CHARACTERISTICS OF THE LAKE VICTORIA FISHERY BASED ON FRAME SURVEYS 2000 AND 2002: WITH RECOMMENDATIONS FOR DEVELOPMENT AND MANAGEMENT OF THE FISHERY

A STATUS REPORT ON FRAME SURVEYS

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Executive Summary

Lake Victoria is one of the major economic assets and a symbol of unity among the Partner States of the East African Community (EAC). The Partner States have declared the lake basin and its basin an Economic Zone to be developed jointly by the Partner States. Fisheries are one of the major resources being developed and managed jointly. Frame surveys were carried out on Lake Victoria in 2000 and 2002 to determine certain characteristics of the fishery to guide development and management of the fishery. The surveys show that: The number of fish landing sites was higher compared to fisheries staff with each fisheries officer expected to man three landing sites. There were inadequate facilities at the fish landings. The number of fishers on the lake increased from 129,305 to 175,890, fishing crafts from 42,483 to 52,479, and gillnets from 655,053 to 984,084 between the years 2000 to 2002. This is an indication of increases in fishing effort. The fishermen needed to go further ashore using outboard engine to fish suggesting depletion of fish stocks in near-shore areas. The Partner states have made deliberate efforts to improve facilities at fish landings to meet fish quality requirements and curb illegal fishing gears as manifested in the reduction in the number of beach seines and illegal sizes of gillnets in some of the Partner States. There were, however still a large number of illegal gill nets of mesh sizes ranging from 2.5 inches to 4.5 inches, and illegal beach seines on the lake by the year 2002. It was, therefore recommended that: The ratio of staff to landing site be matched to improve development and management efforts; Fish handling facilities and access to fish landings should be improved; The implication of the increases in fishing effort on the fish stocks should be assessed and appropriate measures taken; and, Specific efforts should be made to remove illegal sizes of gill nets and beach seines from the lake.

Introduction

Lake Victoria is the second largest freshwater body in the World. The lake has a surface area of 68,800 km^2 of which 35,088 km^2 (51%) is in Tanzania, Uganda 29,584 km^2 (43%) is in Uganda, and 4,128 km^2 is in Kenya 6%. It has a shoreline length of 3,450 km of which 1,150 km (33%) is in Tanzania, 1,750 km (51%) is in the Uganda and 550 km (16) is in the Kenya. The lake has a catchment of 194,200 km^2 with a rapidly growing population of over 30 million people.

Lake Victoria is very important to the economies of the East African Community (EAC) Partner States. It is the most productive fishery in Africa, with an annual fish landing of 500,000 metric tons. The fishery is valued at US$ 600 million locally with exports, which were valued at US$ 217 million annually by 2001. It provides high protein food, employment, income, and clean water for domestic and industrial use. It had high fish species diversity of economic and ecological importance and is used as an avenue for transport, recreation and power generation

The dynamics of the fishery of Lake Victoria has changed dramatically since the emergence of the Nile perch fishery in the late 1970s and the subsequent evolution of fish processing for export. The incentive created by the ready market by the fish processing plants has fuelled rapid increase in fishing effort. Fish export is a major foreign exchange earner of the Partner States and efforts have been made to ensure sustainability of this resource. Relevant parameters of the fishery are monitored to guide its development and management. Frame survey is one of the avenues through which the Partner States are monitoring the fishery resource.

The three Partner States have conducted frame surveys on Lake Victoria individually since the 1970s. Frame surveys were conducted in the Kenyan part of Lake Victoria in 1972, 1990, 1994 and 1998. National frame surveys

were conducted annually in the Tanzanian parts of the lake since the 1970s but stopped with decentralisation during the 1980s. They were later resumed biannually from 1992. In Uganda, frame surveys were conducted on Lake Victoria in 1970, 1971, 1072 and 1988 (Frielink, 1989, Tumwebaze and Coenen, 1990). These surveys have had very limited regional application but provide a benchmark against which subsequent regional surveys can be compared.

The first lake wide frame survey was conducted on Lake Victoria from 22nd to 25th March, 2000 with the support of the GEF/World Bank funded Lake Victoria Environmental Management Project (LVEMP) and the EU funded Lake Victoria Fisheries Research Project (LVFRP). The second survey was carried out from 10th to 13th April 2002. It was funded by LVEMP. Both surveys were coordinated by the Secretariat of the Lake Victoria Fisheries Organization (LVFO). This report summarizes the findings of the 2000 and 2002 frame surveys and gives recommendations for development and management of the fisheries.

Objectives

The overall objective of conducting the frame surveys was to provide information on the facilities and service providers at the landings and on the composition, magnitude and distribution of fishing effort to guide development and management of the fishery. The specific objectives were to provide information on:

  a) The number of fish landing sites;
  b) The facilities available at the fish landings to service the sector including accessibility to the landings;
  c) The service providers especially fisheries staff and Beach management Units (BMUs) at fish landings;
  d) The number of fishermen;
  e) The number and types of fishing crafts and their modes of propulsion;
  f) The types and sizes of fishing gears used on the lake and their mode of operation; and

g) Make specific recommendations on development and management of the fishery.

The information collected would also be used as a raising factor in estimation of fish stocks and fish catches in the lake e.g. in relation to catch assessment survey (CAS) data and sampling frames.

Expected Outputs

The outputs expected from the frame surveys are as follows:

a) Information on the number of fish landings on the lake;

b) Information on the facilities available at the fish landings to service the fisheries sector including those landings that can be accessed by all weather roads;

c) Information on the number of fishermen and how they have changed since the last surveys;

d) Information on the number and types of fishing crafts and how they have changed since the previous frame surveys;

e) Information on the modes of propulsion of the fishing craft to provide an insight on how far the vessels can fish;

f) Information on the types and sizes of fishing gears especially the number of illegal fishing gears in the fishery;

g) An indication of the impact of management measures e.g. enforcement of the legal fishing gears and methods;

h) Recommendations on development and management of the Lake Victoria fisheries.

Methodology

A full census was carried out at all fish landing sites on Lake Victoria by staff from the departments of Fisheries Management and Fisheries Research Institutions of the Partner States, collaborating institutions including universities and local communities. Prior to the surveys, supervisors and enumerators to undertake the exercise were identified and trained.

The data was recorded using a structured questionnaire as detailed in the Standard Operating Procedures (SOPs) for Frame Survey on Lake Victoria. The data was analysed using a computer program called *SAMAKI* developed by LVFRP. The officers involved in data processing were trained on the use of *SAMAKI*.

Observations of the 2000 and 2002 Frame Survey

The findings of the Frame Survey 2000 and that of 2002 are summarized in Table 1.

Landing Sites

The total number of landing sites on the lake decreased slightly from 1,492 in 2000 to 1,452 in 2002. In Tanzanian part of the lake the landing sites decreased from 598 to 594 while in Uganda they decreased from 597 to 552. In Kenya however, the landing sites increased from 297 to 306. The observed decrease in Uganda and Tanzania could possibly be a result of merging of certain landing sites. Overall, there were an average of four landing sites per 10 km of shoreline in 2002. The highest number of landing sites per 10 km was recorded in Kenya (6) followed by Tanzania (4) and was least in Uganda (3).

It was however observed that the number fisheries staff to man the fish landing sites did not match the number of landings with each fisheries officer expected to man an average of three fish landings. There was need to increase the number of fisheries staff to improve supervision of fishery activities at the landings. The number of landing sites could also be reduced through merging neighbouring landing sites. Another option is to form Beach Management Units (BMUs) and empower them to assist with fisheries development and management activities at the fish landings. In this regard, it will be necessary to record the number of BMUs active on the lake in the next (2004) frame survey.

Facilities Available at the Fish Landings on the Lake

The facilities examined included landing sheds (*bandas)*, cold rooms, pontoon/ jetties, fish stores, potable water, toilet facilities, boat and net repair facilities, access to the fish landing site by all-weather roads and electricity supply. Most landing sites did not have adequate facilities. For instance, only 9% of the landing sites had *bandas*, less than 1% had working cold rooms, 3% had jetties, 3% had fish stores, 1.8% had potable water, 18% had toilets, 4% were supplied with electricity and only 27% were accessible by all-weather roads.

Discrepancies were noted in differences in landing site facilities recorded in 2000 and 2002. Whereas increases in number certain facilities could be attributed to provision of such facilities where they were not previously provided, decreases e.g. in the fish landing sites with power supply could only be attributed to errors in recording or misinterpretations of data. It is therefore recommended the terminologies be defined more precisely in subsequent surveys and that efforts should be made to accurately record all the information in the questionnaire.

Nevertheless, the general observation is that facilities at the fish landings were inadequate. There is, therefore need to improve facilities servicing fisheries at the landings.

Number of Fishers

The total number of fishers operating on Lake Victoria increased from 129,305 in 2000 to 175,890 in 2002, an increase of 36% **(Fig.1).** The fishers increased from 38,431 to 54,168 (41%) in Kenya, 55,985 to 80,053 (43%) in Tanzania and from 34,889 to 41,674 (19.4%) in Uganda.
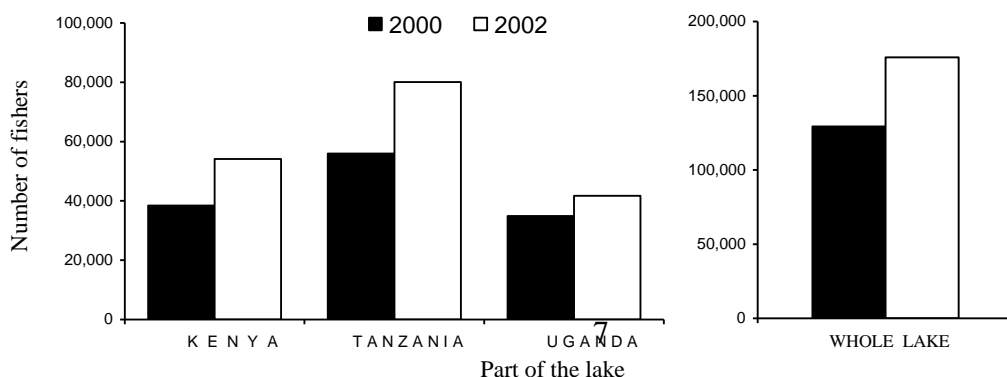
Figure 1. The number of fishers in Lake Victoria in 2000 and 2002

Of the total number of fishers recorded in the lake in the year 2000, 30% operated in the Kenyan side, 27% in the Ugandan side while 43% operated in the Tanzanian side. In the year 2002, 31% operated in Kenyan side, 24% in Ugandan and 45% in Tanzania waters of Lake Victoria **(Fig. 2)**.

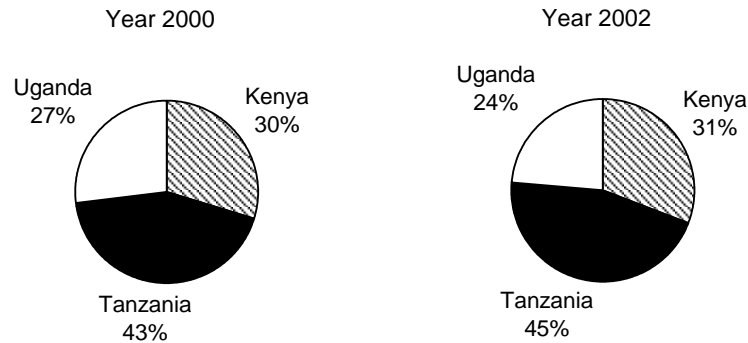Year 2000   Year 2002

Figure 2. The distribution of fishers in Lake Victoria in 2000 and 2002

The density of fishers recorded in 2002 survey was highest in Kenya (14 fishers km^{-2}), followed by Tanzania (3 fishers km^{-2}) and was least in Uganda (2 fishers km^{-2}).

The Increase in number of fishers operating on the lake implies that there was an increase in the fishing effort. There is need to control the number of fishers in the lake e.g. by making relevant adjustments in the number of fishers or fishing license fee.

Fishing Crafts
The total number of fishing crafts over the entire lake increased from 42,483 in 2000 to 52,479 in 2002, an increase of 23.5%. Of these, 23% operated in Kenya, 35% in Uganda and 42% in Tanzanian waters of the lake in 2002.

The types of fishing crafts in Lake Victoria were dominated by Sesse boats which are pointed at both ends in the Kenyan and Tanzanian parts of the lake but by Sesse that are flat at one end were more common in the Ugandan part of the lake (Fig. 3). Parachute boats were more commonly used in Kenya and Uganda but were rare in the Tanzanian waters. Parachutes are less stable and are operated in near-shore and protected bays, which are common in Uganda and Kenya parts of the lake as opposed to the more open Tanzanian waters.

The increase in the number of fishing crafts is another indication of an increase in fishing effort in the lake. There is, therefore, need for control of the number of fishing crafts e.g. by limiting licensing of new entrants.
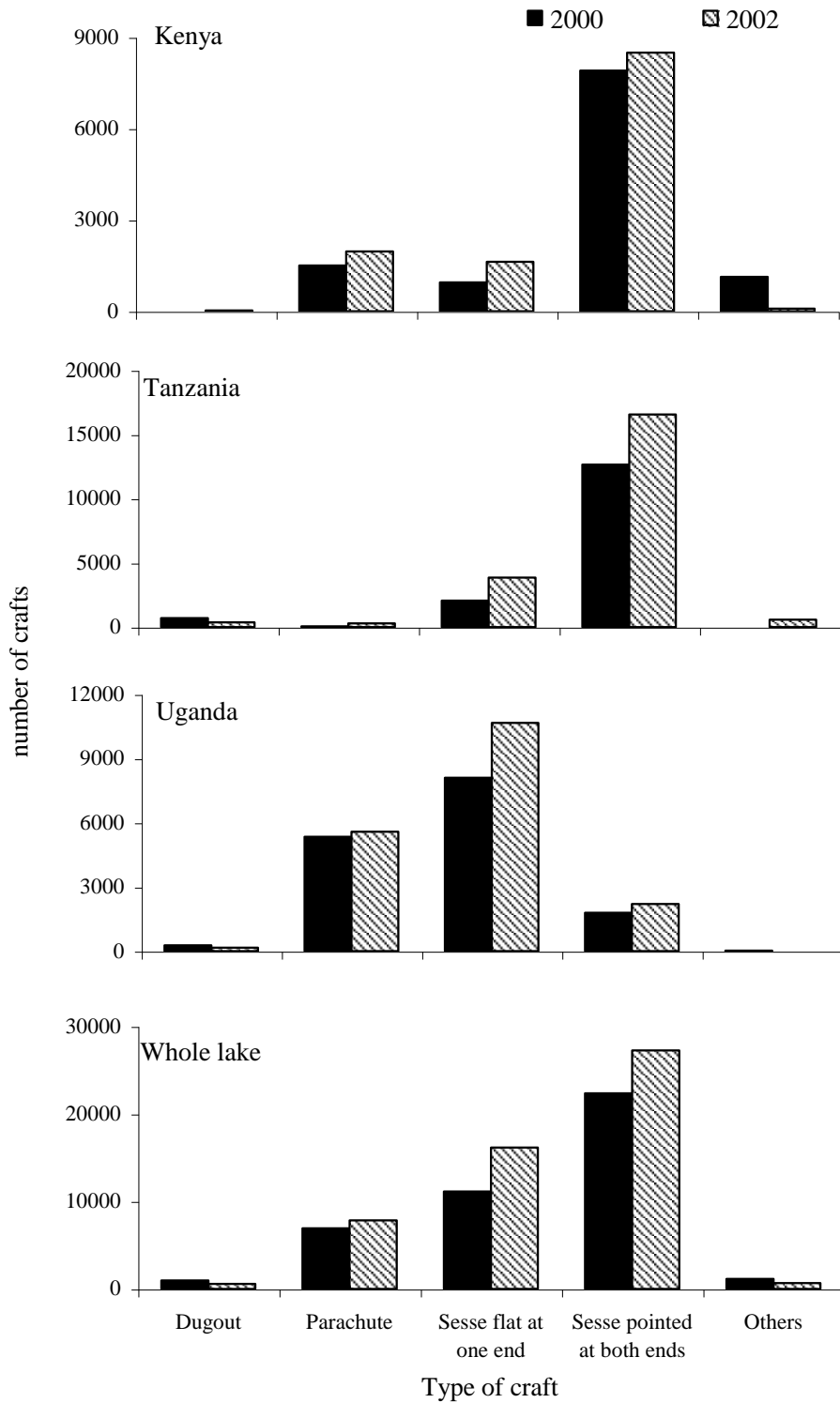
Figure 3. Distribution of fishing crafts by type in Lake Victoria in 2000 and 2002

Year 2000 Year 2002
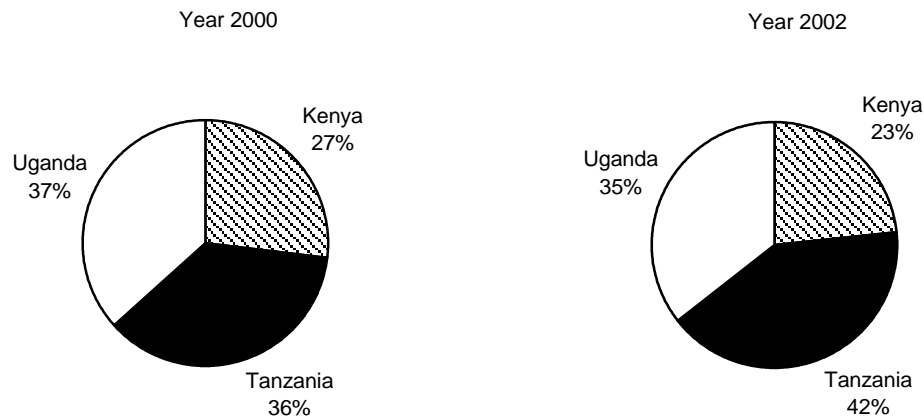
Figure 4. The distribution of fishing crafts in Lake Victoria in 2000 and 2002

Mode Of Propulsion Of Fishing Crafts

The number of fishing crafts propelled by paddles, sails and engines increased except in Kenya where paddled boats decreased slightly (Fig. 5). The least increase (11.5%) was among the paddled boats. The fishing crafts using sails and outboard engines increased substantially (53.6% and 59.5% respectively).

The increase in number of boats propelled by engines could imply that the fishery was still profitable and attractive to new investments. These crafts target the Nile perch fishery. The increase in use of outboard engines suggests fishermen had to go further away from the shore probably as a consequence of a decrease in fish stocks near-shore.
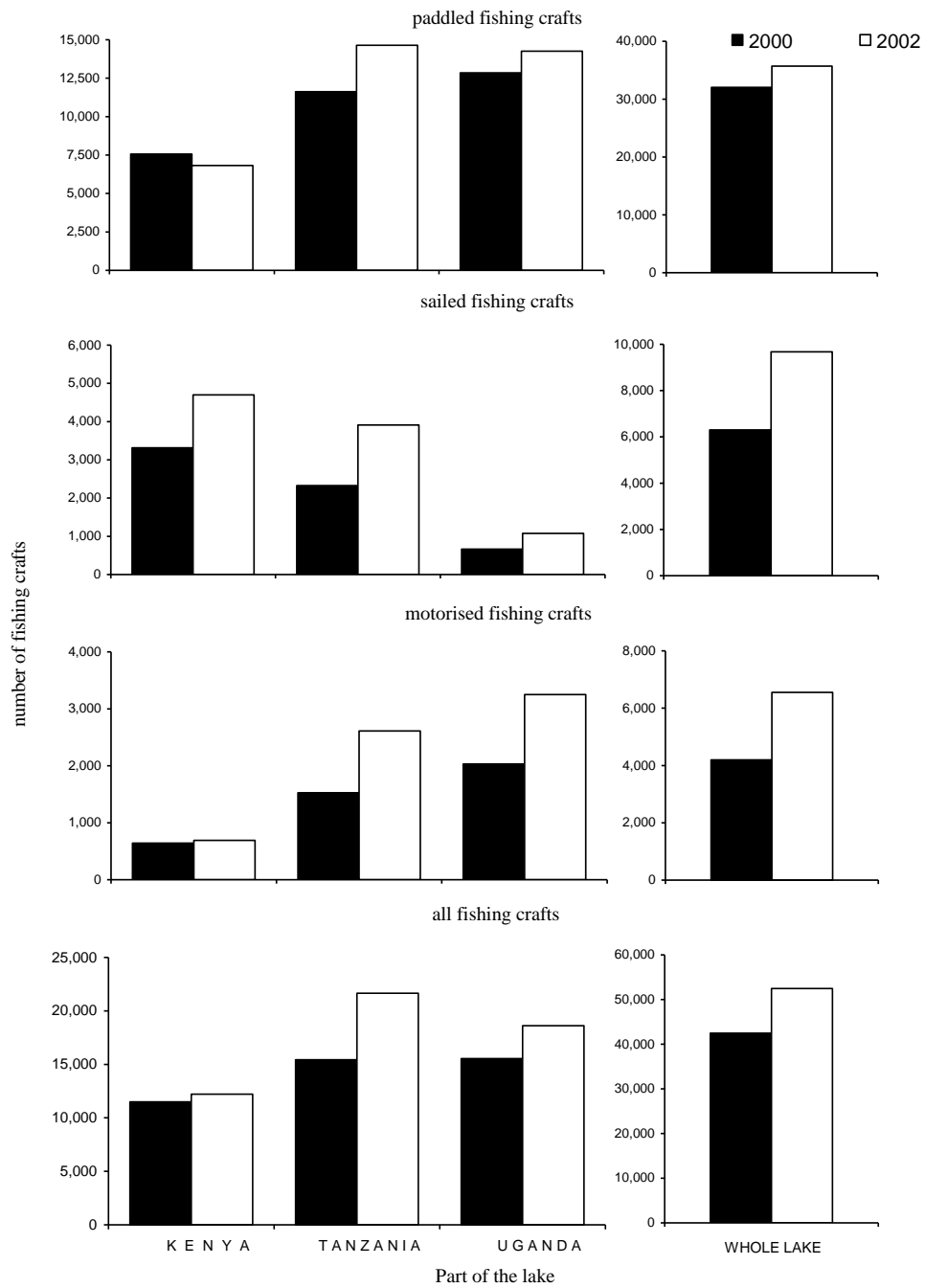
Figure 5. The number of fishing crafts in Lake Victoria in 2000 and 2002

Fishing Gears

The legal fishing gears permitted by the three Partner States on Lake Victoria are gillnets of 5 inches in mesh size and above, hooks and mosquito seines. Beach seines, monofilaments and cast nets are not allowed in the lake.

During the 2000 and 2002 frame surveys, the main fishing gears encountered on the Lake Victoria included gillnets, beach seines, cast nets, hand line hooks, long line hooks and mosquito seines.

Gill nets

The total number of gillnets on Lake Victoria increased from 655,053 in the year 2000 to 984,084 in the year 2002, an increase of 50.2%. The number of gillnets used in Tanzania and Uganda increased from 224,025 to 425,888 and 297,663 to 427,488 respectively in 2000 and 2002 (Fig. 6). In Kenya, the number of gillnets remained more or less the same at 133,365 and 130,708 in 2000 and 2002 respectively.

The proportion of undersized gillnets (< 5 inch mesh size) increased from 17.3% (113,177 nets) in 2000 to 18.1% (178,205 nets) in 2002. In Kenya, the proportion of undersized gillnets decreased from 25.2% (33,544 nets) in 2000 to 21.8% (28,527 nets) in 2002 (Fig. 8). In the Ugandan waters, the proportion of undersized gillnets declined from 18.3% (54,454 nets) to 12.4% (52,846) over the period. Conversely, in Tanzania the proportion of undersized gillnets increased from 11.2% (25,179 nets) in 2000 to 22.7% (96,832 nets) in 2002. The number of gillnets of mesh sizes between 6.5 to 8 inches changed a little but the larger mesh size of more than 8 inches decreased by over 49%.

Beach seines

Beach seines are illegal in all the three Partner States. There was an overall decrease in number of beach seines from 7613 in 2000 to 3491 in 2002, a decrease of 54.1%. However, most of this decrease was recorded on the Kenyan side of the lake where the numbers decreased from 5803 in the year 2000 to 1157 in 2002, a decrease of 80%. In the Ugandan portion of the lake, the number of beach seines increased from 811 in the year 2000 to 880 in 2002 (8.5%) while in Tanzanian portion of the lake, it increased from 999 2000 to 1454 in the year 2002, an increase by 46%.

Monofilament nets

Monofilament nets are illegal in all the three Partner States. Some monofilament nets were encountered during the 2002 survey. Up to 180 monofilament were impounded in the Musoma areas of the Tanzanian part of the lake in February 2004. There is need to enhance efforts to remove monofilament nets from the fishery. Data on monofilament nets should be recorded during the 2004 frame survey

Hooks

There was a dramatic increase in the number of long line hooks in all the three Partner States from 3,496,247 hooks in 2000 to 8,098,023 hooks in 2002, an increase of 131.6%. The rise in number of hooks could be attributed to the increased demand for Nile perch by fish processing plants since this is the main target species of long-line fishery.

The increase in the number of fishing gears in the lake provides additional evidence of increases in fishing effort and this needed to be controlled.

There were, however, still a large number of illegal mesh sizes of gill nets ranging from 2.5 inches to 4.5 inches, which need to be removed from the lake. Although the number of beach seines was reported to have decreased in some parts of the lake, especially in Kenya, there were still a large number of illegal beach seines in the lake. Specific efforts should be made to remove illegal sizes of gill nets from the lake. Efforts to remove beach seines should be enhanced especially in Uganda and Tanzania. The Republic of Kenya is commended for drastic reductions in number of beach seines and encouraged to totally eliminate them.
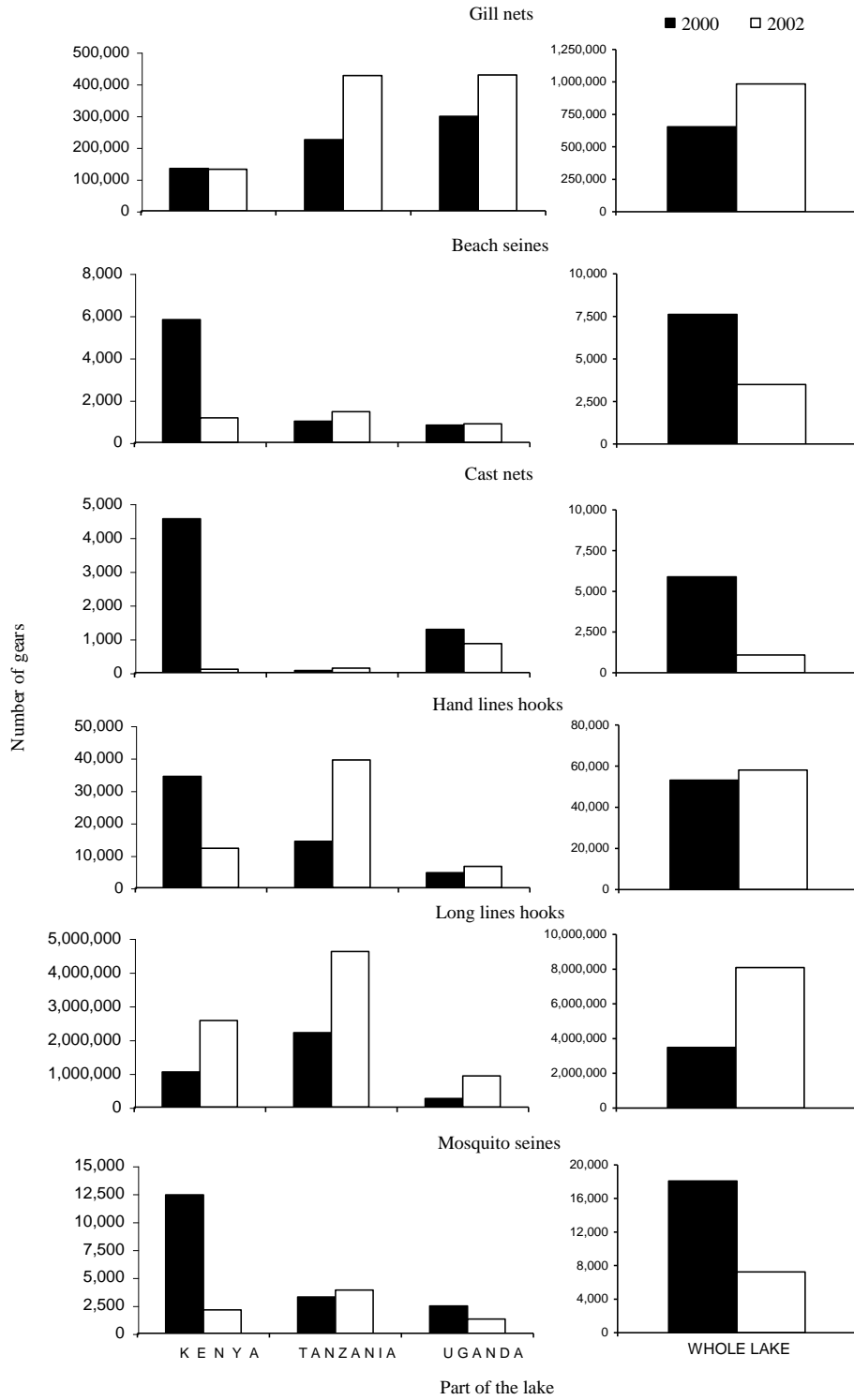
Figure 6. The numbers of the main fishing gears used in Lake Victoria in 2000 and 2002
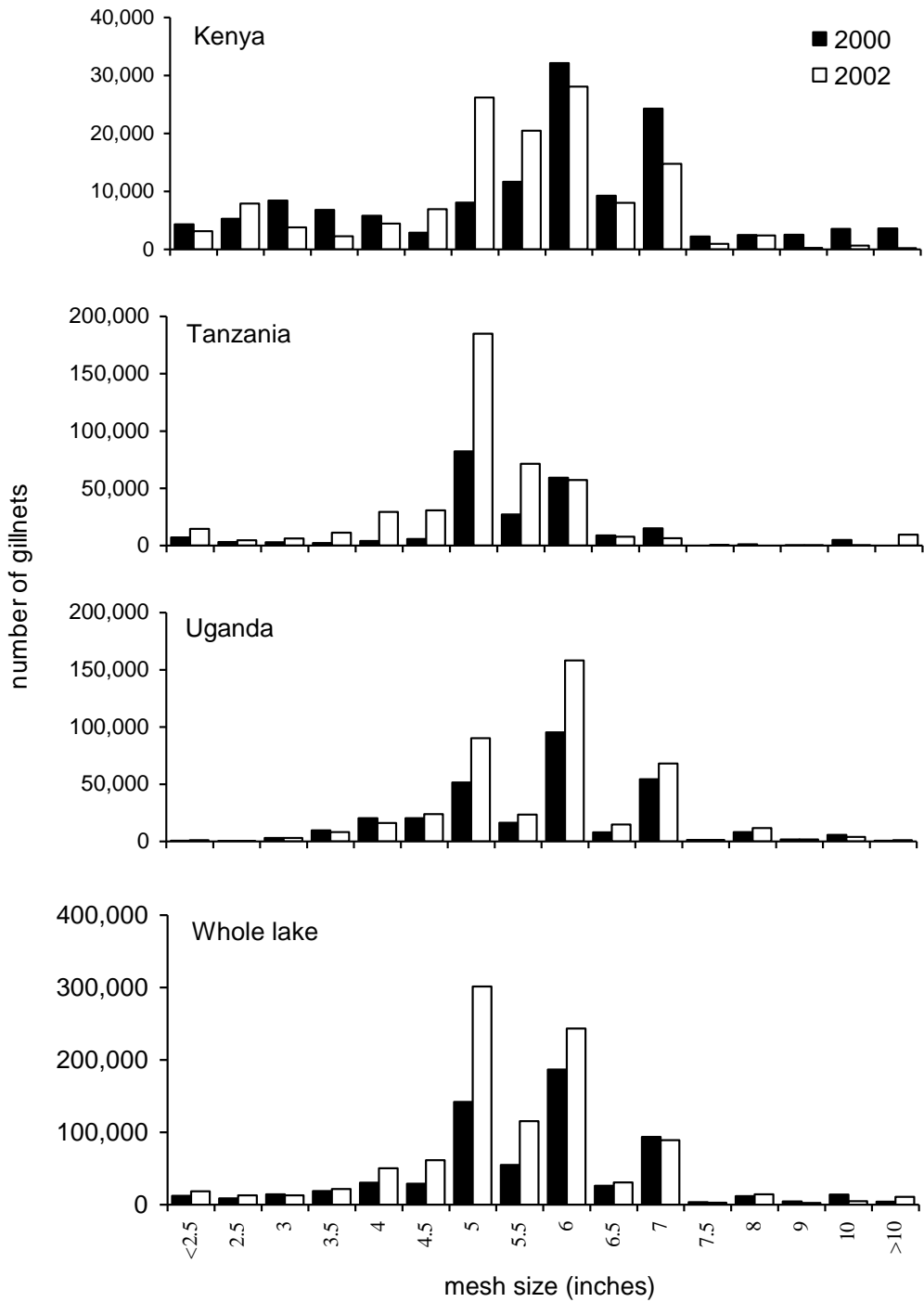
Figure 7. The gillnet mesh size composition by country in 2000 and 2002 Frame surveys of Lake Victoria

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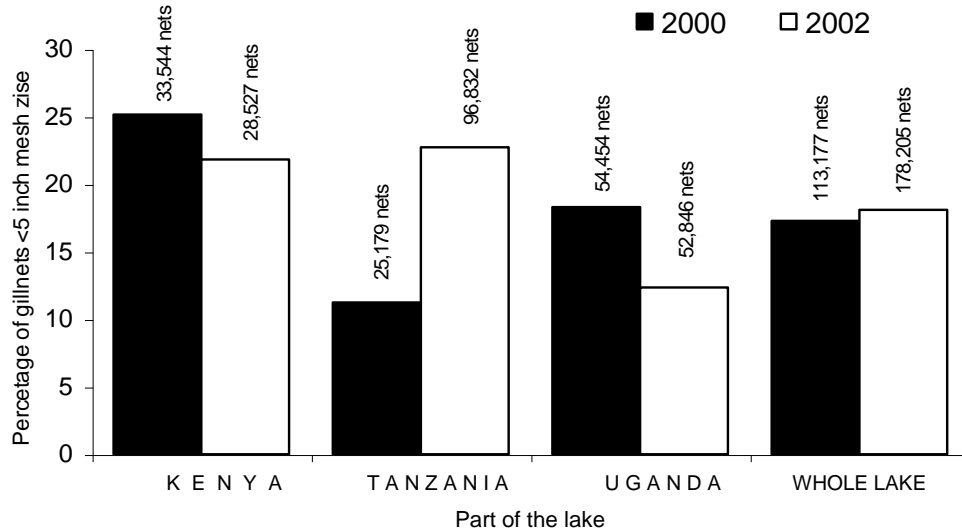
Figure 8. The percentage of undersize gillnets mesh sizes (<5 inch) in Lake Victoria in 2000 and 2002

Conclusions and Recommendations

The frame surveys carried out on Lake Victoria in 2000 and 2002 show that:

a) The number of fisheries officers did not match the landing sites with each fisheries officer expected to man at least three landing sites. In order to achieve effective supervision the number of fisheries officers should be increased or alternatives developed through promotion of BMUs.

b) There are inadequate facilities servicing the fisheries sector at the fish landings and deliberate efforts should be made to improve them.

c) The number of fishers, fishing crafts, and fishing gears on the lake increased drastically from the year 2000 to 2002. This is an indication of increase in fishing effort. The implication of the increase in fishing effort on the fish stocks should be assessed and appropriate measures taken.

d) There were still a large number of illegal mesh sizes of gill nets ranging from 2.5 inches to 4.5 inches, and illegal beach seines on the lake. Specific efforts should be made to remove illegal sizes of gill nets and beach seines from the lake.

Issues For Consideration During The 2004 Frame Survey

The following issues should be considered in planning for the 2004 Frame Survey:

a) Definitions of terms on the questionnaire should be clarified
b) The number of BMUs on the lake should be evaluated
c) The mesh sizes of mosquito nets used to catch *Mukene* should be indicated
d) Monofilament nests should be captured during the 2004 survey.

Acknowledgements

This paper is based on earlier reports of the frame surveys and the authors are grateful to the following institutions for their role in the two surveys. GEF/World Bank through LVEMP and European Union through LVFRP for providing funds for the surveys; The LVFO for coordinating the survey; The departments of fisheries management and those of fisheries research in Partner States especially the National and Regional Task Forces on frame survey for organising and conducting the surveys, analysing the data and preparing the initial reports; and The fishing community for mobilization, publicity, enumeration and provision of essential data and information.

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Tumwebaze, R. & Coenen, E.J. (1991). Report on the Frame Survey conducted in the Ugandan part of Lake Victoria 3rd September – 20th December 1990. FISIN STAT DOC No. 22. FAO/UNDP UGA/87/007. 143 pp

Table 1a. Summary of the 2000 and 2002 Lake Victoria fisheries frame surveys (beach facilities and crafts). In brackets are percentage decreases.

I T E M		C O U N T R Y						T O T A L		Variance
		K E N Y A		T A N Z A N I A		U G A N D A				in the two
		2000	2002	2000	2002	2000	2002	2000	2002	surveys (%)
LANDINGS	Number of Landing Sites	297	306	598	594	597	552	1,492	1,452	(2.7)
FACILITIES	Bandas	80	72	30	28	56	33	166	133	(19.9)
	Cold Rooms (Working)	1	0	2	6	7	4	10	10	0.0
	Cold Rooms (Non working)	1	2	0	27		1	1	30	2,900.0
	Pontoon/Jetty	9	5	32	31	34	5	75	41	(45.3)
	Fish Stores	16	12	14	24	78	6	108	42	(60.7)
	Potable Water	-	29	-	1	-	21	-	51	-
	Toilet Facilities	-	150	-	20	-	95	-	265	-
	All Weather Roads	60	102	137	189	138	108	335	399	19.1
	Boat Repair Facilities	51	0	224	323	221	40	496	363	(26.8)
	Net Repair Facilities	51	0	248	332	181	23	480	355	(26.0)
	Electricity Supply	29	15	20	35	16	10	65	60	(7.7)
FISHERIES STAFF	Fisheries Staff (Presence)	280	288	65	52	70	165	415	505	21.7
	Fisheries Staff (Residency)		22		2		18	0	42	-
FISHERMEN	Number of fishers	38,431	54,163	55,985	80,053	34,889	41,674	129,305	175,890	36.0
FISHING CRAFTS	Number of fishing vessels	11,505	12,209	15,434	21,658	15,544	18,612	42,483	52,479	23.5
PROPULSION	Number of outboard engines	626	692	1,451	2,611	2,031	3,250	4,108	6,553	59.5
	Number of inboard engines	15	0	75	0	0	0	90	0	(100.0)
	No.of boats with paddles	7,561	6,820	11,623	14,638	12,848	14,262	32,032	35,720	11.5
	No.of boats with sails	3,313	4,697	2,326	3,909	665	1,074	6,304	9,680	53.6
BOAT TYPES	Dugout	3	29	694	373	269	164	966	566	(41.4)
	Parachute	1,501	1,966	69	295	5,342	5,580	6,912	7,841	13.4
	Sesse flat at one end	951	1,625	2,068	3,856	8,107	10,666	11,126	16,147	45.1
	Sesse pointed at both ends	7,903	8,499	12,659	16,552	1,797	2,197	22,359	27,248	21.9
	Other (rafts, foot fishers etc)	1,127	90	-	582	29	2	1,156	674	(41.7)
TRANSPORT BOATS	Transport boats	409	508	639	1,082	910	790	1,958	2,380	21.6
DERELICT BOATS	Derelict boats	1,876	2,467	2,812	3,458	2,777	3,278	7,465	9,203	23.3

Table 1b. Summary of the 2000 and 2002 Lake Victoria fisheries frame surveys (fishing gears). In brackets are percentage decreases.

I T E M		C O U N T R Y						T O T A L		Variance in the two surveys (%)
		K E N Y A		T A N Z A N I A		U G A N D A				
		2000	2002	2000	2002	2000	2002	2000	2002	
GILL NETS (mesh sizes in inches)	<2.5	4,313	3,123	7,095	14,563	675	1,013	12,083	18,699	54.8
	2.5	5,266	7,907	3,123	4,614	321	345	8,710	12,866	47.7
	3	8,412	3,817	2,936	6,159	3,014	3,090	14,362	13,066	(9.0)
	3.5	6,826	2,262	2,300	11,305	9,646	8,168	18,772	21,735	15.8
	4	5,825	4,475	4,074	29,475	20,366	16,244	30,265	50,194	65.8
	4.5	2,902	6,943	5,651	30,716	20,432	23,986	28,985	61,645	112.7
	5	8,085	26,194	82,290	184,943	51,479	90,298	141,854	301,435	112.5
	5.5	11,677	20,501	27,089	71,347	16,294	23,448	55,060	115,296	109.4
	6	32,147	28,096	59,326	57,274	95,302	158,128	186,775	243,498	30.4
	6.5	9,249	8,039	8,804	7,834	8,067	14,759	26,120	30,632	17.3
	7	24,293	14,779	15,123	6,343	54,459	68,069	93,875	89,191	(5.0)
	7.5	2,226	981	0	530	1,398	1,285	3,624	2,796	(22.8)
	8	2,501	2,420	1,139	21	8,100	11,725	11,740	14,166	20.7
	9	2,513	264	198	296	1,776	1,729	4,487	2,289	(49.0)
	10	3,527	669	4,877	198	5,709	4,011	14,113	4,878	(65.4)
	>10	3,603	238	0	270	625	1,190	4,228	1,698	(59.8)
Total gill nets		133,365	130,708	224,025	425,888	297,663	427,488	655,053	984,084	50.2
OTHER GEARS	Beach seines	5,803	1,157	999	1,454	811	880	7,613	3,491	(54.1)
	Scoop nets	0	12	809	812	0	555	809	1,379	70.5
	Dagaa seines	0	0	22	969	0	20	22	989	4,395.5
	Cast nets	4,548	102	63	135	1,276	858	5,887	1,095	(81.4)
	Lift nets	0	11	315	130	0	3	315	144	(54.3)
	Number of hand line hooks	34,313	12,172	14,307	39,404	4,585	6,547	53,205	58,123	9.2
	Number of long line hooks	1,039,893	2,562,066	2,201,901	4,608,998	254,453	926,959	3,496,247	8,098,023	131.6
	Number of traps	3,179	2,311	2,584	1,030	11,349	5,781	17,112	9,122	(46.7)
	Mosquito nets	12,387	2,097	3,251	3,874	2,452	1,276	18,090	7,247	(59.9)
	Others (Unspecified)**	1,649	2,539	0	46	71	266	1,720	2,851	65.8

** The majority of unspecified fishing gears were dominated by drift gillnets in Kenya and monofilamet gillnets in Uganda.