The Tanzania Fish Export Sector

Sector Diagnostic Report

DRAFT

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Prepared for: **Board of External Trade**

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LIST OF ABREVIATIONS

MSY	Maximum Sustainable Yield
BET	Board of External Trade
EU	European Union
GDP	Gross Domestic Product
ITC	International Trade Centre
ISO	International Standardization Organization
LDC	Least Developed Countries
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organisation
SCT	Sector Counterpart Team
EPZ	Export Processing Zones
BoT	Bank of Tanzania
HACCP	Hazard Analysis and Critical Control Point
TBS	Tanzania Bureau of Standards
UNIDO	United Nations Industrial Development Organization
CBO	Community Based Organizations
GoT	Government of Tanzania
MIMP	Mafia Island Marine Park
NEMC	National Environment Management Council
NGO	Non-Government Organization
MNR	Ministry of Natural Resources and Tourism
TAFIRI	Tanzania Fisheries Research Institute
VPO	Vice President's Office
DF	Department of Fisheries
TCMP	Tanzania Coastal Management Partnership
CITES	Convection on International Trade on Endangered species
EEZ	Exclusive Economic Zone
LCS	Legal Continental Shelf
MFDC	Mbegani Fisheries Development Centre
LVFO	Lake Victoria Fisheries Organisation
LVFPA	Lake Victoria Fish Processors Association

METHODOLOGY

The Sector Counterpart Team (SCT) has greatly contributed to the preparation of the Fisheries Sector Diagnostic Report. The Board of External Trade (BET) in league with the International Trade Centre (ITC) made the whole process of preparation of the Report possible by facilitating the technical support in all aspects. A series of meeting with subsequent table and field surveys were made to accomplish the data and information collection.

Members of the Sector Counterpart Team made field visits to fisheries related companies in Dar es Salaam, Mwanza, Kyela and Zanzibar. Major fisheries production sites were visited, while discussions with the fishers, processors, traders, and fish exporters were accordingly made. Field surveys data and the existing in formations on the sector gave us a good analysis.

CHAPTER 1

1.0 FISH SUPPLY CAPACITY AND CONSTRAINTS

1.1 FISH SOURCES

Tanzania is endowed with considerable water resources that supports the maximum sustainable yield of about 730,000 metric tons (1966). *It is the only country with the biggest fresh water coverage among countries South of Sahara. The major water resources fall into Fresh – water resources and the Marine water resources as follows:-

1.1.1 Marine water resources

This includes the Indian Ocean coastline covering about 840 kilometres in the North-South stretch, and the Exclusive Economic Zone which are provided with many outstanding features of economic importance such as the islands, the coral reefs, a wide range of biological resources, such as fish, turtles, Dugongs, mangroves, sea birds, sea grass, etc. This area as a source of fish contributes 15% of all the fish landed in Tanzania. The Exclusive Economic Zone of the Indian ocean covers 64,000km².

1.1.2 Fresh water resources:

Fresh waters form the biggest source of fish in Tanzania. This includes Lake Victoria, Lake Tanganyika, Lake Nyasa, Lake Rukwa, the Mtera and Nyumba ya Mungu Dams, and the minor fresh waters (all the riverine fresh waters). There is barely any fish harvested from aquaculture.

The fresh waters as a source of fish contributes a total of 80% of total fish landed annually in Tanzania. On the whole, the main features for each of the fresh waters as a source of fish are as follows:-

1.1.2.1 Lake Victoria:

Lake Victoria, covering an area of 68,000 km² is the second largest lake in the world after Lake Superior in North America. It is shared by the three East African countries with Tanzania occupying the largest portion as follows:, Tanzania (51%,) Uganda (43%) and Kenya (6%). Lake Victoria contributes 49% of the total landed fish in Tanzania.

1.1.2.2 Lake Tanganyika:

Lake Tanganyika covers an area of 32,945 km² out of which 13,510-km² lies within the borders of Tanzania. The lake is about 650 km long with an average width of about 80 km. This lake ranks second

among the deepest lakes of the world and seventh in order of the size among the lakes of the world. The north-eastern section belongs to Burundi, the whole of the West Coast belongs to Democratic Republic of Congo, the southern part to Zambia, and about 480 km of the eastern coast belongs to Tanzania. Most of the interesting life in the lake is confined to the upper 200 m. of depth. Lake Tanganyika contributes 20% of total fish landed in Tanzania.

1.1.2.3 Lake Nyasa:

Lake Nyasa occupies 28,000 km² out of which 5,600 km² is in Tanzania. The rest portion of the lake belongs to Malawi. The lake reaches a depth of 53 metres. Lake Nyasa contributes 9% of total fish landed in Tanzania.

1.1.2.4 Others:

This group includes one Rift Valley lake known as Lake Rukwa (610 km²). The artificial lakes or reservoir of Mtera Dam (610 km²) and Nyumba ya Mungu Dam (180 km²) and all the riverine waters are included in this group. This group contributes 7% of fish landed in the country.

The over all fish production in the country has been growing gradually from 150,000 metric tons in 1980s to 300,000 metric tons in the 1990s. Between the years 1990 and 2000 fish production has been rather constantly stable with the peak of 350,000 metric tons in the year 1996 and 1997, but declined to 310,000 tons in 1999 and 320,000 metric tons in the year 2000. The recent constant fish production has been mainly due to stagnant production levels of fish from the inland fresh waters. In other words Tanzania fish production has rather reached its full exploitable levels within the fishing grounds near to the fishing communities. Alternatively, fish production could be increased by exploiting the new fishing grounds further out in the sea. (See table No. 1.0 and fig. 1.0)

Table 1.0 – Quantities of fish landed – 1993 – 2002 (metric tons)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
All freshwaters	**295**	**206**	**208**	**265**	**307**	**300**	**260**	**271**	**283**	**274**
Lake Victoria	*176*	*119*	*122*	*159*						
Lake Tanganyika	*72*	*54*	*55*	*66*						
Lake Nyasa	*26*	*33*	*17*	*20*						
Lake Rukwa	*3*		*1*	*4*						
Mtera Dam	*2*		*2*	*2*						
Nyumba ya Mungu Dam	*2*		*1*	*1*						
Other minor waters	*14*		*10*	*13*						
Marine fisheries	**37**	**41**	**51**	**61**	**50**	**48**	**50**	**50**	**53**	**50**
Total	**331**	**269**	**258**	**324**	**357**	**348**	**310**	**321**	**336**	**324**

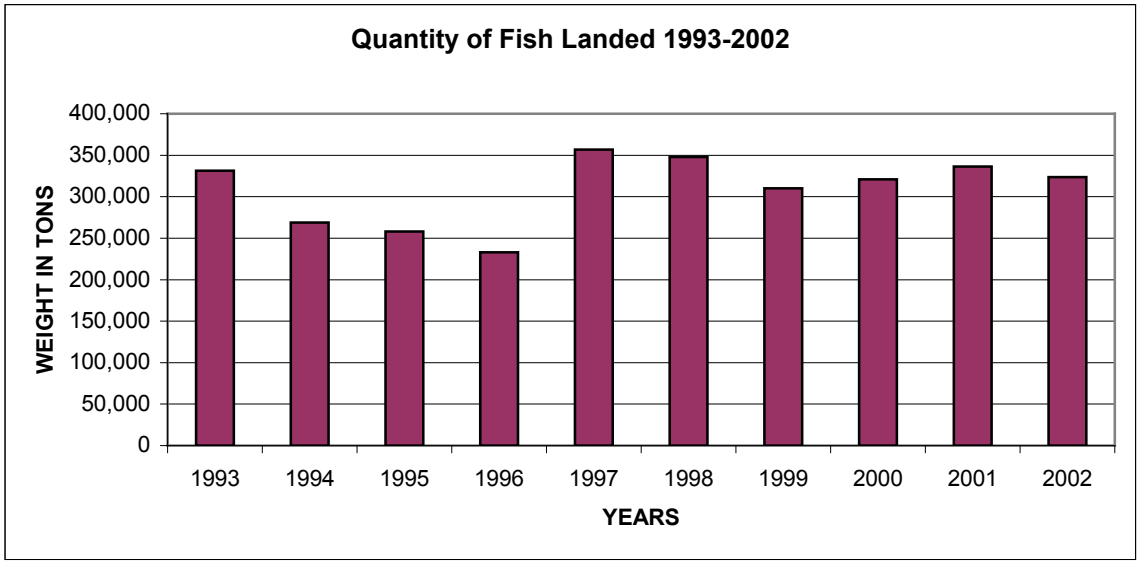


Fig. 1.0

1.2 FISH VARIETY AVAILABLE

Lake Victoria and other Rift Valley lakes such as Lake Nyasa and Lake Tanganyika contain more species of fish than any other lake in the world, and each holds the record that is not known as new species are being discovered each year. A considerable number of these species are endemic i.e. species of fish found in the lake where it evolved and not anywhere else. This factor is dependent on the evolutionary rate of speciation in the whole process of adaptability, which is specifically determined by the ecological conditions existing in that lake. For example every ecological niches is governed by the environmental specific conditions such as food availability, water temperature, pH values, oxygen availability, water salinity, and other organic and inorganic nutrient concentrations.

In this respect, therefore, each fish species only occupy its own niche, thus in a wider sense one lake may contain fish species not available in other lakes. Good examples are the Nile perch (Lates niloticus) which is found in Lake Victoria and Tanganyika. Nile perch was introduced into Lake Victoria sometimes in 1954. This carnivorous fish thrived very well in the new environmental conditions, but with the consequent depletion of other fish species such as Tilapia, Haplochromis, Alestes, labeo, Schilbe, Barbus, etc. Fish species such as Lates marinae, Euchenoglanis, Boulengerochromis, Dinopterus, Thylochromis, Capocta exist in Lake Tanganyika alone. Protopterus is found in lake Victoria only; Mormyrus is available in lake Victoria and Nyasa; Barilius and Ramphochromis are found in Lake Nyasa alone.

There are fish species that show some resistance towards any varying environmental conditions subjecting them to live in most fresh waters, that is, Lake, dam or riverine waters with the exception of marine waters. Good examples of this includes Tilapia and clarias (see table 2.0).

Table No. 2.

FRESH WATERS FISH PRODUCTION (IN METRIC TONS) FOR THE YEAR 1995 BY SPECIES.

Spp. Name	Lake Victoria	Lake Tanganyika	Lake Nyasa	Lake Rukwa	Mtera Dams	Nyumba ya Mungu	TOTAL
Tilapia	14,188	202.9	763.7	412.2	1,071.1	1,101.9	17,739.8
Haplochromis	22.2	429.4	8,170.4	-	-	-	8,622
Labeo	-	-	48.7	9.1	25.6	-	83.4
Barbus	5.5	1.3	81.5	-	-	-	88.3
Bagrus	74.5	27.9	862.9	0.2	104.9	-	1,070.4
Clarius	383.2	1.8	523.0	31.9	367.3	60.4	1,367.6
Lates	103,481.3	435.0	-	-	-	-	103,916.3
Protopterus	316.3	-	-	-	-	-	316.3
Synodontis	-	-	1,247.1	67.6	144.91	-	1,459.6
Mamyrus	16.0	0.9	-	-	-	-	16.9
Schilbe	2.5	-	2,121.7	1.3	0.2	-	2,125.7
Alestes	68.5	-	-	0.9	2.6	0.6	72.6
Dagaa	3,145.7	40,763.7	2,918.4	-	-	-	46,827.1
Barilius	-	-	2,039.0	-	-	-	2,039.0
Lusiolates	-	11,546.1	-	-	-	-	11,546.1
Euchenoglanis	-	40.1	-	-	-	-	40.1
Capocta	-	-	-	-	-	-	-
Boulengero Chromis	-	350.1	-	-	-	-	350.1
Citharinus	-	-	-	-	-	-	-
Dinopterus	-	180.0	-	-	-	-	180.0
Thylochromis	-	365.4	-	-	-	-	365.4
Hydrocynus	-	-		2.6	10.5	99.6	112.7
Bathy bates	-	113.1	1,689.1	-	-	-	1,802.2
Rampho chromis	-	-	-	-	-	-	-
Distichodus	-	-	-	-	2.8	-	2.8

Table No. 3.0

MARINE WATERS FISH PRODUCTION (IN METRIC TONS) FOR THE YEAR 1995 BY SPECIES

SPECIES	FISH
Sharks	1,398.7
Rays	3.326.9
Octopus	492.1
Prawns	1,117.0
Flatfish/Parattotides SPP	144.2
Sardines/Anchory	8,514.3
Threadfins/Nemipterus SPP	590.9
Catfish	1,545.8

Half beaks/Hemiramphus SPP	1,285.5
Mackerels	3,778.5
Parrotfish	3.146.4
Rabbit fish	3,245,7
Scaveragers/Lethrinus	6,024
Kingfish/Scombridae	697.1
Tuna/Thunnidae	150.0
Jacks/Carangidae	83.9
Rock Cods/Grouper	598.9
Silver Biddy/Ponadas yidae	344.1
Mullet	503.2
Milk fish/Chanos chanos	174.0
Cobia/Rachycentron	119.8
Swordfish	358.3
Queen fish/Istiophorus SPP	1,986.0
Others	8,599.2
Mixed fish (trawled)	974.9
Lobsters	21.1
Squids	12.9
Crabs	1.3
Beche der mer	263.8
Sea shell	54.0
Aquarium fish	3,622

The high degree of variation has resulted into existence of big numbers of fish species with varying usefulness as a resource to the country economically. For example in Lake Victoria fish varieties such as Nile perch and Tilapia have become of commercial and nutritional importance. You also have dagaa fishing (stolothrissa spp. & Limnothrissa Spp) and the worldwide prominent aquarium fish production on Lake Nyasa and Tanganyika.

Fish species available in the lakes are evolution wise different from those found in the saline waters of Indian Ocean. They are adapted to saline water ecosystems. The presence of varying niches within the marine environmental conditions has given rise to existence of many fish species. For example in the Indian Ocean prawns are adapted to flourish around river deltas such as Rufiji, Ruvu, Wami, Ruvuma and Pangani river deltas. Around these areas you have brackish waters with low salinity convenient for prawn life – cycles (table 3.0).

1.2.1 Lake Victoria fisheries

Lake Victoria used to be inhabited by hundreds of fish species (see hausen, 1996) so that by that time some motive fish species of the lake could not be found in any other area in the world. In order of abundance there used to be about 500 species of haplochromines *(furu)* and tilapiines *(sato*) that formed an important food item. Others were catfishes (Bagrus docmak, and clarias gariepinus) and lungfish (Protopterus aethiopicus).

For decades, there have been a progressive change in the lake ecosystem so that the big range of fish species has greatly been reduced, that is the 500 fish species have now been dominated

by three fish species namely Nile perch (Lates niloticus) introduced in 1954, the sardine – like Dagaa (Rastrineobola argantea), and the Tilapiines (Oreochromis niloticus), also introduced.

The outstanding new change to the ecosystem of Lake Victoria has been remarkably contributed by the introduction of the exotic fish species of Nile perch (Late niloticus) and Oreochromis niloticus. Nile perch a voracious predator, which feeds on smaller fish, contributed much more to the ecosystem change than the Oreochromis niloticus. The other changes, which are more or less of the environmental influence included the changes in water quality, and the presence of an exotic aquatic weed, the water – hyacinth (Eichlornia crasspes). In the early years of 1990s the weed had spread all over many parts of the Tanzania side of the lake chocking most of the sheltered bays and inlets. However the weed has almost been cleared and its spread is now under control. It has been eradicated mechanically and biologically by using weevils (Bruchid & Eichornea species) which feed on weeds.

The three commercially important fish species mentioned above constitutes 99% of the total fish landed on Lake Victoria i.e. Nile perch 80%, Tilapia – 11.6% and Dagaa spp – 7.3%. Other species that make up for the remaining 1% of the total fish landed include the Haplochromines, Bagrus spp., C;larius Spp., Protopterus Spp., Mormyrus Spp, Alestes Spp., Schilbe Spp. and Barbus Spp. Among these fish species, Labeo spp., Barbus spp., Alestes spp and Mormyrus have become increasingly scarce, while synodontis spp. are hardily seen.

In Lake Victoria there are only six fish species such as Labro chromis ssp, Astatoreochromis ssp and Haplochromis ssp which could be considered for use in aquarium industry. The numbers are so limited to an extent that any investment in the field of wild – caught aquarium fish is not worth while. The few numbers of acquarium fish has been caused by the depletion resulting from Nile perch predating on the once extensive and valuable acquarium fish stocks.

The total allowable fish catches (MSY) in Lake Victoria has been estimated at 200,000 metric tons per year (1996). The fish stock assessment was done only once and so it has never been confirmed. No figures for the Maximum Sustainable Yield for each species have been indicated. This could as well be right in the sense that the average fish production of 150,000 metric tons from Lake Victoria has never surpassed the 200,000 metric tons (MSY). If this is the case then it means we still have the capacity to increase the exploitation of fish either in Nile perch, Tilapia or ***dagaa.*** The total fish production is averaging 150,000 metric tons per year, which is equivalent to 49% of the total fish landed in Tanzania.

Generally fish production from Lake Victoria has been on the gradual increase from 110,000 metric tons in the early years of 1990s to 170,000 metric tons of fish in 1997 and 1998. From there it started a declining trend down to the present figure of about 150,000 metric tons. This is a drop of about 11.7%.

From the above fish production trend we learn that the fisheries resources has been over – exploited. Other supporting facts include a drop in mean catch size of Nile perch fish (juvenile Nile perch forms 60% of each catch) and a drop in catch per unit fishing vessel of 42.0 kg in 1993 to 20.0 kg per vessel in 1996. Alternatively it could as well mean that the fishers have repeatedly been fishing on the same fishing grounds for years mainly due to lack of better fishing gears and equipments such as a motorised boat which could take him further out to new fishing grounds.

Before the year 1996 the use of fishing gears like beach seines, small mesh size gill –nets or trawlers was commonplace in the lake. The use of these indiscriminate fishing gears contributed greatly to the catching of immature fish, interfere with the brooding fish in the breeding grounds thus intervening fish productivity. Fishing trawlers which are no longer operational on Lake Victoria used to interfere with still fishing gears such as gillnets. Although trawling for fish has completely been controlled, use of beach seines nets still persist in many parts of the lake.

In 1996, the Government started combating the use of indiscriminate fishing gears. She prohibited the use of trawlers, which were eleven (11) that year. Beach seine nets were also prohibited in the same year.
However these measures did not seem to give good results. Now the government has decided to introduce another more effective control known as the "SLOT SIZE" method. This method is very specific and only applies on the systematic use of the gillnets. With this method only fish with an over-all length between 50 cm and 85 cm will be allowed to form a catch. This method will apply only to Nile perch. As for other fish species the following fishing gears will be used: -

- Gillnets with the five inch mesh-size,
- Dagaa nets whose mesh-size is 10mm or above
- Hooks of the size no. 8 or above will be used

These methods are being introduced gradually while learning heir effectiveness. Another method under proposal is the introduction of seasonal fishing. This method will have to be introduced with precaution to make sure that the Fish processing plants are not rendered non-operational during certain seasons.

1.2.1.1 Seasonality in fish Production in Lake Victoria

Fish production normally varies with time of the year for each fish species. When fish production is optimum or is high for a particular fish species we normally call that period as the good season for that specific species.

This period is normally followed by a breeding season. During this period and under the natural phenomenon the fish species is triggered to reproduce resulting into increased fish populations. But the breeding season will only occur when there is enough food to support the new fish population. There must be a favourable change in terms of water quality, water temperature, and other important environmental factors to sustain the whole life cycle of fish species. In the majority of cases it has been noted that breeding seasons will coincide with the rainy seasons. It is during this period that nutrient concentration increases and also water macrophyte flourishes. From this then we find that rainfall will determine the breeding season, and which in turn determine seasonality of fish species.

According to the fisheries statistics (Fisheries Division) of the year 1996 annual patterns for Nile-perch, Tilapia and Dagaa shows some close correlations between Tilapia and Dagaa (see fig. 2.0). It indicates that Tilapia and Dagaa species are occupying the same niches and have a correlated feeding habits leading to having same population fluctuations with a small time lag. Carnivorous Nile perch patterns are completely opposite to those shown by Tilapia and Dagaa

spp. For example the fishing season for Tilapia and Dagaa spp. is during the rainy season, that is, between the month of December and April of the year, while that of Nile perch is between the months of May and October of the year. This means that the Tilapia and Dagaa spp. population during the rainy season precedes that of the Nile perch to accumulate enough food for the predatory Nile perch (see fig.2). Between the months of June and November it is a low season for Tilapia and Dagaa spp, but a high season for Nile perch.

Annual pattern of Nile - Perch, tilapia and Dagaa in Lake Victoria

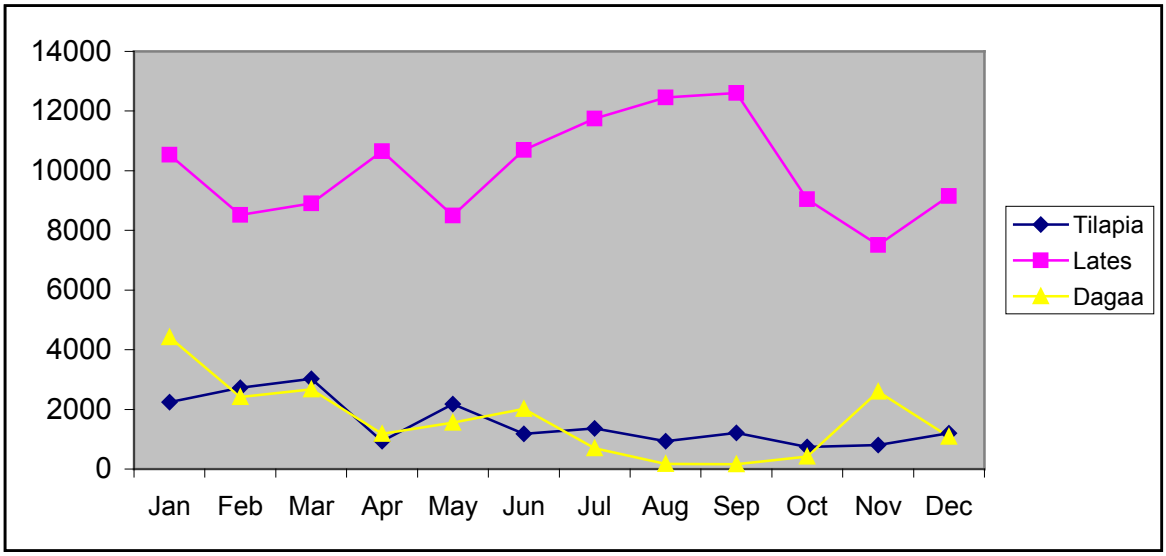


Fig. 2.0

1.2.1.2 Nile-perch Fishing Operations

Generally, fishing of Nile perch is done by the use of motorized boats using simple gears such as gill-nets and long-lines. The gill-nets are made of synthetic or man-made fibres materials. Fishermen set gill-nets over night and hauls them in the morning, while most of the long-liners will set the baited long lines in the morning hours and haul them in the afternoon.

The fishing boats that the fishermen use are made of wooden materials, and paddles, sails or outboard engine used as propellers. The main fishing boats used in Nile perch fishing included dugout-canoes and plank boats. A well established fishermen use motorized plank boat for towing a fleet of up to ten (10) small fishing boats to the fishing grounds and back. In most cases such fishermen will also have a transport boat with insulated containers, which are fibreglass coated and used to carry fish.

In case of a common artisanal fishermen who cannot afford motorized engines normally organize themselves in small groups. They will hire a motorized boat to ferry their small fishing crafts to and from the fishing grounds. They will also hire a transport boat or van for transporting Nile-perch to specific landing sites on the shores where it is bought by traders or directly by processors for transportation to processing plants or local markets. The latter is treated either by smoking in locally constructed ovens (kilns) or dry salted and sun dried before they are afforded for sale to other local markets.

1.2.2 Lake Tanganyika Fisheries

The water visibility in Lake Tanganyika can be up to more than 20 metres deep. It is excellent for fish – diving tourism. Lake Tanganyika has the highest diversity of organisms on earth. It harbours more than 1,300 known species of fish, invertebrates and plants and at least 500 spp. are endemic.

Lake Tanganyika is well known for its popular Dagaa (60%) and Luciolates fish species, (33%) not forgetting the significant aquarium fish populations. Dagaa fish species include mainly the stolothrissa ssp and the Limnothrissa spp. The dagaa spp. is normally processed by drying. It is popular for human consumption as well as for making animal feeds. It is consumed locally and also exported to the neighbouring countries like Democratic Republic of Congo, Burundi and Rwanda and Zambia. Luciolates is also consumed locally. In 1996 fish landed from Lake Tanganyika was 66,470 metric tons (Fisheries Division Statistics) and formed about 20% of the total fish landed in Tanzania. The fish production trends have been constant over the years. Other fish species landed but at a rather smaller scale includes the Tilapia spp., Haplochromis spp., Bagrus spp., Lates spp., Euchenoglanis spp., Boulengerochromis spp., Dinopterus spp., Thylochromis spp., Bathybates spp., and Ramphochromis spp. These species form 9.8% of the total landed fish catch from Lake Tanganyika.

The dagaa fishing is rather unique in the sense that it is done in the darkness during the night. The fishing is done by using the lamps to attract the fish which is caught by using scoop nets or lift nets, etc. Its catchability depends on the number of dark days in a month, and the number of the dark hours in a day depending on the moon phases.

Aquarium fish fishing in Lake Tanganyika involves small-scale artisanal fishermen. The fishing is done by using near shore traditional beach seining. It is also done by hand netting by diving and snorkelling along the boulder and shore-rocks. Most of fish caught from this lake is endemic. Aquarium fish populations are quite significant but modestly tapped. Fishing for aquarium fish is more developed in Burundi and Zambia compared to Tanzania. There are about 206 species of aquarium fish that is commonly present in the trade of aquarium fish e.g. Altolamprologus calvus black, Ectodus descampsic etc.

12.1.1 Seasonality in Fish production in Lake Tanganyika

Fig. 3.0 shows the seasonality of two fish, species namely Dagaa and Lates marinae of the Lake Tanganyika. Both species are showing very big and sharp variations. Each species shows three short-lived peaks. In case of Lates marinae the peaks appear in April, June and November. It is during those peaks that Dagaa fish season is very low. The low season for Lates marinae is between the months of July to November of the year. Normally the Dagaa species peaks, precedes those of Lates marinae. It appears that both species feed on the same habitat. But Dagaa spp. will feed on small phytoplanktons after which they will give way to Lates marinae that will feed on large particles of phytoplanktons. Dagaa spp. do not show any remarkable low season.

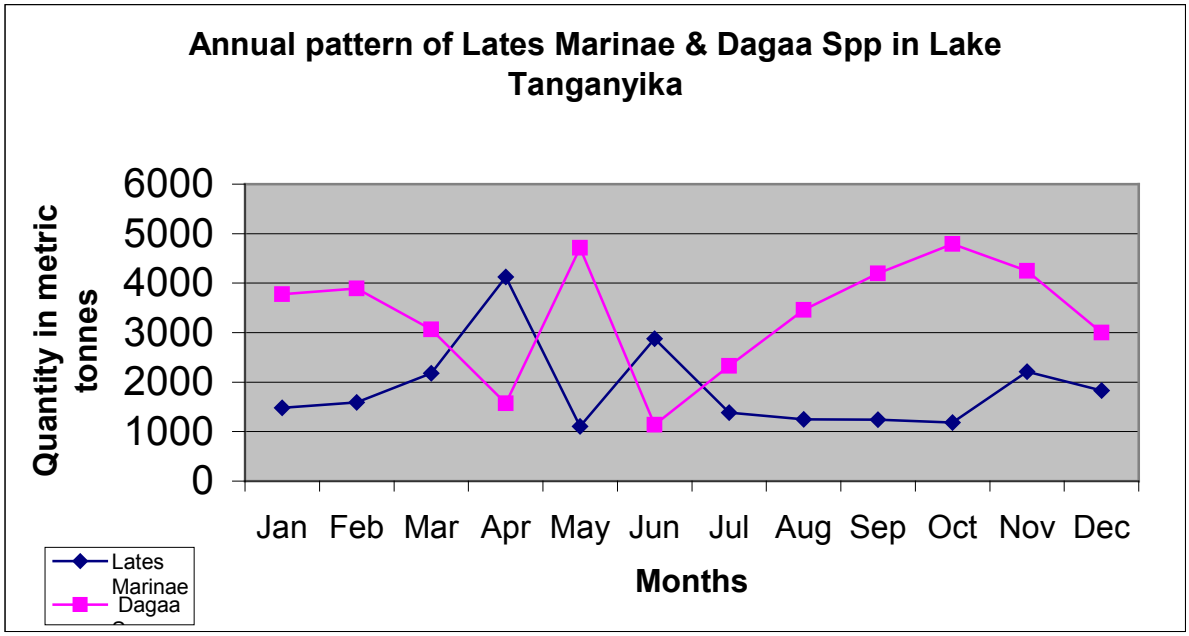


Fig. 3.0

1.2.3 Lake Nyasa Fisheries

Lake Nyasa probably contains 260 species of fish of cichlids, but it is not yet established because more and more fish species are being identified. The total fish landed from Lake Nyasa (Tanzania) is about 20,000 metric tons forming about 9% of the total catches in the country. The fish production has been rather consistent with very small variations over the years. The outstanding landed fish catches from this lake includes the Haplochromis species (30.3%); the Ramphochromis spp. (15.4%) and the Dagaa spp. (24.4%). Other fish species landed from Lake Nyasa includes Tilapia, Labeo, Bagrus, Clarias, Barbus, Barilius and Dagaa. Rare fish species includes Synodontis spp., Schilbe spp., Hydrocynus spp., Mormyrus spp. and many others.

Lake Nyasa has an amazing variety of cichlid fish, internationally known as brilliantly coloured rockfish or "mbuna" (local name). They are found in huge numbers all around the rocky coastline of Lake Nyasa. The fascination for aquarists and biologists is that they display one of the most remarkable examples of adaptive radiation known in the animal world. In the Southern parts of the lake (Mbamba Bay), the most coloured fish, Emperor perches, Aulonocara spp. are most abundant. The world market is wide open for this bright coloured types of wild – caught fish. In the year 2001 the total number of aquarium fish exported was 80,577. This is a very high number compared to 12,949 pcs exported in 1993. (see fig. 4.0)

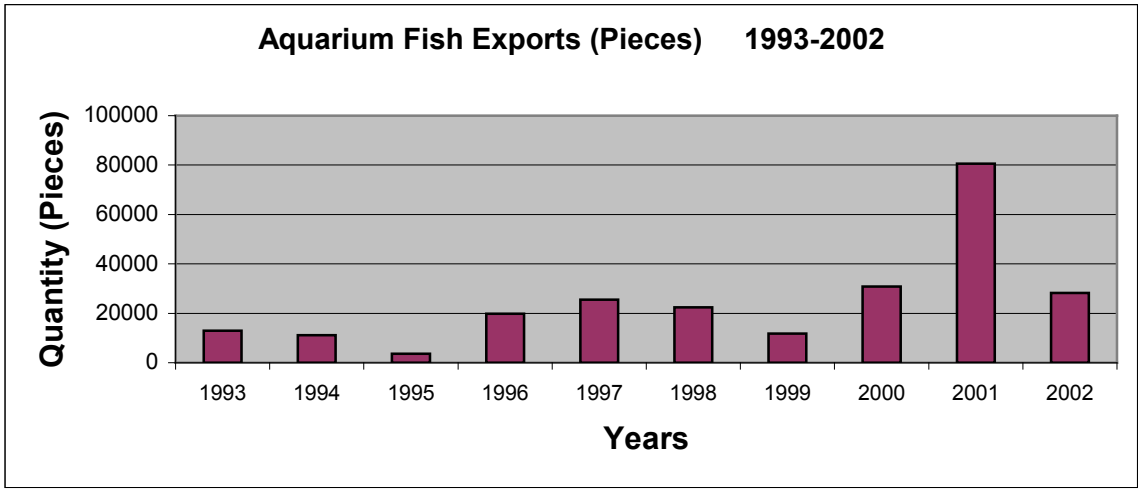


Fig. 4.0

1.2.3.1 Seasonality in Fish production in Lake Nyasa

In fig. 4.0 we can see the variation in fish production for species of haplochromis, Ramphochromis and Dagaa spp. The three species are much more correlated to each other in terms of their feeding habits in a common niche. Haplochromis spp. are more active than the others, and so has got three peak seasons. The most prominent one appears during the rainy season that is between the months of January and April. Each of the other two species has got one peak season happening concurringly between the months of June and October.

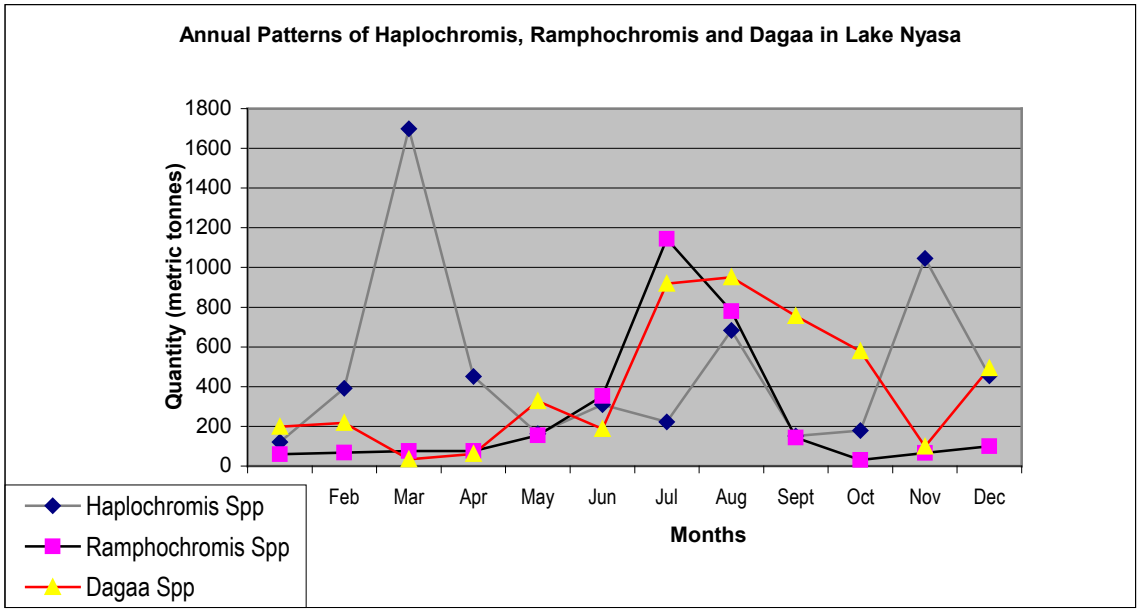


Fig. 5.0

1.2.4 Others (Minor Waters)

Lake Rukwa produces about 4,451 metric tons of fish per year. Tilapia spp. alone forms 73.7% of the total fish production in Lake Rukwa. Other fish species available in the lake includes: Alestes, Bagrus, Clarias, Hydrocynus, Synodontis, Schilbe and Labeo. In the Mtera Dam fish species landed includes Alestes, Bagrus, Clarias, Cintharinus Distichodus,

Hydrocynus, Labeo, Synodontis, Schilbe and Tilapia. Tilapia alone forms 58.8% of the total production landed from Mtera Dam. From Nyumba ya Mungu dam a limited number of fish species is available and these includes clarius, Synodontis, alestes and Tilapia. Total fish landed from this dam is 1,162 Metric tons, Tilapia spp. forms 94.7% of the total fish caught from Nyumba ya mungu Dam. Riverine fisheries altogether contributes a total of 9,773 metric tons.

There are a number of threats that are rendering most of the minor waters unproductive with fish. For example in Lake Rukwa there is a dramatic drop in fish – production due to the presence of crocodiles that devour most of the fish in the lake.

Lake Jipe is slowly being eaten away by siltation processes, and encroachment by water weeds that reduce total fishing space. Nyumba ya Mungu Dam is also facing similar problem like Lake Jipe. A greater part of the Dam is shallow due to siltation and water weeds encroachment.

1.2.5 Marine Fisheries

Fish landed from marine waters was about 61,981 metric tons (1996) forming about 15% of the total fish production in the country.

This amount of fish was caught either by the artisanal fishermen (97.9%) or from Industrial fishing (2.1%). The artisanal fishermen normally catch his fish from the shallow coastal waters where un-motorised fishing vessels are commonly used. These boats are the out rigger dug-out canoes and the planked fishing vessels using sails for their power.
The Industrial fishing consist of carrying out fishing operations using trawlers. These vessels can carry out fishing operations within the inshore or offshore. They are targeted to catch prawns and to some extent fin fish. Presently there are no official records showing the existence of fishing vessels fishing in the Exclusive Economic Zone. There could be foreign owned vessels carrying out fishing operations in the EEZ without the knowledge of the concerned authorities.

1.2.5.1 Seasonality in Fish production - Marine

Among the marine fish species prawn species have shown to be commercially important and has successfully won the export market. The Fisheries Division Statistics (1996) indicates that the prawn season lies between the months of February and August. It coincides with the last half of the rainy season. More than half of the catches are from the trawl fishing. In other words, the prawn fishing is more or less dependent on the commercial fishing by use of trawlers. Prawn catches forms 2.2% of the total marine fish production. Although the percentage is small, it is very valuable.(see fig. 6.0)

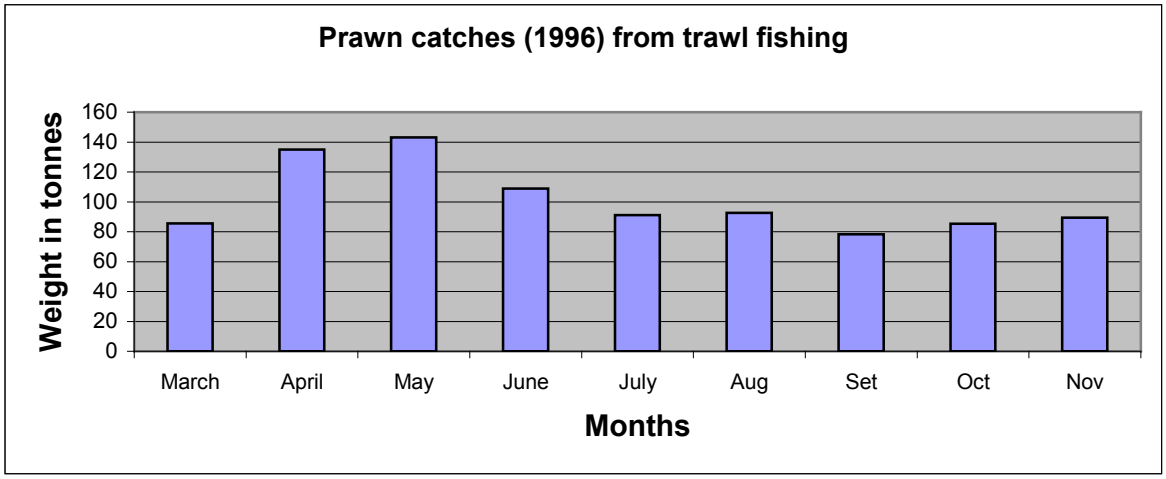


Fig. 6.0

1.2.5.2 Prawn Fishery

Prawn is a crustacean species found along the coast of Indian Ocean especially in the brackish waters. Dominating species of commercial importance include **Penaeus indicus** (Indian white prawn) 74.8%. Metapenaeus menoceros (speckled shrimps) – 17.2% Penaeus semiculatus (Green tiger) 3.8%, **Penaeus monodon** (Giant tiger) 3.8%, and **metapenaeus stebbigi** – 0.4%;Commercially they are categorised as King, Tiger and white prawns.

Harvesting of prawns is normally done by either trawling or by traditional methods usually applied by the artisanal fishermen.

When fishing by using a trawler, the trawl net is normally towed by a big fishing vessel near to the bottom of the sea, and in so doing it collects prawns and other dermersal fish species. Trawlers also catch other fish indiscriminately. For the purpose of the fish resources management trawlers are authorised to operate within a specified period in a year. Also, in each year only an optimum number of trawlers and of the specified size and power are allowed to fish under a license.

The most prominent production areas includes the whole coastal north –south stretch along the Indian Ocean. A list of names of the fishing villages and fishing grounds are as shown in the table no 4.0 below:

Table 4.0-

FISHING GROUNDS FOR PRAWNS

S/N	REGION	VILLAGE	FISHING GRUND
1.	COAST	Kibanju	Vikacha, utungini, Kieshuru, Mbaranyimbo
		Kiomboni	Bunduki, Barcelona, Potelea mbali, Twana
		Kisiju	Kisiju, Kwale
		Taja	Kibega, Fungu la nyani, Kitope, Mange, Mvinjeni
		Sadani	Sadani
2.	DAR ES SALAAM	-	Shungbay, Salender bridge
3.	LINDI	-	Unazi moja (Mingoyo), Ufukweni, (Lindi Town)
4.	MTWARA	Msimbati	Msimbati
		Sudi	Sudi
5.	TANGA	-	Pangani estuary

Prawn trawlers normally operate under the following restrictions: -

- All prawn trawling vessel have to be registered and licensed by the Fisheries division after qualifying for seaworthiness and fulfilling the E.U. food standards and others;
- Each trawler has to be provided with an approval number to show that he is permitted to carry out fishing operations.
- Each trawler will have to carry a qualified quality controller and a fisheries supervisor on board the vessel at all times of operations.
- All the trawlers must abide by the government regulations relevant to employment Act,, safety regulations, Taxation, etc;
- Landing of fish catches must be done in Dar es Salaam harbour at the end of each month;
- All fishing operations must be done during daytime. They should be done strictly from 0600 hrs to 18.00 hours in the inshore;
- Trawling is not allowed in shallow waters at sea.

- The artisanal fisherman normally uses traditional fishing methods such as Drift gillnetting, seining, weirs and cast netting.

Drift – gillnetting

- The gear is constructed from nets of two ply with mesh size of 19mm. Consisting of 15 pieces of 50m long nets connected together to form a driftnet. This method catches about 6 to 10 kgm a day (Mawua and Msimbe – 1997).

Seining

The gear is constructed from nets of 4 to 6 ply with mesh size of 19mm (Bwathond – 1997). Catches per day ranges between 8 kgms to 12 kgms per day.

Weirs
Weirs are constructed in the creeks and along the beaches by poles, they are a permanent structures. During low tide prawns become entrapped in these weirs and so become collected.

Cast netting
The gear is constructed from nets of 2 ply with two different mesh sizes. At the bottom the net mesh size is ¼" while in the upper portion of the gear it is two inches mesh size.

Among the traditional fishing methods Drift – gillnetting is more efficient (48.7%) followed by seining (25.2%), then weirs (19.1%) and finally cast netting (6.9%).

The fish varieties that are normally caught from our marine waters includes the following:-

- Fin fish (94.5%) - Sharks, rays, flat fish, sardines, threadfins, Half beaks, mackerels, Parrot fish, Rabbit fish, Scavengers, King fish, Tunas, Jacks, Rock cods, silver biddies mullets, milk fish, Cobia, Sword fish, Queen fish and aquarium fish.
- Cephalopods & Echinoderms (2.5%) Includes the Beche-de-mer, Octopus and squids.
- Crustaceans (0.5%) Prawns, crabs and lobsters
- Molluscs (0.15%) Mostly sea-shells
- Industrial Fisheries (2.1%) - Mainly prawns and fin fish caught by trawlers.

Our artisanal fishers have been fishing in the same fishing grounds for over years. With the motorised fishing boats the fishing capacities could be increased by going out in the off shore marine waters where a large fisheries potential exists.

1.2.5.3 Aquarium Fish (marine)

The coral reefs around Tanzania and Zanzibar are well developed and their very nature is different from the rock-based reefs in other Indian Ocean countries e.g. Sri Lanka. 70% of Tanzania Mainland coastline is covered with coral reefs. The colourful aquarium fish are prolific in numbers as well as in species. Tanzania can raise a considerable amount of foreign exchange by exporting of aquarium fish on a larger scale.

1.3.0 FISHING EFFORTS

Table 5.0:
DISTRIBUTION OF FISHING EFFORTS IN TANZANIA BETWEEN YEARS 1993 AND 1996

	1993			1996		
Lake / Dam	**No. of Fishers**	**No. of Fish vessel**	**No. of Engines**	**No. of Fishers**	**No. of Fish Vessel**	**No. of Engines**
Victoria	20,064	4,185	146	34,832	7,953	452
Tanganyika	9,190	2,937	219	12,510	3,494	494
Nyasa	6,764	2,353	2	5,708	2,353	2
Rukwa	863	512	4	1,029	1,026	4
Mtera Dam	2,149	2,008	-	1,645	1,623	-
N/ ya Mungu	1,102	545	-	929	534	-
Marine Fish	15,027	3,232	306	13,822	3,768	306
Minor Waters	6,784	5,204	-	5,246	2,225	1
Total	**61,943**	**20,976**	**677**	**75,721**	**22,976**	**1,259**
% increase				22%	9.5%	85%

Observing from table No. 5.0 (Fisheries Division statistics) we note that generally there was an average increase in fishing efforts almost in all aspect of fisheries. Between the years 1993 and 1996 there was a remarkable increase in the number of fishermen by 22%. But at the same time we observe that the increase in number of fishermen exists only in major waters of Lake Victoria, Lake Tanganyika and Rukwa. We also note that the number of fishing vessels increased by an overall 9.5%. When we consider each individual water body we learn that an exception exist in case of minor water bodies, that is, the dams and rivers where the number of fishing vessels dropped. The same trend exist for the number of engines or in other words the number of motorised boats that there is an outstanding increase of 85%, but on close observation the increase exist in the main water bodies especially in Lake Victoria and Lake Tanganyika where it was more than twice.

On the whole there was a general increase in fishing efforts in the major waters of Lake Victoria. Lake Tanganyika, Lake Nyasa and the marine waters. But this increase did not influence fish production for the year 1996 mainly due to the drop in fishing efforts in most of the minor waters. However the drop of 2.3% was rather marginal.

An increase in the number of engines by 85% means that the fishermen would now have the accessibility to new fishing grounds further out in the offshore and so have an effective influence over the fish production. However, this has not been the case. To be more specific the increase in the number of engines happened only to Lake Victoria and Lake Tanganyika. The increase was three-fold for Lake Victoria and two-fold for Lake Tanganyika. In 1996 there were two main events that happened, that is, the imposition of a ban over the use of beach seine nets and the establishment of the Fish processing Factories in Mwanza. These events meant an increase in demand for Nile perch fish, which was selling at a better price now. Thus most of beach seining fishermen had opted for alternative fishing method, and

with the existing of demand for Nile perch most of them acquired motorized boats. In case of Lake Tanganyika it is also possible that these beach seiners opted for dagaa fishing which also use motorized boats for an effective fishing. Dagaa fish production has been leading in production for years.

On the whole the artisanal fisheries being the backbone in the fisheries industry in Tanzania has to be re-addressed and the constraints re-assessed for more effective solutions. Some of the problems that is facing the artisanal fisheries includes:-

- The artisanal fishermen does not have accessibility to credit,
- Lack of infrastructures at the landing beaches,
- Most fishers use non-motorized and risky boats with low carrying capacities,
- The fishermen or the fishing communities at large do not have business management skills,
- They lack knowledge and skill in hygienic fish handling and marketing,
- They do not have cold storage facilities,
- The fishermen live in an environment with un-established method and know-how for the organisation of the fishers and community development,
- The fishermen is reluctant to abandon the use of traditional boats and fishing methods,
- Lack of reliable accessibility to remote fish landing beaches – influences the fish pricing,
- There exists poor social and economical infrastructure in the fishing community,
- Most fishermen have low education level.

Unless the fishermen's problems are solved the fisheries industry will remain undeveloped due to failure in proper management and sustainable utilization of the fisheries resources. If the above mentioned constraints are removed fish production will definitely increase to meet the demand imposed by the growing population.

1.4.0 FISHING GEARS

1.4.1 Types of fishing gears (Table – 6)

Common fishing gears in Tanzania includes the traditional gears, gillnets, seine nets, line gears and the trawls as follows:-

1.4.2 Traditional gears

These are simple fishing gears, which have been used locally for many years. They are there for obtaining small fish catches for home consumption. They are commonly used in rivers, sea or lake bays/gulfs and in the estuaries. Good examples include the traps, baskets, weirs, fixed traps, spears, etc.

Table No. 6.0

NUMBER OF FISHING GEARS COMMONLY USED IN FISHING OPERATIONS IN TANZANIA
(1996 Figures)

S/N	ITEM	FRESH WATERS	MARINE WATERS	TOTAL
1.	Number of gill nets	174,603	4,120	178,723
2.	Shark nets	-	3,357	323,813
3.	Beach Seines	1,343	350	1,693
4.	Scoop nets	1,629	75	1,704
5.	Cast nets	6	49	55
6.	Apollo Lift nets	4	0	4
7.	Lift nets	1,403	0	1,403
8.	Ring nets	0	21	221
9.	Dagaa Seine Nets	2,368	0	2,368
10.	Hooks/Hand lines	1,692,035	7,839	1,699,874
11.	Long lines	0	1,575	1,575
12.	Traps (Madema)	5,086	3,390	8,476
13.	Fixed Traps (Uzio)	0	25	25
14.	Spears	0	134	134
15.	Mosquito Nets	67	0	67
16.	Purse Seiners	611	0	611
17	Trawlers		140	11

1.4.3 Gill nets

Types of gillnets are usually determined by their mesh-sizes and plies. The mesh sizes commonly used in Tanzania ranges between 1½" to 12". If it is desired to catch smaller size fish, then a gill net with small mesh size and lower ply will be used. In case of Lake Victoria the mesh size legally allowed for catching Tilapia and Nile perch is not less than 6". All other gill net mesh sizes are allowed to be used in other water bodies. This also applies to the riverine fisheries. The measurements are normally made along the diagnal with the mesh stretched across.

Along with the gill nets you have the shark-nets commonly used when fishing in he marine waters. They are usually stronger with big plies convenient for catching big fishes like sharks, rays, rock cods, etc.

1.4.4 Seine – nets

In this case you have the beach seine nets, the dagaa seine nets, lift-nets, purse seine nets scoop nets, cast nets and ring nets.

The use of beach seine nets is banned because of their indiscriminate catching of fish. They are usually used in catching fish around the shallow waters near to the beaches. They normally become very destructive when used in catching fish in the river estuaries.

Dagaa seine nets, Lift nets, Scoop nets, and Cast nets are usually targeted to catch small sardine-like fish by the use of lamps to attract them.

The fishing operations take place during the dark nights. The use of these gears are legally permitted. Purse seine nets are used in industrial fishing. They are also targeted to catch sardine-like fish, but in most cases big pelagic fish is also caught in good numbers. The big pelagic fish become attracted by the presence of big sardine like fish shoals which form good food for them. The fishing method uses big lamps to attract fish. The fishing operations are done in the deeper waters.

1.4.5 Line gears

There are three types of line gears. These include the simple hand lines, the long lines and the long-liners. They all use the same principle of having a line (nylon rope) along which hooks are hanged at regular intervals. The simplest line gear is the hand line or angle-line. This consist of a pole, a line and a hook. The simple line and the long line are the only line gears applied in Tanzania. We do not have long-liners.

1.4.6 Trawlers

A trawler is a fishing vessel manufactured to suit the use of trawl nets. The trawl nets are usually towed by the fishing vessel equipped with accessories, which are used to control the movements of the trawl net. The trawl nets are targeted to catch all kinds of fish i.e. dermersal and pelagic. For example when it is desired to catch dermersal fish the trawl net is normally lowered to the sea-floor so that when it is towed along the sea floor it will collect all the fishes in its way. The use of trawlers in Lake Victoria was banned in order to avoid indiscriminate destruction of the breeding grounds. The trawlers used to interfere with the gill nets or other still gears when left in the sea.

Table No. 7

Costs of a complete Sharknet (4"– 6" x 150m of 36ply)

S/N	Item	Quantities	Price/Unit	Total (Tshs.)
1.	Nets (36ply, 4"-6" of 150)	1piece	140,000/=	140,000/=
2.	Headropes (10mm)	1/2 rolls	10,000/=	15,000/=
3.	Foot-ropes(8mm)	1 1/2 rolls	7,500/=	11,250/=
4.	Mending twines (36ply)	3 spools	520/=	1,560/=
5.	Floats	50pcs.	800/=	40,000/=
6.	Sinkers(Locally made from stones)	-	-	3,000?=
7.	Anchor (25kg.)	1piece	30,000/=	30,000/=
8.	Labour charge			6,000/=
9.	Total cost for one sharknet			246,810/=
10.	Total cost for nine sharknets	9pieces	246,810/=	2,221,290/=
11.	Marker Buoys	3pirces	5,000/=	15,000/=
12.	Insulated box (4'x3x3')	1piece	540,000/=	540,000/=
Total costs		9sets		2,776,290/=

Table No. 8

Costs of making a local boat of length 24ft long, prices as at August, 2003 (fishing on the Indian Ocean Waters)

S/N	Item & Component	Details	Price/Unit	Total (Tshs.)
1.	Keel (made out of a log)	1 piece	60,000/=	60,000/=
2.	Timber	50 pieces of 1"x12"x 10"	8,000/=	400,000/=
3.	Ribs (frames)	60 pieces	2,000/=	120,000/=
4.	Nails of different sizes	80kgms	450/=	36,000/=
5.	Putty	1tin	12,000/=	12,000/=
6.	Cotton	3kgms	1,500/=	4,500/=
7.	Thwarts, stem & stern	-	-	100,000/=
8.	Paddles (kofia)	5 pieces	5,000/=	25,000/=
9.	Anchors (25 kg)	2 pieces	30,000/=	60,000/=
10.	Anchor rope (18mm)	1 roll x 15,000/=	15,000/=	15,000/=
11.	Paint	3 tins	7,000/=	21,000/=
12.	Labour charge (overall)	-	-	450,000/=
13.	Sail	1	150,000/=	150,000/=
Total				1,453,500/=
14.	Yamaha outboard engine	1	2,080,000/=	2,080,000/=
Total				3,533,500/=

An estimated cost of investing in a fishing operation consisting of a 24-foot boat, motorized by a 25 Hp Yamaha outboard engine and nine sharknets has been found to be around 6.5mill. Tshs.
This is only possible with a financially capable fisherman or a number of fishermen who have come together and have decided to carry out joint fishing operations.

The boat is a planked wooden boat made out of the local boat designs. The sail is also made locally out of the traditional designs. The sinkers of the foot-rope of the Sharknet are made of stones in order to minimize the costs. The sharknets are used in catching mainly fin-fish both dermersal or pelagic of different species (see table 3).

On the whole the cost of investing in a sharknet fishing on the Indian Ocean is too high for a normal fisherman to afford, unless he is accessible to credits from financial institutions with reasonable interest rates.

1.5 AQUACULTURE PRODUCTION

Fish culture was introduced in Tanzania in 1949 (Balarian, 1985). For the first time earthen fish ponds were constructed in Korogwe (Tanga Region) and Malya (Mwanza Region) and stocked with Tilapia spp. (oreochromis niloticus) Bailey, 1966). These ponds were regarded as demonstration fish ponds.

Trout fish spp. was also introduced in river distributaries in the Regions of Mbeya, Iringa, Arusha, and Kilimanjaro. This was just before independence. In the years of 1980s carp fish spp. was introduced in fish ponds in Morogoro. This was done so as to find out which fish species would respond favourably to the climatic conditions of Tanzania.

Since then, many Tanzanians became interested in raising fish in earthen fish ponds although with poor results. By the year 2002 there were a total of 14,169 fish ponds (see table No. 9.0).

Table No. 9

Number of fish – ponds per Region

S/No.	Region	Number of fish – ponds
1.	Arusha	691
2.	Dar es Salaam	38
3.	Dodoma	83
4.	Iringa	3,137
5.	Kagera	92
6.	Kigoma	135
7.	Kilimanjaro	1,855
8.	Lindi	367
9.	Mara	105
10.	Mbeya	1,176
11.	Morogoro	452
12.	Mtwara	230
13.	Mwanza	44
14.	Pwani	86
15.	Rukwa	13
16.	Ruvuma	4,942
17.	Shinyanga	11
18.	Singida	147
19.	Tabora	112
20.	Tanga	453
	TOTAL	**14,169**

Source: Fisheries Department

Sea – weed farming is also being practised by many Tanzanians along the North - South coastal stretch of Indian ocean in the Regions of Tanga, Coast, Dar es Salaam, Lindi and Mtwara. The common sea-weeds being farmed are the Eucheuma – cottonii and eucheuma – spinossum. The sea-weeds harvest have been increasing constantly since 1997.

Table no. 10

Sea Weed Production (In metric tons)

Year	Tanga Region		Coast Region		Lindi Region		Mtwara Region	
	Wt.	T.Shs.	Wt.	T.Shs.	Wt.	T.Shs.	Wt.	Tshs.
1997	-	-	2.2	-	-	-	6.8	476,000
1998	58	8,088,000	3.0	-			13.4	1,072,000
1999	74.0	8,983,800	2.3	-	139	16,680,000	20.6	2,472,000
2000	54.1	5,874,300	1.98		170	20,400,000	33.8	5,070,000
2001	88.1	5,223,426	2.5		210	25,200,000	-	-
2002	-	-	2.0					
TOTAL	**274.2**		**13.98**		**519**		**74.6**	

Despite of the big aquaculture potential the fish harvests from aquaculture are negligible mainly due to lack of extension services parted to the farmers. There are many constraints facing the fish – farmers and these are as follows: -

- There is little information regarding aquaculture in the country;
- Data collection system is non- existent;
- Ineffective extension services;
- Lack of co-ordinated approach to aquaculture research and extension;
- Lack of farm-based research results for small-scale aquaculture development;
- Decreasing interest in fish farming due to low returns and uncertainties;
- Presence of cheaper fish from capture fisheries in various parts of Tanzania do not encourage the farmers to produce fish from aquaculture;
- Lack of knowledge in book-keeping and farm management;
- Lack of accessibility to credit facilities.

The prevailing potential for aquaculture in Tanzania will remain unproductive if the above-mentioned issues are not addressed. Aquaculture development should aim at: -

- Development of quality seeds and fingerlings production at the fingerling production centres of Kingulwira (Morogoro) and Mbarali (Mbeya);

- More fingerlings production centres should be established in designated regions to reduce the distance covered in the fingerlings distribution chains;

- Semi-intensive and intensive aquaculture should be encouraged in order to commercialise aquaculture fish production;

- Extension services to aquaculture farmers should be improved to enable farmers to acquire farm management skills;

- Market research for potential aquaculture products should be made;

- Animal feeds manufacturers should also indulge in making adequate quality fish feeds.

CHAPTER 2

2.0 THE FIRM LEVEL PERFORMANCE

2.1 TANZANIA'S FISH EXPORT INDUSTRY

The majority of fish caught in Tanzania is consumed as fresh fish, the rest is processed into traditional fish products' by drying, smoking or salting while dagaa fish is processed into fish-meal . Generally our fish is put into different uses as follows:

- For human consumption – 62%
- For animal feed or non food use – 8%
- For export – 30%

Tanzania was exporting fish and fish products even before the years 1980s, but mostly were in small quantities. By that time the fish varieties included in the exports consisted of prawns, lobsters, beche-de-mer, marine finfish, aquarium fish etc. In the early years of 1980s the fish-tawlers came in and started operating along the coast of Indian Ocean for prawns and it is from there on that Tanzania started exporting a reasonable amount of fish products which gave Tanzania a meaningful amount of foreign exchange earning.

The Tanzania's foreign exchange earnings were substantiated early in 1990s when Fish Processing Factories started being established on Lake Victoria. These fish processing plants were established specifically to cater for Nile perch processing for export purpose. As a consequence, in 1994 the marine fish and fish products export earnings became surpassed by the Nile perch fish products export earnings (see Fg. 7.0). Since then the Nile perch fish products export earnings kept on increasing while those of the marine fish products exports remained the same.

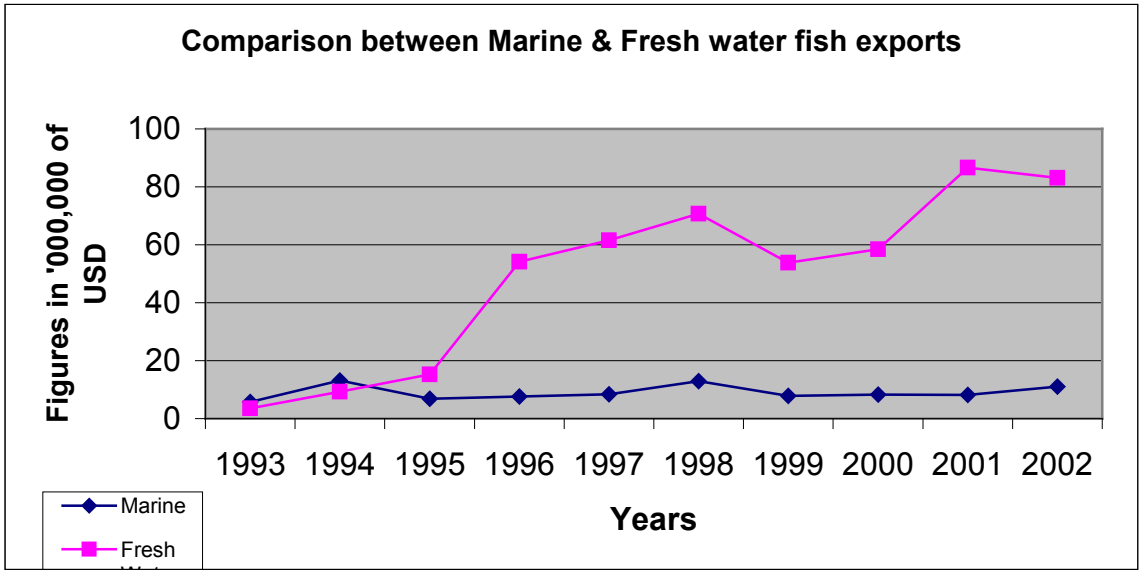


Fig. 7.0

Basically the improvement in the quality of fish products processed in the factories, and the increase of fish and fish products exported in terms of value, that is, from 7,958 metric tons in 1993 to 32,953 metric tons in 2002 enabled a corresponding increase in export foreign earnings from US$ 9.5 mill., in 1993 to US$ 94.2mill., in 2002 (see fig 7.0).

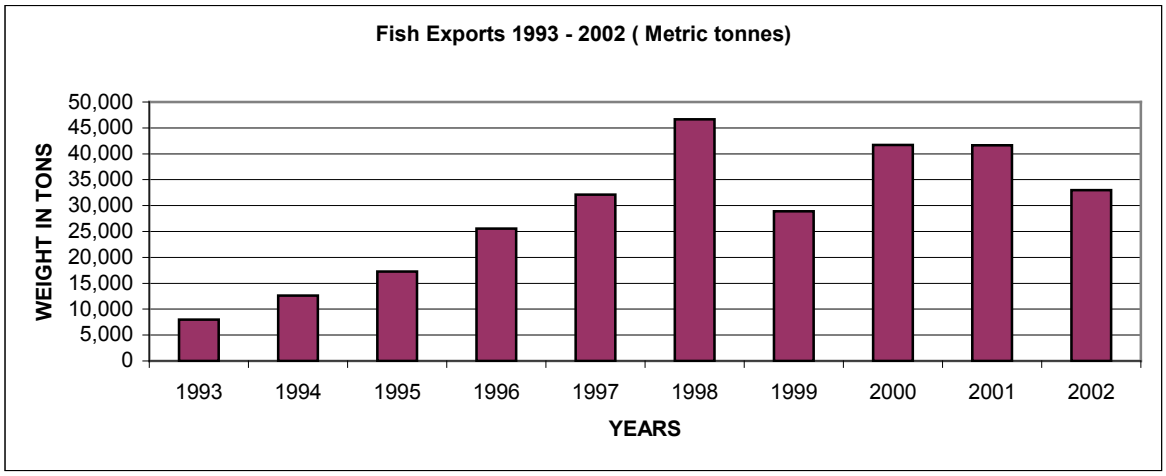


Fig. 8.0

Fish as one of the non-traditional product has averaged a rapid growth of 10% since 1990 and has become an important export product comprising 12.3% of the total export value (1998), that is, out of both traditional and non-tradition exports.

The fish export industry has also enabled the Government to earn incomes through fishing licences, registration of boats and fishermen, royalty fees on fish and fish products exports and local levies charged at the fish landing beaches. For example in 2002 4.9 Billion TShs., was charged as Royality fees on exported fish and fish products. Other Government revenues earnings include the licensing of the fish processing factories and fish meal firms, taxes on imported machinery, value added tax (VAT) etc.

All these levies if not well scrutinized add greatly to the cost of fish production and marketing thus may render Tanzania fish and fish products less competitive in the world market.

2.2 EXPORTED FISH & FISH PRODUCTS

According to the 2002 fisheries statistics of the Fisheries Division a total weight of 32,953 metric tons of fish and fish products worth 94.0 mill., US$ were exported. As a fish product the Nile perch fillet took the lead by forming 80.9% followed by prawns – 7.0%, fish-maws – 3.0%by value. Considering the Nile perch fish products collectively, they form a total of 88.0%. The Nile perch fish products exported includes the Nile perch fillets, Belly-flaps, fish-maws, fish-offals, whole fish (headed and gutted), fish-chests, fish-skins, off-cuts and salted and dried Nile perch. Other fishery products from the fresh waters included dagaa and aquarium fish. The marine fish and fish products consist of crabs, live crabs, lobsters and live lobsters, octopus, prawns, sea-shells, squids, sharks-fins, marine fish fillets, beche-de-mer and aquarium fish. Unfortunately very little fin-fish from the marine waters is exported after the

government's prohibition. However, fin-fish if allowed by the government could be exploited further in order to increase the volume of fish exports. With the exceptions of dagaa fish, Nile-perch and aquarium fish, all other fish from the fresh waters is not allowed for exports mainly due to food security reasons.

2.3 PROCESSING INDUSTRY STRUCTURE

The fish processing plants could be categorized in three groups, as follows:

- Land based fish processing plants (factories) specialized in processing Nile perch fish on Lake Victoria.
- Land based fish processing plants located along the Indian Ocean coastal regions. Most of them process the cephalopods (octopus and squids), the crustaceans (prawns, crabs, lobsters), the beche-de-mer and very little finfish.
- The trawlers performing fishing operations along the Indian Ocean coastal waters are normally installed with fish processing plants. They fish for prawns and finfish. They are all stationed in Dar es Salaam.

Currently there are eleven (11) Nile perch processing factories and these include: the Omega Fish Ltd., Mara-Fish packers Ltd., Prime Catch Ltd., Tanzania Fish Processors Ltd., VIC – Fish Ltd., Nile Perch Fisheries Ltd., Tan perch Ltd., Mwanza Fishing Industries Ltd., Chain Food International Ltd., Musoma Fish Processors Ltd., Victoria Fisheries (T) Ltd.,

The land based factories processing marine fish are the Tampesca Mafia Plant, Fruits-de-la-Mer Ltd., Sea ProdcutsTanzania Ltd., Lucia Abdulley Omary, Samaki Cold Storag, Shamez Enterprises, Asmara Trading Co. Ltd and Kilwa Bahari Star..

The last group that usually process their fish on board the vessels includes the Heltanco Ltd., Tramico, Fruits-de-la-mer Ltd., and Tanpesca co. Ltd., These companies altogether own a total of twenty four trawlers (24) trawling for prawns.

2.3.1 The Nile perch processing factories:

The fish processing factories on Lake Victoria depend on the whole and fresh Nile perch as the only raw materials (fig. 9.0). The raw material for the factories is supplied by the fish-agents who are normally independent or company agents. The marketing channels of Nile perch have been systematized so that they are definite and who ever is involved can easily be traced. This situation is in response to the requirements put forward by the European Union, for more than half of Nile perch products find their way into the E.U. markets.

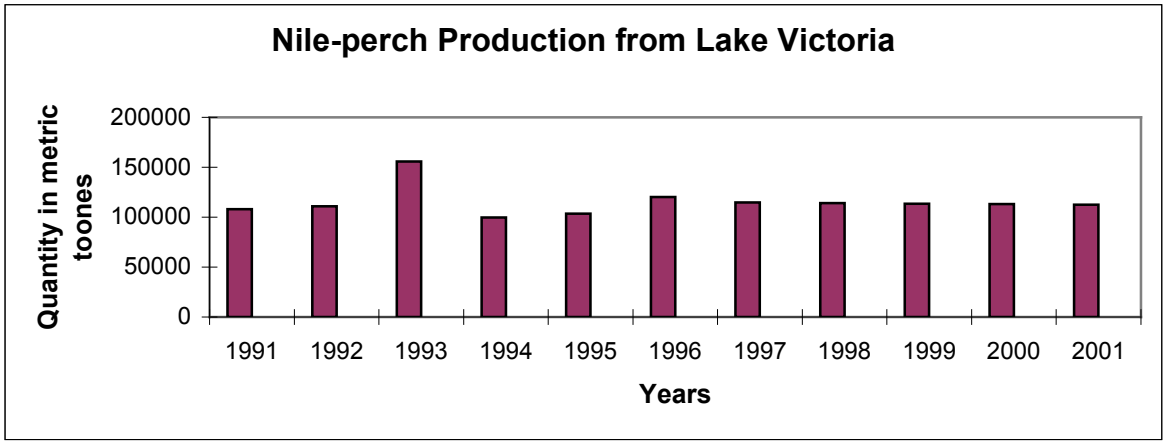


Fig. 9.0

As per E.U. recommendations all the fish catches that are due for processing in the fish factories should be indicative of the fish supplier or the agent, the fishermen and the fishing ground. This is done by allocating a code number characteristic of all the above features. The fish processing factories get the fish supplies along the following marketing channels.

(i) The Fishers → The Agent → Processing Plant

(ii) A group of fishermen (Association)/Individual fishermen → Fish Processing Plant

(iii) The fisher → Fish Processing Factory.

In case of the first marketing channel the fishers catch fish from a specific fishing ground. He takes the catch to an official landing point on the lakeshore. From here the Agent collects only the good quality fish and deliver it to the Fish Processing Plant.

In some cases the factory owners will give fish equipments and gears such as boat and several smaller boats an outboard-engine and fish nets to an Agent. The loan is provided on the high purchase basis. Then the Agent will hand over the fishing gears to the fishermen who in turn will use it for catching fish and supplying it to the Agent at the collection point. Normally the agents will pay the fishermen at a price not more than half the price they get at the factory gate. The prices here are rather exploitative to the fishermen.

In case of the second marketing channel a group of associated fishermen or an individual fisherman owning all the necessary fishing facilities enters into an agreement with the Factory Management so that they supply fish at an agreed price. Here the group or an individual fisherman could as well be owning the fishing equipments obtained by hiring them from other people. In this case the Factory Management sends his workers to come and collect fish from the landing point.

Finally you have a well to do fishermen owning the fishing equipment and gears sometimes up to twenty (20) sets of boats. This fisherman is free to sell his catches to whomever he feels like at good and competitive prices.

Occasionally the Factory management may enter into a contract with a group of fisherman and supply them with an engine, a boat and fishing gears so that in return the fisherman

supplies fish to the Factory management to offset the credit. There are two disadvantages here: The Factory management will have tied the fishermen to his uncompetitive prices, but at the same time the fishermen could be supplying half the amount of fish caught and divert the rest to other factories or fish agents.

The working relationship between the Nile perch processing Plants, the Agents and the fishermen have raised some issues that are worth noting. These issues are a big constraints to the fishermen and they are as follows:-

- All fish processing plants owners are members of the Lake Victoria Fish Processors Association which takes care of their problems, while fishermen do not have one. So the fishermen do not have effective influence over price fluctuations.
- Fishermen are not free to sell their fish to any buyer due to the existence of the high-purchase system of acquiring fishing facilities.
- There is a remarkable drop in Nile perch stock in Lake Victoria thus threatening the performance of the fishermen's economy as well as the Fish Processing Establishments. The MSY for Lake Victoria has been taken to be 200,000 metric tons, but this figure could as well be not realistic. To me of the features that have shown to be indicators for the fish stock decline includes:
  (i) A steady decline in catches over the years compared to a four-fold increment in the efforts put on the resource (Frame Survey reports – 1998 & 2000). Fisheries Division.
  (ii) The fishing of vast quantities of young or immature Nile perch from the available stocks as well as breeders – which could adversely affect the future harvests.
  (iii) The unrestricted fishing that could lead to poor stocks from over fishing.
  (iv) The rampart use of illegal gears in the entire lake.
- Fishing gear theft is still a menace to the fishermen. Just now each individual fishing unit has gone to an extent of using guns to protect them selves against the invaders while at sea.

Normally, fish and fish products from the Nile-perch factories bound for external markets are taken to Dar es Salaam port by rail while stored in the reefers. Occasionally they are routed through Mombasa port. While at the ports they are trans-shipped into other ships destined for abroad. Most of these fish products are the frozen products.

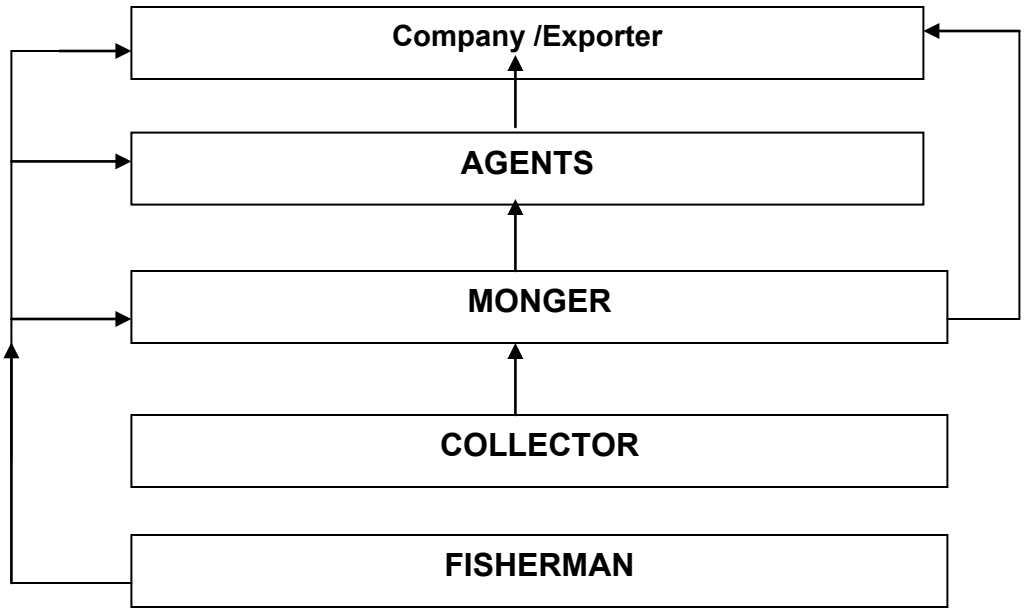
All the chilled fish-products are air –freighted directly from Mwanza on Lake Victoria to outside the country e.g. Europe.

2.3.2 The Marine Fish Processing Factories

The land based Fish Processing Plants located along North-South stretch of Indian Ocean coastline do process a wide range of fish varieties such as prawns, lobsters, crabs, octopus, squids, etc.(with the exception of fin fish). These processing centers get their raw material supplies from independent middlemen. In most cases the middleman assumes the position of the collector or a Monger and/or an agent all of which will sell the fish products to the Export Company/Individual exporter. (table No.11).

Table No. 11

MARKETING CHANNELS FOR ARTISANAL FISH PRODUCT COLLECTION



Definitions:

Company - Registered and authorized company for fish products export.
Exporter - An individual person licenced or authorized to export but using processing plant of a registered company
Agent - One negotiating the buying and or selling of fish products e.g. prawns, crabs, lobsters, etc., for a company and or fisherman and fishmonger.
Monger - Middle man between fishermen and agents/companies /exporters
Collector - Person used by mongers to collect fish products such as prawns from individual fisherman vessels but by paying the money and he is also paid commission.
Fisherman - One doing the actual fishing

The important person in the above marketing channels is the fisherman. There are well to do fishermen who may decide to sell the catches to the monger or to the agents or directly to the exporter. The usual channel is for the fisherman to be visited by the collector who collects fish products and sells it to the fishmonger or the agents who will take it to the exporter. The fishmonger can also take the fish products to the exporter where he will fetch better prices. In this case all the fish products are caught by the artisanal fishermen. The exporters in this case are mostly small scale exporters and deals in cephalopods & crustaceans.

2.3.3 The Trawler –Fish Processing Plant

This is the case where the processing of fish is done while on board the fishing vessel. Since the trawler is meant for catching prawns, so all the processing facilities on the trawler are designed for the purpose of processing prawns. The trawler catches the prawns, then it is processed on board the vessel, it is packed in the required packages and stored in the cold storage on board the vessel. At the end of the each month the trawler brings the prawn products to the Dar es Salaam harbour where it is transferred to another ship destined to outside the country for the export market (see fig. 10.0)

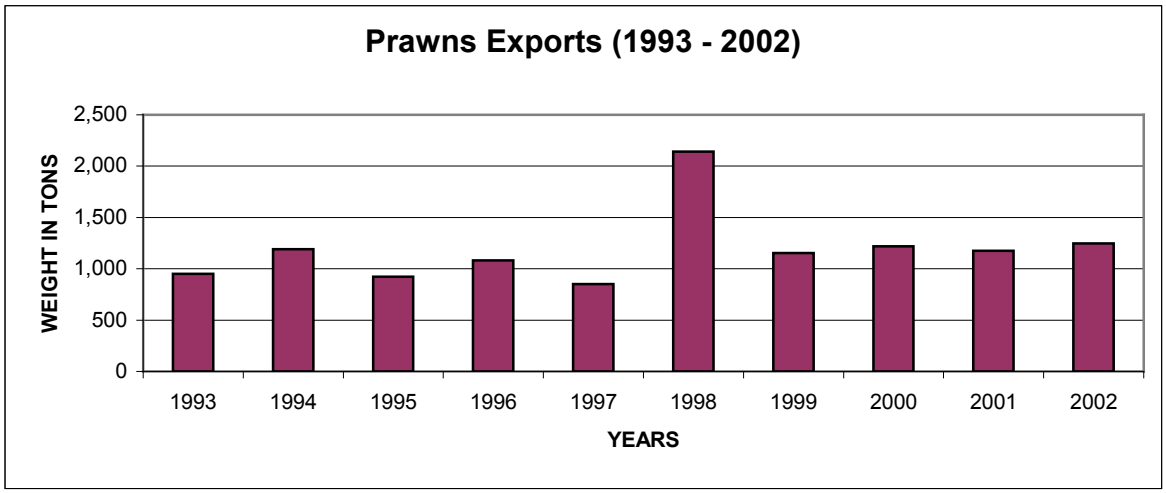


Fig. 10

2.4 NILE PERCH PROCESSING INDUSTRY

In the year 1994 the fresh water fish exports surpassed the marine fish exports. The fresh water fish exports kept on increasing until when it reached the peak in the year 2001. This rend gave the investors some hope about the future of the Nile perch processing industry. So most investors decided to modernize the existing fish factories and establish the new ones. Within a period of eight years eleven (11) fish processing factories had been constructed and made operational. There are two main factors that made most of the fish factories to flourish, and these were the fast growing fish production and the low prices of the Nile perch. Nile Perch prices ere low because at that time there were few fish factories, and at the same time most of the people disliked eating Nile perch. At that time Nile perch was very exotic and many people did not prefer its fatty nature of the flesh. Before the year 1999, that is, before the export ban that was imposed by the E.U. Nile perch fish price was 450/= (Tshs.) per kg. while in the year 2000 the prices became higher, that is 1,400/= per kilogram. In this respect further expansion of the factories was found to be justified when you think of the big profit margins they made. In 2001 when fish production started declining most of the Nile perch fish factories became under-capacity utilization. (see table No. 12.0)

Table No. 12

NILE PERCH PROCESSING PLANT AND THEIR CAPACITIES

S/N.	Name and Address of the Fish Processing Factory	Factory Installed Capacity (Tons/day)	Current Processing Capacity (Tons/day)	Quantity to be offered for value Addition (Tons/day)
1.	OMEGA FISH Ltd. Approval No. APP – 215, P.O. Box 94 Mwanza Tel. +255-28-2560601 Fax: +255-28-2560661 Year of operation - 1997	70	35	15
2.	MARAFISH PACKERS Ltd. Approval No. APP – 206 P.O. Box 440 Musoma Tel: 028-2622592 Fax: 028-2622592	75	20	4
3.	PRIME CATCH Ltd. Approval NAPP – 221 P.O. Box 786, Musoma Tel: 028-2640002 Fax: 028-2640003 Year of operation 2001	150	40	10
4.	TANZANIA FISH PROCESSORS Ltd. Approval No. APP-209 P.O. Box 3001Mwanza Tel: 028-2550105 Fax: 028-2550870 Year of operation 1994	150	100	15
5.	VIC FISH Ltd. Approval No. APP – 205 P.O. Box 1654 MWANZA Tel: 255- 2306/2550589 Fax: 028-2550597 Year of operation 1992	140	60	15
6.	NILE PERCH FISHERIES Ltd. Approval No. APP – 208 P.O. Box 1753 MWANZA Tel: 2570329 Fax: 028-25 Year of operation 1992	100	65	30
7.	TAN PERCH Ltd. Approval No. APP – 207 P.O. Box 549 Mwanza Tel: 2561338-9	120	30	7.5

	Fax: 028-2561335 Year of operation 1992			
8.	MWANZA FISHING INDUSTRIES Ltd. Approval No. APP – 210 P.O. Box 348, Mwanza Tel: 255 – 28 – 2560868 Fax: 028-2561184 Year of operation 1994	70	40	6
9.	CHAIN FOOD INTERNATIONAL Ltd. E.U. Approval No. APP-222 P.O. Box 211 Mwanza Tel: 255-28-2560395 Year of operation 2000	15	5	2
10.	MUSOMA FISH PROCESSORS Ltd. P.O. Box 1149 Musoma Tel: 028-2622988/9 Fax: 028-2622112 Year of operation 2002	70	40	4

Source: Lake Victoria Fish Processors Association MWANZA

Fish supply problems, and insufficient operating capital seem to be outstanding. This situation has enabled some factories to introduce value-added fish products which sell at better prices. The value added fish products which are now in the export market entered the market just few years ago and seem to some extent to compensate the factory under utilization factor.

Nile perch products are processed by both the processing plants themselves and the artisanal processors. The products produced ranges from those meant for human consumption to those for animal feeds and they are as follows:(see table 13.0).

- Fillets (frozen & chilled) for local and for exports
- H&G (frozen) – for export
- Skin (frozen) – for local and export
- Belly flaps (frozen) – for exports
- Chest (frozen) for local and export
- Fish-maws (frozen/dried) for export
- Scales (local for pillow making)
- Fish meal – for local and export
- Fish offals – for export and local
- Trimmings (cut otts).

Nile Perch products (In kg) from fish processing plants in Tanzania

TABLE No. 13.0

Year	Fillets	Skin	Maws	Belly flaps	Fish Oil	Dried Nile perch	Off Cuts	Carcass	Fish Meal	H & G	Fish Frames
1992	4,248	0	0	0	0	0	0	0	0		
1993	6,096,819	0	0	0	0	0	0	0	0	0	0
1994	8,453,506	0	0	0	0	0	0	0	0	0	0
1995	12,404,862	0	355,857	864,304	100	43,300	0	57,350	0	0	0
1996	20,296,124	0	162,490	394,190	0	157,638	235,100	13,113	0	0	0
1997	23,075,905	0	869,187	2,522,516	55,020	143,477	122,760	530,472	0	0	0
1998	36,386,241	0	500,504	2,792,600	0	122,880	384,392	456,080	1,002,768	0	0
1999	23,757,462	0	280,080	77,162	0	402,509	384,250	156,300	766,266	0	0
2000	30,831,841	66	1,267,838	1,896,470	0	0	144,720	537,802	1,192,500	1,769,426	0
2001	31,390,254	88,000	1,431,253	2,874,402	0	0	34,680	13,274	1,584,650	1,060,486	428,900
TOTAL	**192,697,262**	**88,066**	**4,857,209**	**11,421,644**	**55,120**	**869,804**	**1,295,902**	**1,764,391**	**4,546,184**	**2,829,912**	**428,900**

(Source: Fisheries Division Statistics Report {1992 – 2001})

2.4.1 Frozen Fish

It is estimated that about 35 – 40 metric tons of frozen Nile perch is eaten in the country daily. The process applied to the fish is gutting and washing followed by freezing. About 3 – 6 metric tons of frozen Nile perch is air shipped to DSM every day while about 8 – 12 metric tons go by road or rail. The major freezing center include TAFICO and Nyegezi Freshwater Fisheries Institute (NFFI).

2.4.2 Cured fish for export

In this case the products are deep salted and then sun dried to reduce the water content. Curing increases shell life of the processed fish products so that it reached even the most remote areas up country. Dry salting of stale plant-reject fresh Nile perch and trimmings from fish factories on locally made wooden racks is a popular way of preservation which has a long tradition. The products have a wide acceptance in the central African states. Those products are popular in countries like Burundi, Zaire, Rwanda and Congo.

2.4.3 Nile perch fillets (see fig. 11.0)

Fillets form the bulk of fishery export originating from Tanzania. Nearly 50% of exports is chilled fresh Nile perch fillets and 50% is frozen products. The fillets are exported to Europe (the majority), Far East, Australia, USA, Israel and to other emerging markets such as Venezuela, Brazil and Dubai. Usually fillet yields are 35 – 40% depending on the type of the fillet. The fillet exports started in 1992 and peaked in 1998. The quantity exported in 1998 was 36,386, metric tons, followed by a sharp decline in the volume of exports to 23,757, metric tons in the year 1999. In year 2000 after the ban had been lifted the exports regained and increased to 30,831,metric tons, and about 31,390,metric tons, in the year 2001.

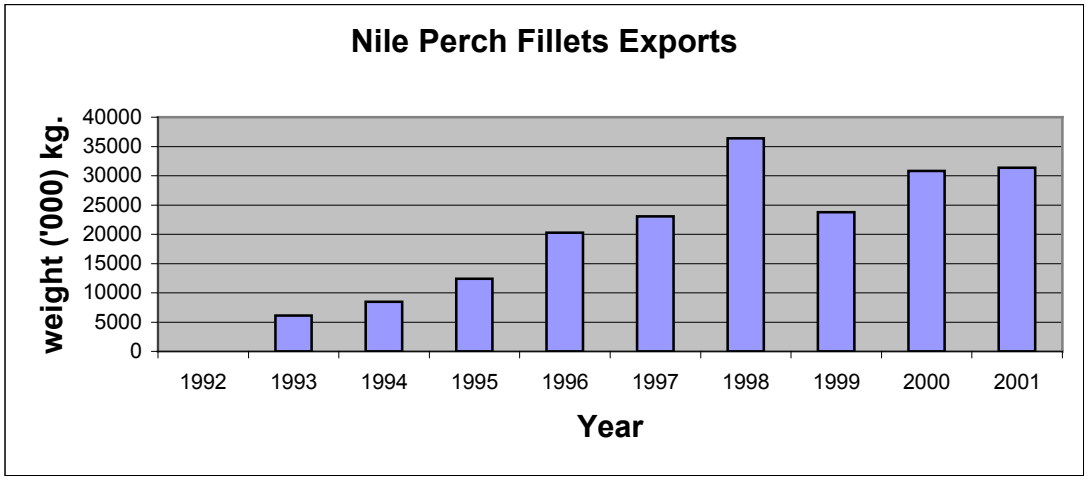


Fig. 11.0

2.4.4 Nile perch Skin

Comparatively Nile perch skin is not at all of much importance. For the first time 66 metric tons of skin was exported to Kenya. In 2001 more of this product went to United Kingdom and Kenya. Five fish processing factories have embarked in the production of fish skin for export. A local consumer of this product manufactures leather goods such as belts, wallets, ladies bags etc.

2.4.5 Nile perch Maws: (see fig. 12)

Fish Maws are either sun dried or frozen before being exported. The dried products are transported by Railways wagons to DSM harbour where they are put in the reefer containers for shipping to respective markets. Maws from big size fish are more popular. Exports started in 1995 when 355,8 metric tons were exported. Fish maws are exported to Hong Kong and Far Eastern countries for local delicacies. A very small portion is sold to some EU member countries. Fish maws are the most expensive Nile perch items.

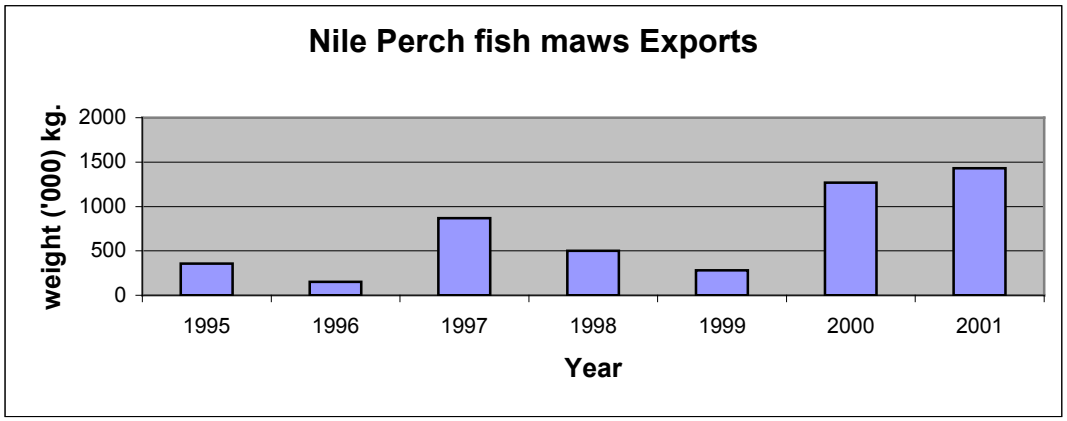


Fig. 12.0

2.4.6 Nile perch Belly Flaps (see fig. 13)

Bell flaps, is a by-product of the Nile perch fillet processing which targets foreign markets. A small portion of the product is sold to the local consumers and a large part is frozen and sold to Kenya. The dry salted and then sun dried one is sold to Central African countries. The first export was done in 1995 when 864,304kg., was exported. The exports peaked in the year 2001 when the amount reached 2,874,metric tons.

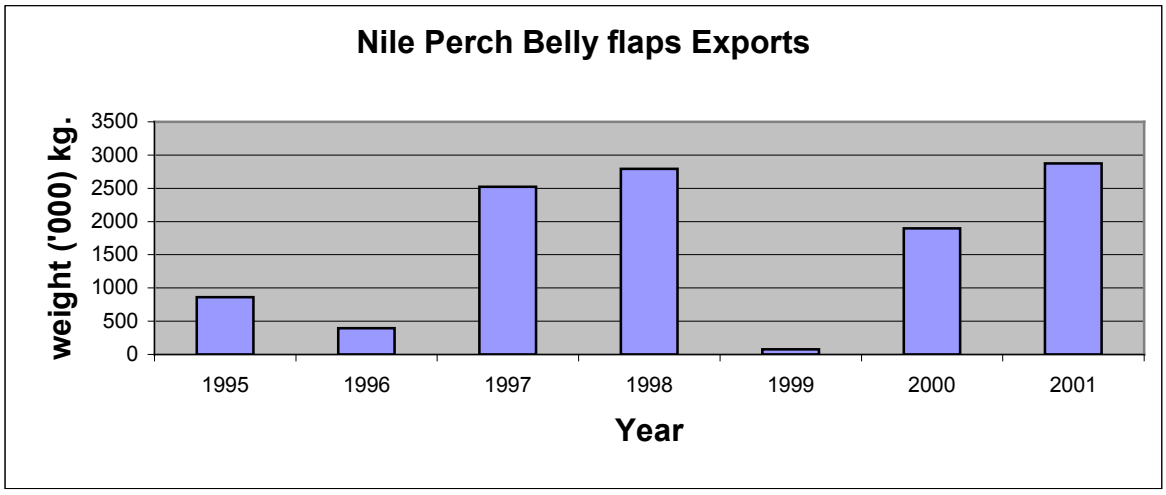


Fig. 13.

2.4.7 Nile perch Fish Oil

Fat is rendered by boiling the visceral parts to produce oil, which is sold to fish –fryers. The first export of fat was done in 1995 when 100 kg., was exported to Kenya. Also in 1997 about 55 metric tons were exported to Kenya again.

2.4.8 Fish-meal

A fishmeal plant which existed in1975 in Mwanza was making fish meal from the haplochromines and to some extent Dagaa fish. It used to manufacture 40mt., a day. Nile perch being carnivorous fish its increase in number meant a decrease for the other fish in the lake. So following a decline in haplochromines and dagaa in the lake, Nile-perch by-products mostly frames took over as raw material for fish meal production. The first export of fish meal made out of the Nile perch by-products were made in 1998 when 1,002 metric tons, were exported. There was a decline in 1999 when 766,metric tons. was exported. It picked up in 2000 when 1,192metric tons was recorded and further increased to 1,584 metric tons in the year 2001.

2.4.9 Nile perch Off-cuts/Trimmings/Chipps

Trimmings or off-cuts are by-products of the Nile-perch flesh obtained after shaping the fillets the way importers want it to appear. For most markets trimmings are pieces of flesh after removal of the sub cutanous fat, dark-flash and pieces with pin-bones from fillets.

Trimmings have good market locally and to the neighbouring countries such as DRC, Rwanda, Burundi and other Central African countries. Usually trimmings are sold to business people who then dry-salt them and sun dry on locally made racks ready for foreign markets.

2.4.10 Nile perch Carcasses or rejects

This is the rejected Nile perch (carcasses) due to spoilage at the landing sites and those from the factories after sorting and filleting. Main markets include local markets as well as the neighbouring countries. Preparation of the carcass normally involves de-scaling and the splitting of the carcass to remove the visceral parts, washing of the carcass, adding the dry salt followed by sun drying.

2.4.11 Nile perch frames/skeleton

Nile perch frames are those parts of the Nile perch fish remaining after fillets have been removed. Nile perch frames processing provides an important impact in terms of employment of inhabitants in Mwanza City and Musoma Town on Lake Victoria.

Normally the fish factory sell fish frames to the businessmen who in turn will auction it to other businessmen. The fish frames will be ferried to main frames processing centers where again are sold to local people for local consumption. The rest is sold to the processors who will smoke or fry them. The smoked lot is made into fish-meal.

2.4.12 Headed and gutted (H&G) Nile perch products

For many years back the production of Heeded and Gutted Nile perch (almost whole fish) was not allowed. The restriction was based on the fact that the export of whole fish would affect food security and also reduce employment prospects.

The export of heeded and gutted Nile perch was allowed for the first time in the year 2000 just on a limited scale. The filleting operation which results in a range of by-products enables a boom in employment. H&G fetch higher prices at the International markets as compared to frozen fillets. In 2000 a total of 1,769 metric tons was exported followed by 1,060 metric tons., in the year 2001.

2.5 MEASURES TAKEN SO FAR TO IMPROVE HYGIENIC CONDITIONS OF FISH (To meet EU standards)

In order to improve the hygienic conditions of fish and fish products measures to ameliorate hygienic conditions have to be taken at every stage of fish handling and processing, that is, right from the fishing ground to the time of fish-product exports. These measures are as follows:-

- Effective use of ice as a preservative in handling fish from the time is caught at the fishing ground to the time it enters the fish processing plant. Most of the fish factories supply ice to the fishermen and fish collectors.

- Floating barges (matshari) have been introduced to certain selected landing sites. In some areas a small jetty has been constructed. This condition helps to avoid contacts between fish and the sandy beach. Fish is hauled directly from fish containers in the fishing boat to another transport boat or an insulated van. A barge acts as a stage for fish transfer. There are eleven (11) barges/jetties established so far and more are to be constructed. There are a total of 850 landing beaches on lake Victoria (Tanzania).

- Code-numbers have been introduced to depict the name of the fishing ground, the fishermen, the agent and the fish processing factory. This code-number is also stamped on the package containing a fish-product pending exports. This system enables "TRACEBILITY". In case of any infringement regarding the hygienic standards of the fish-product exported it becomes easier to trace the cause of the problem.

- Fish samples are picked at every stage of fish handling on a monthly basis, and sent to South Africa for quality analysis. For example the samples are picked at the fishing ground, landing sites, on arrival at the fish-factory gates, etc., up to the time of finished products.

  However, with the financial support from the world Bank a new quality control laboratory is under construction at the Nyegezi Fresh-water Fisheries Institution premises.

2.6 PRAWN PROCESSING INDUSTRY

As seen earlier, prawns are either caught by the artisanal fishermen or by a trawler. Prawns caught by the artisanal fishermen are normally processed in the land-based fish processing plant. In case of prawns caught by a trawler are processed on board the vessel by using the processing plant installed on board the vessel.

However, grading of prawns for the purpose of export are both subjected to the same principals of processing and grading. Two main types of processing procedures are applied here in Tanzania.

During grading of prawns, the prawn product is renamed as Tiger or White. Tiger stands for prawns which when packed can attain fifteen pieces per kilogram, and other prawns that maintain green colour of Tiger.

White prawns are those prawns that attain more than fifteen pieces of prawns per kilogram. The table No. 14.0 below shows the grading guideline:-

Table No. 8.0 – GRADING GUIDELINE

No.	Number of prawns per kg		Grading		Remarks
	Head on	**Headless**	**Tiger**	**White**	
1.	1-9	1-15	Too	-	Jumbo
2.	1 - 15	16 – 25	To	-	Large
3.	16 –24	26 – 40	T1	W1	King
4.	25 – 36	41 – 60	T2	W2	King
5.	37 – 48	61 – 80	T3	W3	Medium
6.	49 – 60	81 – 100	T4	W4	Queen
7	61 – 90	101 – 150	T5	W6	Small
8.	91 – 120	151 – 200	T6	W6	Cocktail
9.	Above 120	Above 200	T7	W7	Mixed

Export destination countries for prawns include:

- 90% destined for Europe (EU)
- Other include Japan, Hong Kong and Middle East.

2.7 THE EXPORT INDUSTRY CONSTRAINTS.

Production

(i) Diminishing Nile perch stocks
(ii) Destructive fishing methods
(iii) Fish spoilage (Post harvest losses)
(iv) Lack of cold storage facilities in the landing beaches.

Marketing

(i) Complying with quality and safety standards set by the international markets.
(ii) Trade restrictions
(iii) Dependence on a single market
(iv) Improper fish handling from the harvesting to packaging
(v) Price disparities between landing beaches and the urban areas.
(vi) Many levies and fees imposed by the government over fish and fish products at different levels add greatly to the cost of fish production and marketing thus rendering Tanzania fish and fish products less competitive in the world market.

CHAPTER 3:

3.0 THE POLICY ENVIRONMENT, INSTITUTIONS AND THE CONSTRAINTS OF THE FISHERIES SECTOR

3.1 Introduction

Fisheries Sector in Tanzania play an important role in socio-economic aspects of its population. The sector provides employment, protein food, revenue and foreign currency through exports of fish and fishery products. Foreign currency is also earned through licensing of foreign fishing vessels particularly in the Exclusive Economic Zone (EEZ).

The Fishery is managed through the Fisheries Main Act Number 6 of 1970 and subsequent legislatives. The principal regulation provides some management control mechanism through which the fishery is managed. This main act is supporting the National Fisheries Policy Statements and Strategies, which provides guidance on conservation and development of this fishery.

The policy was developed and in a participatory approach where all key stakeholders were consulted and involved in its formulation. Since the act was enacted first before the policy was developed, a need to review the policy for conformity purposes was perceived. In that regard, currently the act is under review.

The policy and strategies are in consistence with other ministerial policies and pronouncements/sentiments, which in reality are developed to capture the main national thrust of sustaining the natural resources for sustainable development of the nation. Fish being one of the inheritable commodities, the main objective is to rationally harness the resources and indulge in good management and conservation practices that will ensure future sustainability of the resources and therefore achieve sustainable development in the Fisheries industry.

The Ministry vision is to see sustainable natural resources for sustainable development. This is quite in conformity with Government development policies and environmental conservation.

3.2 The Policy Environment

The Fisheries Act is the policy instrument empowering some conservation, management and development practices and control. Although, this exists and is under going review as need be, it cannot on its own achieve sustainability of the fisheries resources and the benefits that is expected from the sector. This is because the industry is also surrounded by other factors that can in one way or another affect the sector.

In achieving sector specific or general government objectives whether short or long term, there are constraint towards that end. In addressing such obstacles different institutions are earmarked and have some important roles to play. Such roles though not targeted to the Ministry of Natural Resources and tourism, but are collaborating wit a spirit of having a sustainable development from the fisheries resources. Such institutions, and constraints are here under discussed and analysed.

In ensuring that the fishery operators gain from the industry, the question of quality assurance is giving its due consideration. This takes into consideration the market quality requirements and also to ensure safety to the consumers either within or abroad. Different markets have different quality standards that our country has to meet and conform. In view of this **quality assurance legislation was established.**

Our policy environment is in such a way that there is always collaboration with the relevant institutions. This includes those within and some identified accredited ones abroad.

3.3 Production Development Policy

Fisheries production is geared towards meeting the domestic demand and export for foreign currency earnings. Fisheries contribute substantially to the country food security and its given priority just like agriculture sector in the country.

The policy statement focuses on the promotion of sustainable exploitation, utilization and marketing of fish resources to provide food, employment, income and foreign exchange earnings.

Effective protection of aquatic environment to sustain development is of great importance to the Tanzanians and to its economy The policy provides for improving aquaculture as a means of complementing fish production from the capture fishery as well as providing alternative income generation to the local communities along the coast and even to the inland areas where aquaculture practices are suitable.

Aquaculture activities and its production particularly from fish farming is expected to contribute to poverty reduction in rural communities. It is also expected to help in addressing the question of unemployment in rural areas. Introduction of non- traditional produce like seaweeds will assist local communities in terms of livelihoods improvement.

In view of the above, the policy and the accompanying strategies encompasses the need for changing attitudes towards rational resource use, effective management practices and control the environment for sustainable development within the fisheries sector. Resources conservation and management is therefore intended to promote peoples prosperity. Utilization of new stocks like in the Exclusive Economic Zone is given due consideration as it adds to the countries fish production potential. Deep Sea Fishing Authority Act of 1998 is meant to promote resources management and utilization of the area. The act was established to regulate deep-sea fishing in the EEZ and for related matters.

3.4 Conservation Policy

Development aspects of fishery resources have to take into consideration conservation of the resources in the first place. The policy encourages collaborative resource management where both the government and stakeholders are involved and have specific roles to play. Equally, conservation of the fisheries related environment is given keen consideration due to its necessity in making sure that its conducive for biodiversity sustainability. In Tanzania the department dealing with environment management and control is centrally placed such that coordination is easy and possible. The National Environment Council (NEMC) is responsible for addressing environment issues at national level and is being overseen by the Vice Presidents office – Environment Division.

3.5 Conservation Measures

The Fisheries Act provides for conservation mechanisms. The policy encourage the use of legal environmentally fishing gear, technologies, practices and the use of traditional knowledge accumulated by the fishers. Fishers along the coastal areas practice fishing and related activities but not without practicing some conservation measures either established locally by themselves or as stipulated in the government law(s).

In Lake Victoria for example, Beach Management Units have been established to enable fishing communities to practice fisheries management including resources control measures as jointly agreed by the government. In this case community empowerment and education becomes quite necessary.

Measures take to address aquatic resource conservation include closure periods, areas provide to have importance in resource sustainability like breeding and nursing areas etc. Gear control and mesh size restrictions in various place depending on specific resource has been established and are in practice. Some destructive gears like monofilament nets, beach seines on environmental practices are also restricted. Here resource users are very much encouraged to cooperate. The policy recognizes that fisheries resources and environment is for all of us. Conservation measure are subject to review whenever need arises just to ensure resource sustainability.

In order to achieve conservation objectives, in 1994 Marine Parks and Reserves Act was passed. This deals with resources conservation using different strategies. Since then, Tanzania has to gazette two marine parks, namely Mafia Island and Mnazi Bay Marine Parks. This followed the establishment of a specific unit within Fisheries Division, which deals with fisheries resources conservation and protection. The unity has also managed to gazette the Dar es Salaam marine protected areas. This includes various small islands within Dar es Salaam area.

In conservation, it is encouraged that local knowledge is collected, documented and used wherever possible to facilitate conservation practices. Traditional knowledge is valued and scientists are encouraged to collaborate with local communities towards that end.

Endangered species are highly protected by law. Tanzania has ratified different conventions that are meant to protect the endangered species. CITES is one of them. FAO Fisheries Code of Conduct is practiced as well.

3.5.1 Wildlife Conservation

The Wildlife Conservation Act was enacted in 1974 to encourage the conservation of certain species. This Act operates in accordance with the limitations and requirements of the Convention on International Trade in Endangered Species (CITES), the National parks Ordinance and the related Regulations.

3.5.2 Forest Ordinance (1957), and Forest Chapter 389 of the Laws (Principal Legislation), supplement 57, Part V

Deals with the protection of Forests and forest products in Forrest and Mangrove Forest Preserves and restrictions and prohibitions within the Reserves. This Ordinance forbids any person, without a license or other lawful authority to cut, burn, or damage mangrove trees in the reserve area for any purpose. In 1987, the Tanzanian Government placed a National ban on cutting mangroves. Ecologically mangroves are important as a breeding ground for most of crustaceans and molluscs.

3.5.3 National Water Policy (1993)

The policy pinpoints water as a key factors in the Socio – economic development of any country and therefore calls for sustainable development water supply and sanitation in Tanzania. The policy aims at managing and developing the water resources in a co-ordinated and integrated manner so as to provide water of acceptable quality.

The water utilization and control Act (1974) provides for the right to use the water for various purposes. However, amongst the conditions implied for use of water is that water shall not be polluted with any matter to the extent of making it likely to cause injury either directly or indirectly to public health, livestock, fish or crops. It establishes temporary standards for receiving waters and effluent discharge standards. The Tanzania Bureau of Standards has issued effluent standards for a limited number of specific industries (the tannin industry and the phosphatic fertilizer industry as of December 1996).

3.6 Management Measures

These are intended to improve some control mechanisms, which help to ensure that fisheries resources are continued for the benefit of all generations. Fisheries resources are considered as inherited resources that should be passed from one generation to another.

Management measures include the imposition of appropriate regulations on the fishing gears, fishing grounds and the effort used in the fishery. Law prohibits use of destructive gears and practices.

All fishing vessels must operate with a valid license and the boats have to be properly registered. The Main fisheries act and other legislations also restrict on the fishing effort that can be deployed into any fishery. For example in the coastal prawn fishery, the vessels are licensed after establishing the resource status for the past fishing Season and from this report the number of prawn trawlers is limited accordingly. The number of fishing gears in the fishery is also limited to reduce and control the operating effort.

Data collection from the fishery is collected, analyzed and is used for management advice. In the prawn fishery use of logbooks has been introduced to capture more data and information, which is useful in providing advice to the fishery. There is fishing vessel specification given to investors in different fisheries to avoid destruction of not only the environment but also as a control measure towards the resource conservation.

3.7 Licensing

The Director for Fisheries Division is responsible for issuing licenses in the country. However, there is delegation of power to the district authorities. Vessels above 11metres are

licensed by the central government while the district authorities license those below. The Fisheries act specifies on who is empowered to issue licenses.

All licenses are annual but renewable. The licensing authority can attach conditions to the license as management measure. Licenses provide better control of the fishery as the authorized licensee can attach conditions to the license, which is geared towards resources management and avoidance of resource use conflicts.

In view of monitoring, control and surveillance, other institutions are required to cooperate. These include Marine police, police, Navy, judiciary and others.

Through licensing it is possible to control entry to the fishery and therefore the fishing effort. Legislation is closely monitored to ensure that people comply with the laid down regulation.

3.8 Microeconomic policy

Investment policy of the country considers fisheries as one of an important production sector of the economy. This is supported by the Tanzania Industrial development policy, which encourages rational use of natural resources for the betterment of the economy.

The main thrust is to promote economic growth using the available resources whereby individual production sectors are to contribute. Food self-sufficiency and security is given priority. As a strategy to improve fish consumption per capita through increased production of fish from fish farming is strongly encouraged. There has been deliberate effort to restrict export of whole fish and some types of fish. In lake Victoria for example, export of Tilapia is prohibited. This is because the fish is greatly used by the local people.

The foreigners are exploiting exploitation of resources, which the national cannot have access to. This is specifically true with the EEZ fishery which most national cannot afford to invest due to limited financial capacity and technical know how. Under such situation the locals are encouraged to enter into joint venture with foreign investors.

The local investors are protected since they have to enjoy this economic venture. In lake Victoria Industrial fishing is legally restricted to protect small-scale fishers.

On the processing and marketing side, investors have been encouraged to invest so as to improve the quality standards to meet different market requirements.

Aquaculture development is encouraged as an alternative in income generation and complements the capture fishery. Already Mariculture investors Guidelines have been developed in 2001. Given its importance it is under plan to develop Aquaculture Development Guidelines which encompasses both aquaculture and mariculture (Seaweed Investors Forum Report(2003) – undocumented)) .

3.9 Trade Policy

Recently there has been trade liberalization where competition is allowed. This has prompted straggle in the fisheries industry. The policy encourages people to market quality products and make sure that the products acquire the required standards. Here the Tanzania Bureau of

Standards play a great role to set standards which individual producers has to comply. This has no exception with fisheries.

In the fishery sector, the aspect of quality assurance and control is given a very high priority. This followed a bitter lesson learnt when European Union barred export of fish and fishery products to its member countries in 1999. There is therefore regular checking on the quality of the fishery products meant for foreign trade.

Deliberate move has been directed to improvement of the fish landing sites, provision of barges in places where it was considered necessary to address cleanliness to ensure that there is no biological contamination from the catch point to market and possibility to the consumers. Testing of products is done regularly both within the country and outside just to cross check and make sure that fisheries trade is practiced without problems.

3.10 Quality Assurance Measures and Control

This is given high priority to ensure that consumers are protected from contaminated fish food. It is also a way of maintaining our fish markets abroad. In view of that the following control mechanisms have been put in place;

- Regular laboratory checks of fish and fishery products
- Regular checks on environmental parameters including pesticide residues, minerals levels pollutants which can prove to be fatal to fish consumers.
- Laboratory checks on pathogenic / biological and or chemical contamination.

Apart from that some elaborate quality assurance mechanisms and code of conduct have been developed. Regular counterchecking is done at all stages. Fish inspection is done in the processing plants; transport boats and vessels and exports samples are taken for laboratory checks as stated earlier on.

Training is being provided regularly not only to the industrial people but also to fishers and traders who need to know the need for quality products. Cleanliness has been encouraged at all places where fish is being handled or processed. Such training is continuous since it involves changing people's attitudes towards quality assurance and mechanisms that ensure safety to consumers through proper fish handling and processing.

3.11 Private sector

Involvement of private sector in fisheries is encouraged in the National Policy and Strategy Statement (1997). It is a national perception that the government cannot do everything to bring about desired development not at its anticipated rate. This is also contained in other policies of the country where private sector is encouraged to join forces to bring about development in the country. Such policies include the National Investment Policy of 1996. Among other things the policy emphasizes on re – defining the roles of the private sector and puts it into a more central role and it encourages the enhancement of transparent legal framework that facilitates the promotion and protection of all investments.

Private sector is encouraged to enter into development and resource conservation for sustainable development. In fisheries most of investors are in the capture fishery and

processing and marketing. Some few are facilitating aquaculture activities particularly in seaweed farming along the coast.

The investors' Guideline to Tanzania (1998) provides guidance to both national and foreign investors and the mechanisms through which one can invest in the country. Tanzania Investment Center (TIC) is a one stop Agency of the government established under the Tanzania Investment Act, No. 26 of 1996. TIC is meant to promote, co-ordinate and facilitate investment in the country.

3.12 SUPPORTING INSTITUTIONS

The Fisheries sector is normally managed by several supporting Institutions namely the Department of Fisheries, Tanzania Fisheries Research Institute (TAFIRI), Tanzania Bureau of Standards (TBS), Lake Victoria Fish Processors' Association (LVFPA), Board of External Trade (BET), Marine Parks and Reserves Unit, University of Dar es Salaam, (Fisheries Institution), Nyegezi Fisheries Institute and Mbegani Fisheries Development Centre (MFDC). At the Regional level you have the Lake Victoria Fisheries Organisation (LVFO). At the International level, the main institutions providing support to the fisheries sector in the country include the FAO and the IUCN.

3.12.1 The Department of Fisheries

The Department of Fisheries is the main Institution responsible for the Fisheries Sub-Sector. The Department falls under the Ministry of Natural Resources and Tourism. It is the "competent authority" and the key agent in the fisheries policy formulation. The main roles and responsibilities of the Department include fisheries management, and administration as well as conservation. In particular this will consist of:-

- Formulation of the policy and oversees its implementation;
- Sector planning and budgeting;
- Formulation and review legislation;
- Law enforcement and surveillance;
- Monitoring and evaluation of the sector performance;
- Management information system;
- Manpower planning and human resources development;
- Extension services;
- Research, Training and Curriculum Development;
- Coordination with other stakeholders;
- Licensing;
- Revenue collection;
- International Co-operation collaboration.

The Fisheries department headquarter is situated in Dar es Salaam with its fisheries staff posted on all the main fisheries waters all over the country. There are twenty-one Regional Fisheries Officers posted at each Regional headquarters and 107 District Fisheries Officers posted at each District headquarters.

3.12.2 Local Government

Considering the devolution of powers from the central to the local government, the management responsibility of the local government in the fisheries sector has been expanded both in scope and scale. In this context local Government will be responsible for:-

- Issuing of licenses for artisanal and small-scale fisheries operations;
- Coordination of extension services;
- Law enforcement and surveillance;
- Issuing of By-laws and participation in the formulation of regulations;
- Revenue collection emanating from various fees;
- Involvement in the conservation of aquatic and coastal areas;
- Proposition of areas with conservation and biodiversity values for subsequent gazettement as protected areas;
- Involvement in the management of aquatic and coastal protected area e.g. marine parks, marine reserves, etc.;
- Promotion of aquaculture and quality seed production.

3.12.3 Tanzania Fisheries Research Institute (TAFIRI)

Tanzania Fisheries Research Institute was formed by the Tanzania Fisheries Research Institute Act of 1980. This is the only Fisheries organ that carries out different researches on fisheries matters. Such research includes stock assessment, control of pollution, and other environmental issues. It responds to giving solution to various fisheries problems arising from the fisheries industry with much emphasis on applied research.

3.12.4 Tanzania Bureau of Standards (TBS)

This is a government institution that deals with formulating and foreseeing implementation of quality standards in Tanzania.

3.12.5 The Lake Victoria Fish Processors Association (LVFPA)

This is a professional association of the fishery industry on Lake Victoria. It consists of Nile-perch fish processors and exporters whose headquarters is located in Mwanza. It is coordinated by a Secretariat based in Mwanza and its main roles include promoting marketing of Nile perch fisheries products, liasing with other relevant organizations, formulating and facilitating implementation of fisheries industry code of practice and ensuring quality standards, training of company staff on quality standards and implementing projects which promote the fisheries sector, as an institution or jointly with other partners.

3.12.6 Board of External Trade

This is a government organisation with mandate to promoting Tanzanian exports. It collaborates with stakeholders in export market such as Ministry of Trade and Industry, producers, processors, exporters, etc. It organises market tours in liaison with development partners and through trade fairs and exhibitions.

3.12.7 Lake Victoria Fisheries Organization (LVFO)

This is a regional organization with the following objectives:

- To foster cooperation among the Republics of Kenya, Uganda and Tanzania;
- Harmonize national measures for the sustainable utilization of the living resources of the Lake Victoria;

- To develop and adopt conservation and management measures to assure the Lake's ecosystem health and sustainability of the living resources.

Its headquarters is in Jinja – Uganda. Its responsibilities include:-

- Promoting the proper management and optimum utilization of the Fisheries resources of the lake;

- Enhancing capacity building of existing institutions and develop new ones;

- Provide a forum for discussions of the impacts of initiatives dealing with the environment and water quality in the lake basin and maintain liaison with existing bodies and programmes among others.

The organisation is headed by the council of ministers consisting of ministers responsible for the Fisheries in Tanzania, Kenya and Uganda or their representatives. Below the council there are various committees consisting of heads of fisheries departments of the three countries.

3.12.8 Marine Parks and reserves

This unit was established by the Marine Parks and Reserves Act of 1994. It is enacted to legislate the establishment of the Marine Parks and Reserves Unit and of the Board of Trustees. The bodies will establish and monitor the management and administration of marine parks and reserves e.g. Mafia Island Marine Park. The general management plan for each Marine Park provides for the conduction of certain activities within delimited zones of development, provided the activity has no negative effect on fish, animals, water, aquatic flora, vegetation, or aquatic substrate.

3.12.9 University of Dar es Salaam (Fisheries Institution) and Nyegezi Fisheries Training Institute

The Fisheries Institution which is part of the University of Dar es Salaam is a newly established Institution after taking over Kunduchi Fisheries Institute. It will be responsible in providing Senior Fisheries Management and extension officers. Kunduchi Fisheries Institute used to provide a Fisheries Diploma, but now under the new management it will able to offer both the Fisheries Diploma as well as the degree course on fisheries Management.

Nyegezi Fisheries Training Institute is a sister Institute offering a fisheries Certificate in Fisheries Management and extension services. It is mainly concerned with providing extension officer for the country. The Fisheries Institute under the University of Dar es Salaam is located in Dar es Salaam while Nyegezi Fisheries Training Institute is located in Mwanza. They are both also responsible in performing fisheries researches only to some extent.

3.12.10 Mbegani Fisheries Development Centre

Mbegani Fisheries development Centre is focused to offer specialist courses both short and long courses in Marine engineering, Boat – building, Fish processing and Marketing, Refrigeration engineering and nautical Science. Most of graduates from this Institute are absorbed in the fishing boats as skippers, engineers, deck-hands, coxswains, etc. Some of then are employed in the Fish Processing factories, boatyards, Cold storage Centres, etc.

3.12.11 Naional Environment Management Council (NEMC)

NEMC was formed in 1983 through National Environment Management Act. NEMC will advise the Government on all environmental matters. Principally it has been mandated to:-

- Advise the government on all technical matters related to the effective management of the environment;
- To coordinate technical activities of all bodies concerned with environmental matters;
- To enforce environmental regulations (norms, standards, guidelines and procedures) as provided in the National Environmental Policy;
- To assess, monitor, and evaluates all activities that have impact on the environment;
- To promote and facilitate environmental information communication and capacity building;
- To seek advancement of scientific knowledge of changes in the environment technology.

3.13 heries Sector Constraints

Just like any other sector of economy, the sector is constrained in various ways. The National Fisheries Sector Policy and Strategy Statement details all the constraints facing the fisheries industry in the country. The following are the major ones:

- Insufficient information on the resource base
- Inadequate infrastructure and inefficient utilization
- Inadequate capacity to carry out research
- Poor handling, processing and technology
- Inadequate fish inspection and quality control mechanisms
- Inadequate national capacities and infrastructure in training institutions
- Invasion of noxious aquatic plants
- Environmental degradation and inability to integrate environmental protection with development
- Poor interaction between players in community and community related issues and activities. Scant information on the traditional/local knowledge of fisheries resources
- Unfavourable credit conditions from lending financial institutions.

In view of the above constraints, the fisheries policy is concerned about the following major issues

- Improved resource management and control
- Integration of environment protection and development
- Improved training and education
- Improved knowledge of the Fisheries resource base
- Efficient resource utilization and marketing
- Applied /strategic research

- Aquaculture development
- Community participation
- Fisheries information and management
- Gender and development
- Cross-sectoral collaboration
- Integrated coastal resource management
- Regional and international co-operation.

The developed strategies are all geared towards addressing the above issues.

3.13 Conclusion

Fisheries sector in Tanzania can substantially contribute to the economy of the country. It can to a grate extent contribute to poverty reduction particularly in rural coastal areas. Mariculture development if well developed is another avenue of the sector, which can help in addressing community livelihoods in the rural coastal areas of Tanzania.

To achieve the above potentials the strategies mentioned in the National Fisheries Sector Policy AND strategy Statement have to be put into operation. The need for enhancing community involvement and education is paramount.

Other relevant policies have to be defined and used to encourage the potential investors being local or foreign. Quality assurance and control requires keen consideration to maintain the current fish markets.

Fisheries conservation, management and envelopment have to take into account environmental control and management.

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