Catch trends from Lake Victoria – Tanzanian waters

O.C. MKUMBO, *TAFIRI, P.O. Box 475, Mwanza, Tanzania*
I.G.COWX, *University of Hull International Fisheries Institute, Hull HU67 RX, UK*

Abstract: Catch trends from Fisheries Department reports from the last eleven years (1985-1995) were analysed. These showed a shift in the fishery from a cichlid-based system to one dominated by Nile perch and tilapias. In recent years, catches have declined from a peak in the early 1990s. Catch per unit effort appears to have remained stable except for a drop in 1995, however, this is considered dubious because the effort showed a doubling in that year. Limitations of the fisheries data collection system for the Tanzanian sector of Lake Victoria are highlighted and discussed.

Introduction

Lake Victoria, shared by Tanzania, Uganda and Kenya, lies between longitudes 0° 30' N and 2° 20' S, and latitudes 31° 40' and 34° 50' E. The lake has a surface area of 68 680 km^2, with a catchment area of about 200 000 km^2. The lake has traditionally supported valuable fisheries which are an important source of protein for the indigenous peoples. However, from the 1950s to the 1980s catches from the lake have been steadily declining (Hamblyn 1961; Cadwalladr 1965; Fryer 1973; Arunga 1981; Welcomme 1988).

In the early 1980s, the lake underwent a dramatic change. This is linked to the introduction of Nile perch, *Lates niloticus* (L.), overexploitation of the endemic haplochromine fishes, eutrophication and general degradation of the habitat. The lake's fisheries have subsequently become dominated by catches of Nile perch and *Rastrineobola argentea* (Pellegrin) (CIFA 1986, 1990 & 1992; Rabuor 1989, 1991; Othina & Osewe 1995, 1996). In Tanzanian waters, in 1987 the total catch was about 160 000 t, and Nile perch contributed 60% (Ligtvoet *et al.* 1988; Bwathondi 1990). Their contribution increased in the catches up to 90% in 1990 (Ligtvoet & Mkumbo 1991), although all other species continued to decrease. In Kenya, catches of Nile perch increased from almost zero in 1989 to over 20 000 t in 1982, and Nile perch comprised about 60% of the catch (Okemwa 1984; Ogari & Asila 1990). The same trend was reported for Uganda (Okaronon *et al.* 1985; Orach-Meza 1991).

To assess the dynamics of the fishery for management purposes, catch assessment surveys have been implemented in all three riparian countries for a number of years, including one run by the Fisheries Department in Tanzania. The present study reviews catch trends in the Tanzanian sector of the lake since 1985, examines trends found for future management of the fishery, and assesses sources of bias in the catch statistics and makes recommendations for improving the catch assessment system.

Materials and methods

To assess the trends in the fisheries of Lake Victoria, data were obtained from the Fisheries Department in Dar es Salaam. In Tanzania, fisheries data are collected by district staff and compiled by the Fisheries Department. Unfortunately, this system broke down in the period 1996 to the present because of lack of resources and poor infrastructure. Consequently data were only available for 1985-1995.

The information available was: total number of fishermen; total number of fishing vessels; total weight of fish landed; total value of fish in Tanzanian shillings; and number of gears by type and size. In addition, the same data were broken down into three regions: Kagera in the west; Mwanza in the south; and the Mara in the east. Information on effort (number of boats and gear types) was somewhat variable and thus treated with caution. This was evident from the apparent almost doubling of fishing effort between 1994 and 1995. The problem was linked to the availability of information from a frame survey conducted in 1995, which provided a more comprehensive coverage of the exploitation patterns in the fishery. Frame surveys were conducted in 1990 and again in 1995; effort exhibited a steady decrease between the two surveys but doubled once the new survey data became available. This is consistent with the differences that usually occur between the recording systems used for the different programmes. The monthly data collection programme probably records actual numbers of vessels fishing whereas the frame survey tends to count all fishing vessels and does not discriminate those lying idle.

Results

As with other countries around Lake Victoria, landings from Tanzania showed a marked increase in the mid-1980s to peak at 230 000 t in 1990 (Fig. 1). Thereafter, the landings progressively declined to around 120 000 t in 1995. No information is available after that date because the Fisheries Department does not consider the data valid and has not compiled them.

Marked regional differences were found in the catches (Fig. 1). The trend described above was prevalent in the Mwanza zone which contributed the bulk of the catches, especially through the boom years of the 1980s. Catches in the Kagera and Mara zones appear relatively stable, although in real terms they have declined by about 40% since the late 1980s.

Data on fishing effort expended in the region (Fig. 2; Table 1) are somewhat dubious, (the huge in increase in longline hooks and dagaa seines in 1995 which was not sustained through to 1998 being notable examples) and probably reflect the problems associated with the frame surveys outlined above. There was a general drop in effort between frame surveys followed by a dramatic increase in the years the frame surveys took place, e.g. between 1990 and 1995 (Fig. 2; Table 1). In reality, the number of boats utilised in the fishery has probably increased marginally between 1986 and 1998, although the proportion actually fishing may be considerably less. Zonal differences in the number of boats show considerable differences. As expected from catches, most boats operated in the Mwanza area. Although few data are available, anecdotal evidence suggests fishing pressure has intensified in the Mara region, coupled with the building of more fish processing plants in the area. The number of boats operating in the Kagera region has declined by about 30%, from a peak in the late 1980s. It is not clear whether this is a deficiency in the data recording system or a real trend, but the decline partially explains the drop in catches for the region. The remoteness of the area and the weak infrastructure support the latter reason. Perhaps the most notable trends in the fishery are the increase in lift nets in recent years and the more than doubling of the number of smaller mesh sized (especially around 5") gillnets.

As a result of the poor catch and effort data, no meaningful interpretation can be made from the CPUE trends (Fig. 3). There was a general drop in CPUE towards 1995, which would support the general complaints received from fishermen, but the true extent of this is unknown.

With respect to species composition of the catches, this was dominated by Nile perch with a peak towards the end of the 1980s (Fig. 4). The apparent demise of the Nile perch fishery in the early 1990s was concomitant with an increase in the *Rastrineobola* fishery catch. The latter has subsequently declined. This possibly reflects a migration from the longline and gillnet fishery to lift netting, but without details of gear usage this is impossible to confirm. Catches of other species, which include *Bagrus, Barbus, Synodontis, Clarias* and *Protopterus*, have dropped from approximately 40 000 t in 1986 to less than 300 t in 1995. The once prolific haplochromine fishery of the 1950s and 1960s became virtually extinct by 1987, and there is no evidence of an improvement in the catches from the data available. However, evidence from experimental trawls (Mkumbo & Ezekiel 1999) suggests the stocks are regenerating and they could become more prevalent in the fishery in the future.

One of the most significant outputs of the data collection system is the first sale value of the commodity. This has increased progressively since 1985 but almost doubled in consecutive years on two occasions: between 1991 and 1992 and again between 1994 and 1995. Whether this is the real value of the landings is debatable but it suggests that the value of the fish has increased despite the decline in catches. It is possible this reflects the demand for Nile perch from the fish processing factories, pushing up the unit value.

Discussion

Analysis of fisheries statistics from Tanzania is fraught with problems. The data on effort are extremely weak with a drop in values between frame surveys and a readjustment in the year of the survey. There was, however, a general tendency for effort to increase in the fishery between 1985 and 1995. Similarly data on catches must be treated with caution, especially in the Kagera region, because the infrastructure for effective catch assessment surveys is inadequate for such a dispersed fishery. This has been highlighted by the lack of data since 1995. The Fisheries Department does not consider the data to be sufficiently accurate to summarise the information. It will be necessary to return to the district offices to gain access to these data for complete analysis. Notwithstanding this, some basic trends are discernible from the data.

The increase in total landings from Tanzanian waters of Lake Victoria in the early 1980s was reported in all fishery statistics of the three riparian countries (Kenya, Uganda and Tanzania) (CIFA 1982, 1985 & 1988). The increase shown in 1985 to 1986 marks the peak of fish production in the lake, which was contributed mainly by Nile perch. This was followed by relatively stable catches until 1990, probably indicating the maximum fishing capacity. From 1990 a general decline was noted. This was more prevalent in Kenya (Othina & Tweddle 1999) and Tanzanian waters than in Uganda and is probably linked to overfishing. Fishermen complained of a drastic drop in catches by about 50% in 1991 (Riedmiller 1994).

Regional differences in catches highlight the potential problem of overfishing. This is prevalent in the Mwanza, and to lesser extent, Mara regions. Results from the trawl surveys support this conclusion (Mkumbo & Ezekiel 1999), and the problem must be addressed. Indeed a tentative surplus yield model was used to determine the status of the stocks and this estimated the maximum sustainable yield to be in the region of 220 000 t and effort to achieve MSY of about 12 000 boats. However, caution must be used when interpreting these data for management purposes because the input data are weak.

This review of the fisheries statistics shows the potential of good information for management purposes. Unfortunately the inadequacies highlighted undermine any reliance in the data. It is therefore essential that a catch assessment survey programme is put into place. Whilst this is not strictly the remit of the EU Lake Victoria Fisheries Research Project, it is needed by the programme. Efforts to minimize the inaccuracies and maximize on the benefits are being incorporated into the LVFRP in Tanzania through the initiation of a catch assessment project (Nsinda 1999). However, every effort must be made to ensure the recent frame survey, which LVFRP supported with training, is analysed as rapidly as possible and the information used to assess the fishery characteristics more accurately. To this end further funds should be allocated from LVFRP to support fishery dependent research initiatives.

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. Summary of fishing effort statistics for Lake Victoria, Tanzania

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1998
Total number of fishermen	17086	24241	22207	22926	29816	29095	25900	20064	20064	20064	34832	32403
Total number of vessels	4048	7404	6667	6546	7757	7797	5948	5041	4185	4185	7953	7618
Total weight of fish landed (t)	98971	216407	159915	218443	205476	231547	146311	132171	176264	118633	121891	
Total value of fish (tshs x 1000)	1231350	3622008	3117913	5000593	6468256	6101582	6221807	12443967	18513677	15699369	28740419	
Number of gears by type and size												
Gillnets		139	2	76	2	2	2	2120	2120	2120		226
12"												
11"								1453	1453	1453		79
10"		6673	4566	404	2776	2288	2288	2288	2288	2288		216
9"		2612	3863	3060	5180	5187	5187	5187	5187	5187		
8"		16014	9919	5325	10278	9775	9775	9775	9775	9775	2479	1886
7"		9285	10639	22261	33791	32979	32979	32979	32979	32979	32717	20185
6 ½											18236	2280
6"		10867	8290	8683	8976	6881	6881	8881	8881	8881	39481	43997
5 ½"		245	206	768	335	337	337				15610	6602
5"		11030	6023	4059	12915	12149	12149				1269	42953
4 ½"		15215	8026	5577	7353	4246	4246					1252
4"		14482	6599	4059	5021	3585	3585	3585	3585	3585	2345	3189
3 ½"		11218	3587	1762	2071	1716	1716					2785
3"		21056	3870	1315	1949	1414	1414	1414	1414	1414	3102	1112
2 ½"		7209	4991	1270	1553	1332	1332	1328	1328	1328		1674
2 ¼"		13961	4162	1886	392	392	392	392	392	392		
2"		2696	2887	1008	1295	1447	1447	1447	1447	1447	4259	1278
1 7/8"		36	10	533	1762	1693	1693					
1 ½		480	683	4	231	231	231					481
1"				6	19	19	19					
7/8"				481	105	105	105					
Total gillnets		142884	78323	60993	96005	87778	87778	70849	70849	70849	119498	130195
Number of beach seines		1464	523	558	659	573	573	573	573	573	528	826
Number of dagaa nets			523	937	1052	1140	1140	1140	1140	1140	2024	1070
Number of scoop nets		1658	1585	1420	1923	1408	1408	1408	1408	1408	749	916
Number of hooks		350850	482129	390938	621950	369444	369444	369444	369444	369444	1419687	674318
Number of trawl nets		18	22	17	17	13	13	13	13	13		
Number of lift nets					24	27	27	27	27	27	315	507
Number of outboard engines		148	146	130	154	111	111	111	111	111	441	825
Number of inboard engines		45	26	28	32	35	35	35	35	35	11	5
Number of trawlers				14	17	12	12	12	12	12	11	

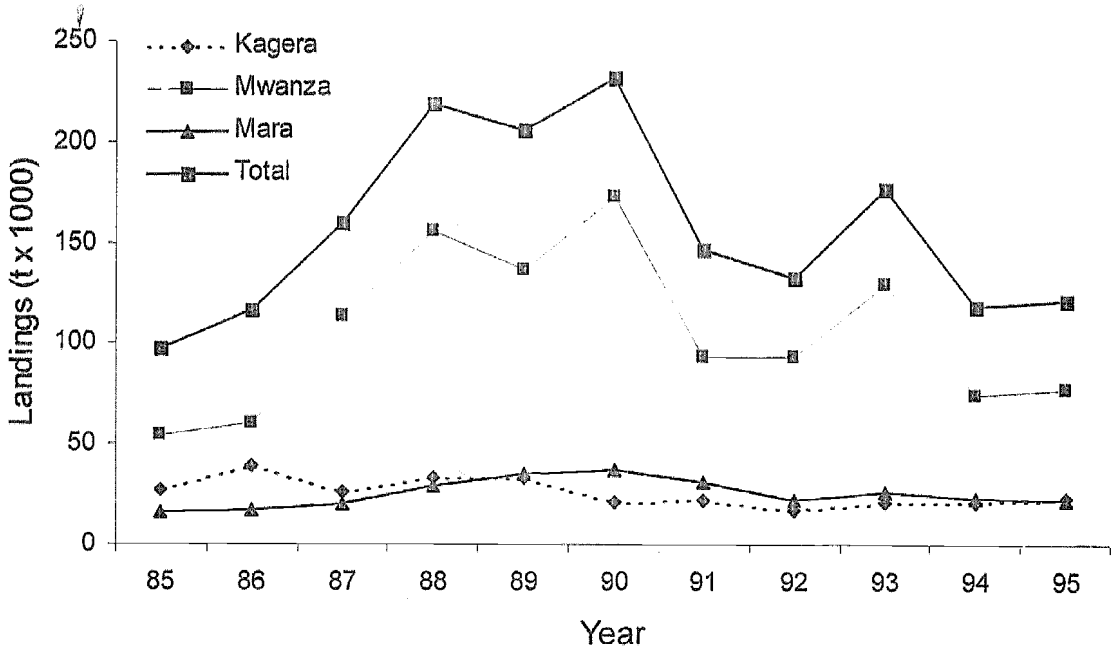

Fig. 1. Total catches in different regions of the Tanzanian sector of Lake Victoria

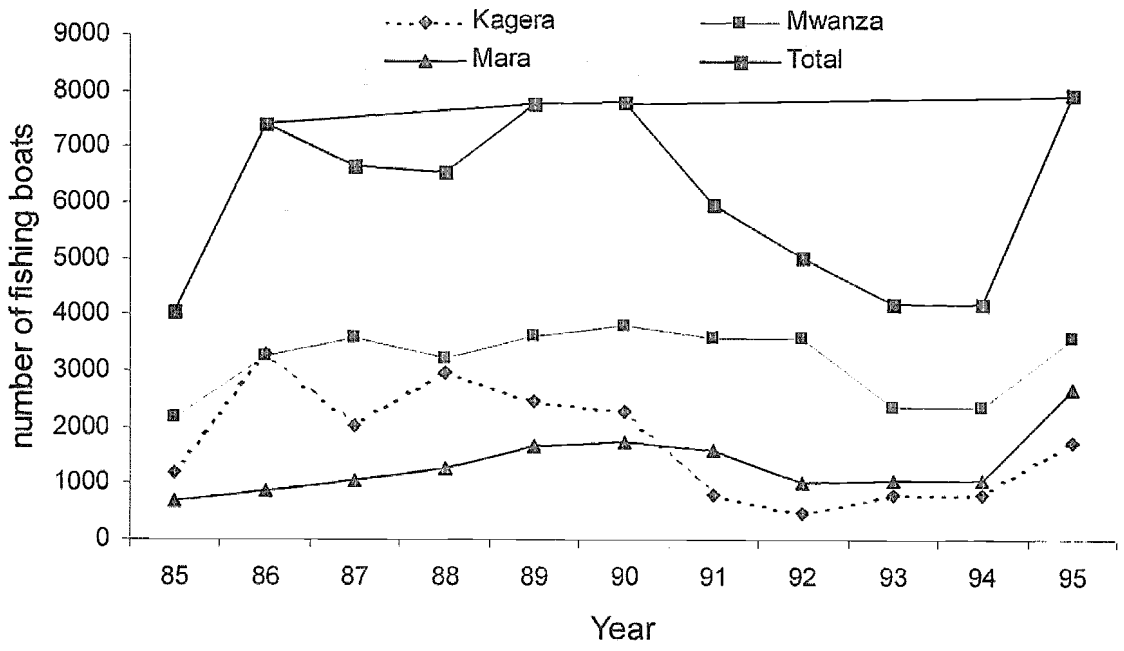

Fig. 2. Total number of boats in different regions of the Tanzanian sector of Lake Victoria

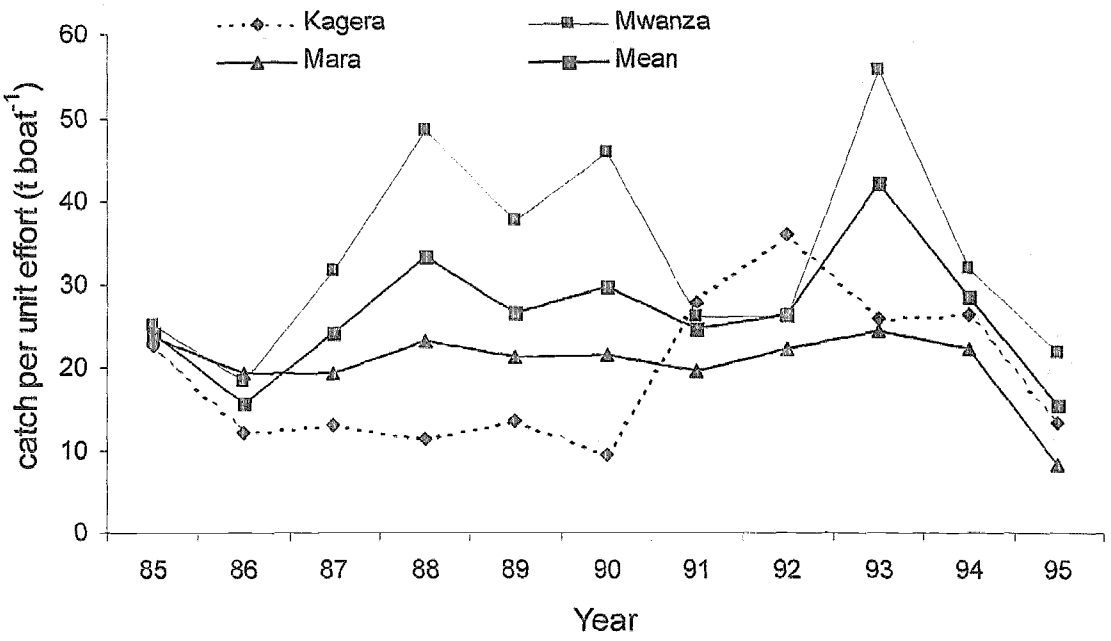

Fig. 3. Total catch per unit effort (t boat^{-1}) in different regions of the Tanzanian sector of Lake Victoria

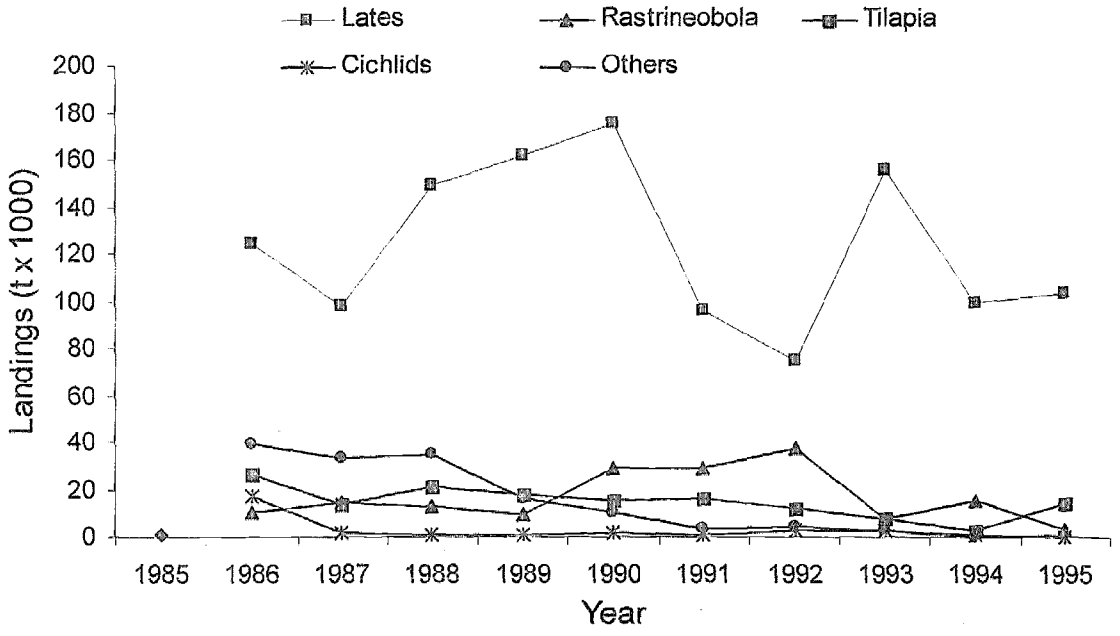

Fig. 4. Landings by species in Tanzanian waters (t x 1000)