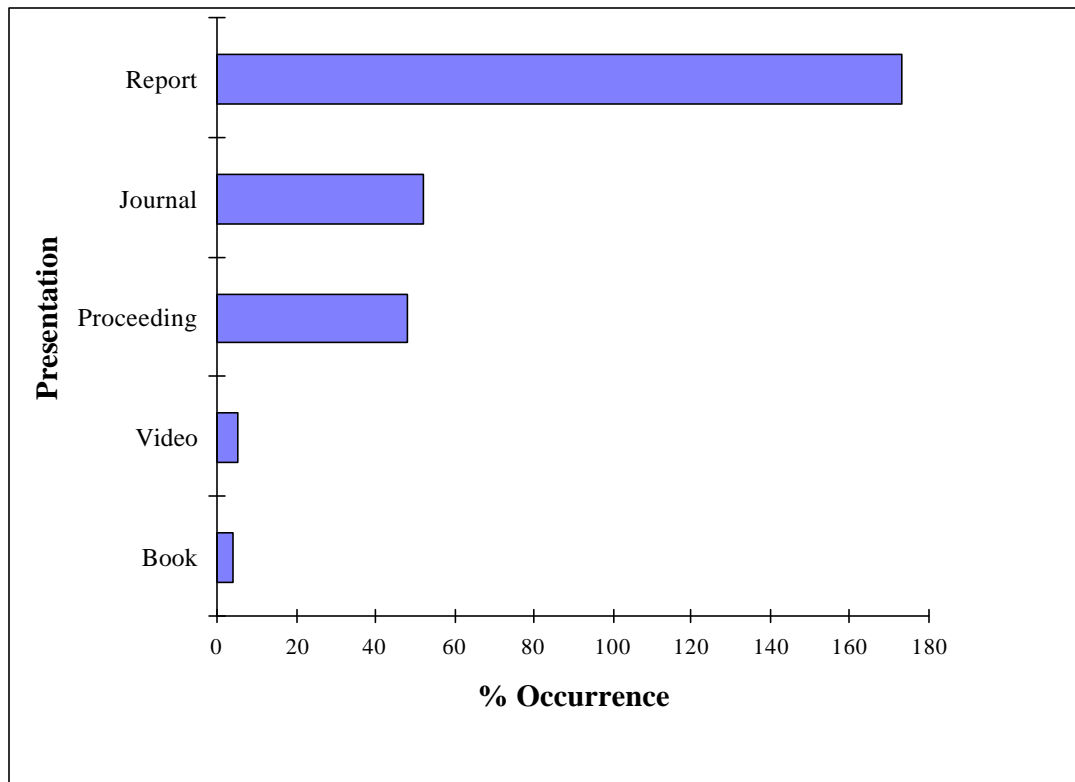


Fig. 4 Information presentation by researchers

5. Recommendations for future work

There must be better collection of landings and economic data from the fisheries. Without effective data collection it will be difficult to formulate better management strategies. Therefore, for the assessment of these fisheries it is important to use standardised techniques over the whole country for comparison purposes and to initiate incentive schemes for data collectors..

Specific reference points should be selected along the coast for monitoring purposes to ensure that at least the whole coast of Tanzania is represented. These could be in the major fish landing ports and areas where such information is required such as where there are marine protected areas.

The areas which have been less studied such as minor fisheries such as the octopus fishery, the sea cucumber fishery, fence trap fishery need to be studied. Also more biological studies of important commercial fish species.

Basic science studies such as looking at food and feeding habits of fish of which the results can be used in ecosystem modelling such as the ECOPATH.

Resist should be multidisciplinary and integrated involving all users. Socio economist and scientists should formulate joint research proposals in determining problems facing the fisheries industry.

Monitoring is required throughout the country especially to look at the catch landings, catch rates and species diversity so as to be able to determine immediate changes. The monitoring exercise need to be long term. The monitoring should involve the community in collaboration with scientists.

Most of the fisheries staff in Tanzania are at a diploma and Masters level of education. There is need for capacity building in fisheries staff at a much higher level (Phd level) due to scarcity of such people in the country.

Effective communication links between relevant institutions within the country can reduce duplication efforts as well as keeping each one up to date with what's happening in the country.

There should be a defined national policy for the protection, conservation and restoration of marine and coastal habitats

Workshops involving community need to be conducted regularly and they should be involved in all decision making plans and resource assessments to ensure a sense of ownership..

Fish farming in marine ponds needs to be encouraged as a source of alternative employment to reduce pressure on the fishing grounds.