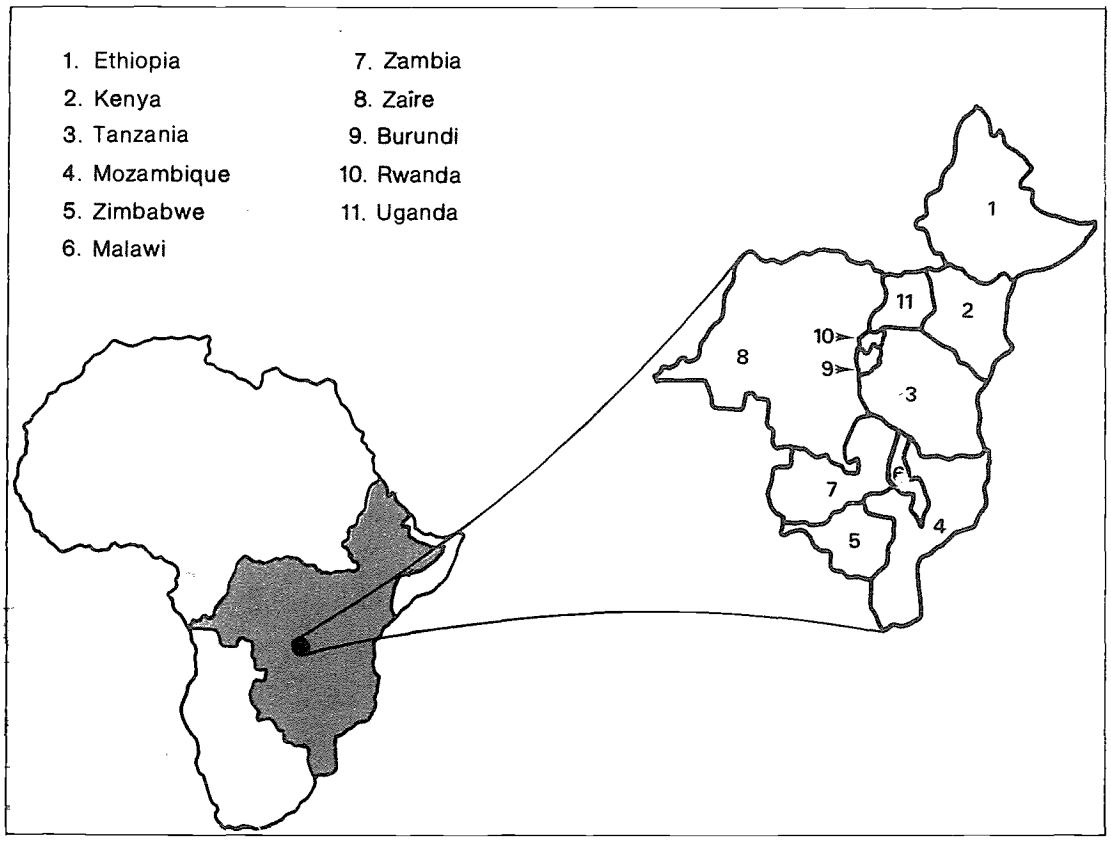
REGIONAL PROJECT FOR INLAND FISHERIES PLANNING, DEVELOPMENT AND MANAGEMENT IN EASTERN/CENTRAL/SOUTHERN AFRICA (I.F.I.P.)

IFIP PROJET

RAF/87/099-WP/03/90 (EN) April 1990

Recent observations on the Fisheries of Lake Tanganyika



UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

UNDP/FAO Regional Project
for Inland Fisheries Planning
Development and Management in
Eastern/Central/Southern Africa

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Recent observations on the Fisheries of Lake Tanganyika

by
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
UNITED NATIONS DEVELOPMENT PROGRAMME

PREFACE

The IFIP project started in January 1989 with the main objective of promoting a more effective and rational exploitation of the fisheries resources of major water bodies of Eastern, Central and Southern Africa. The project is executed by the Food and Agriculture Organisation of the United Nations (FAO), and funded by the United Nations Development Programme (UNDP) for a duration of four years.

There are eleven countries and three intergovernmental organisations participating in the project: Burundi, Ethiopia, Kenya, Malawi, Mozambique, Uganda, Rwanda, Tanzania, Zambia, Zaire, Zimbabwe, The Communauté Economique des Pays des Grands Lacs (CEPGL), The Preferential Trade Area for Eastern and Southern African States (PTA) and the Southern African Development Coordination Conference (SADCC).

The immediate objectives of the project are: (i) to strengthen regional collaboration for the rational development and management of inland fisheries, particularly with respect to shared water bodies; (ii) to provide advisory services and assist Governments in sectoral and project planning; (iii) to strengthen technical capabilities through training; and (iv) to establish a regional information base.

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This document on recent observations on the fisheries of Lake Tanganyika provides an update of information on recent fisheries development activities and common fisheries development problems in the lake area. Information on recent developments in the four countries were obtained directly or indirectly from IFIP project office and partly during a visit to the countries in September-November 1989 and completed through a review of recent documents.

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IFIP PUBLICATIONS

Publications of the IFIP project are issued in two series:

A series of technical documents (RAF/87/099-TD) related to meetings, missions and research organized by the project.

A series of working papers (RAF/87/099-WP) related to more specific field and thematic investigations conducted in the framework of the project.

For both series, reference is further made to the document number (3), the year of publication (90) and the language in which the document is issued: English (En) or French (Fr).

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1. INTRODUCTION

1.1 General description of the lake area

Lake Tanganyika is situated in the Western branch of the African Rift Valley between 3° 20' to 8° 45' S and from 29° to 30° E at an altitude of 773m. The Lake is 673 km from North to South a maximum of 48 km wide. The shore line length is approximately 1500 km.

With a maximum depth of 1470 km Lake Tanganyika is the second deepest lake in the World after Lake Baikal in the USSR. It's average depth is 570m and the lake volume is estimated to be about 19000 x 10^3 m^3. There are relatively few shallow areas apart from the Northern end and to a lesser extend. the Southern extremity. The bottom falls away sharply along the east and west coastlines and most of the lake area can be considered a pelagic zone.

The catchment area is mostly under light subsistence cultivation with the exception of the Ruzizi plain and the Burundi coastal plain in the North, where intensive agriculture is practiced. The catchment population mostly live in small villages although there are a number of small urban areas (Uvira, Kigoma, Kalemie, Mpulungu) and one large town (Bujumbura) at the lake side. The lake is an important waterway for the transport of goods and people especially in view of the poor communications along the shores of some countries.

1.2. The Fish Stocks

Lake Tanganyika has a highly differentiated fish fauna with a large number of endemic species. Of biological interest is the large number of species that occupy the rocky shore lines. Out of 250 species, 150 mostly endemic, belong to the family Cichlidae. This high degree of species differentiation is probably due to the long period of time that the lake has been isolated from neighbouring river and lake systems.

The pelagic fish community, the most important economically consist of consists of the two planktonivorous clupeids Stolothrissa tanganicae and Limnothrissa miodon and their predators Lates (Luciolates) stappersii and three Lates species, L. microlepis, L. mariea and L. angustifrons. All these are endemic to the lake. Clupeids and young Lates (Luciolates) (under 130 mm) which are caught together, are called 'ndagala' in Burundi and Zaire, 'dagaa' in Tanzania and 'kapenta' in Zambia.

Stolothrissa tanganicae is the most important commercial species in the lake. The growth of Stolothrissa is rapid with a short life-cycle of only between 6 and 18 months with an average life span of 12 months. Stolothrissa alternates in abundance with it's major predator Lates (Luciolates) and is reported to have a peak abundance on a 6 or 7 year cycle. There is also a very marked pattern in the seasonal abundance with a minimal biomass in May-July and a maximum in the second half of the year. This pattern follows very closely the hydrobiological regime of the lake and is possibly explained by variations in the strength of recruitment to the stocks. Spawning is continuous and timing of the peak spawning periods varies from year to year.

The other clupeid species Limnothrissa miodon, occupies the more inshore areas compared with L. tanganicae. It is possible that the abundance

of Stolothrissa, with which it probably competes for the food in the pelagic area. The life span of Limnothrissa is also short but longer than that of Stolothrissa. Maximum length of this species is 75 mm. Adult Lates (Luciolates) stappersii are pelagic and show seasonal abundance pattern with a peak in December-June. From a length of 130 mm Lates (Luciolates) becomes totally piscivorous and feeds almost entirely on Stolothrissa. Spawning is continuous, with annual peaks between February and April. It's life cycle may vary from 5 to 10 years and it can reach a maximum length of about 450 mm.

1.3 The Fishery

All the major fishing activities on Lake Tanganyika are based on attraction of fish by artificial light source (usually kerosine pressure lamps) at night. Fishing is therefore more successful during moonless nights and, the pattern of fishing follows precisely the lunar month cycle. There are three major types of fisheries on the lake: traditional, artisanal and industrial fisheries.

1.3.1 Traditional Fishery

Traditional fishermen operate from canoes using mostly large scoopnets (lusenga), beach seines, gillnets and handline. In the most heavily exploited areas, especially Zambia but in Burundi the number of traditional fishermen have been increasing according to official statistics. It is however the dominant technique in Tanzania and Zaire waters. Beach seining is most common in Zambia and the southern corner of the lake. The traditional fishery operates close inshore and catches mainly small clupeids and cichlids.

1.3.2. Artisanal Fishery

The artisanal fishery is carried out from catamarans with a liftnet. This method was introduced in the 1950's and is now commonly used in Burundi, in the Northern parts of the Zaïre waters and the Kigoma region of Tanzania. At Mpulungu, Zambia there are presently two catamaran units, of which one is owned by the Department of Fisheries and is used for demonstrations to the fishermen. The artisanal fishery operates up to 5 km offshore (by regulation in Burundi waters) and catches predominantly clupeids and young Lates (Luciolates).

1.3.3. Industrial Fishery

An industrial fishing unit usually consists of a large steel boat of up to 18.3 metres an auxiliary boat and normally five light boats. They use ringnets of up to 400 metres length and 100 meters deep (Pearse, 1985). There are at present 16 industrial units in Burundi, 16 in Zaire, 15 in Zambia and two operating out of Kigoma. The industrial boats are supposed to operate at least 5 km off shore.

2 RECENT DEVELOPMENT AND TRENDS IN THE FISHERIES

2.1. Burundi

Burundi is a small country (27850 km^2) densely populated (4.7 million, 1986) for which mostly Lake Tanganyika represent the only source of fish. Burundi waters are bounded by Zaïre on the West and Tanzania on the South.

Although Burundi has only 2600 km² of national waters, some 8 % of the whole lake water surface, it is estimated that the annual catch of Barundi fishermen is in the order of 15000 tonnes per year. The high yield of the fisheries both artisanal and industrial, is partly due to easy access to markets and the high demand of the population for cheap sources of protein.

The UNDP/FAO project BDI/86/006, carried out an analysis of the fisheries and fish culture sectors in August 1986. This analysis led to the formulation of a Fisheries Development Master Plan. A number of projects have been identified, concerning improved fish drying techniques, the establishment of a fishery surveillance unit, a study of the aquatic resources and the institutional strengthening of the fisheries services of the Department of Waters and Forests.

In February 1988, the Government of Burundi in collaboration with FAO, organized a national seminar on fisheries and fish culture. For further strengthening of the sector, the Government of Burundi created the Department of Waters, Fisheries and Fish Culture in January 1989.

2.1.2. The Fishery

The Fisheries of Burundi comprise of industrial, artisanal and traditional components all of which use light attraction. There is an industrial fleet of 16 units (Bambara, pers. comm.) contributing some 37 % of the total catch to supply the capital Bujumbura, and indirectly neighbouring towns and communities. There is an artisanal fleet of some 600 catamaran lift nets units 1989 which shows a decrease in comparison to a recorded number of 807 units in 1982. The number of traditional fishing units along the Burundi sector of Lake Tanganyika is estimated at 94 according to 1989 official records. This shows a remarkable increase over the 1982 estimates of 40 traditional fishing units using small scoopnets, beach seines, gillnets and hand lines.

2.1.3 Utilization of the catch

The entire catch of the industrial units is sold at the Bujumbura central market (by Goverment regulation). This is to allow the artisanal fishermen to dispose of their catches to the fish mongers who could eventualy supply the villages along the lake shore and the interior markets. Hoverever recent observations show that the major catch of the artisanal fishermen are also sold at the Bujumbura market. This is because the individual fishmongers organized themselves by hiring pickups to transport their fish to the same market. The Bujumbura market thus acts as a wholesale market for the catch of the industrial and artisanal fleets, and as a market for fresh and dried fish. Much of the catch of the artisanal fleet is sundried, generally on the ground, a treatment which permits some 1-2 months preservation.

The processing facilities put up by earlier Fisheries Development Projects at Kitaza, Magara, Rumonge and Nyanza Lac are not fully utilized because some of the infrastructures need to be rehabilitated. The artisanal catches are sold to fish mongers directly at the landing site to supply nearby markets. The fresh fish is normally bought by the fish mongers using bicycles for transportation to nearby villages or to the central market. The price of fresh fish at the landing site fluctuates depending on the days catch. However, any fresh fish which is not sold fresh is bought by the processors for drying.

By far the most important source of cash income for small scale fisheries along the lake shore is catching and processing of Stolothrissa tanganicae (Ndagala in local terminology). This can mainly be explained by the fact that the processing of 'Ndagala' through sundrying is comparatively much easier and less labour intensive than the smoking of bigger fish. The shelf life of the end product is also much longer thereby allowing wider market penetration and resulting in higher returns to the processor. Regional trade in dried 'Ndagala' extends as far as Kirundo in the North but also imports from neighbouring countries as Tanzania and Rwanda. Exports or imports to neighbouring countries which can also take the form of barter trading are thought to be particulary frequent from fishing communities which are located close to the boarder with either Tanzania or Zaire if the distance is shorter than the regional centre.

The species used for smoking, Lates Luciolates stappersii or 'Mikebuka' in local terminology is smoked with the tail fin slit through the gills there by almost forming a circle. The fish is then placed one by one on wooden sticks placed pararell to each other and holding 12-15 fish each are smoked this way in one shift over an earth hole. The shortcomings and deficiencies of this type of smoking method are as follows:

(a) the inefficient use of available firewood: a significant amount of heat and smoke dissipates from the earth hole without even reaching the fish.

(b) quality is poor because the fish is not evenly smoked and some parts are rather burnt.

(c) shelf life of the product is short.

(d) health problems to the processor inhaling the smoke and could hurt his or her fingers during intermittent turning of the fish.

The drying and smoking techniques used for processing of Stolothrissa tanganicae and L.stappersii in Burundi is peculiar to the other Riparian Countries.

The dry fish products have a wider market in Burundi than fresh fish. This is because the product could be preserved for a longer period. There is an auction hall at the central market with a cold store which is not operational at present. The hall is kept clean which keeps the quality of the fresh fish from the time of arrival at the market and time of sale to the retailers in a better condition. The warehouse for the storage of dried fish is well ventilated, but due to the quantity of fish stored at a given time especially during peak seasons of Ndagala, circulation of air is inadequate. In the warehouse is stored not only fish dried in Burundi but also dried fish from the Tanzanian part of Lake Tanganyika.

The fish are packed in jute bags of 35-40 kg. each selling from 10,000-12,000 Burundi francs per bag. At the central market dried fish is sold by weight, per bag or through bargaining. The retailers display their fish on tables in small heaps for 50-100 Burundi francs per heap. Some wholesalers transport dry fish in trucks for distribution to Cibitoke, Bubanza, Kayanza, Ngozi, and Gitega. The purchasing power of the inhabitants of these areas is

high because those are the areas for the production of coffee and cotton (Karakura, 1988). Some of the dry fish bought from the central market are exported to the eastern border areas of Zaire and Rwanda.

The distribution of fresh fish is centred around Bujumbura and villages around the lake, this is because of the following:

- lack of storage facilities to preserve the fish;
- communication difficulties in the interior;
- the purchasing power of the inhabitants in the regions isolated is low which does not encourage the establishment of a distribution system in those regions.

Among the four riparian States, Burundi is the country which is exploiting its territorial waters intensively. This is primarily due to:

(i) a central market in the city of Bujumbura and it's environs with a population of about 200,000 inhabitants;

(ii) a road along the lake which facilitates transportation of fresh fish to the consumer markets.

2.1.4 Statistics

Earlier observations (Roest, 1985) of industrial catches sold in the Central Market of Bujumbura have, however, indicated that fish crates used are no longer of the standard size, which is considered to weight 40 kg for statistical purposes. Some crates used now contain at least 50-60 kg. Artisanal fisheries data collection is incomplete, and although nine statistical assistants are continuing their daily recording of catches, this survey is to have deviated in such a way from the original design, that a through revision of the system is needed. Data are possibly useful for defining trends in catch rates, but it is not known to what extent samples are representative of the general situation, and reliable recent estimates of the total number of fishermen, gears and boats are not available (frame surveys).

2.1.5 Fish Production in Burundi for the years 1979-1988 in kg.

Year	Artisanal Fisheries	Traditional Fisheries	Industrial Fisheries	Total (kg)
1979	2.543.314	218.785	4.739.700	7.501.799
1980	4.261.481	116.252	6.205.580	10.583.313
1981	2.726.001	43.467	4.118.550	6.888.198
1982	4.461.044	28.620	3.640.910	8.130.574
1983	3.149.217	17.720	3.202.840	6.369.777
1984	2.287.861	28.701	3.453.580	5.770.142
1985	2.682.625	85.859	2.600.850	5.369.334
1986	4.175.953	124.757	2.333.150	6.633.860
1987	2.924.655	120.782	1.825.160	5.870.597
1988	4.945.976	185.638	1.545.054	6.676.668

Source: Annual Report 1988. Fisheries Department, Burundi.

2.2 Zaire

FAO executed a fisheries sector study (ZAI/84/015) up to 1986, financed by UNDP, which has led to the preparation of a fisheries master plan which was adopted by the Government in June 1987. The fisheries master plan contains three major elements:

(i) a description of the present fisheries situation and its problems in relation to the status of the resources;

(ii) a description of the policies and action programmes which need to be developed;

(iii) an identification of projects which will increase fish production.

Priority areas indicated in the master plan concern the lakes of the eastern part of the country and Lake Tanganyika in particular. For lake Tanganyika, the fisheries master plan proposes three projects: artisanal fisheries development projects at Northern and Southern part of the lake as well as rehabilitation of the private industrial fisheries complex FITRACO.

Along the Zaire sector of lake Tanganyika both semi-industrial, artisanal and traditional fishing are practiced. Kalemie a town along the lake is a centre for both the production and marketing of fish. There are about 10 industrial units (purse seiners) at Kalemie (Corsi, 1988). These purse seiners are used by the semi-industrial boats. The artisanal fishermen use catamaran with liftnets and pressure lamps to attract fish. The main species caught by the artisanal fishermen consist of Stolothrissa and

Limnothrissa miodon. The traditional fishermen use dugout canoes manned by two or three fishermen operating beach seines or hand lines.

There are some 450 artisanal and 4,000 traditional fishing units, and some 13,000 fishermen, landing fish on the Zaïre shoreline between Uvira and the Zambian border (Mikkola, and Lindqvist, 1988). It is very difficult to collect reliable fisheries statistics along the 675 km of coastline. The recorded fish catch in the Kalemie subregion has been steadily increasing in recent years: 8,000 tonnes in 1985 to 10,000 tonnes in 1987. Most of the increase has been within the artisanal sector. The share of the industrial fishery out of this catch has varied between 10 and 20 %. Moba is the next biggest fishing subregion in Shaba Province with recent catches of about 3,200 tonnes.

There are cold stores put up by Greek traders in Kalemie to store fish bought from the artisanal fishermen. The S.N.C.Z. which provides rail transport to consumer centres from Kalemie, has isotherm compartments (with use of ice and ventilators to keep the air cool) for the conservation of fish during transportation. The towns connected namely Lubumbashi, Kolwezi, Likasi and Kananga have cold storage facilities for storage of fish.

There is a private type of fisheries development project in Kalemie, the Celze (Communaute Evangelique Lutherienne du Zaïre-Est) Fishing Project. The project operates two purse-seine units (Mikkola, and Lindqvist, 1988).

The stated aims of the Celze Fishing Project in eastern Zaire is to enable the people in the area to better exploit and utilize the natural resources of Lake Tanganyika, to increase the use of fish as a valuable source of protein, and to improve the nutritional value of food of the local people. The fishing project also aims at generating regular income for Celze to be used for further development work in the area, such as the training of physically handicapped children, the provision of medical service with an emphasis in preventive care, and raising the level of education in nutrition through school programmes.

In the Baraka area, an EDF project supplied fishing gears, improved canoes and a transport vessel. Recent statistical data from Zaire sector lake Tanganyika are not available but the total annual catch in the Zaïre waters is estimated at about 30,000 tonnes a year.

The Research Centre for Natural Science (CRSN, Centre de Recherche en Sciences Naturelles) in collaboration with Kyoto University (Japan) carried out a number of ecological and limnological studies of the lake for the past years.

2.3 Tanzania

A major fishery development activity has been going on since 1983 around Kigoma on lake Tanganyika, where an FAO/Netherlands project offers integrated technical assistance and credit to the artisanal fishermen. The second phase of the project has just ended in December 1989. The short term objectives of the project are to provide technical assistance and loans in kind to artisanal fishermen in order to increase fishing productivity through improvement of fish catching methods, processing as well as marketing and transport arrangements for fish products.

The project has registered success in extending assistance to fishermen in gear design, net construction and fishing projects operations. The project constructed a large Trimaran with a net of 85m and 24m deep, three large boats and columbus lamps with 6800 cp (normal liftnet operate with 2100 cp pressure lamps) and an outboard engine. The engine is powered by diesel (long shaft system). Whiles on fishing trials the liftnet (Trimaran) recorded considerable savings in fuel consumption with an increase in catches. Training and demonstration of this fishing method started early 1989 in villages North of Lake Tanganyika and later will be extended to the Southern part of the lake.

The project is carrying out training programmes on fish processing. With the aid of UWT (Umoja Wa Wanawake Tanzania) women groups of three villages in the northern side of lake Tanganyika were identified as prospective trainees in improved drying and smoking techniques. An experimental Chorkor oven of two compartments was constructed in one of the fishing villages. There are some drying racks distributed to fishing villages by the project. These racks are being used by the processors under the supervision of the project field staff.

The second phase of the project extended credit facilities to individuals and by November 1989 a total of 243 individuals had benefitted from the project revolving loan scheme. A Women Development Officer has been recruited by the project and her task is to get the women in the fishing villages engaged in income generating activities like, fish processing, marketing, vegetable gardening etc. Women from certain villages along the lake already organized themselves in groups and have already benefitted from loans provided by the project.

The project, with 15 staff members of Fisheries Department, is also engaged in statistical data collection along the lake. The annual compiled recorded data available relate to landing sites where beach recorders are posted. It is however, believed that the extent of coverage of these data is high. The following table furnishes some basis statistical data for 1987 (based on the records of the Tanzanian Fisheries Division).

Item	Kigoma Region	Rukwa Region
i) number of beach recording stations	11	5
ii) number of beach recorders working	23	10
iii) number of fishing villages	_	38
iv) number of fishermen	10.470	6,095
v) number of fishing vessels	1,710	2,591
vi) Estimated landing (tons) 1987.	78,514	15,215

There is only one semi-industrial fishing company operating in Kigoma

(Uvuvi Kigoma Ltd). The company operates one purse seine boat and sells its catches to the traders after landings.

2.4 Zambia

Zambian waters of Lake Tanganyika are not uniform and fishing is not evenly distributed. Physically the fishery comprise two shelf areas (Mpulungu and Nsumbu) separated by an area of deep pelagic waters. The Mpulungu coastline is almost the same length with Nsumbu but three quarters of the fishermen and almost all the industrial boats operate from Mpulungu. This area must be considered overfished. The Nsumbu coastline half of which is protected by the Nsumbu National Park, and with a low artisanal and industrial population is considered not fully exploited. Nsumbu could be fully exploited if industrial boats at Mpulungu operate from the area.

For the full exploitation of the Zambian waters of lake Tanganyika, the artisanal fishery needs a change in it's mode of operation by introducing the catamaran liftnet which proved successful in the other Riparian States. The common gear used in the Zambian waters is the beach seine which is detrimental to the juvenile fish stocks.

In October 1988 the World Bank Fisheries Development project funded a visit to Burundi for some fisheries personnel to study the operation of a catamaran. They stayed in Burundi for a month fishing together with Burundi fishermen and using the liftnet. At the end of the visit, some nets were purchased in Burundi to make lift nets in Zambia. The fisheries extension unit in Mpulungu constructed one catamaran with a lift net which is used for demonstrations through mobile training. The demonstrations have already been performed in four fishing villages for three nights per village. These demonstrations are carried out by the extension workers with the fishermen of the villages concerned.

There are 15 industrial boats, fourteen in Mpulungu and one in Nsumbu. In october 1989 only twelve boats were operating in Mpulungu. There are five industrial fishing companies at Mpulungu, three of which have freezing and cold storage facilities. The other two companies sell their catches fresh to the fish mongers.

The fishing companies have large steel boats of up to 18.3 metres used in conjuction with one large and normally five light boats. They use ringnets of up to 400 metres length and 100 metres deep. There is normally a crew of 35-40 men for hauling the net by hand. Both the industrial and artisanal catches comprise mainly of kapenta and Luciolates but of a smaller size in the catches of the latter. From the months of May to September there is a strong wind which blows (commonly known as kapata) this forces the industrial fleet to fish close to the shore resulting in conflicts between the fishermen. The powerful lights of the industrial boats attracts fish from the artisanal boats. In 1986 the World Bank Fisheries Development Project provided financial support to the Department of Fisheries for conducting frame surveys of various Zambian lakes including Lake Tanganyika.

According to the results of the survey, 1,049 boats were recorded with a total of 1429 fishermen. Among the total number of boats only 87 were motorised. The boats consisted of 4 % dugout canoes, 96.9 % plank boats and 0.1 % fibre glass boats. The total catch according to the frame survey was

6473 metric tons in 1986 for the artisanal sector. Recent estimated catch for the industrial and artisanal sectors are given in annex 1.2.3.

3. PROBLEMS ENCOUNTERED IN FISHERIES DEVELOPMENT

Impediments to fisheries develpmenton on lake Tanganyika are largely common to the four riparian countries and can be summarised as follows:

3.1 Uneven pattern of exploitation

- the greater part of the lake. where roads or railways are non-existant and human settlements scare, it will be difficult or impossible to even come close to full exploitation of the fisheries potential of the lake. Fishing is at present very unevenly distributed being possible only where sufficient market outlets are available.

3.2 Precarious economic situation of the riparian countries

The continuing economic crisis in all four countries has led to many problems, such as:

- lack of imported goods, gears, spare parts, fuel;
- loss of purchasing power of revolving funds as a result of devaluation of local currencies, which in some cases has also led to retroactive increase of downpayments;
- the weakness of national fisheries administrations due to their lack of trained manpower, and inablity to set up and maintain a sound statistical data collection system that is essential to fisheries planning, development and management.

3.3 Transport problems and lack of infrastructure

For Tanzania, Zaire and Zambia this Lake is located far from the Capital Cities in a remote corner. Road connections are often difficult and even railway lines in bad condition, so that no easy market outlets are available. Fish wastage is a common phenomen because of poor processing methods and lack of proper storage facilities.

3.4 Sociological factors.

At least in the Northern half of the lake, artisanal fishermen are not fully engaged in fishing as they are part-time farmers. Their fishing activities are influenced by agricultural activities. Hence, attempts to increase, for example, the number of fishing trips per catamaran per year, may not necessarily be successful.

Annex 1 Industrial Fish Catches by species of Lake Tanganyika (Zambian waters) in metric tons

	Mpulungu			Nsunbu		
Year	Limno.	Stolo.	Buka.	Limno.	Stolo.	Buka.
1979	(together)	667	321	(together)	0	0
1980	374	129	879	"	65	0
1981	475	3I7	880	"	43	0
1982	559	980	535	35	138	0
1983	628	441	1736	(together)	1420	0
1984	819	2001	1256	285	1457	28
1985	1287	2222	2202	(together)	1651	9
1986	551	485	4297	"	973	25
1987	150	5	4074	496	114	82
1988	286	270	4380	720	656	49

Source : Data from industrial returns and fish sampling based on records of the Fisheries Office, Mpulungu

Notes : Limno = Limnothrissa

Stolo = Stolothrissa

Buka = Buka Buka (Lates Luciolates stapperssi)

Annex 2 Artisanal Catches (metric tons) based on CAS

Year	Kapenta - Mpulungu		Kapenta - Nsumbu	
1979	?	(2000)	?	(500)
1980	3702		1512	
1981	?	(1700)	?	(600)
1982	?	(3000)	?	(4000)
1983	1506		?	(I500)
1984	440		?	(2000)
1985	3176		?	(1000)
1986	?	(2500)	556	
1987	?	(700)	?	(600)
1988	?	(600)	?	(2000)

Figures in brackets are guesses based on incomplete Catch assessment survey (CAS) together with sampling data (based on records of the Fisheries Office, Mpulungu)

Annex 3 Abundance of Kapenta from the Artisanal Fishery

	Mpulungu	Nsumbu
Year	Kapenta	Kapenta
1979	210 (data incomplete)	87 (incomplete data)
1980	195 (all rounds)	152 (all rounds)
1981	107 (data incomplete)	109 (data incomplete)
1982	182 (all rounds)	182 (" ")
1983	169 (" ")	192 (" ")
1984	72 (" ")	340 (" ")
1985	117 (" ")	133 (" ")
1986	206 (data incomplete)	74 (" ")
1987	47 (" ")	53 (" ")
1988	71 (all rounds)	40 (" ")

Data is average catch/night (kilograms) by kapenta seines.
(based on CAS and records of the Fisheries Office, Mpulungu)

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