OF LAKE VICTORIA, UGANDA

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(A paper presented at the workshop on "People, Biodiversity, Fisheries and the Future of Lake Victoria", 17-20 August 1992, Jinja, Uganda)

ABSTRACT

The Uganda sector of Lake Victoria occupies 29,580 km^2 (43%). The lake used to boast of a multi-species fishery but presently relies on three major species *Lates niloticus, Oreochromis niloticus* and *Rastrineobola argentea.* During the past decade the total fish production on the Ugandan sector increased drastically from 17,000 tonnes in 1981 to about 130,00 tonnes 1991, indicating a healthy state of the fishery. This was contributed by a combination of factors including the explosive establishment of the introduced *L. niloticus* which contributed 60.8% in 1991 and the increase in the number of fishing canoes from 3470 in 1988 to 8000 in 1990.

Isolated fishery resources studies carried out in different areas of the lake since 1971 seem, however, to indicate contrary trends in the available stocks and, therefore, the status of the fishery. In the experimental fishery, continued decline in catch rates have been recorded. Similarly, in the commercial fishery catch per unit of effort has been considerably poor (33 kg per canoe during January - March 1992) and the average size of individual fish landed continued to decline, obviously pointing at possible over-fishing. This, therefore, calls for further urgent research on the available stocks for proper management strategies to be formulated.

INTRODUCTION

The UNDP/FAO/EAFFRO stock assessment study of Lake Victoria during 1969/71 indicated the lake to still support the multispecies complex consisting of 24 fish species excluding the haplochromine cichlids; at least 80% of the ichthyomass was composed of the haplochromines and *Lates niloticus* contributed less than 0.1% (Kudhongania and Cordone 1974). Following this study, a number of developments have taken place partly aimed at exploitation and utilization of the apparently abundant fish stocks in the lake. These developments included the introduction in early 1960s of the predatory Nile perch (*Lates niloticus*) to

utilize the abundant haplochromine stocks. Also increased entry into the fishery became apparent as the demand for the fish and their products for domestic and export use increased with time. Increased entry obviously meant increased effort and increased sophistication in the methods of exploitation.

Although the UNDP/FAO/EAFFRO stock assessment study and the catch assessment exercise by Wetherall (1972) had been done with varying degrees of success constant changes affecting the fisheries (including such factors as biological, physical and socio-economic variables) would inevitably occur, considering the above developments. This, therefore, called for constant updating of information on the state of the fish stocks, taking into account developments in the fisheries. The purpose of this paper is to provide some information (provisional trends) on changes in fish population (species composition, catch-rates) since the 1969/71 and 1972 surveys, paying special reference to increasing fishing pressure from the increased effort. The paper makes use of the information from the 1981/86 experimental trawl fishing in the Jinja area of Lake Victoria, catch assessment survey for the whole Uganda sector of the lake during January - February 1989, UFFRO records of commercial landings in Masese since 1988 and experimental gillnetting in selected areas since 1991, among other sources.

MATERIALS AND METHODS

Experimental trawl fishing was conducted in the northern portion of Lake Victoria (Uganda) using the Research Vessel IBIS during the period 1981/86. The fishing was done mainly during the day hours and using the 19mm mesh codend for the trawl. Haul durations were between 1 hour and 1 hour 30 minutes. Every effort was made to trawl along the same transects.

During the period January - February 1989 a catch assessment survey was conducted on Lake Victoria. The survey covered 14 randomly selected fish landing sites. Both the selection of fish landing sites and sampling of fishermen's catch was on a stratified sampling design, using the information obtained from the Frame Survey of 1988 (MAIF 1988).

Since 1991 experimental gill-netting was regularly carried out in selected areas of the lake. Gillnets of mesh sizes ranging from 25.4 mm to 203.2 mm were used for over-night fishing. During these surveys the fishermen's catches were also examined and analysed. Two UFFRO staff were also stationed in Masese Fish Landing, near Jinja, to take records of the commercial fish landings. This exercise was done almost daily since 1988.

RESULTS

1. Commercial fishery

(a) Fishing factors

Gillnets are the major fishing gear used by the fishermen for catching fish in Lake Victoria. Other gears currently used include seine nets, cast nets and hooks on long line. Gillnets of mesh sizes ranging from 101.6 mm to 304.8 mm were in common use during January-February 1989 (Okaronon and Kamanyi 1989). The most popular nets in use (January - February 1989) were the 203.2mm mesh (45.5% of the total number and in 32.4% of the fishing canoes) and the 127 mm mesh (22.8% of the total number and in 33.8% of the fishing canoes); these nets were used for catching mainly **L. niloticus** and **O. niloticus.** The fishermen use planked and dugout canoes and operate from landing sites scattered all over the lake and along the 2500 km shoreline.

During the frame survey of 1990 carried out by the FAO in conjunction with the Uganda Fisheries Department (UFD), the Uganda sector of Lake Victoria had a total of 8674 active canoes (8000 fishing and 674 transport) operating from 715 landing sites (Table 1). The landing sites had drastically increased from 197 in 1971 and 291 in 1988 while the fishing canoes had similarly abruptly increased by 130.5% between 1988 and 1990 compared to a 6.3% increase between 1971 and 1988. About 80% of the fishing canoes were of planked type in 1990 and the rest were dugouts. It is estimated that each canoe carries 16 gillnets on the average (Orach-Meza 1992), although a number of canoes were observed to carry up to 700 gillnets each in the Entebbe waters during the period October 1991 - May 1992. The use of beach seines was rampant in the Entebbe waters.

(b) Fish production

At the beginning of this century when the fishery was at subsistence level and dominated by the cichlid fish, the catches were considerably high. As more people entered the fishery and more sophisticated developments - including introduction of more sophisticated and efficient fishing gear and outboard motor engines - continued to take place, the catch per unit of effort in the 127 mm mesh gillnets declined from 30 fish of *Oreochromis esculentus* per net in 1921 to 6 fish in 1928 and 2.9 fish during the early 1940s. The total catch from the artisanal fisheries rose steadily from about 10,000 metric tons in 1952 to about 43,000 tons in 1968/69 although the contribution from the lake to the total national fish production fluctuated between 30% and 40% during the period (Table 2). The bulk of the commercial catch during the 1960s and 1970s was contributed by the tilapiine cichlids (Fig 1) as well as a number of associated non-cichlid fishes like *Bagrus, Synodontis, Clarias, Protopterus* and *Barbus.*

Among the species whose numbers dwindled in catches are *Labeo victorianus, O. esculentus, Schilbe mystus, Alestes jacksonii* and *A. sadleri.*

Following the introduction of four exotic tilapiine cichlids (*Oreochromis niloticus, O. leucosticus, Tilapia zillii* and *T. rendalli*) and the predatory Nile perch (*Lates niloticus*) into Lake Victoria during the late 1950s and early 1960s, significant changes have been recorded since about 1980. The previously multi-species fishery which was dominated by the traditional cichlids, increasingly tended to a fishery dominated by three fish species, the two introduced species of *L. niloticus* and *O. niloticus* and the indigenous cyprinid *Rastrineobola argentea.* The annual fish production from the lake also increased from 10,000 tons in 1980 to about 130,000 tons in 1991, of which about 61%, 22% and 15% comprised *L. niloticus, O. niloticus* and *R. argentea*, respectively, in 1991.

In the Jinja area of Lake Victoria the contribution of *L. niloticus* to the landed commercial catches increased very abruptly from 0.4% in 1981 to 62.7% in 1983 and, thereafter, appeared to stabilize at about 50% while the haplochromine landings dropped drastically from about 96% in 1981 to NIL in 1985 (Table 3). The landings of R. argentea increased from 0.5% in 1981 to about 30% in 1989. However, during the same period 1981/89 the mean weight of *L. niloticus* landed dropped from about 9 kg in 1982 to about 2 kg in 1989 (Table 4). During the period October 1991-May 1992 over 90% of *L. niloticus* retained by the commercial gillnets in the Entebbe waters weighed less than 4 kg (Table 5); most of the fish (*L. niloticus*) retained by the beach-seines in the Entebbe area during the period weighed less than 1 kg individually.

Catch assessment records by UFFRO staff stationed in Masese Fish Landing near Jinja indicated that the landed commercial fish catches (both fresh and processed) during the period June 1988 to May 1992, inclusive, averaged about 600 tons monthly (about 20 tons daily) - ranging from about 277 tons in June 1988 to about 969 tons in January 1992 monthly - of which 46.1% was *L. niloticus,* 36.3% *R. argentea* and 15.3% *O. niloticus* (Table 6); other species recorded included *O. leucostictus, O. variabilis; Tilapia zillii, Bagrus docmac, Protopterus aethiopicus, Mormyrus kannume* and *Barbus* spp. The daily landings for fresh fish in Masese during June 1988 to May 1992 fluctuated greatly with the highest average landings of 11.353 tons for all species being recorded in October 1989 and the lowest recorded average daily landings of 4.237 tons for all species - affecting mainly *L. niloticus* - was in December 1991 (Fig 2). It is evidently significant that the drastic decline in landings of the fresh fish, especially *L. niloticus*, started around October 1990 and persisted thereafter.

During the January - February 1989 catch assessment in Lake Victoria 8 fish species were landed by the commercial fishermen; these included *O. leucostictus, O. variabilis, O. niloticus, Tilapia zillii, Bagrus spp, Clarias spp, Lates* spp and *Barbus* spp; *R. argentea* and *Protopterus* spp were not encountered (Okaronon and Kamanyi 1989). The average catch of 44 kg per canoe per day was obtained for the whole lake of which *L. niloticus* and *O. niloticus* contributed about 49% each. The 127 mm mesh nets, one of the two most popular sizes in use, retained *L. niloticus* of 53 cm mean total length (2.2 kg mean weight) and *O. niloticus* of 31 cm mean total length (0.7 kg mean weight) (Okaronon and Kamanyi 1989). In Entebbe and Masaka/Ssese Islands the commercial fishermen landed an average of about 30 kg of fish per canoes per day during October 1991 - June 1992.

2. Experimental fishing

During the experimental trawl fishing in the northern portion of Lake Victoria (mainly within 10-49 metres depth zone) during 1981/86 more than 12 fish species were encountered excluding the haplochromiines (Table 7). The composition by weight of *L. niloticus* rose from 0.92% in 1981 to 95.63% in 1985 (Table 3, Okaronon et al 1984, Okaronon and Kamanyi 1986). The corresponding figures for the haplochromiines were 91.4% in 1981 and 1.15% in 1985. The catch rates in the northern portion of the lake for all species decreased from 797 kg/hr in 1969/71 to 595 kg/hr in 1981 and 166 kg/hr in 1985 (Table 7). The abundance of the haplochromines decreased drastically down to 294 kg/hr in 1982 from the 1969/71 level of 668 kg/hr and then to 5 kg/hr in 1985 while the *L. niloticus* stock increased from 5 kg/hr to 159 kg/hr in 1981 and 1985, respectively. The experimental trawl results also indicated the continued decline in the mean size of the individual fish (particularly *L. niloticus*) caught in the northern portion of the lake. The mean weight of *L. niloticus* dropped from about 5 kg in 1982 to less than 1 kg in 1985 (Table 4).

The results of the gillnetting work in selected areas of the lake indicated catches to be dominated by *L. niloticus* and the catch rates to be relatively poor. In the Entebbe waters of Central Lake Victoria (Uganda) the best catches of up to 5 kg (about 2 fish) per net were obtained in the 127 mm and 101.6mm mesh gillnets during the period October 1991- May 1992 (Table 8). Gillnets of mesh sizes larger than 127mm hardly recorded any fish catch (Table 8). More or less similar catches were recorded from the gillnetting work in the Masaka and Ssese Islands waters in Lake Victoria West during the period November 1991 - June 1992 (Table 8). The catches in Lake Victoria West were almost exclusively of *L. niloticus* and the best catches were generally from the 101.6mm, 127mm and 152.4mm mesh nets; again nets of mesh sizes larger than 152.4mm recorded no fish catches (Table 8).

DISCUSSION

During the 1980s drastic changes in catches and stocks in Lake Victoria became apparent. In the Ugandan sector the stocks of *L. niloticus* and *R. argentea* drastically increased while the stocks of the previously predominating haplochromines declined. In the Jinja waters of Lake Victoria the trend in both the commercial and experimental trawl fishery were similar during the period 1981/85. Nile perch stocks (commercial figures in brackets) rose from an insignificant figure of 0.9% (0.4%) by weight in 1981 to 96% (53%) in 1985, while the haplochromine stocks declined (commercial figures in brackets) from 91% (96%) 1% (Nil) during the same period. Although the annual fish production continued to increase - attributable to the explosive establishment of the L. niloticus - the catch per unit of effort in the Uganda sector of the lake declined from 767 kg/hr for all fish species in 1969/71 to 595 kg/hr in 1981 and down to 166 kg 1985. This decline was apparently due to drastic decline of the haplochromine catches from 668 kg/hr to 543 kg/hr and down to less than 5 kg/hr during the same period.

In the Nyanza Gulf (Kenya), the drastic changes in catches and stocks, particularly the haplochromines, were in the Nyanza Gulf (Kenya) attributed to several factors: (a) introduction of the tilapiine cichlids since the 1950s; (b) the introduction of the voracious Nile perch; and (c) an intensive artisanal fishery in the inshore water of less than 25m depth around the lake (Ssentongo and Welcomme 1984). In the Uganda sector of the lake all these factors would likely contribute to the changes in catches and stocks of not only the haplochromines but other fish species. It has been documented that the establishment of four exotic tilapiine (*O. niloticus, O. leucostictus, Tilapia zillii* and *T. rendalli*) into the Lake Victoria ecosystem suddenly increased inter-specific competition with other indigenous species (Lowe 1958, Welcomme 1967, Ogutu-ohwayo 1988, Okaronon and Wadanya 1991). It has also been argued by Ogutu-Ohwayo (1990) and several other authors that since there was only an artisanal fishery for haplochromines in the Kenya and Uganda parts of the lake, the severe decline in the haplochromines observed particularly in kenya and, similarly, in Uganda can be attributed to predation by *Lates niloticus* and the increasing use of seine nets by the artisanal fishermen.

According to Ssentongo and Welcomme (1984) the Nyanza Gulf (Kenya) with an area of 6000 km^2 and a shoreline length of about 760 km had the greatest concentration of fishing units (about 25000 fishermen and 5 canoes/km of shoreline). The Tanzania sector, with an area of about 34400 km^2 and a shoreline length of about 2900 km, had less fishing intensity (about 8000 fishermen and with a density of 1 canoe/km of shoreline) whereas the Uganda sector with an area of about 28400 km^2 and a shoreline length of 2500 km was somewhat lightly fished (about 8000 fishermen and with a density of

1 canoe/km of shoreline). Within a period of about one decade the fishing intensity in the uganda sector of the lake increased to the present level of about 24,000 fishermen - each fishing canoe was in 1989 estimated to carry 3 fishermen on average (Okaronon and Kamanyi 1989) -and with about 4 canoes/km of shoreline, approximately a four-fold increase in fishing effort. Although there have been increased annual fish landings resulting from the increased effort, the annual fish landings only increased by about 12% between 1988 and 1990 compared to an increase of 130.5% for the fishing canoes during the same period. The estimated catch per canoe rose from about 40 kg per day in 1971 to about 103 kg in 1988 and then abruptly declined to 50 kg per day in 1990. The increased catch rates per canoe from 1971 to 1988 was due to high increase in fish production (175.9%) during the period compared to a relatively low increase in the fishing effort (6.3%). The drop in catch rates between 1988 and 1990 was therefore a result of increased effort. More or less similar observations were registered in the Tanzania sector around about the same period. The fishing effort (i.e. canoes) and fish production increased by 76.3% and 206.4%, respectively, between 1981 and 1986; the catch per canoe-day also increased from 56 kg to 98 kg during the same period (Bwathondi 1990). However, during 1987 fish production, fishing effort and catch per canoe declined.

It is apparent that fish catch rates in the Uganda sector of Lake Victoria have continued to decline, most probably reflecting an unhealthy state of the stocks. During the period 1991 and 1992 the catches of not more than 5 kg (about 2 fish) per net per night for *L. niloticus* in the experimental gillnets in the Entebbe and Masaka/Ssese Islands waters are obviously poor. Similarly, commercial catches of the magnitude of 30 kg per canoe per day during the same period and same area are equally very poor, considering that most of these canoes carried as many as 70 nets each. It is also significant that during this period the experimental nets of mesh sizes larger than 127mm hardly caught any fish and over 90% of the fish landed by the commercial fishermen in the Entebbe area (like most other areas) were below 4 kg in weight. This may appear to indicate scarcity of fish weighing 4 kg or heavier. According to Ogutu-Ohwayo et al (1988) and Okaronon & Kamanyi(1989) the 127mm gillnets retain *Lates niloticus* about 50 cm mean total length (about 2 kg weight) and the 4 kg (70 cm meantotal length) fish are retained by nets of 152mm mesh and larger.

In the Jinja area of the lake the daily landings of fish in Masese have been falling especially so since about October 1990. The fall affected mostly fresh fish landings of *L. niloticus* which dropped from a daily average of 8.636 tons in October 1989 to 1.421 tons in April 1992. This is partly attributed to smuggling of fish to neighbouring countries. Wadanya (1990) reported that the buying of fish, in the eastern part of the lake (bordering Kenya), generally takes place on water where fish is sold to the Kenyan fishmongers with the result that very

little fish reaches the Uganda landings in fresh form; similar practices have since continued to be reported (Okaronon and Wadanya 1991, Okaronon 1992).

Partly as a result of increased fishing effort - involving increasing use of small meshed gillnets and seine nets - and increasing demand of fish products, the size of fish landed (particularly *L. niloticus*) has since 1980 continued to decline. This is partly due to increasing use of small meshed gillnets and seine nets. In the Entebbe waters *L. niloticus* landed from beach seines during 1991 and early 1992 comprised mainly fish of less than 1 kg in weight. During the period November 1991 - June 1992 the processed fish from mainly the Ssese Islands area to the Bukakata market on Saturdays comprised a considerable quantity of small (less than 1 kg) *L. niloticus;* some were so small that a number of them are fixed on a stick before being processed and marketed still on the stick. It is apparent that, because of the prevailing law on catching of small fish, these small sized fish are usually retained for processing and then marketed conveniently in bundles.

It is becoming increasingly clear that increased effort arising from increased demand for fish and then products - has resulted in increased pressure in the fish stocks of Lake Victoria, Uganda, consequently leading to drastic negative changes in the fishery more especially during the last decade. Despite the apparent increase in annual fish landings, the drop in both the catch rates and mean size of the individual fish landed points to a bleak future of the fisheries resources especially so when the magnitude of the stocks being harvested has remained unclear during the last two decades. On the contrary, most of the traditional fishing craft operate in the inshore waters (bays, gulfs and inlets of less than 25 metres depth), hence the pressure referred to has been on the inshore stocks. Probably as shown by Bergstrand and Cordone (1971) and Kudhongania and Cordone (1974), there are good possibilities for deep water fishing, but the precise magnitudes and resistance to exploitation of the deep water resources are unclear.

ACKNOWLEDGEMENT

We are grateful to Mr. F. Moini for the work in Masese and various UFFRO scientists and staff for their significant contributions towards the successful preparation of this paper. Our great thanks also go to Mr. S.N. Sowobi for the preparation of the figures and Mrs. Ruth Byekwaso for kindly typing the manuscript.

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Table 1a Changes in the fishing factors in the Uganda sector of Lake Victoria.

Year	Frame Survey executor	Number landings	Number fishing canoes	Number planked canoes	Number dugouts
1971	EAFFRO/FAO	197	3,264	-	-
1988	MAIF/P.U.	291	3,470	3,359	111
1990	UFD/FAO	715	8,000	5,758	2,242

Source: Tumwebaze, R. and E.J. Coenen (Eds.), 1991

Table 1b Totals of selected variables for the five regions and the whole Uganda sector of Lake Victoria during 1990.

Region	Landings	Active Canoes	Transport Canoes	Fishing Canoes	Dugout Canoes	Planked Canoes	Powered Canoes
Jinja	188	2,512	222	2,290	408	2,104	257
Entebbe	243	2,782	255	2,290	703	2,079	472
Tororo	68	1,502	105	1,397	623	879	181
Ssese	182	1,172	62	1,011	123	1,049	246
Masaka	34	706	30	676	385	321	94
Total	715	8,674	674	8,000	2242	6,432	1,250

Source: Tumwebaze, R. and E.J. Coenen (Eds.), 1991

Table 2. Estimated fish production in Uganda

Period	Total	LAKE VICTORIA		LAKE KYOGA	
	(tonnes)	(tones)	%	(tonnes)	%
1952	23,400	10,000	42.7	2,500	10.7
1953	23,800	-	-	-	-
1954	22,600	10,500	46.5	3,000	13.3
1955	44,600	22,700	50.9	5,000	11.2
1956	45,300	22,700	50.1	5,000	11.0
1957	50,500	-	-	-	-
1958	52,000	-	-	-	-
1959	54,700	-	-	-	-
1960	61,600	-	-	-	-
1961	60,200	-	-	-	-
1962	66,500	23,400	35.2	13,200	19.8
1963	69,800	24,400	35.0	17,000	24.4
1964	70,600	24,400	34.6	18,500	26.2
1965	71,300	24,400	34.2	18,400	25.8
1966	83,400	28,000	33.6	19,900	23.9
1967	99,100	38,200	38.5	26,300	26.5
1968	109,900	40,500	36.9	32,500	29.6
1969	125,500	41,200	32.8	48,900	39.0
1970	138,500	34,800	25.1	62,100	44.8
1971	163,100	38,100	23.4	89,700	55.0
1972	165,200	33,900	20.5	95,100	57.6
1973	169,300	32,500	19.2	100,500	59.4
1974	165,300	24,400	14.8	105,000	63.5
1975	173,400	16,900	9.7	104,200	60.1
1976	194,600	11,100	5.7	145,800	74.9
1977	222,500	15,700	7.1	167,000	75.1
1978	221,500	14,200	6.4	167,000	75.4
1979	180,100	12,100	6.1	133,000	73.8
1980	166,900	10,000	6.0	131,000	78.5
1981	165,100	17,000	10.3	130,100	78.8
1982	173,300	13,000	7.5	138,000	79.6
1983	222,100	17,000	7.7	188,000	84.6
1984	212,200	-	-	-	-
1985	160,900	45,400	28.2	102,700	63.8
1986	200,900	56,500	28.1	128,000	63.7
1987	141,700	80,800	57.0	40,000	28.2
1988	214,300	109,100	50.0	86,700	40.5
1989		132,400			
1990		120,000			
1991		130,000			

Table 3. Estimated fish catches in the Jinja area of Lake Victoria

(a) Commercial fish landings in Masese

Period	Total (tonnes)	Percentage by weight of Ha	Ra	Ti	Bd	Cm	Pa	Ln	Others
1971	832	1.24	-	63.68	4.84	9.62	18.49	0.67	1.47
1972	850	1.01	-	65.47	6.38	7.95	16.05	0.60	2.53
1973	698	0.04	-	64.42	6.54	11.39	16.01	1.06	1.54
1974	691	0.23	-	40.81	10.22	11.27	9.27	26.68	1.55
1975	-	-	-	-	-	-	-	-	-
1976	431	3.22	0.31	42.63	15.30	10.66	9.31	17.86	0.61
1977	235	3.32	0.64	41.34	28.98	9.95	0.95	3.90	2.90
1978	-	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	"-	-
1980	-	-	-	-	-	-	-	-	-
1981	8211	96.38	0.47	2.16	0.19	0.00	0.28	0.40	0.03
1982	1418	65.79	3.33	8.92	0.56	0.95	1.31	20.31	0.93
1983	427	1.35	9.07	17.03	0.67	2.04	5.09	62.70	2.08
1984	672	0.36	11.89	33.57	0.37	0.57	2.09	50.50	0.64
1985	861	-	12.07	34.13	0.12	0.40	0.13	53.00	0.15
1986	-	-	-	-	-	-	-	-	-
1987	1848	-	12.21	49.29	0.05	0.10	0.36	37.86	0.13
1988	3675	-	27.03	28.20	0.02	0.09	0.18	44.46	0.02
1989	5983	-	30.08	16.06	0.01	0.16	0.16	53.52	0.00

(b) Experimental trawl catches

1981	-	91.14	-	2.99	0.73	2.62	0.42	0.92	0.18
1982	-	81.02	-	2.34	2.30	1.97	0.30	11.58	0.45
1983	-	76.22	-	1.73	3.16	1.19	"0.63	16.17	0.98
1984	-	42.63	-	0.72	1.65	0.83	0.16	57.73	0.27
1985	-	1.15	-	1.95	0.79	0.04	0.30	95.63	0.14

Ha=*Haplochromis*, Ra=*Rastrineobola*, Ti=*Tilapiines*, Bd=*Bagrus docmac*, Cm=*Clarias mossambicus*, Pa=*Protopterus aethiopicus* Ln=*Lates niloticus*

Table 4. Average size (kg) of fish landed at Masese

Period	Ov	One	Bd	Cm	Pa	Ln	One*	Ln*
1972	0.32	1.19	1.04	3.29	5.74	21.41	-	-
1973	0.29	1.31	1.07	3.54	3.74	21.61	-	-
1974	0.29	0.54	1.58	3.83	5.72	38.11	-	-
1975	-	-	-	-	-	-	-	-
1976	2.30	1.13	1.20	4.02	7.17	41.01	-	-
1977	0.34	1.05	0.86	4.44	6.93	41.54	-	-
1978	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-
1981	0.38	1.21	1.07	3.35	9.14	4.81	0.69	4.30
1982	0.33	0.98	0.70	5.85	7.76	8.64	0.62	5.28
1983	0.29	1.02	0.73	4.74	8.61	5.79	0.84	5.07
1984	0.26	1.43	1.40	3.65	7.97	5.64	0.88	2.30
1985	0.35	1.42	1.71	2.58	6.62	1.57	0.99	0.84
1986	-	-	-	-	-	-	1.20	0.49
1987	0.35	1.80	2.28	3.97	7.21	4.12	-	-
1988	0.65	1.53	6.38	8.14	9.91	1.85	-	-
1989	0.35	1.08	4.63	7.16	13.68	2.39	-	-

Ov=*Oreochromis variabilis*, One=*Oreocjromis niloticus eduardinanus*, Bd=*Bagrus docmac*, Cm=*Clarias mossambicus*, Pa=*Protopterus aethiopicus*, Ln=*Lates niloticus*

*Specimens obtained by experimental bottom trawling in the Jinja area of Lake Victoria.

Table 5 The percentage size distribution of fish (*Lates niloticus*) landed by the commercial fishermen using mixed mesh size gillnets in the Entebbe waters of Lake Victoria.

	Total number of fish	INDIVIDUAL WEIGHT OF FISH (kg)											
		< 1	1	2	3	4	5	6	7	8	9	10	>10
October 1991	131	25.2	-	46.6	16.8	5.3	1.5	3.1	-	0.8	-	0.8	-
January 1992	593	32.0	38.1	19.9	3.9	2.2	2.9	-	-	0.7	-	0.2	-
May 1992	720	7.4	24.4	30.4	28.3	5.4	2.5	0.6	-	0.4	-	0.1	0.4

Table 6 Fish landings in Masese during the period June 1988-May 1992

(a) Fresh and processed fish

FISH SPECIES	TOTAL	MONTHLY AVERAGE		MONTHLY RANGE	
				MINIMUM	MAXIMUM
	Metric tons	Metric tons	%	m. tons	m. tons
All species	28,701.3	597.9	-	278.6	968.9
Oreochromis niloticus	4,388.9	91.4	15.3	46.0	132.6
Lates niloticus	13,226.2	275.5	46.1	101.2	499.4
Rastrineobola argentea	10,413.2	216.9	36.3	22.8	581.9

(b) Fresh fish

FISH SPECIES	TOTAL	DAILY AVERAGE		DAILY RANGE	
				MINIMUM	MAXIMUM
	Metric tons	M. tons	%	M. tons	M. tons
All species	347.092	7.231	-	4.237	11.353
Oreochromis niloticus	136.986	2.854	39.5	1.460	3.642
Lates niloticus	207.891	4.331	59.9	1.421	8.636

Table 7. Trawl mean catch rates (kg/hr) of the various fishes in the northern part of the Uganda waters of Lake Victoria.

Fish species	1968-71 510 hauls Ca.500 hrs	1981 127 hauls 144.5 hrs	1982 191 hauls 223.4 hrs	1983 263 hauls 269.5 hrs	1984 110 hauls 113.3 hrs	1985 70 hauls 68.1 hrs
Haplochromis spp	668.20	543.30	294.34	270.84	108.48	4.78
Oreochromis esculentus	29.79	0.15	0.04	0.01	-	-
O.variabilis	1.04	8.70	1.97	1.07	0.04	0.00
O.niloticus	3.36	13.60	6.56	5.03	1.80	3.25
O.leucostictus	0.18	0.11	0.02	0.01	0.00	0.00
Tilapia zillii	0.00	0.00	0.00	0.00	0.00	0.00
Bagrus docmac	33.26	4.09	8.37	11.24	4.20	1.32
Clarias mossambicus	32.60	15.07	7.16	4.32	2.11	0.06
Protopterus aethiopicus	22.08	2.66	1.09	2.23	0.40	0.50
Lates niloticus	0.96	5.02	42.08	57.47	136.73	158.95
Synodontis victoriae	4.77	0.91	0.27	0.35	0.21	0.11
S.afrofischeri	0.10	0.01	0.00	0.01	0.01	0.00
Other species	2.56	0.32	1.40	2.69	0.47	0.11
Total	796.72	594.94	363.30	355.28	254.46	166.22

Table 8 Catch per unit of effort in the experimental gillnets fished in Lake Victoria, Uganda.

Gillnet Mesh Size (mm)	LAKE VICTORIA CENTRAL						LAKE VICTORIA WEST					
	October 1991		January 1992		May 1992		November 1991		February 1992		June 1992	
	No	Kg	No	Kg	No	Kg	No	Kg	No	Kg	No	Kg
63.5	-	-	0	0.0	7	1.2	4	1.0	10	1.8	1	0.2
76.2	0	0.0	0	0.0	2	0.3	4	1.5	1	0.3	1	0.4
88.9	-	-	-	-	-	-	4	2.4	-	-	-	-
101.6	5	3.3	2	1.2	2	0.9	11	8.1	2	1.4	1	0.9
114.3	-	-	1	1.0	-	-	8	7.6	2	1.9	-	-
127.0	5	5.2	1	2.0	3	2.2	6	7.0	1	1.0	4	1.3
139.7	-	-	1	1.3	-	-	3	4.8	2	2.3	-	-
125.4	1	2.3	-	-	0	0.0	6	11.9	1	1.0	2	3.3
165.1	-	-	-	-	0	0.0	-	-	-	-	-	-
177.8	-	-	0	0.0	1	2.0	-	-	0	0.0	1	2.3
203.2	-	-	0	0.0	-	-	0	0.0	0	0.0	0	0.0

0/0.0 = trace quantities

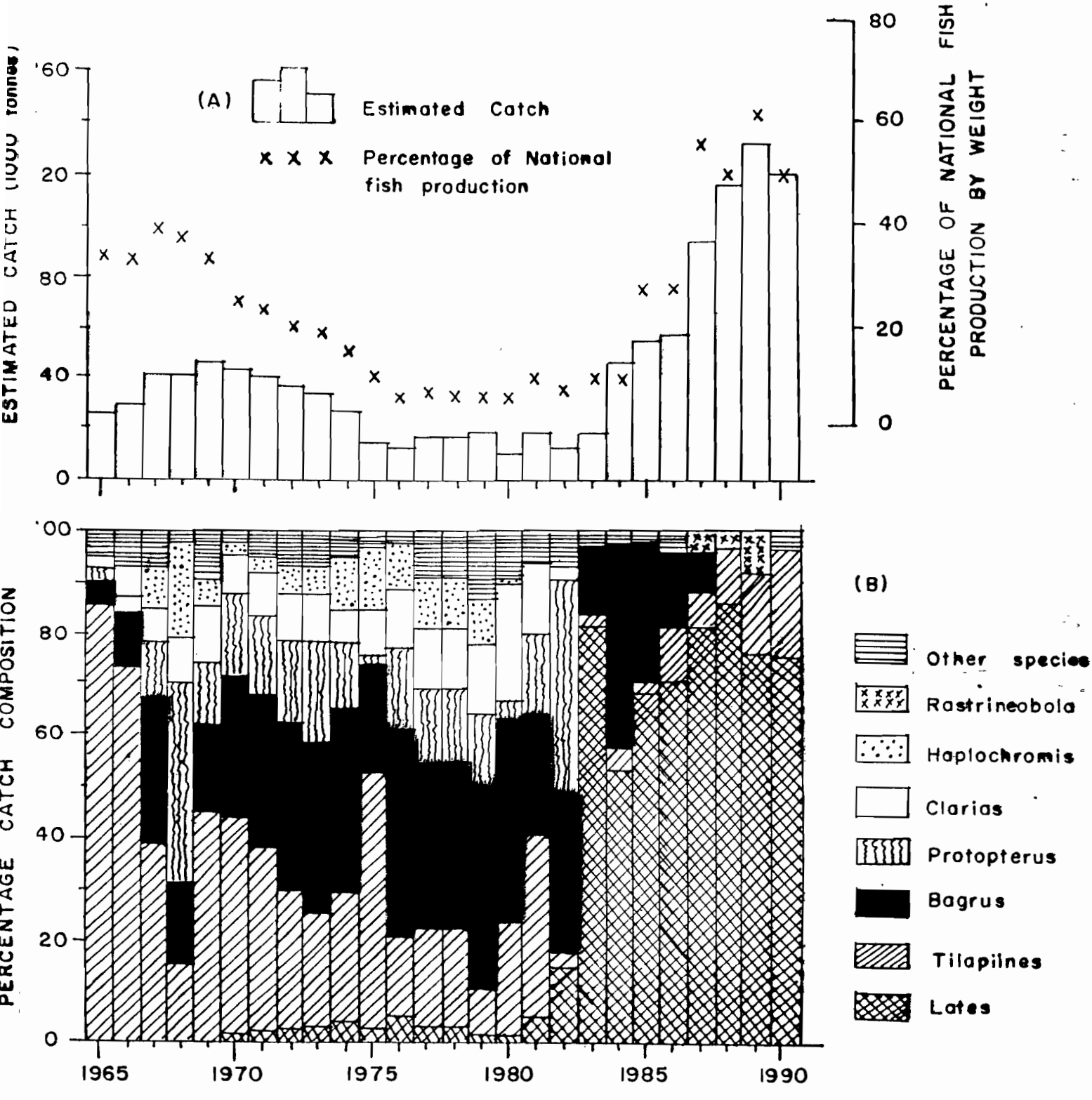

Fig. 1. Estimated fish production from Lake Victoria, Uganda, during the period 1965-1990.

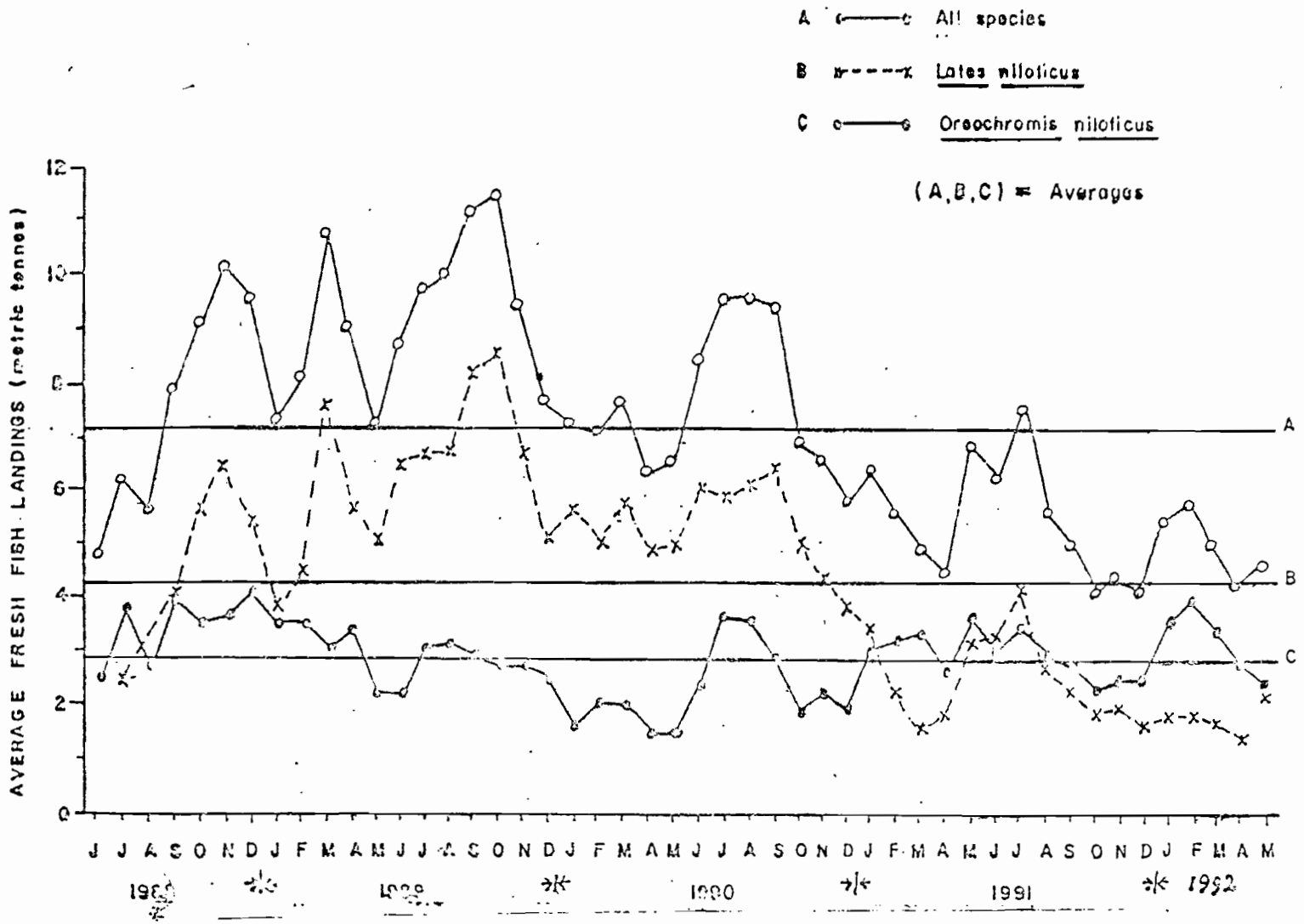

Fig 2 . Average daily landings (for fresh fish) at Masese Fish landing on Lake Victoria, Uganda.