NATIONAL FISHERIES RESOURCES RESEARCH INSTITUTE (NAFIRRI)

THEME 3:
ENHANCING INTEGRATED MANAGEMENT OF NATURAL RESOURCES

PROJECT:
GENERATION OF KNOWLEDGE AND TECHNOLOGIES THAT ENSURE SUSTAINABLE USTILISATION OF FISH STOCKS (CAPTURE FISHERIES) ON LAKES KYOGA, KWANIA, BISINA, ALBERT AND ALBERT NILE.

ARTP II

Report of frame survey of the kyoga basin lakes 2002

THEME 3: Enhancing Integrated Management of Natural Resources

PROJECT: Generation of Knowledge and Technologies that Ensure Sustainable Utilization of Fish Stocks (Capture Fisheries) on Lakes Kyoga, Kwania, Bisina, Albert And Albert Nile.

PROJECT LEADER: J.R. Kamanyi
Principal Research Officer, NAFIRRI.

Back ground

The project objective is to generate, package, and disseminate information/technologies/methods and policy advice for increasing and sustaining Fisheries resources and development of options for optimizing socio-economic benefits from the aquatic systems. The activities were to be conducted on Lakes Kyoga, Kwania, Bisina, Albert and Albert Nile. However due to limited funds, work was not extended to Lake Albert, Albert Nile.

There are six studies/experiments/activities in the project namely:

1. Population characteristics of fish stocks (composition, distribution, abundance and population structure).
2. Estimation of fish biomass
3. Fish catch assessment (catch rates) and estimation of annual commercial catch
4. age estimation of the major commercial fish species
5. Lake Kyoga and Kwania Frame survey data analysis (ILM 2002)
6. Packaging and dissemination of information

STUDY TITLE: Analysis of Frame survey data collected by ILM in 2002 on lakes Kyoga and Kwania and Bisina.

STUDY LEADER: Levi I. Muhoozi
Senior Research Officer, NAFIRRI.

INTRODUCTION:

A comprehensive Frame survey was carried out in lakes Kwania, Kyoga and the Kyoga basin minor lakes which include Lake Bisina in 2002 (Figure 1). The Frame survey was coordinated by the Department of Fisheries Resources (DFR) assisted by the National Fisheries Resources Research Institute (NAFIRRI) with technical support. The riparian districts through the sub-county fisheries offices and the BMUs provided the enumerators and supervisors. The frame survey captured all the important characteristics of the fisheries and facilities supporting the fisheries and thus provides a strong baseline for future reference of management interventions in the basin.

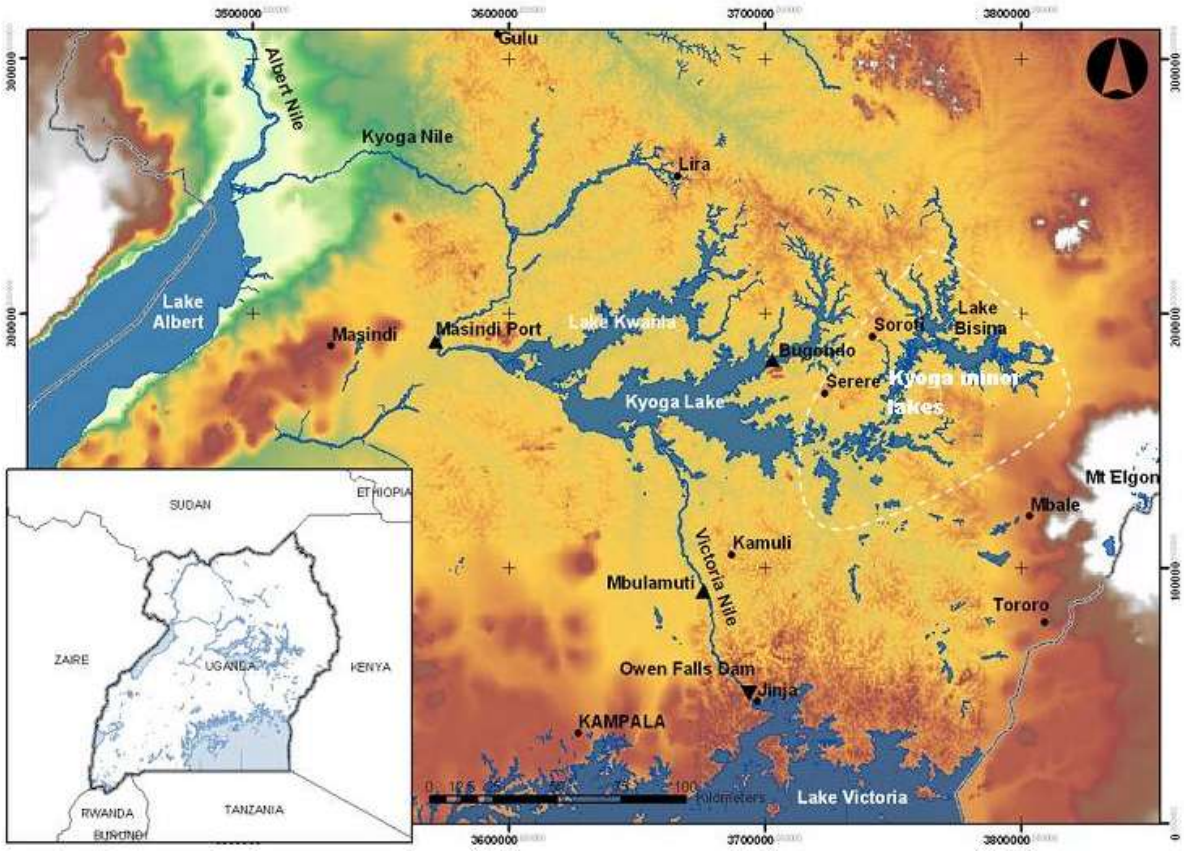

Figure 1. The location of the Kyoga basin lakes

There was inadequate provision for handling and analysis of the large data sets immediately after the Frame survey. However, in view of the importance of the information in these data, NAFIRRI sought to intervene through ARTP II funding and have the data input and analysed. Thus through ARTP II funding the raw data files were obtained from DFR, input and analysed. This report is one of the final stages of this process.

The data sets captured did not show the lake on which the data were collected. This was a major drawback during data analysis because the Kyoga basin has many lakes. To overcome this constraint, secondary data on lake location of landing sites was collected from the riparian districts. This helped to distinguish clearly between landing sites located on lakes Kwania and Kyoga. However, it was not possible to segregate the minor lakes completely and they are treated as one block in this report. Future surveys in the basin should distinguish between the different water bodies to avoid a repeat of this confusion.

Below are details of the generic objectives pursued in undertaking the Frame surveys which were also pursued by the survey under report, the methodology and procedures followed in the survey and the results from the analysis undertaken by NAFIRRI.

Objective of the Frame Surveys

The overall objective of the Frame Surveys was to provide information on the facilities and services at landing sites and the composition, magnitude and distribution of fishing effort to guide development and management of the fisheries resources of the Kyoga basin lakes.

The specific objectives were to provide information on:

a) The number of fish landing sites;
b) The facilities available at the fish landing sites to service the sector including accessibility;
c) The service providers especially fisheries staff at fish landing sites
d) The number of fishers;
e) The number and types of fishing crafts and their mode of propulsion;
f) The number,types and sizes of fishing gears used on the lake and their mode of operation.

Expected Outputs

The outputs expected from the frame surveys are as follows:

a) Information on the number of fish landing sites on the basin lakes;
b) Information on the facilities available at the fish landing sites to service the fisheries sector ;
c) Information on the number of fishers;
d) Information on the number and types of fishing crafts;
e) Information on the modes of propulsion of the fishing crafts;
f) Information on the number types and sizes of fishing gears including the number of illegal fishing gears in the fishery; and
g) Recommendations on development and management of the fisheries of the Kyoga basin lakes.

METHODOLOGY

Preparation and Conducting of the Frame Survey

The frame survey covered Lakes Kwania, Kyoga and the Kyoga minor lakes. It involved a complete enumeration (count) of all landing sites and the facilities available, fishers, fishing crafts and fishing gears by type and size. The Frame survey was conducted with support and coordination of the Integrated Lake Management (ILM) project. The Department of Fisheries Resources (DFR) and the National Fisheries Resources Research Institute (NAFIRRI) provided the technical support. The riparian districts through the sub-county fisheries offices and the BMUs provided the enumerators and supervisors.

Before conducting the survey, supervisors and enumerators were identified among the key stakeholders including BMUs. Training session was conducted for the field supervisors and enumerators in each district using standard field guides.

The DFOs were senior supervisors at the district level and sub county FOs were supervisors located at the lower administrative units. Each supervisor was in charge of several enumerators at the BMU level

Data Capture

The Enumerators collected the data by filling the Frame Survey Recording Form (Annex 1) that included Details of the Operational Fishing Crafts and Gears.
The information recorded on the landing site facilities included availability of a fish shade (banda), cold rooms, pontoon or jetty, fish store, electricity supply, toilets, potable water, facilities for repair of boats and nets, presence of resident fisheries staff and availability of nearby fish market.

The information recorded on crafts (crafts) included both fishing and non fishing crafts. The craft categories includes: operational fishing crafts that were actively fishing; derelict crafts that were damaged and not operational; and Transport crafts that were used to transport fish and other purposes. The craft types were classified in four categories namely: Sesse; Parachute, Dugout, and Others, where other referred to any craft that was not covered by the first three categories. The length of individual crafts was recorded in metres. The method of propulsion of the craft, i.e. Inboard motor, outboard motor, Paddles and sails, and the number of crew of each craft were also recorded.

The type and size of fishing gear, which included Gillnets, Small seines used for Mukene, Long line hooks, Boat/beach seines, Cast nets, Monofilament nets, Traps and Others (not classified in the above categories) were recorded. The main fish species targeted by the fishing craft and gear were also recorded.

3. DATA ENTRY, STORAGE AND ANALYSIS

The field data forms were collected by the supervisors who compiled returns to ILM. The raw data forms were later submitted to the Department of Fisheries Resources (DFR) for analysis. Due to difficulties in securing funding to support data input, analysis and reporting, DFR was unable to finalise the process. In April 2006 NAFIRRI, through NARO-ARTPII funding, worked closely with DFR in carrying out the above activity to conclusion.

5. RESULTS

The findings of the Frame Survey of the Kyoga basin lakes in 2002 are summarized in Table 1.

5.1. Landing Sites

A total of 378 landing sites were recorded in all the Kyoga basin lakes, out of which 76 were on Lake Kwania, 213 on Lake Kyoga and 89 on the numerous Kyoga minor lakes.

5.2. 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. The facilities at the landing sites were quite inadequate.

On Lake Kwania, none of the landing sites had a fish shade, cold room, Jetty, permanent fish store and a facility designated for net repair. Only 9 (12%) landing sites had temporary fish stores; 1 (1%) had electricity; 6 (8%) had public toilets; 2 (3%) had a designated boat repair area; 9 (12%) were accessible by all weather roads; 10 (13%) had portable water; and 17 (22%) had a fisheries office. Also 13 (17%) of the landing sites on Kwania were temporary, i.e. operating for less than 5 months in a year.

On Lake Kyoga main, only 5 (2%) of the landing sites had *bandas*, and 3 (1%) had Jetties. No landing site on Kyoga main had a cold room or a permanent fish store and only 14 (7%) had temporary fish stores. The Electricity supply was at 2 (1%) landing sites; 19 (9%) had public toilets 30 (14%) had portable water; 39 (18%) were accessible by all weather roads; and 17 (22%) had a fisheries office. Also, a total of 17 (8%) landing sites on Kyoga were temporary, i.e. operating for less than 5 months in a year.

Table 1. Summary of results of the Frame survey of the Kyoga basin lakes in 2002

	Lake Kwania			**Lake Kyoga**							**Other Kyoga basin lakes**				**All lakes**
	Apac	Lira	**Total**	Kaberamaido	Kamuli	Kayunga	Lira	Nakasongola	Soroti	**Total**	Kamuli	Kumi	Pallisa	Total	**TOTAL**
Landing sites	42	34	**76**	30	46	9	27	31	70	**213**	19	52	18	**89**	**378**
Total number of crafts	2,032	547	**2,579**	686	987	343	902	1,370	1,202	**5,490**	501	861	304	**1,666**	**9,735**
Delelict crafts	258	88	**346**	86	167	78	181	366	197	**1,075**	57	115	58	**230**	**1,651**
Transport crafts (non fishing)	87	33	**120**	7	46	2	18	10	14	**97**	3	23	13	**39**	**256**
Fishing crafts using engine	2	2	**4**	9	-	3	1	23	-	**36**	-	-	-	**-**	**40**
Fishing crafts using paddles	1,713	427	**2,140**	590	773	260	690	975	987	**4,275**	441	722	238	**1,401**	**7,816**
Fishing crafts using sails	-	2	**2**	-	-	-	2	-	3	**5**	-	-	-	**-**	**7**
Total Number of fishing crafts	1,715	431	2,146	599	773	263	693	998	990	4,316	441	722	238	1,401	**7,863**
Number of crew	3,605	1,046	**4,651**	1,145	1,349	514	1,310	1,629	1,967	**7,914**	926	935	467	**2,328**	**14,893**
Fishing craft types															
Dugout	23	14	**37**	117	82	-	1	2	111	**313**	48	524	67	**639**	**989**
Parachute	864	2	**866**	158	396	152	246	724	467	**2,143**	393	198	171	**762**	**3,771**
Sesse	825	415	**1,240**	324	287	111	446	272	412	**1,852**	-	-	-	**-**	**3,092**
Other crafts	3	-	**3**	-	8	-	-	-	-	**8**	-	-	-	**-**	**11**
Facilities at landing sites															
Fish shade	-	-	**-**	1	-	1	-	1	2	**5**	-	-	-	**-**	**5**
Cold room	-	-	**-**	-	-	-	-	-	-	**-**	-	-	-	**-**	**-**
Jetty	-	-	**-**	1	-	-	1	1	-	**3**	-	-	-	**-**	**3**
Permanent fish store		-	**-**	-	-	-	-	-	-	**-**	-	-	-	**-**	**-**
Temporary fish store	6	3	**9**	1	-	2	5	5	1	**14**	-	7	1	**8**	**31**

	Lake Kwania			**Lake Kyoga**							**Other Kyoga basin lakes**					**All lakes**
	Apac	Lira	**Total**	Kaberamaido	Kamuli	Kayunga	Lira	Nakasongola	Soroti	**Total**	Kamuli	Kumi	Pallisa	Total		**TOTAL**
Electricity supply	-	1	**1**	1	-	-	-	1	-	**2**	-	3	-	**3**		**6**
Public toilet	3	3	**6**	3	3	-	5	6	2	**19**	1	2	2	**5**		**30**
Net repair facility	-	-	**-**	-	-	2	3	2	-	**7**	-	-	-	**-**		**7**
Boat repair facility	1	1	**2**	-	-	-	6	3	3	**12**	1	-	3	**4**		**18**
All weather road	5	4	**9**	5	3	-	3	17	11	**39**	-	6	11	**17**		**65**
Portable water	3	7	**10**	2	10	-	6	10	2	**30**	3	1	2	**6**		**46**
Fisheries staff resident (Office)	7	10	**17**	-	2	1	11	5	2	**21**	-	-	2	**2**		**40**
Beach use less 5 months (temporary)	8	5	**13**	2	3	-	2	3	7	**17**	3	6	7	**16**		**46**
Number of Gillnets																
GN < 2½"	96	230	**326**	-	3	-	87	-	66	**156**	26	906	91	**1,023**		**1,505**
GN 2½"	392	335	**727**	562	35	-	196	15	1,034	**1,842**	20	1,536	136	**1,692**		**4,261**
GN 3"	536	28	**564**	130	89	-	343	13	326	**901**	68	1,177	219	**1,464**		**2,929**
GN 3½"	481	18	**499**	61	30	-	229	130	361	**811**	32	1,345	12	**1,389**		**2,699**
GN 4"	955	201	**1,156**	189	164	-	388	103	781	**1,625**	1,652	415	184	**2,251**		**5,032**
GN 4½"	698	215	**913**	200	161	38	193	112	864	**1,568**	3,234	477	1,495	**5,206**		**7,687**
Gillnet <5" mesh size	**3,158**	**1,027**	**4,185**	**1,142**	**482**	**38**	**1,436**	**373**	**3,432**	**6,903**	**5,032**	**5,856**	**2,137**	**13,025**	#	**24,113**
GN 5"	1,265	161	**1,426**	234	1,335	1,472	392	845	872	**5,150**	531	155	346	**1,032**		**7,608**
GN 5½"	2,419	45	**2,464**	25	493	215	129	1,142	31	**2,035**	10	15	-	**25**		**4,524**
GN 6"	4,151	179	**4,330**	988	2,821	648	1,058	4,124	1,724	**11,363**	19	5	-	**24**		**15,717**
GN 6½"	1,248	60	**1,308**	14	146	36	72	355	8	**631**	-	-	-	**-**		**1,939**
GN 7"	450	75	**525**	828	897	1,262	1,094	117	1,943	**6,141**	75	-	-	**75**		**6,741**
GN 7½"	-	-	**-**	-	19	-	-	-	31	**50**	-	-	-	**-**		**50**
GN 8"	-	34	**34**	91	137	318	234	96	464	**1,340**	83	-	-	**83**		**1,457**
GN 9"	190	6	**196**	10	11	7	19	-	-	**47**	13	-	-	**13**		**256**
GN 10"	190	-	**190**	-	21	40	40	29	20	**150**	130	-	-	**130**		**470**

	Lake Kwania				**Lake Kyoga**								**Other Kyoga basin lakes**					**All lakes**
	Apac	Lira	**Total**		Kaberamaido	Kamuli	Kayunga	Lira	Nakasongola	Soroti	**Total**		Kamuli	Kumi	Pallisa	Total		**TOTAL**
GN >10"	155	-	**155**		-	-	30	-	12	-	**42**		-	230	-	**230**		**427**
Gillnets ≥5" mesh size	**10,068**	**560**	**10,628**		**2,190**	**5,880**	**4,028**	**3,038**	**6,720**	**5,093**	**26,949**		**861**	**405**	**346**	**1,612**		**39,189**
Total No. gillnets	**13,226**	**1,587**	**14,813**		**3,332**	**6,362**	**4,066**	**4,474**	**7,093**	**8,525**	**33,852**		**5,893**	**6,261**	**2,483**	**14,637**		**63,302**
No. of other gears																		
Long line (No. hooks)	26,160	913	**27,073**		4,718	5,166	4,672	989	13,817	13,070	**42,432**		3,683	86,495	7,368	**97,546**		**167,051**
Beach/boat seines	346	169	**515**		119	19	7	88	48	188	**469**		8	2	11	**21**		**1,005**
Cast net	65	5	**70**		6	1	3	10	23	4	**47**		39	-	8	**47**		**164**
Hand lines	262	108	**370**		613	189	4	45	119	40	**1,010**		80	128	12	**220**		**1,600**
Traps	3,075	-	**3,075**		1,113	87	12	235	1,145	1,473	**4,065**		326	182	-	**508**		**7,648**
Mosquito seines	32	51	**83**		85	179	-	142	-	123	**529**		-	-	-	**-**		**612**
Scoop nets	-	-	**-**		-	-	-	-	6	-	**-**		-	-	-	**-**		**6**
Drift nets	1,281	966	**2,247**		-	571	-	210	1,264	-	**2,045**		-	-	-	**-**		**4,292**
OTHERS	454	3	**457**		1	11	3	38	60	-	**113**		1	55	-	**56**		**626**

5.3. Number of Fishers

The total number of fishers operating on the Kyoga basin lakes was 14,893 distributed as follows: Lake Kyoga main, 7,914 (53%); Lake Kwania, 4,651 (31%) and Kyoga minor lakes 2,328 (16%) (Figure 2).

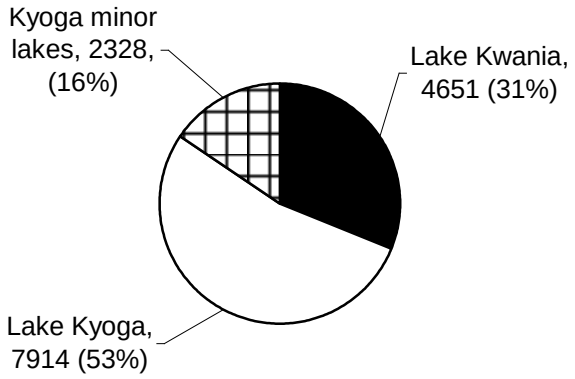

Figure 2. The distribution of fishers in the Kyoga basin lakes in 2002.

5.4. Fishing Crafts

The total number of fishing crafts operating on the Kyoga basin lakes were 9,735, distributed as follows: Lake Kyoga, 4,316 (55%); Lake Kwania 2,146 (27%) and Kyoga minor lakes 1,401 (18%) (Figure 3).

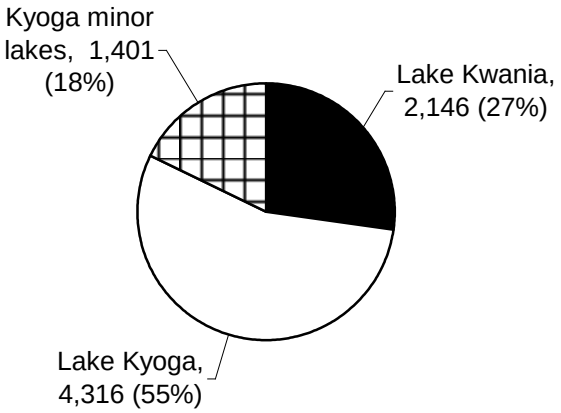

Figure 3. The distribution of fishing crafts in the Kyoga basin lakes in 2002.

The fishing crafts in lakes Kwania and Kyoga were dominated by Sesse boats which constituted 58% and 48% of the crafts in the two lakes respectively (Figure 4). The parachute boats (*bawo tatu*) were the second most important fishing craft contributing 40% and 50% of the fishing crafts in the two lakes respectively. The dugout boats contributed only 2 % of fishing crafts in Lake Kwania and 7% in Lake Kyoga. In the Kyoga minor lakes, no Sesse boat was reported. Out of the 1,401 fishing crafts operating there, 762 (54%) were Parachute boats and 639 (46%) were dugout boats.

The distribution of fishing craft types is influenced by the stability requirements, manoeuvrability and the capacity to carry the right quantities of fishing gears carried for the fishing operations in the different waters bodies. The Sesse boats are the most stable and can be constructed to the size required for particular fishing operations. This explains the large proportion of these boats in lakes Kwania and Kyoga which have large expanses of open waters compared with the minor lakes. On the other hand, the small unstable Parachute and dugout boats are easy to manoeuvre in the shallow and often vegetated waters, which are a common feature of the Kyoga minor lakes.

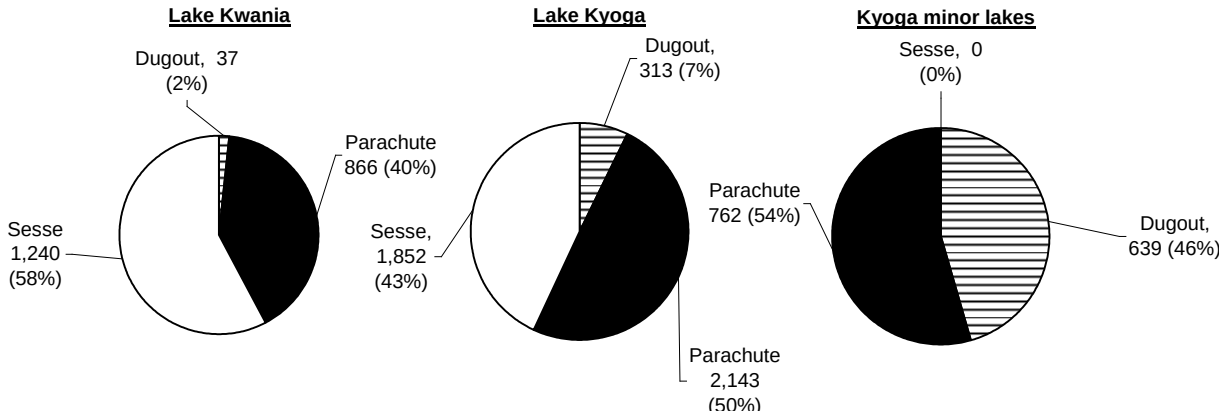

Figure 4. The distribution of fishing crafts by craft type in the Kyoga basin lakes in 2002.

In Lake Kwania, the majority of fishing crafts (80%) were landing in Apac district and the rest (20%) in Lira district (Figure 5). In Lake Kyoga, Nakasongola district had the largest number of fishing crafts, 998 (23%) followed by Sororti 990 (23%), Kamuli 773 (18%), Lira 693 (16%) and Kaberamaido 599 (14%). Kayunga had the least number of fishing crafts on Lake kyoga, i.e. 263 (6%). In the Kyoga minor lakes, Kumi district had the largest share of fishing crafts i.e. 722 (52%) compared with 441 (31%) in Kamuli and 238 (17%) in Pallisa.

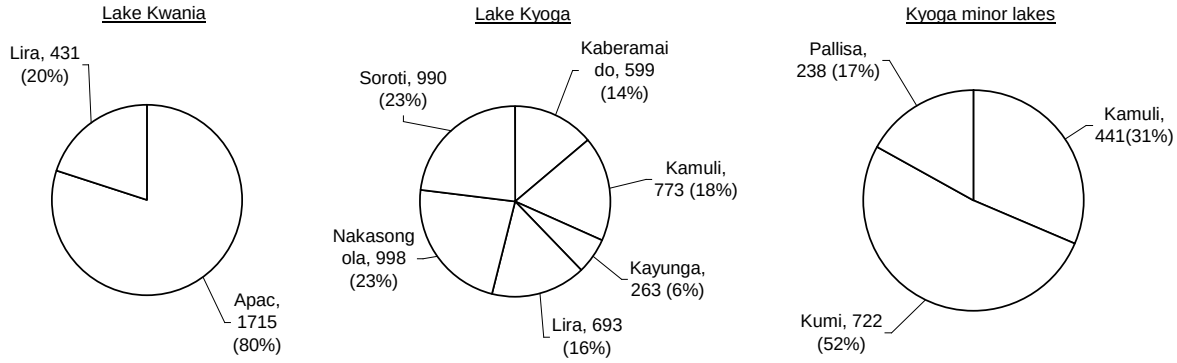

Figure 5. The distribution of fishing crafts by district in the Kyoga basin lakes in 2002.

5.5. Fishing Gears

The fishing gears recorded in the Frame survey included gillnets, long line hooks, beach/boat seines, cast nets, hand lines, traps, mosquito nets for mukene, and scoop nets.

5.5.1. Gill nets

A total of 63,302 gillnets were recorded in all the Kyoga basin lakes distributed as follows: 14,813 (23.4%) in Lake Kwania, 33,852 (53.5%) in Lake Kyoga and 14,637 (23.1%) in the Kyoga minor lakes. The undersized gillnets (< 5 inch mesh size) predominantly used in the minor lakes compare with lakes Kwania and Kyoga where the main mesh sizes in use were ≥5 inch (Figure 6). The size structure of the fish stock of the Kyoga minor lakes should be assessed to ascertain whether the 5 inch mesh size applied in the larger water bodies is also applicable to them.

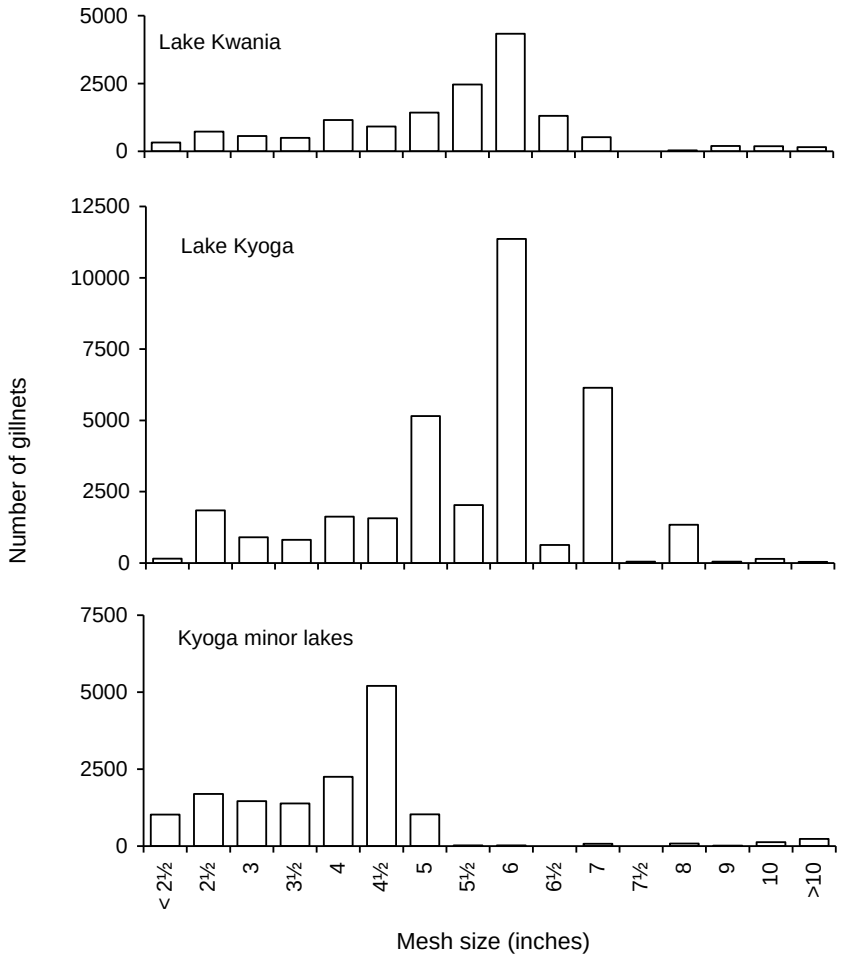

Figure 6. The distribution of gillnet mesh sizes by lake in the Kyoga basin lakes in 2002.

5.5.2 Beach seines

The beach/boat seines, which are illegal in all Ugandan water bodies, were quite common in the Kyoga basin lakes. Lake Kwania, with 515 (51%) had the highest number of beach/boat seines, followed by Lake Kyoga 469 (47%) and 21 (2%) in the Kyoga minor lakes (Figure 7). The highest number of beach/boat seines (346) was recorded in Apac district, followed by Lira (257), Sororti (188) and Kaberamaido (119). There is need for deliberate efforts to remove these illegal gears from the lake.

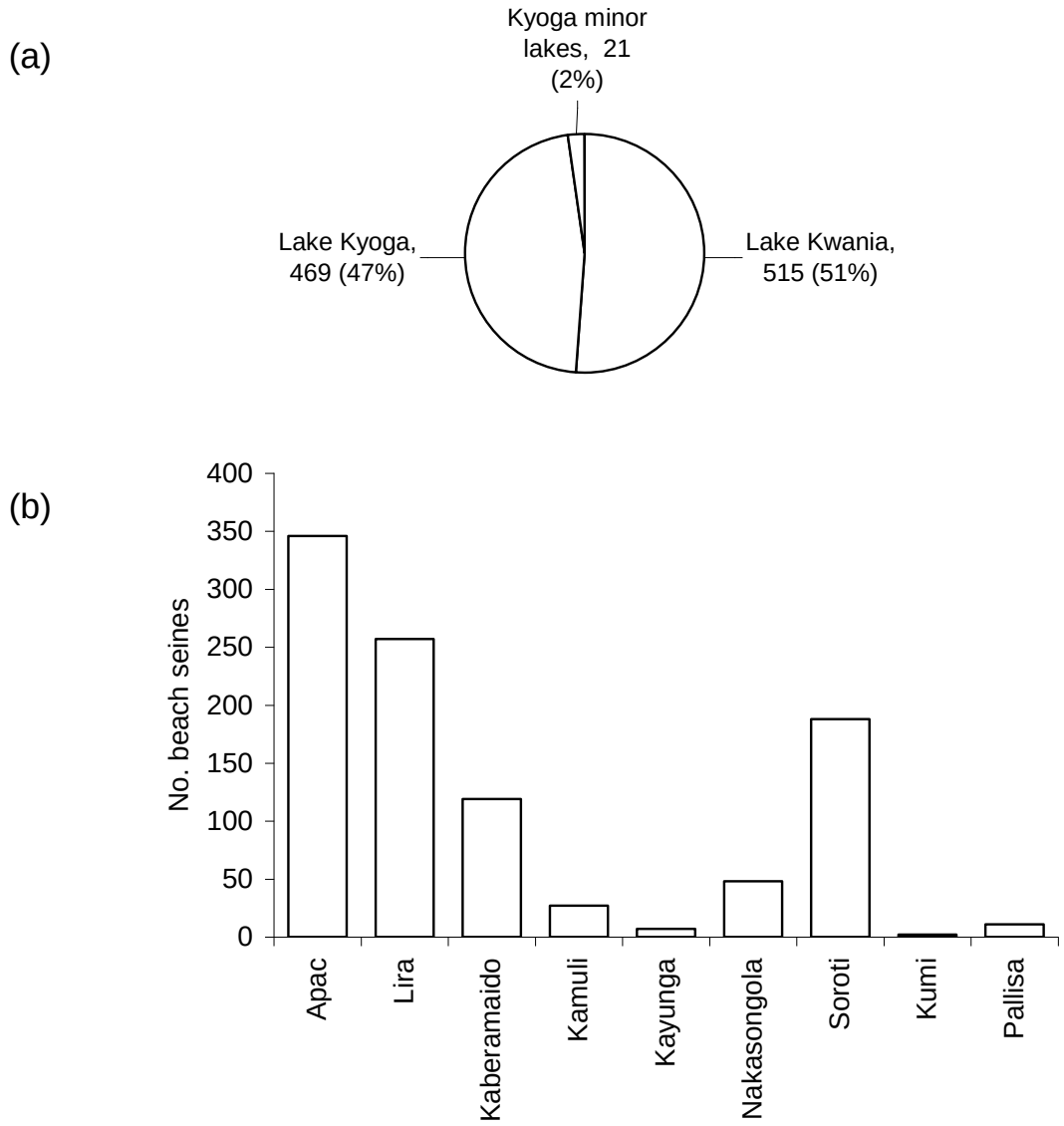

Figure 7. The distribution of beach/boat seines by (a) lake and (b) district in the Kyoga basin lakes in 2002.

5.5.3 Hooks

Hooks were quite an important gear in all the lakes but were most common in the minor lakes. Out of 167,051 hooks in the long line fishery, 97,546 (59%) were in the minor lakes, 42,432 (25%) in Lake Kyoga and 27,073 (16%) in Lake Kwania. In the minor lakes, the long line hooks were mainly used to target *Protopterus* spp. A total of 1,600 hand line hooks were also recorded in the Kyoga basin lakes.

5.5.4 Mukene gears

Mukene is fished with both Mosquito seines and Scoop nets. This fishery did not exist in the Kyoga minor lakes but was mainly on Lake Kyoga where 529 (86%) mosquito seines were recorded. Lake Kwania had only 83(14%) of the mosquito seines. The Mukene fishery was predominantly in Lira, Kamuli, Soroti and Apac districts and more or less absent in Kayunga and Nakasongola districts.

5.5.5 Other gears

As expected in lakes with abundant marginal vegetation including papyrus fringes, high numbers of Traps were recorded. There were 3,075 traps in Lake Kwania, 4,065 in Lake Kyoga and 508 in Kyoga minor lakes. Cast nets were not wide spread in the Kyoga basin lakes as only 164 were recorded. A large number of drift nets, i.e. 4,292 were recorded but this number is too high and doubtable. Some ordinary gillnets are likely to have been misreported as drift nets

5.6 Comparison of 2002 Frame survey results with previous surveys

Some patchy records are available from the surveys conducted in lakes Kyoga and Kwania in 1991, 1997 and 2002 (Table 2). The number of landing sites on the two lakes increased from 266 in 1997 to 289. The total number of fishing crafts operating on the two lakes increased from 4,045 in 1991 to 6501 in 1997 but decreased slightly to 6,462 in 2002. over time, there have some qualitative changes in the gear usage, e.g. the number of crafts using gillnets have been declining from 2,924 in 1991 to 2,567 in 1997 and 1,647. Conversely, the number of crafts using beach/boat seines increased from 885 in 1997 to 983 in 2002; the crafts using hooks (long line and hand lines) increased from approximately 180 in 1991 and 1997 to 976 in 2002. The number of crafts using Mukene nets increased as well as those operating traps and cast nets which were not previously recorded appeared in the fishery in 2002. This trend of diversifying from the traditionally gillnet dominated fishery to other fishing gears and methods could be a response of fishers to decline in returns from the gillnet fishery.

Table 2: Comparison of 1991, 1997 and 2002 Frame survey data for lakes Kyoga and Kwania

Parameter measured	**1991**	**1997**	**2002**
Number of landing sites		266	289
Total number of fishing crafts	4,045	6,501	6,462
Number crafts using gillnets	2,924	2,567	1,647
Number of crafts using beach/boat seines		885	983
Number of crafts using hooks	186	180	976
Number of crafts using Mukene nets		109	619
Number of crafts using basket traps	118	161	389
Number of crafts using cast nets			116

6. CONCLUSIONS AND RECOMMENDATIONS

The frame surveys carried out on the Kyoga basin lakes in 2002 went into great depth of the characteristics of the fisheries and facilities supporting the fisheries and provides a strong baseline for future reference of management interventions in basin: the results show that:

a) There is acute shortage of facilities servicing the fisheries sector at the fish landings and deliberate efforts should be made to improve them.

b) There was lack of basic sanitation facilities, especially public toilets and portable water, at most landing sites in the basin. The local leadership at BMUs, local government and Community Based Organisations should strive to provide these amenities.

c) There was a large number of illegal gillnet mesh sizes and illegal beach/boat seines on the lake. Efforts should be made to remove illegal sizes of gill nets and beach/boat seines from the lake.

d) There were indications that the fishery was shifting from the traditional use of gillnets to a diversity of other fishing gears. The driving forces to these changes and their impacts in the fishery should be evaluated.

7. ACKNOWLEDGEMENTS

The integrated Lake Management (ILM) Project provided funds for the survey; The Department of Fisheries Resources (DFR) assisted by the National Fisheries Resources Research Institute (NAFIRRI) coordinated activities of the survey and the District Fisheries Offices in the riparian districts mobilised the communities through the Beach Management Units (BMUs) and supervised enumeration. The ILM project and DFR are further thanked for availing the data sets to be analysed in NAFIRRI, which resulted in this report.