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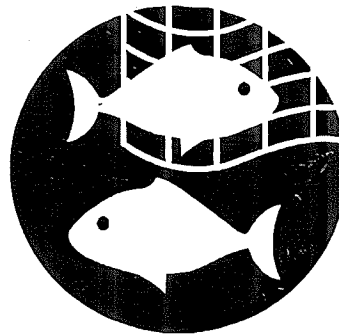
# **FRAME SURVEY OF KAINJI LAKE, NORTHERN NIGERIA, 1996**

by T.A. DU FEU and O.S. ABAYOMI

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**Nigerian-German (GTZ)  
Kainji Lake Fisheries  
Promotion Project**



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## **Acknowledgement**

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## Summary

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Since 1993, annual frame surveys have been conducted by the Nigerian-German Kainji Lake Fisheries Promotion Project to determine the distribution and number of fishing localities, fisherfolk, fishing canoes and fishing gears around Kainji Lake.

The total number of fishing localities has increased from 221 in 1993 to 286 in 1996. The fishing localities included 245 permanent fishing villages, 29 permanent fishing camps, 8 temporary fishing camps (with fishermen from Kainji Lake) and 4 temporary fishing camps (with fishermen from outside Kainji Lake area). There was an increase in the total number of fishing entrepreneurs, fishing assistants and fishing canoes over the years. A total number of 5,499 fishing entrepreneurs, 12,449 fishing assistants and 9,278 fishing canoes were recorded during the 1996 frame survey. From 1995 there was a decrease in the number of shoreline fisherfolk and a decrease in the number of transport canoes, the number of engines remained the same.

During the 1996 survey, a total number of 18,655 gill nets, 1,560 drift nets, 753 beach seines, 5,548 cast nets, 7,400 longlines and 36,979 traps were recorded. The concentration of the gears (number per km shoreline) was highest in sub strata 06 and 08. The total number of gill nets increased from 17,680 in 1995 to 18,655 in 1996. For the remaining 5 gear types a decrease in number was observed.

Despite increasing numbers of gears on the lake, of concern is the decline recorded in all the fishing methods of the number of gears owned by individual entrepreneurs. This was most notable in the gill net and longline fisheries. These two fisheries have the lowest daily catch values and coupled with the problem of gear theft on the lake, ownership in future, may be expected to fall further. The number of larger fishing units also declined as did the number of gears new entrants enter the fishery with. The decline is particularly worrying for the beach seine fishery where diversification into other fishing methods would be beneficial in light of the present ban on seines.

The group of not active fishing entrepreneurs (those who do not themselves participate in fishing activities) had the highest ownership of gears whilst the new entrants into the fishery had the lowest. There was evidence that these new entrants into the fishery were using cast nets which is worrying given the trend of using smaller mesh sizes of this gear.

## 1. Introduction

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The purpose of the annual frame survey of Kainji Lake is to monitor the size and distribution of fishing localities, fisherfolks and fishing equipment around the lake. The results are needed for the management of the fishery particularly for the projection of the total fish yield from the catch and effort sampling data.

There have been 5 frame surveys conducted on the lake prior to the start of the KLFPP (Ekwemakor, 1975). Since 1993 the project has carried out 4 surveys using standardised methods for easy comparison of the results. With the availability of 4 years data, the provisional trends of the lake fishery can be established.

## 2. Methods

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The frame survey took place between 6th to 30th of September, 1996. The survey methodology used was the same as outlined in the previous frame survey reports (du Feu, 1993; du Feu and Omorinkoba, 1994; Apeloko and du Feu, 1995). The frame survey database program was used for input and analysis of the data.

In line with the project's objective of ensuring the survey's sustainability by the counterpart institutions, attention was given to the gradual hand-over of the responsibility of the survey to the Fisheries Division of Niger and Kebbi State which border the lake. For data collection, Niger State Fisheries Division was made responsible for the southern lake basin (SS01 & SS02), Kebbi State Fisheries Division for the northern basin (SS07 & SS08) whilst NIFFR undertook the field work in the central basin (SS03, SS04, SS05 & SS06). Prior to and during field work, training was given to ADP extension agents and fisheries staff so that they can, in future, undertake the survey's field work independently.

Splitting the lake into three data collecting zones reduced the survey length and made the recording of migratory fishermen, who normally move around the lake during the survey, easier.

Where practical, survey costs were minimised by the use of motorcycle transport to the villages.

### 3. Results

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#### 3.1. Fishing Localities

A total number of 286 fishing localities were recorded giving a 5% increase from the 1995 frame survey. Since 1993 there has been a steady increase in the total number of fishing localities in all the sub strata. The exception was in 1994 when a high water level was recorded (du Feu & Omorinkoba, 1994) causing temporary fishing camps to be abandoned.

The highest number of fishing localities occurred in the eastern part of the lake, especially SS02 and SS08 (Table 1) where the terrain is suitable for settlement and fishing activities. Niger State has more fishing localities (60%) than Kebbi State (40%), which maybe attributed to its longer shoreline. Kebbi State has more permanent fishing camps than Niger, particularly SS05 (Foge Island). Where they exist the temporary fishing camps were evenly distributed between the sub strata (Table 2).

**Table 1. The number of fishing localities per stratum recorded during the 1993 - 1996 frame surveys.**

<i>Sub stratum</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>
01	27	19	34	39
02	44	50	56	53
03	41	42	50	48
04	8	8	10	12
05	15	10	16	15
06	32	23	27	27
07	17	17	22	28
08	37	48	58	64
Total	221	217	273	286

**Table 2. The number of fishing localities per settlement type by State, L.G.A. and stratum recorded during the 1996 frame survey.**

State	Settlement Type				Total 1996
	1	2	3	4	
Niger	156	13	2	0	171
Kebbi	89	16	6	4	115
<b>LGA</b>					
Agwara	42	3	0	0	45
Borgu	69	3	3	0	75
Magama	41	5	0	0	46
Ngaski	42	15	3	0	60
Yauri	50	3	3	4	60
<b>Sub stratum</b>					
01	37	1	1	0	39
02	46	5	2	0	53
03	44	4	0	0	48
04	8	2	2	0	12
05	3	12	0	0	15
06	26	1	0	0	27
07	23	1	2	2	28
08	57	3	2	2	64
<b>Total</b>	<b>244</b>	<b>29</b>	<b>9</b>	<b>4</b>	<b>286</b>

*Note: 1= permanent villages, 2= permanent fishing camps, 3= temporary fishing camps (from within Kainji Lake), 4= temporary fishing camps (from outside Kainji Lake).*

### 3.2. Fishing Entrepreneurs

The number of fishing entrepreneurs recorded in 1996 was 5,499 giving an increase of 12% since 1995<sup>1</sup>. The decline in number in 1994 and the large variation between 1994 and 1995 may be due to the high water level that year which caused the displacement of a large number of the entrepreneurs (Table 3).

A total of 780 fishermen entered the fishery, a decrease of 18% from 1995. Of these 94% were the sons of resident entrepreneurs who became entrepreneurs; the remaining were new entrants from outside the lake area. A total 116 (2%) of the fishing entrepreneurs migrated away from the fishery whilst 47 died during the year. 42 entrepreneurs were recorded as migratory fishermen originating from within the Kainji Lake area.

*The number of new migrant fishermen settling around the lake is small suggesting that the fishery is no longer attractive to outsiders. If the reverse was true and Kainji had lower catch rates than other fisheries one would expect a reverse trend with people leaving the fishery. The small number of fishermen leaving indicates that this is not the case, although the situation would have to be quite severe to prompt the indigenous fishermen to leave.*

*The number of entrepreneurs grew by 12% from 1995. Although this is high, since the mean number of gears per entrepreneur is declining, the resultant increase in fishing effort is of less concern. What is worrying is the decreased revenue per entrepreneur which results from the declining ownership in gears and catch rates. Extension messages can highlight this problem emphasising the problem caused by the increased number of sons becoming fishermen, which means that there are less fish for everyone to catch. Especially if everybody is targeting the juveniles!*

The concentration of fishing entrepreneurs followed the same pattern as for 1993 with the highest numbers occurring in SS06 and SS08 (Table 4). From 1994, there was an increase in the number of fishing entrepreneurs per km shoreline from 4.4 to 6.3.

Niger and Kebbi States had almost the same number of entrepreneurs (2,589 and 2,809 resp.).

*Extension campaigns to villages can expect 50% more fishing entrepreneurs in villages within Kebbi than villages in Niger State.*

<sup>1</sup> Distribution between the sub strata is significantly different from 1995 - 1996. Chi-square test.  $P < 0.05$

**Table 3. The total number of entrepreneurs per sub stratum recorded during the 1993- 1996 frame survey.**

<i>Sub stratum</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>New entrants 1995</i>	<i>New entrants 1996</i>
01	353	400	591	742	86	39
02	687	559	709	639	110	36
03	687	619	751	755	102	26
04	59	64	75	86	6	7
05	199	156	245	274	44	81
06	907	744	955	1,047	239	168
07	368	358	436	478	48	82
08	1,025	1,015	1,211	1,478	317	341
Total	4,285	3,915	4,937	5,499	952	780

**Table 4. The number of entrepreneurs per km shoreline recorded during the 1993-1996 frame surveys**

<i>Sub stratum</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>
01	2.3	2.6	3.9	4.9
02	6.5	5.3	6.8	6.1
03	3.2	2.9	3.5	3.5
04	1.8	1.9	2.3	2.6
05	2.5	1.9	3.0	3.4
06	10.7	8.8	11.2	12.3
07	5.2	5.0	6.1	6.7
08	7.8	7.7	9.2	11.3
mean	5.0	4.5	5.8	6.3

### 3.3. Fishing Assistants

The total number of fishing assistants has increased slightly since the 1995 frame survey. The highest number of assistants occurred in SS06 and SS08 (also where the highest number of fishing gears were recorded), where drift netting and beach seining is practised which requires a large number of assistants to operate the net (Table 5).

The concentration of assistants per km shoreline has increased for each year during the last 3 years. The number of assistants per entrepreneur has declined since 1993 from 2.7 to 2.3; the fall corresponds to the fall in gears owned per entrepreneur and the decline in gears makes the excess assistants redundant.

The fishing methods which are labour intensive, beach seining and drift netting, had the highest number of assistants per entrepreneur (4.9 and 3.2 res.), the remaining fishing methods had an almost equal number (2.2 - 2.4). Not surprisingly the 'old' or 'not active' fishing entrepreneurs were the group with the highest number of assistants (3.4) whilst the new entrepreneurs had the lowest (1.8). Migrant fishermen within Kainji Lake who mainly use beach seine had a high number of assistants (4.1).

*The number of fishing assistants (sons of entrepreneurs) is proportional to the future number of entrepreneurs (sons who then become fishermen) entering the fishery. For example: taking the minimum age of an assistant as 8 years and the average age of marriage as 25 years (when sons become entrepreneurs) then with presently 12,449 assistants and assuming all enter the fishery, one can expect the annual number of new entrants into the fishery to be around  $957 = [12449/(25-8)]$  (Table 3).*

Table 5. The number of fishing assistants recorded during the 1993 - 1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	733	750	1,442	1,501
02	1,333	1,051	1,155	1,013
03	1,774	1,354	1,803	1,984
04	108	183	189	183
05	624	438	687	799
06	2,781	1,631	2,616	2,622
07	881	869	953	1,141
08	3,392	3,163	3,373	3,206
Total	11,626	9,439	12,218	12,449

### 3.4. Shoreline Fisherfolk

The total number of people fishing from the shore has decreased from the last survey. Similar to the fishing entrepreneurs and assistants the areas with the highest numbers of shoreline fisherfolk were SS06 and SS08 which have large flood plains easily accessible and fished by people from the shore (Table 6).

Over half of the shoreline fishermen used longlines, a third used traps and the remainder gill nets. Cast netting was also a popular activity from the shore but this was mainly used by entrepreneurs collecting bait for the longline fishery.

*The number of shoreline fishermen is small because almost everybody can afford a fishing canoe. Despite this they are still of concern since they mainly fish in the shallow areas which are important fish breeding and nursery places for juveniles. They form an important group which can be contacted when deliberating on the catches of undersized fish.*

**Table 6. The number of fisherfolk from the shore recorded during the 1993-1996 frame surveys.**

<i>Sub stratum</i>	1993	1994	1995	1996
01	73	126	13	5
02	101	129	60	28
03	65	24	29	7
04	9	103	0	0
05	4	42	8	0
06	111	164	175	155
07	12	4	152	8
08	85	357	136	157
Total	460	949	573	360



### 3.5. Fisherwomen

The number of fisherwomen is hard to quantify due to the difficulty of contacting them in the villages. Although obviously higher, 124 fisherwomen were recorded. The women recorded entirely used gill nets with an average of 1.6 nets, 0.5 canoes and 1 assistant each. The fishing units were therefore small with the women often borrowing canoes to fish.

Rettberg *et al.* (1995) in a separate study of fisher women estimated some 1,200 fisherwomen to be present on the lake. The study found that they mostly used gill nets with a mean ownership 2.97 nets and a mean mesh size of 2.2 inches. The study also recorded women fishers using longlines, fishing traps and in a few cases cast nets and beach seines.

*The gear composition of the fishing units corresponds to data collected from the women fishers directly (Alege, pers comm.). This is worrying given that almost all gill nets used are 1 inch nylon mesh and that the fisherwomen fish almost every day mostly in the shallow areas. They form a group which should be targeted during extension campaigns on the use of undersized gill nets.*

### 3.6. Canoes

#### 3.6.1. Fishing Canoes

The total number of fishing canoes increased from 8,755 in 1995 to 9,278 in 1996. Substrata SS01, SS03, SS07 and SS08 recorded increases (Table 7). There was an increase in the concentration of canoes per km shoreline. The highest concentration occurred in SS06 where there was a large number of entrepreneurs (Table 8).

Despite the increase in total number of canoes the average number per entrepreneur has consistently decreased from 1.9 to 1.7 for the past 4 years<sup>2</sup>. Apart from the gill net and longline fisheries the ratio of all other gears per canoe (the number of gears used by one canoe) has remained constant. The recorded decrease in gear ownership therefore also means an associated decline in the number of canoes. During 1996 on average one canoe used 2.0 gill nets, 0.8 longlines, 0.6 cast net, 0.1 beach seines, 0.2 drift nets and 4 traps. On average each canoe has 1.3 assistants.

Beach seine and drift net fishermen owned the largest numbers of canoes with 2.3 canoes per net owner. Other gear users owned between 1.7-1.9 canoes each. The older fishermen who were not actively fishing owned the highest number of canoes (2.1), whilst new entrants into the fishery, sons who become entrepreneurs, had the lowest ownership (1.5).

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<sup>2</sup>Significant between all years 1993-1996 (P=0.00). Kruskal-Wallis 1 way anova test.

Table 7. The number of fishing canoes recorded during the 1993 -1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	570	597	897	1,257
02	1,086	908	985	892
03	1,110	926	1,177	1,179
04	111	141	119	121
05	341	333	397	395
06	1,959	1,348	1,984	1,915
07	811	785	911	971
08	2,271	2,317	2,285	2,548
Total	8,259	7,355	8,755	9,278

Table 8. The number of fishing canoes per km shoreline recorded during the 1993 - 1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	3.8	3.9	5.9	8.3
02	10.3	8.6	9.4	8.5
03	5.1	4.3	5.4	5.5
04	3.4	4.3	3.6	3.7
05	4.2	4.1	4.9	4.9
06	23.0	15.9	23.3	22.5
07	11.4	11.1	12.8	13.7
08	17.3	17.7	17.4	19.5
mean	9.8	8.7	10.3	10.8

### 3.6.2. Transport Canoes

The number of transport canoes has declined by 22% between 1995 and 1996. High numbers were recorded in SS07 and SS08 which were in the riverine northern section of the lake noted for transport up the River Niger (Table 9).

Transport canoes, although expensive to purchase, provide a good alternative income source to the fishermen (Fishermen *pers comm*). It is interesting to note that the largest increases in ownership during 1996 occurred amongst those participating in the lucrative beach seine fishery around Foge Island.

**Table 9. The total number of transport canoes recorded during the 1993 - 1996 frame surveys.**

<i>Sub stratum</i>	1993	1994	1995	1996
01	13	33	11	13
02	13	16	12	15
03	14	16	23	16
04	3	4	0	2
05	22	12	11	18
06	16	16	14	15
07	72	26	113	54
08	35	55	37	40
Total	188	178	221	173

### 3.7. Engines

The number of outboard engines recorded during this frame survey has remained stable since 1995 (Table 10)<sup>3</sup>. About 24% of the entrepreneurs and 14% of fishing canoes were recorded as having outboard engines during 1996. The highest number of outboard engines occurred in SS08 and SS03, important areas for beach seining which require an engine to power the larger canoe. About 40% of fishing entrepreneurs in Foge Island owned engines.

The ownership of engines was highest for the old entrepreneurs who were no longer fishing themselves and the migrant fishermen (0.6 engines per entrepreneur) and lowest among the new entrants into the fishery (0.1). Beach seine and drift net fishermen owned the highest number of engines (0.8 and 0.4 engines res.), the remaining gear owners had an equal number of engines (0.14- 0.24). The average size of the outboard engines was 17 Hp. Fisherwomen do not own engines.

*The increase in ownership of engines acts as an indicator for the profitability of the fishery. Within the Kainji fishery only the beach seine and drift net fisheries have a slightly increased ownership of engines whilst for the remaining fisheries numbers per entrepreneur have declined. The decline is probably due to natural wastage of old engines.*

Table 10. The number of outboard engines recorded during the 1993 - 1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	82	104	101	95
02	61	48	82	51
03	199	219	266	266
04	19	23	37	35
05	152	119	182	173
06	196	133	180	171
07	153	180	168	220
08	288	303	291	288
Total	1,150	1,129	1,307	1,299

<sup>3</sup> Distribution of engines between the sub strata is not significantly different from 1995-1996. Chi- square test. P>0.05

### 3.8. Fishing Gears

#### Section Summary

The fishing gears recorded during this frame survey included gill nets, cast nets, beach seine, drift nets, longlines and traps. The distribution of the gears in the sub strata are shown in Table 11. The concentration of gears (number per km shorelines) was highest in SS06 and SS08 (Table 12).

*The large mix of gears and mesh sizes of these gears can be brought to attention during extension campaigns. The scenario to present is that just after lake formation all the fishermen were using gill nets to catch Citharinus and Lates, fishermen were not interested in the other fish. Today, however, they are using such a mix of gears that no fish is safe on any part of the lake and all species are targeted throughout their life by some type of gear.*

For all gear types the percentage of entrepreneurs who own the gear types has not reduced since 1993. For the drift net fishery an increase in the number of owners was recorded due to the increasing use of the gear in the south of the lake. The number of trap fishermen also showed an increase. Almost all entrepreneurs owned gill nets with a little more than half owning cast nets. Trap and drift net ownership were approximately equal with beach seine owners being the least (Table 13).

Although the numbers of gears owned has not changed the numbers of gears per owner has declined. This was highest in the longline fishery where the number of lines per owner has decreased from 1993 by 50%. Gill net and trap numbers per owner have reduced by 30% . Drift and cast net numbers have declined the least (20%) (Table 14).

The decline in number of fishing gears per entrepreneur is an indicator that the fishery is changing. Smaller catches may be the cause making new gears unaffordable to the fishermen. The reason could be due to higher costs of the gears, although from talking with the fishermen this does not seem the case.

*Entrepreneurs will associate with the few gears they now own and this can be highlighted during extension campaigns as a negative effect caused by declining catches due to their use of undersized gears. If they continue to use these bad fishing methods then their catches will always be small and there will never be a time when they will be able to afford new gears.*

*From a management point of view the declining ownership is advantageous since it reduces the impact of the possible increase in fishing effort caused by the higher number of entrepreneurs. The result is that effort in terms of gears is now stabilised, the question is whether this will be sufficient to restore the fishermen's catches. Unless the management measures are adhered to the answer is probably not.*

Within the lake theft of unattended gears is of increasing concern to the fishermen. This will prompt fishermen to opt away from gears they leave overnight such as gill nets, longlines and traps and concentrate on cast nets, drift nets and maybe beach seines.

**Table 11. The distribution of the fishing gears recorded during the 1996 frame survey.**

Fishing Gear	Sub stratum								Total 1996
	01	02	03	04	05	06	07	08	
Gill nets	2,906	1,866	2,770	269	1,139	4,262	1,661	3,782	18,655
Cast nets	859	745	719	57	123	1412	348	1,285	5,548
Beach	110	47	197	16	99	127	27	130	753
Drift nets	204	114	132	2	16	86	354	652	1,560
Longline	1,235	820	468	66	227	1,550	568	2,466	7,400
Traps	4,399	2,308	2,688	150	1,235	9,555	2,615	14,029	36,979

**Table 12. The number of fishing gears per km shoreline recorded during the 1996 frame survey.**

Fishing Gear	Sub stratum								Mean 1996
	01	02	03	04	05	06	07	08	
Gill nets	19.1	17.8	12.8	8.2	14.1	50.1	23.4	28.9	21.3
Cast nets	5.7	7.1	3.3	1.7	1.5	16.6	4.9	9.8	6.3
Beach seine	0.7	0.4	0.9	0.5	1.2	1.5	0.4	1.0	0.9
Drift nets	1.3	1.1	0.6	0.1	0.2	1.0	5.0	5.0	1.8
Longline	8.1	7.8	2.2	2.0	2.8	18.2	8.0	18.8	8.5
Traps	28.9	22.0	12.4	4.5	15.2	112.4	36.8	107.1	42.3

**Table 13. The percentage of the total entrepreneurs owning gear types recorded during the 1993- 1996 frame survey.**

<i>Year</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>
GN	88	81	78	79
CN	57	64	63	61
BS	12	13	15	12
DN	14	14	24	21
LL	45	47	48	42
TR	14	17	20	18

**Table 14. The numbers of nets/ lines owned by gear type owners recorded during the 1993- 1996 frame survey.**

<i>Year</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>
GN	5.9	5.6	4.5	4.3
CN	2.0	2.0	1.8	1.6
BS	1.1	1.2	1.1	1.1
DN	1.7	1.8	1.3	1.3
LL	6.7	6.9	3.3	3.2
TR	45	48	38	32

### 3.8.1. Gill Nets

From 1995 the total number of gill nets<sup>4</sup> increased by 5%, however, a decline was noticed in six of the sub strata<sup>5</sup>. From 1993 the number of nets has declined from 22,387 to 18,655 nets. (Table 15).

The number of gill nets per km shoreline (Fig. 1) shows that the highest concentration of gill nets has consistently occurred in both the central eastern basin (SS06) and the north east (SS08) throughout the 4 years of the frame surveys. There was a decline in the concentration of gill nets over the last three years in SS02, SS04 and SS08. Numbers have increased in SS01 with the other sub strata remaining stable (Fig. 1).

Despite the increased number of gill nets there has been a decrease in the number of nets owned per entrepreneur (Fig. 2). Notable was the decrease in the number of larger gill net fishing units operating on the lake. The number of entrepreneurs owning 3 or more nets declined from 74% to 45% of net owners, whilst entrepreneurs with more than 5 nets fell from 45% to 24% (1993 to 1996). The number of nets owned by each gill net owner has declined since 1993 from 5.9 to 4.2<sup>6</sup>.

The decline in net ownership could be due to gears becoming unaffordable through lowering catches or higher net costs, certainly gill nets have one of the smallest daily catch values with cpue remaining constant from 1995 (du Feu, 1997). Theft of "left" gears is becoming an increasing problem on the lake and this may also be a reason why the gear is becoming unattractive to fishermen.

Older entrepreneurs who were no longer fishing had the highest ownership of nets at 4.3 nets per entrepreneur whilst active entrepreneurs had 3.6 nets. New entrants into the fishery had the lowest ownership level at 2 nets each. This declined sharply from 3.6 nets recorded for 1995 and highlights the overall decrease in gear ownership of the new entrepreneurs coming into the fishery.

*The decline in gill net number ownership can be highlighted during extension campaigns. The older fishing entrepreneurs will be able to recollect the large numbers of nets they owned after the lake was formed when almost every fisherman used gill nets and be able to compare this with what they own now.*

<sup>4</sup> the number of gill nets refers to the number of net bundles, the same unit of measurement used for extrapolation of catch and effort data.

<sup>5</sup> Distribution of gill nets between the sub strata is significantly different for each year from 1993-1996, Chi-square test.  $P < 0.05$

<sup>6</sup> significant ( $P=0.00$ ). Mann-Whitney U test



*Any future increase in gill net numbers must be viewed with caution since there is an increasing tendency for entrepreneurs towards small meshed nets.*

Gill net owners owned on average 1.1 cast net, 0.3 drift nets, 0.1 beach seine, 1.4 longline and 6 traps. This mix of gears has declined during the last 4 years and was most evident for the number of longlines.

Table 15. The number of gill nets recorded during the 1993 - 1996 frame surveys.

Sub stratum	1993	1994	1995	1996
01	1,249	1,533	1,898	2,906
02	3,449	2,567	2,118	1,866
03	3,050	2,537	2,868	2,770
04	393	589	340	269
05	1,341	1,265	1,301	1,139
06	5,997	4,191	4,321	4,262
07	1,532	1,356	1,374	1,661
08	5,376	5,545	3,460	3,782
Total	22,387	19,583	17,680	18,655

Figure 1. The number of gill nets per km shoreline recorded during the 1993-1996 frame surveys.

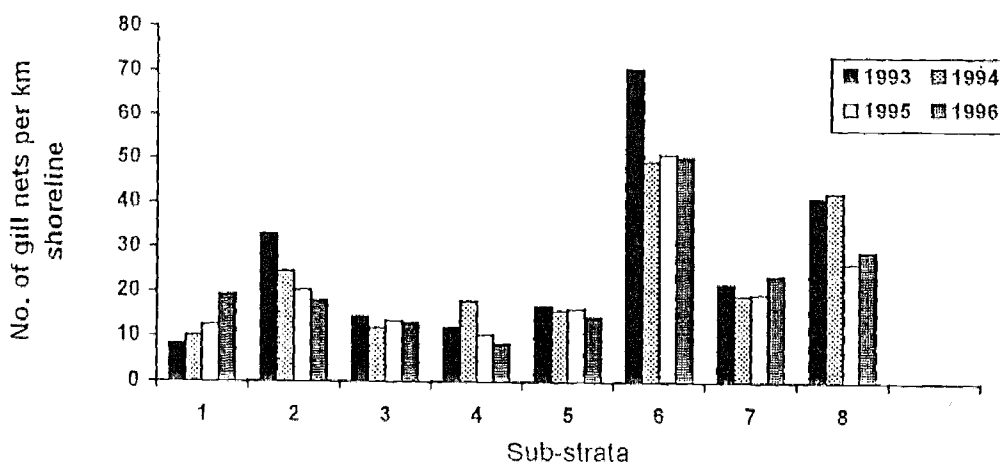
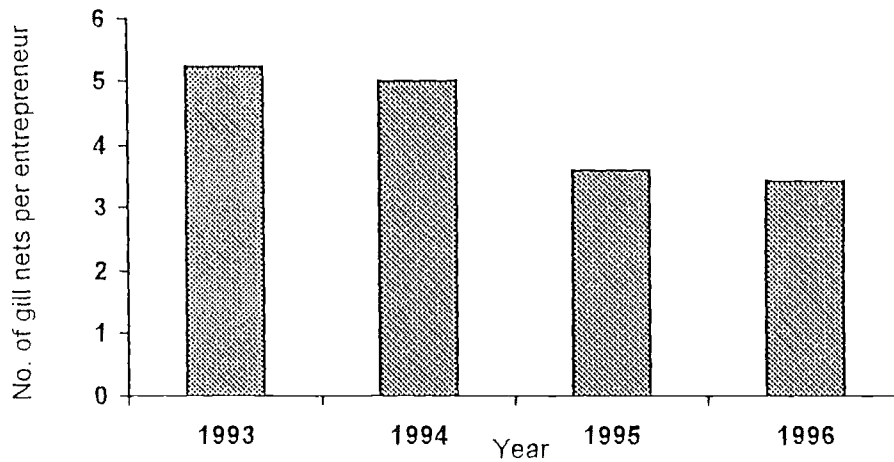


Figure 2. The number of gill nets per entrepreneur recorded during the 1993-1996 frame surveys.



### 3.8.2. Drift Nets

The number of drift nets has decreased slightly from 1995 (Table 16). All the sub strata showed decreases except SS03 and SS01 where the fishing method is becoming increasingly prominent (du Feu and Kasali, 1995)<sup>7</sup>. Despite the decline from 1995 the number of drift nets has increased by 51% from 1993.

The highest concentrations of nets per km shoreline was in SS07 and SS08 (Table 17) possibly due to the large flood plain and river current within these areas.

The ownership of drift nets increased from 1995 to 0.3 nets per entrepreneur in 1996. Like the gill net fishery the highest ownership occurred in the group of non fishing old entrepreneurs (0.65 nets per entrepreneur) and was almost zero for the new entrants group.

The increasing number of drift nets per entrepreneur is rather surprising given the declining cpues and catch values per day (du Feu 1997). The reason could be due to new fishermen entering the fishery in the south of the lake.

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<sup>7</sup> Distribution between the sub strata from 1995- 1996 is significantly different, Chi square test  $P < 0.05$

On average a drift net operator also owns 4.4 gill nets, 0.1 beach seine, 1.3 cast nets, 1.2 longlines and 5 traps. The number of these other gears has declined over the last 4 years and was particularly apparent for longline and traps. The number of nets owned for each drift net owner has declined from 1.7 to 1.3 from 1993 - 1996<sup>8</sup>.

During 1996 migrant fishermen from outside the lake totally used drift nets. Fisherwomen do not use drift nets, possibly since considerable strength is required to scull the canoes during the fishing operation.

**Table 16. The number of drift nets recorded during the 1993 - 1996 frame surveys.**

<i>Sub stratum</i>	1993	1994	1995	1996
01	17	2	117	204
02	3	26	129	114
03	32	16	107	132
04	0	0	3	2
05	12	0	29	16
06	3	0	129	86
07	325	280	340	354
08	643	618	722	652
Total	1,035	942	1,576	1,560

**Table 17. The number of drift nets per km shoreline recorded during the 1993-1996 frame surveys.**

<i>Sub stratum</i>	1993	1994	1995	1996
01	0.1	0.0	0.8	1.3
02	0.0	0.3	1.2	1.1
03	0.2	0.1	0.5	0.6
04	0	0	0.1	0.1
05	0.1	0	0.4	0.2
06	0.0	0.0	1.5	1.0
07	4.6	3.9	4.8	5.0
08	4.9	4.7	5.5	5.0
mean	1.2	1.1	1.8	1.8

<sup>8</sup> significant (P=0.00). Mann-Whitney U test.

### 3.8.3. Beach Seines

The number of beach seines fell by 7% from 1995 to 753 nets in 1996. The decline was mainly due to a large decrease in SS06 in beach seine numbers, with 3 sub-strata actually showing increases (Fig. 3)<sup>9</sup>.

The concentration of seines was highest in SS05 and SS06. From 1995 decreases in the concentration of beach seines were noted in SS01, SS02, SS05, SS06, whilst in SS07 and SS08 the concentration increased. During the last four years the concentration of beach seines has become more uniform throughout the lake (Fig. 3).

Old fishing entrepreneurs had twice the number of beach seines (0.15) than other groups with new entrants to the fishery the lowest (0.07). Indigenous fishermen had a lower ownership of beach seines (0.02 nets) than those fishermen who came to the lake after it's formation (0.13 nets). This supports the comments by fishermen that it is mainly the outside non-indigenous fishermen who practise beach seining. A total of 11% of new entrepreneurs coming into the lake owned beach seines, this has declined from 18% recorded in 1995.

*It is encouraging that the high increase in beach seines recorded during the last frame survey has ceased. The decline in beach seine number is possibly due to fishermen not buying new or replacement nets following news of the proposed ban on seines. It could also be due to fishermen not wishing to divulge information because of this news.*

*If the former explanation is true then there is justification to continue to broadcast news of the ban deterring fishermen from not buying new nets and not replacing nets which are worn out. It is also important that good relationships with beach seine owners continue so that correct monitoring of beach seine fishery can continue.*

*Of concern is the decrease in the number of other gears owned by beach seiners particularly the numbers of gill nets (a decrease from 6.6 to 4.6 nets, 1993-1996) and longlines. The decrease of diversification into other gears will limit income sources from other gears considering the proposed ban of beach seines.*

A typical beach seine owner also owns 4.6 gill nets, 1.1 cast nets, 1.5 longlines, 0.3 drift nets and 5 traps. There is some evidence that beach seiners were increasingly using drift nets. The numbers of gill nets and beach seines owned by beach seine fishermen has fallen sharply.

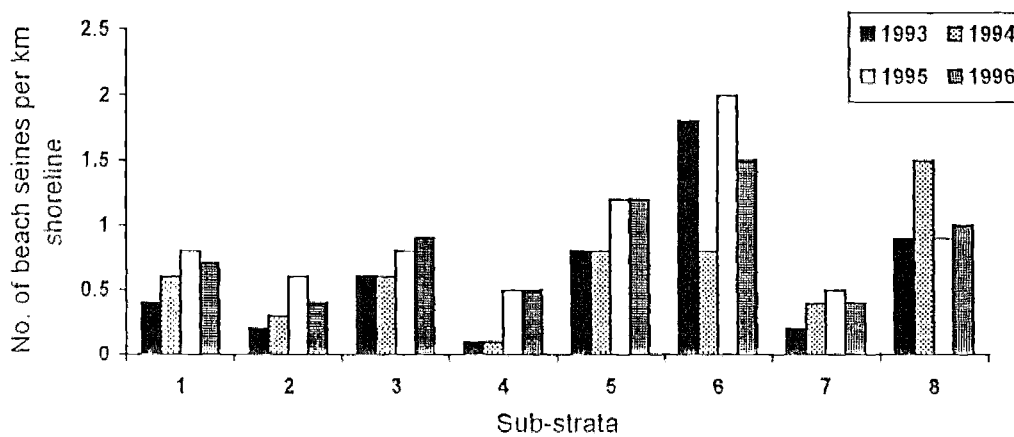
<sup>9</sup> Distribution between the sub strata from 1995-1996 is significantly different, Chi-square test  $P < 0.05$

The mean ownership per entrepreneur of beach seines has decreased from 0.16 in 1995 to 0.14 in 1996. (Fig. 4)<sup>10</sup>. Most beach seine fishermen owned only one net. The reason for this decrease might be due to the ban of the gear in the new Fisheries edicts.

**Table 18. The number of beach seines recorded during the 1993 - 1996 frame surveys.**

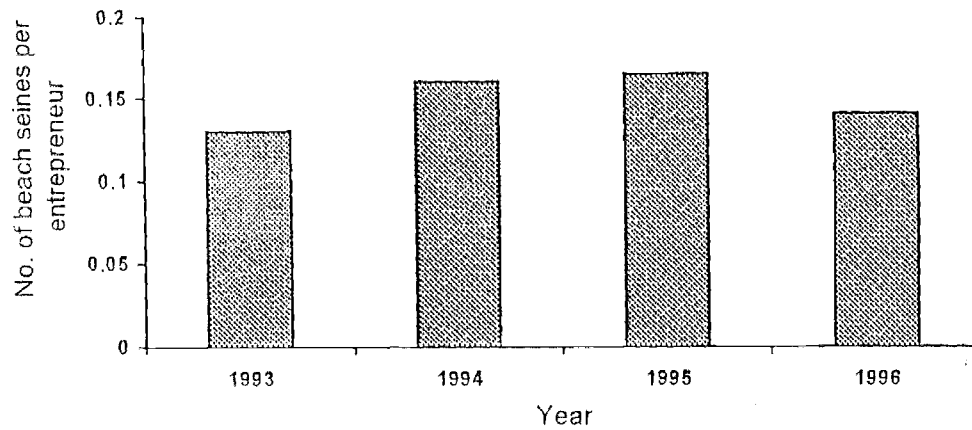
<i>Sub stratum</i>	1993	1994	1995	1996
01	56	92	121	110
02	23	28	62	47
03	120	138	166	197
04	4	4	16	16
05	66	66	101	99
06	155	69	191	127
07	14	28	34	27
08	122	193	119	130
Total	560	618	810	753

**Figure 3. The number of beach seines per km shoreline recorded during the 1993-1996 frame surveys.**



<sup>10</sup> The decrease was not significant from 1993-1996 (P=0.97), but significant from 1993-1997 (P=0.00), Mann-Whitney test

Figure 4. The number of beach seines per entrepreneur recorded during the 1993 - 1996 surveys.



#### 3.8.4. Cast Nets

The total number of cast nets on the lake has decreased slightly from 1995. The decrease was noted in all the sub strata except in SS01 and SS08<sup>11</sup> (Table 19).

The concentration of cast nets were a lot higher in SS06 and SS08, areas noted for having shallow-flooded plains. The concentration was equally high in SS02, where species such as *Citharus* and *Tilapia* seasonally migrate and only cast nets are effective for their exploitation. Within SS01 and the north of the lake, SS07 and SS08, the concentration was increasing, the remaining sub strata showed decreases since 1995 (Fig. 5).

*Entrepreneurs are increasingly using small meshed cast nets making it one of the most detrimental gears in use on the lake. Thus any increase in cast net numbers must be viewed with concern. Of special worry is the increasing use of cast nets by the new entrepreneurs, which, if continues, will increase the number of undersized cast nets by approximately 500 per year. The use of undersized cast nets should, therefore, be a basis for urgent extension activity.*

<sup>11</sup> Distribution of cast nets between the sub strata is significantly different for each year from 1993-1996, Chi-square test.  $P < 0.05$

The number of nets owned by entrepreneurs has declined slightly from 1993, 1.1 nets to 1 nets per entrepreneur in 1996 (Fig. 6). This was less marked than for other gears and the number of larger cast net fishing units has also not declined drastically as for other gears. The cast net fishery has the highest daily catch value of any gear excluding those requiring a large number of assistants (beach seines and drift nets). The gear is not easily stolen as gill nets and longlines and it remains popular to new entrants into the fishery (du Feu, 1997).

Old 'not active' fishing entrepreneurs owned the same number of nets as the other fishing entrepreneurs for this "active" gear. New entrants to the fishery were using cast nets (ownership level of 0.9 nets) and this is of concern given the increased use of smaller meshed cast nets.

A typical cast net fisherman in 1996 owned 4 gill nets, 0.3 drift nets, 0.1 beach seines, 1.6 longlines and 7 fishing traps. This mix has declined over the last 4 years being particularly apparent for the numbers of longlines and gill nets. A cast net fisherman has a smaller number of cast nets than 1993, a fall from 1.7 to 1.3 nets<sup>12</sup>.

**Table 19. The number of cast nets recorded during the 1993 - 1996 frame surveys.**

<i>Sub stratum</i>	1993	1994	1995	1996
01	300	438	591	859
02	1,160	730	895	745
03	616	517	1,004	719
04	50	105	41	57
05	120	152	127	123
06	1,243	946	1,589	1,412
07	281	325	357	348
08	1,120	1,867	1,156	1,285
Total	4,890	5,080	5,760	5,548

<sup>12</sup> significant at P=0.00, Mann-Whitney U test

Figure 5. The number of cast nets per km shoreline recorded during the 1993 - 1996 frame surveys.

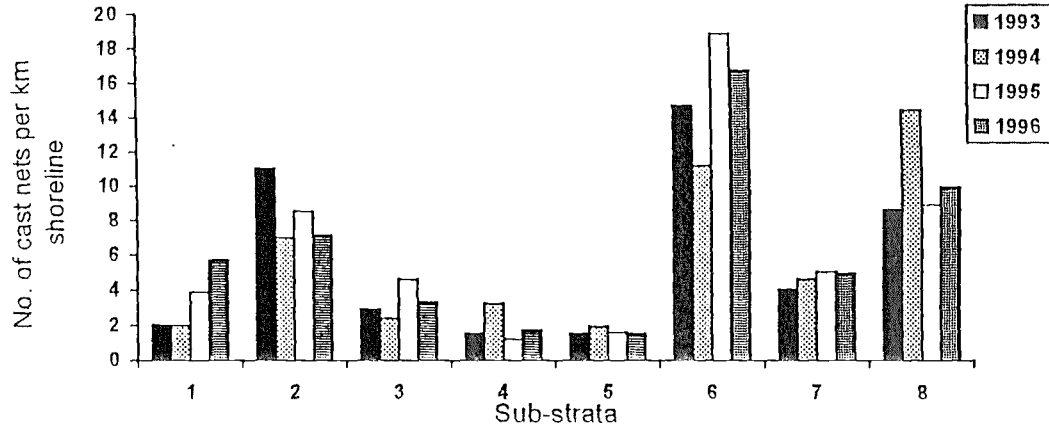
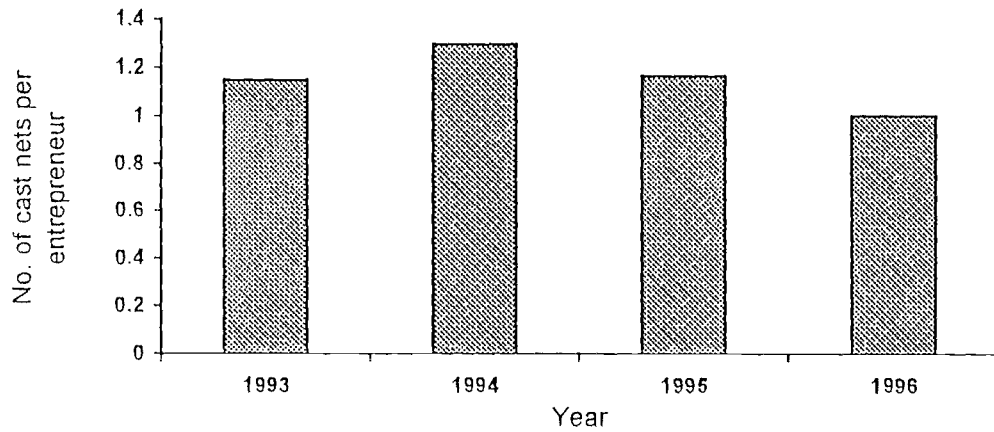


Figure 6. The number of cast nets per entrepreneur recorded during the 1993-1996 frame surveys.





### 3.8.5. Longlines

The total number of longlines decreased by 5% from 1995. There has been a decrease in the numbers of this gear during the past 3 years. The recorded decline was noted in all the sub strata except in SS01 and SS06<sup>13</sup> (Table 20).

The highest concentrations of the lines occurred in SS06 and SS08. Large falls in the concentration of longlines since 1993 were recorded in SS02, SS04, SS06 and SS07. These are all sub strata where the initial concentration was fairly high (Fig.7).

The number of longlines per entrepreneur (all entrepreneurs) has dropped by 50% from 1993 from 3.0 to 1.2 lines (Fig. 8). The number of large longline fishing units has also declined sharply with the number of fishermen owning 1 line or more dropping from 45 to 28%, 1993 to 1996.

*Longlines are one of the most non-selective and non-destructive gears in use on the lake today. Unfortunately numbers have declined drastically since 1993 due to smaller catches caused by the overfishing of the other undersized gears. Unless action is taken to reduce the harmful effects of the illegal gears longline catch and numbers will further reduce.*

A longline fisherman owned on average 4 gill nets, 0.3 drift nets, 0.1 beach seines, 1.3 cast nets and 5 traps, this was similar to gear ratios of other gear types. The number of other gears owned by longline fishermen has reduced for the past 4 years, particularly for cast net and drift nets.

The number of longlines owned by a longline fisherman has declined by 50% from 1993 to 3.2 lines, this was the largest decrease of any gear type<sup>14</sup>. Longlines have the lowest daily catch value of any gear, for example a longline fisherman would have to operate 3 lines to realise the daily revenue of a cast net fisherman. There was no evidence of declining catches or daily revenue which may, in future, accentuate the decline in the ownership of longlines (du Feu, 1997).

<sup>13</sup> Distribution of longlines between the sub strata is significantly different for each year from 1993-1996, Chi-square test.  $P < 0.05$

<sup>14</sup> significant between all years 1993-1996, Kruskal-Wallis 1 way anova test,  $P = 0.00$

Table 20. The number of longlines recorded during the 1993-1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	589	1,055	830	1,235
02	3,213	1,262	1,068	820
03	1,185	1,560	635	468
04	420	487	115	66
05	662	360	418	227
06	2,907	3,034	1,101	1,550
07	1,003	681	968	568
08	2,960	4,115	2,627	2,466
Total	12,939	12,554	7,762	7,400

Figure 7. The number of longlines per km shoreline recorded during the 1993 - 1996 frame survey.

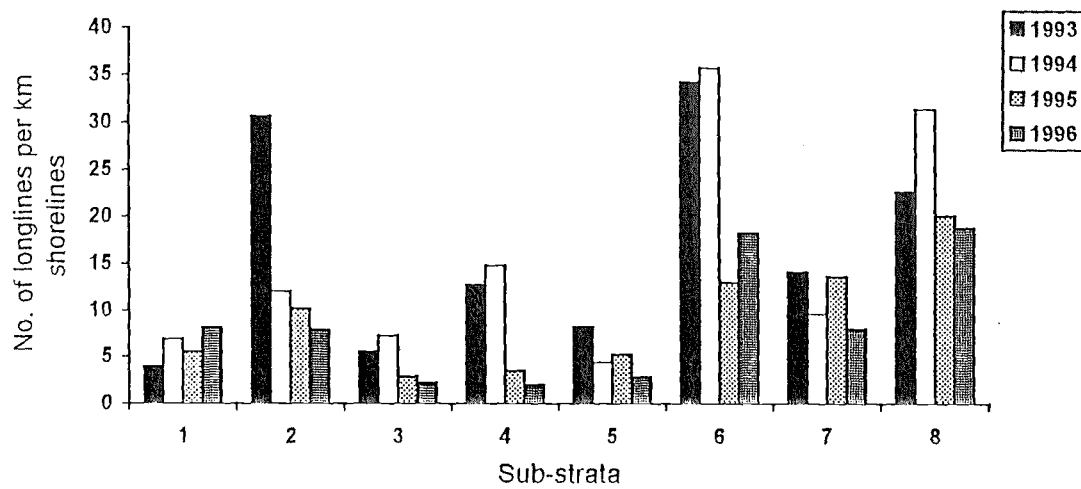
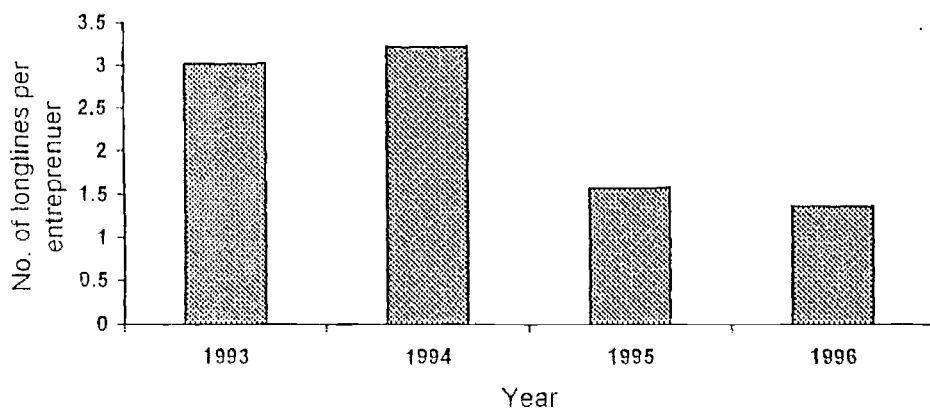


Figure 8. The number of longlines per entrepreneur recorded during the 1993-1996 frame surveys.



### 3.8.6. Fishing Traps

The total number of traps decreased by 5% from 1995 to 36,175 in 1996. Apart from SS04 and SS08, the decline was recorded in all the sub strata<sup>15</sup> (Table 21). Fishing trap numbers have in the past increased every year and perhaps the present decrease may indicate that numbers are now becoming stabilised.

*The decrease in trap numbers is encouraging given the high numbers of undersized commercially important species caught. The fishery must be monitored closely especially with respect to the use of traps during fish fencing. Fish fencing is reported as highly destructive and its practise should be eradicated from the lake shores.*

By far the most important area for traps was the north of the lake with the highest concentration occurring in SS06, SS07 and SS08. These are areas with large flood-plains associated with emergent grasses and sedges which are suited to the gear. The large flood-plains are also areas in which traps are used as part of fish fencing (Fig. 9).

<sup>15</sup> Distribution of traps between the sub strata is significantly different for each year from 1993-1996, Chi-square test,  $P < 0.05$

The number of traps per entrepreneur has decreased for the past 3 years, with a drop from 7.9 in 1995 to 6.7 in 1996 (Fig. 10)<sup>16</sup>. The highest number of traps owned occurred within the new entrepreneur group indicating that due to the cheapness of the gear new entrants are using this gear. The level of ownership by old fishers has declined from 8.5 traps in 1994 to 6.2 traps in 1996.

Trap fishermen had a high diversification of other gear types with an average trap fisherman owning 3 gill nets, 0.1 beach seine, 1.2 cast nets, 0.2 drift nets and 2 longlines. The number of gill nets and longlines owned by trap fishermen has declined since 1993.

The number of traps owned by a trap owner has also declined since 1993 from 42 to 32 traps. The daily catch value of the trap fishery has increased from 1995 from 14 to 21 Naira per trap. The catch value was comparable to other gears where just 7 traps are needed to realise the same catch value as a gill net or longline (21 for cast nets). Although the trap fishery also has costs for bait there is little evidence to support a future decline in trap numbers due to fishermen opting to purchase gill nets or longlines.

Table 21. The number of traps recorded during the 1993-1996 frame surveys.

<i>Sub stratum</i>	1993	1994	1995	1996
01	1,097	3,261	4,492	4,399
02	1,000	2,423	2,901	2,308
03	2,205	3,583	2,893	2,688
04	0	0	95	150
05	1,702	1,045	1,776	1,235
06	10,606	9,413	13,200	9,555
07	6,777	531	3,005	2,615
08	3,790	12,076	10,455	14,029
Total	27,177	32,332	38,817	36,979

<sup>16</sup> significant between all years 1993-1996, Kruskal-Wallis 1 way anova test. P= 0.00

Figure 9. The number of traps per km shoreline recorded during the 1993 - 1996 frame surveys.

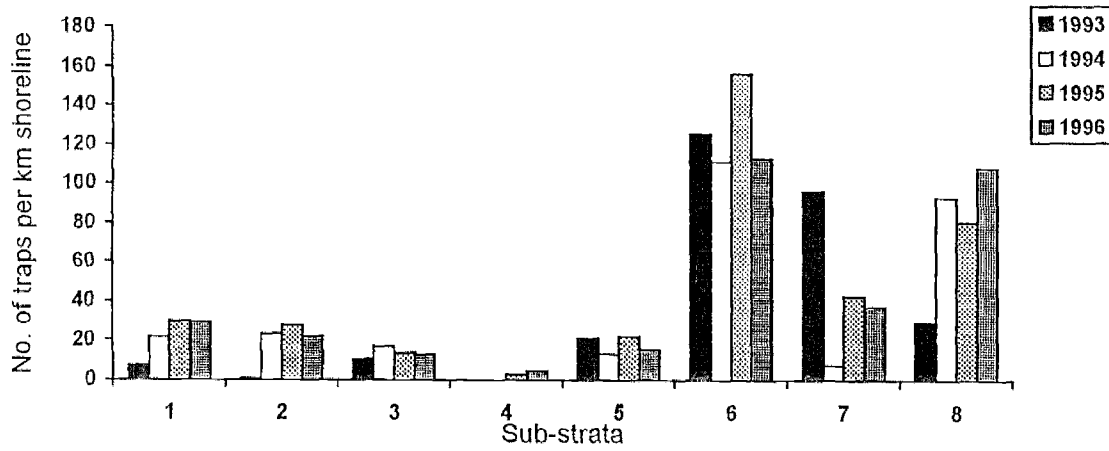
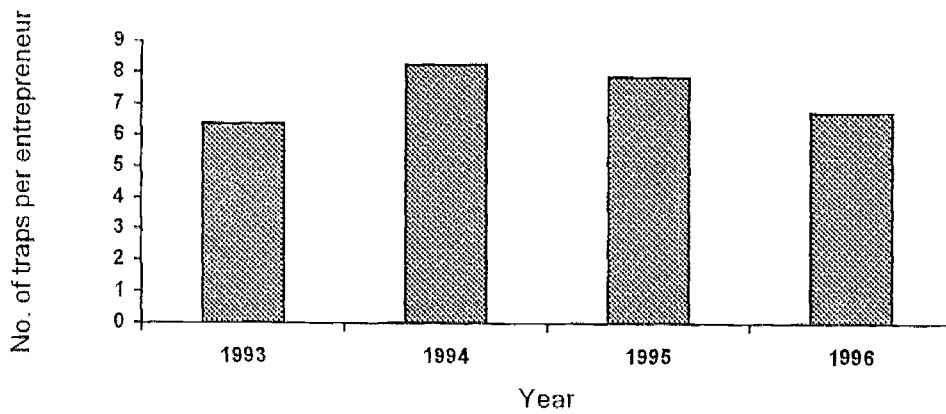


Figure 10. The number of traps per entrepreneur recorded during the 1993-1996 frame surveys.



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## Annex

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### Glossary of terms and abbreviations

**NGKLFPP:** Nigerian-German (GTZ) Kainji Lake Fisheries Promotion Project.

**NIFFR:** National Institute for Freshwater Fisheries Research, New Bussa.

**A.D.P staff:** Agriculture Development Project (agriculture and fisheries extension agents around the lake).

**L.G.A:** Local Government Authority.

**Fishing entrepreneur:** The owner (who may be either fishing or not fishing) of fishing equipment (canoes and fishing gears) used in the fishery.

**Fishing assistants:** People who assist the fishing entrepreneur in his fishing activities. Fishing assistants do not own fishing equipment. They are usually the sons and daughters of the entrepreneur but may also include people, who are normally hired, from outside the entrepreneur's family.

**Fisherfolk:** A term used to include both the fishing entrepreneurs and fishing assistants.

**Migrant fisherfolk:** Fisherfolk who are not indigenous to the Kainji Lake area. Normally they live in separate temporary fishing camps and fish for a limited period of time before moving away from the lake basin.

**Fishing localities:** A term used to describe all the various types of fishing villages/camps around Kainji Lake.

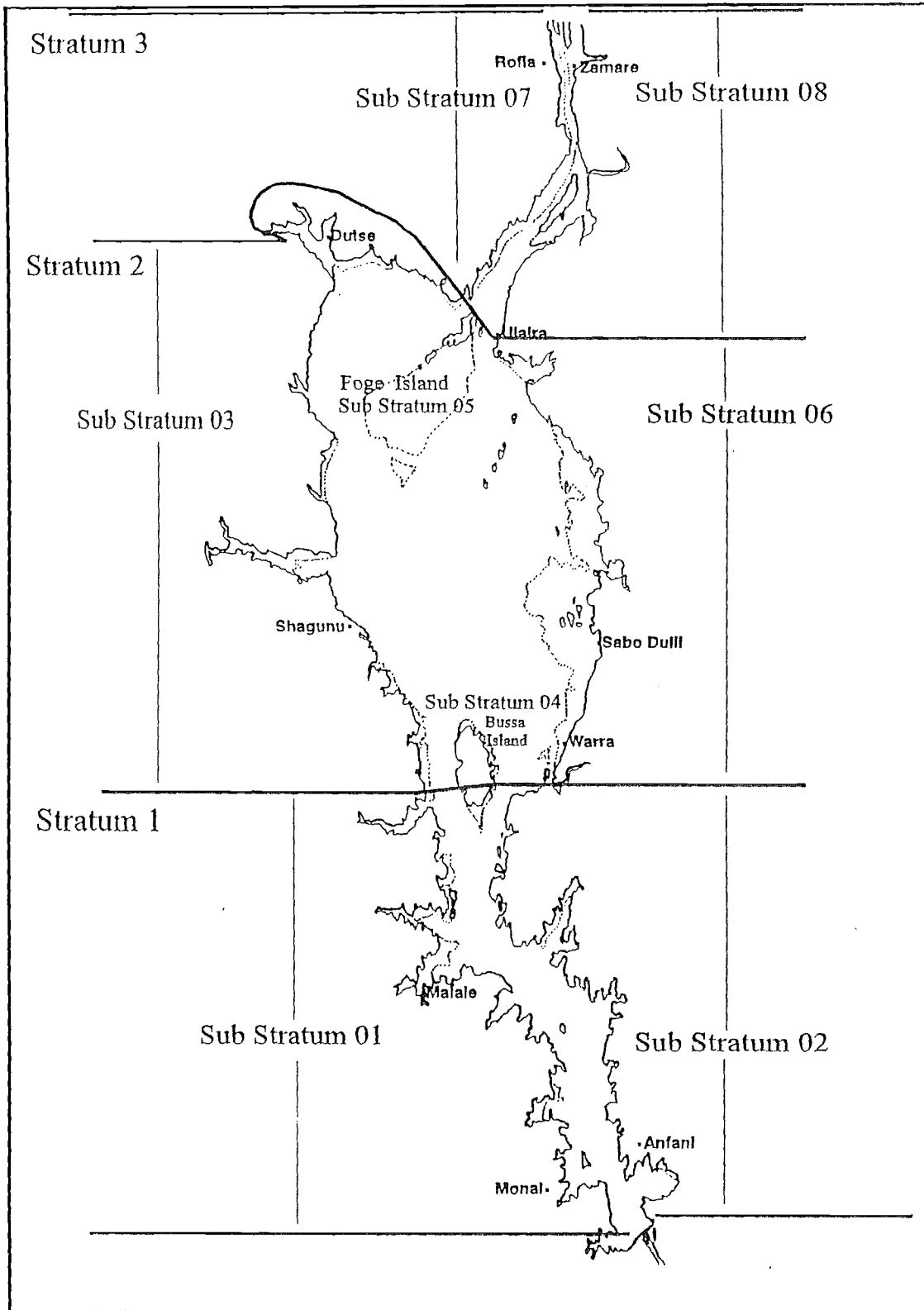
**Permanent fishing village:** A village which has permanent buildings (usually includes a permanent Mosque and market place) and is not moved dependent on the lake water level. Includes all Government resettlement villages around the lake.

**Permanent fishing camp:** A village with no permanent brick houses but houses made of material which is periodically replaced such as grass mats. The village is not relocated dependent on the lake water level.

**Temporary fishing camp (from within Kainji Lake):** A village used for temporary fishing which is periodically moved. Fisherfolk living in the camp are indigenous to the Kainji Lake area.

**Temporary fishing camp (from outside Kainji Lake):** A village used for temporary fishing which is periodically moved. Fisherfolk living in the camp are from localities outside Kainji Lake area (migrant fisherfolk).

Figure 11. Location of the main and sub strata, Kainji Lake





# Kainji Lake, Northern Nigeria.

4. 30 W

Showing the distribution of fishing villages



Copy right: Nigerian Council Kainji Lake  
Fisheries Promotion Project,  
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Niger State, Nigeria



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