



## FISH COMPOSITION OF JEBBA LAKE, NIGERIA

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### ABSTRACT

During the study period, from April 2008 to March 2009, 51 species of fish were recorded belonging to 12 families in Jebba Lake. The commercially important fishes were grouped according to their economic importance into five categories namely, Catfish (*Clarias* spp., *Bagrus bayad*, *Heterobranchus* spp., and *Chrysichthys* spp.), Tilapias (*Oreochromis niloticus* and *Tilapia zilli*), Nile perch (*Lates niloticus*), Freshwater sardines (*Clupeids* spp.) and others (*Alestes* spp., *Citharinus citharus* and *Synodontis* spp.). Three zones were classified according to their biological and limnological characteristics. Stratum I (upstream zone) exhibits riverine conditions with rapid water currents, and contributed 35.1% of the total catch. Stratum II (midstream zone) represents low water currents and contributed 12.5% of the total fish catch. Stratum III (reservoir zone), which exhibits lentic habitat and contributed 52.4% of the total fish catch, due to ecological changes in the aquatic environment that provided abundant natural fish food supply. Traditional fishing gears such as cast net, gill net, drift net, longline and fish trap were used by fishermen. Catch per unit effort (CPUE) per landing site, ranged between 1.05 to 6.22 kg/boat with highest in June at Rimaye landing site while lowest in February was at Faku landing site. The average annual fish landings per fisherman ranged from 62.71 to 129.68 kg/fisherman/yr.

**Key words:** inland waters, lake impoundment, frame survey,

### INTRODUCTION

Nigeria has over 14 million hectares of inland waters, but inland fish production in Nigeria is still very low. It is estimated that contribution from inland and marine sector amounts to 170,000 and 330,000 tonnes respectively of the 500,000 tonnes of total fish production (Miller, 2004). Even though the inland sector contributed nearly one third of the total fish production, its share to the total domestic supply was 60% in contrast to marine sector with 40% - as high percentage of marine production is exported. Therefore, fish production from inland sector is of great significance as it contributes the major share of the protein for domestic consumption. Inland fisheries management in Nigeria is very poor when compare to some of the developed inland waters in other countries. Lack of enhanced fish production, fishing gears and inland waters management measures are great impending factors in the development of a viable inland fishery in the country.

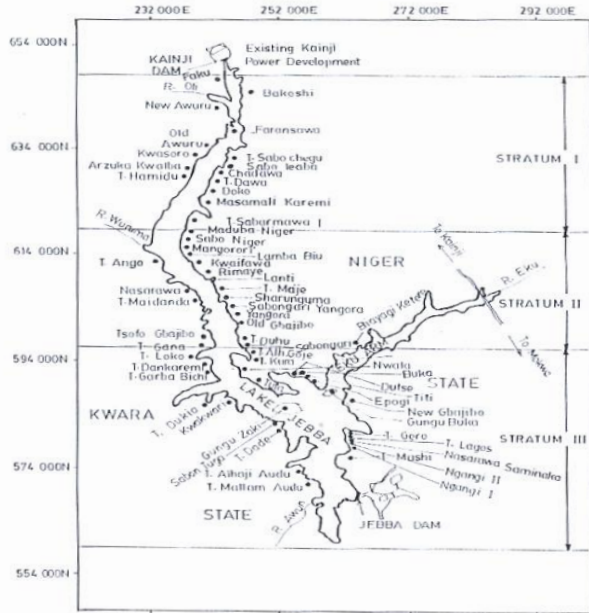
The diversity of fishes mainly depends upon the biotic and abiotic factors and types of ecosystem (Nanda and Tiwari, 2001). Age of water body, mean depth, water level fluctuation, lake design and morphometric features have great ecological implications. Investigations into the biodiversity of

fish species of Nigerian inland water bodies have been carried out by various scientists. These include the works of Reed *et al.* (1967); Jenness (1973); Henderson and Welcome (1974); Bazigos (1972) and Ita *et al.* (1983). Species diversity encompasses variety of species be it wild or domesticated within a geographical area. Shortly after the impoundment of Jebba Lake, conditions of the water body in terms of plant and animals composition changed resulting in the flourishing of large number of fish species. This was attributed to successful spawning and presence of abundant food supply from the decay of flooded vegetation (Ita *et al.*, 1983). The objective of this work is to update the fish diversity and appraise the current fisheries of Jebba Lake, which will help in the management and development of fishery in the lake.

### STUDY AREA

Jebba Lake is located in the North central area of Nigeria. The lake (fig. 1) is man- made and was impounded in 1983 for the purpose of hydroelectric power generation but with opportunities for fishing, drawdown farming and navigation. The lake is about 100 km long and about 12 km at its widest point. It has an estimated surface area of 303 km<sup>2</sup> (varying with seasonal fluctuations) and a volume of 3.31 x 10<sup>9</sup> m<sup>3</sup> with a mean depth of 3.3 m (max. 32.5 m).

The lake has a shoreline length of 74 km with catchments area of 0.3 x 106 km<sup>2</sup> (Ita *et al.*, 1983). The lake gets the bulk of its water supply from the discharge of Lake Kainji while tributaries like Rivers Eku, Awun and others also discharge into the lake.



**Fig 1: Map of Jebba Lake basin showing the distribution of fishing locations and strata**

**MATERIALS AND METHODS**

The study was carried out for a period of one year from April 2008 to March 2009. Frame survey was conducted involving identification and count of all the fishing localities and fish landing sites around the lake with the total number of fishermen, fishing crafts and gears employed. Ten fish landing sites were selected out of 84 recorded during frame survey, using stratified random sampling viz, Faku, New Awuru, Bakoshi, Old Awuru, Rimaye, Lamba Bui, Gbajibo, Gungu Zaki, Tunga Gero and Dam site, where fish collections were made and Catch assessment surveys were conducted for two separate days in every month for 12 months. Samples of fish species soon after collection were cleaned and preserved in 5% formalin. The species were identified to family/species using keys provided by Reed (1967). For catch assessment, the fishing boats were systematically sampled by their landing order, so that boats fishing near and far from the landing site all got an equal chance of being selected. The catches from each boat sampled were sorted, identified by

species, counted, weighed and recorded. Catch per Unit of Effort (CPUE) was computed based on the mean monthly fish landings.

**RESULTS**

**Frame Survey**

About 60 fishing localities were situated around the lake. Fig. 1 shows the distribution of the fishing localities along the lake. A total of 1,160 people working directly as fishermen (both fishing inputs owners and their assistants) were recorded, using 772 wooden planked canoes with six different types of fishing gears; gill nets (1,805), cast nets (151), longlines (681), drift nets (10), lift nets (102) and fish traps (386). Only 55 of the recorded 772 canoes were motorized.

**Fish diversity**

During the study period, 51 species of fish, which belong to 12 families, were recorded (Table 1). Ita *et al.* (1983) observed 59 species under 17 families immediately after the impoundment of the lake in 1983. Welman (1948) identified 181 species of fish from the major river systems of Nigeria and Lake Chad including some estuarine and marine species, which frequent rivers. Banks *et al.* (1965) identified and described 139 species of fish along the upper Niger River within the then proposed Kainji Reservoir Basin, while White (1965) produced a checklist of fish species of the same area and reported a total of 145 species. Reed (1967) identified and described 160 fish species within the then Northern region of Nigeria. When compared with the above inland water bodies, Jebba Lake shows less fish diversity.

**Species Composition**

The species composition of the catches remained relatively stable over the period of study, but varied somewhat among the strata. Table 2 gives the species composition of the catches by number and weight. The table shows that the species most consistently represented across the zones along the lake are *Alestes*, *Hydrocynus*, *Distichodus*, *Citharinus*, *Labeo*, *Chrysichthys*, *Bagrus*, *Clarias*, *Synodontis*, *Heterobranchus*, *Tilapia* and *Lates*.

For each stratum, the fish species listed in Table 3 represented the average monthly sampling and comprised the majority of the catches.

**Table 1: Fish composition in fishermen catches from Jebba Lake from April 2008 to March 2009 (from fishermen landings)**

Family	Species
Cichlidae	<i>Oreochromis niloticus</i> , <i>Sarotherodon niloticus</i> , <i>Tilapia zillii</i> , <i>Hemichromis fasciatus</i> , <i>Tilapia monody</i>
Clupeidae	<i>Pellonula afzeliusi</i> , <i>Sierrathrissa leonensis</i>
Characidae	<i>Alestes macrolepidotus</i> , <i>Hydrocynus forskahlii</i> , <i>Alestes nurse</i> , <i>Alestes dentex</i> , <i>Alestes baremose</i> , <i>Hydrocynus brevis</i> ,
Cyprinidae	<i>Labeo senegalensis</i> , <i>Labeo cubie</i> , <i>Labeo parvus</i>
Bagridae	<i>Chrysichthys nigrodigitatus</i> , <i>Clarotes laticeps</i> , <i>Bagrus bayad</i> , <i>Bagrus docmac</i> , <i>Auchenoglanis occidentalis</i> , <i>Chrysichthys auratus</i> , <i>Auchenoglanis biscutatus</i>
Schilbeidae	<i>Eutropius niloticus</i> , <i>Physalia pellucida</i> ,
Mochokidae	<i>Synodontis gambiensis</i> , <i>Synodontis schall</i> , <i>Synodontis nigrita</i> , <i>Synodontis filamentosus</i> , <i>Synodontis gobroni</i> , <i>Synodontis sorex</i> , <i>Synodontis violaceus</i> , <i>Synodontis membarnaceus</i> , <i>Synodontis courtetti</i>
Centropomidae	<i>Lates niloticus</i>
Mormyridae	<i>Marcusenius senegalensis</i> , <i>Hyperopisus bebe</i> , <i>Hippopotamys pictus</i> , <i>Mormyrus rume</i> , <i>Mormyrops deliciosus</i> , <i>Mormyrus macropthalmus</i> , <i>Marcusenius kainji</i> , <i>Marcusenius cyprinoides</i>
Citharinidae	<i>Citharinus citharus</i>
Distichodontidae	<i>Distichodus rostratus</i> , <i>Distichodus engycephalus</i>
Clariidae	<i>Clarias anguillaris</i> , <i>Clarias lazera</i> , <i>Heterobranchus longifilis</i>

**Table 2: Species composition of the catches by number and weight for each stratum (average monthly sampling, from April, 2008 to March, 2009)**

Species group	Stratum I		Stratum II		Stratum III	
	No	Wt (kg)	No	Wt (kg)	No	Wt (kg)
Clupeids	4135	195.4	-	-	-	-
<i>Alestes</i> spp	58	7.8	5	0.9	22	3.3
<i>Hydrocynus</i> spp	90	5.6	6	1.6	12	5.0
<i>Distichodus</i> spp	17	19.9	12	14.2	5	2.7
<i>Citharinus</i> spp	43	26.4	73	46.6	47	20.5
<i>Labeo</i> spp	11	5.4	5	2.4	8	2.0
<i>Clarotes</i>	3	2.5	19	4.3	-	-
Schilbeids	940	23.9	11	1.0	-	-
<i>Auchenolanis</i> spp	1	0.4	6	2.2	20	3.3
<i>Chrysichthys</i> spp	44	4.1	24	6.3	95	8.6
<i>Bagrus</i> spp	5	2.8	13	8.7	23	7.8
<i>Clarias</i> spp	10	4.9	12	8.9	21	8.2
<i>Mormyrus</i> spp	3	2.4	6	3.3	9	4.4
<i>Heterotis niloticus</i>	-	-	2	1.0	1	0.6
<i>Synodontis</i> spp	178	33.9	139	41.0	21	6.8
<i>Heterobranchus</i> spp	10	2.1	4	1.8	7	3.6
<i>Tilapia</i> spp	8	5.0	3	0.2	20	3.4
<i>Lates niloticus</i>	2	34.8	2	4.4	4	3.2
Other cichlids	3	0.8	-	-	-	-
Other species	134	31.4	38	20.2	10	2.1
<b>Total average sampled</b>	5'696	409.5	380	169.0	325	85.5
<b>No of canoes sampled</b>	70		35		28	
<b>Catch per canoe</b>	81.4	5.9	10.9	4.8	11.6	3.1

**Table 3: Stratum and Landing site details of Annual fish yield in Jebba Lake from April, 2008 to March, 2009**

S/No	Name of landing site	Catch (kg)	%
I	<b>Stratum I</b>	<b>3031.58</b>	<b>35.08</b>
1	Faku	667.18	7.92
2	New Awuru	842.31	10.00
3	Bakoshi	778.06	9.34
4	Old awuru	744.03	8.82
II	<b>Stratum II</b>	<b>1010.52</b>	<b>12.52</b>
5	Rimaye	485.48	5.77
6	Lamba Bui	336.92	4.52
7	Gbajibo	188.12	2.23
III	<b>Stratum III</b>	<b>4378.95</b>	<b>52.40</b>
8	Gungun Zaki	1273.51	15.42
9	Tunga Gero	1293.58	15.36
10	Dam Area	1811.86	21.52
	<b>Total</b>	<b>8421.05</b>	<b>100</b>

**Catch Per Unit Effort (CPUE)**

Catch per unit effort (CPUE) per boat has been estimated on the basis of monthly mean fluctuations of fish catch. CPUE also depends upon many physico-chemical factors, current velocity and volume of water. The factors like availability of food organisms, nutrients and temperature variation are also responsible for movement of fish stocks. In the present study, CPUE was computed in five landing sites of Jebba Lake. CPUE varied between 1.05 to

6.22 kg/boat with highest in June at Rimaye while lowest was in February at Faku (Table 4).

**Annual Fish Landings per Fisherman**

The details of average catch per fisherman per year were presented in Table 5. The average annual fish landings per fisherman ranged from 62.71 to 129.68 kg/fisherman/yr (Table 5). The maximum catch was observed at Bakosi landing site while minimum catch was observed at Gbajibo landing site.

**Table 4: Average Catch per unit effort (CPUE) in kg at five landing sites in Jebba Lake during April, 2008 to March, 2009**

Months	Faku	New Awuru	Rimaye	Lamba Bui	Gbajibo
April	2.41	3.75	5.28	3.60	2.71
May	2.73	3.87	5.78	3.78	2.75
June	2.91	4.16	6.22	2.66	2.96
July	1.25	1.80	4.08	4.44	1.53
August	2.05	1.53	2.10	2.62	2.96
September	1.08	1.40	1.95	2.27	3.26
October	1.11	1.58	2.11	2.52	2.35
November	1.55	1.92	2.63	4.23	1.70
December	1.51	2.35	3.58	4.63	1.95
January	1.84	2.86	3.95	4.01	2.23
February	1.05	3.36	4.37	2.49	2.40
March	2.47	3.49	4.86	3.84	2.51

**Table 5: Average Annual Landing per Site per fisherman at Jebba Lake during April, 2008 to March, 2009**

	Landing site	Number of fishermen	Total Landings	Average per fisherman (weight in kg)
	<b>Stratum I</b>	<b>36</b>	<b>3031.58</b>	<b>84.21</b>
1	Faku	10	667.18	66.72
2	New Awuru	12	842.31	70.19
3	Bakosi	6	778.06	129.68
4	Old Awuru	8	744.03	93.00
	<b>Stratum II</b>	<b>15</b>	<b>1010.52</b>	<b>67.37</b>
5	Rimaye	7	485.48	69.35
6	Lamber Biu	5	336.92	67.34
7	Gbajibo	3	188.12	62.71
	<b>Stratum III</b>	<b>36</b>	<b>4378.95</b>	<b>121.64</b>
8	Gungun Zaki	12	1273.51	106.13
9	Tunga Gero	10	1293.58	129.36
10	Dam Area	14	1811.86	129.42

## DISCUSSION

The highest concentration of fishermen and gears occurred in stratum I (upstream zone) of the lake with 44% of the fishermen located in that part, while 20% was located in stratum II (midstream zone) and 36% in stratum III (reservoir zone).

The fishery of Jebba lake is a tropical, multi-species and multi-gears artisanal fishery. The dominant fish species of the Lake includes; *Lates* spp, *Clarias* spp, *Bagrus* spp, *Tilapia* spp, *Oreochromis* spp., *Heterobranchus* spp., *Synodontis* spp., *Chrysichthys* spp; *Citharinus* spp., *Alestes* spp., and *Clupeids*. The commercially important fishes of this lake could be grouped according to their economic importance into five major categories; Catfish (*Clarias* spp., *Bagrus bayad*, *Heterobranchus* spp., and *Chrysichthys* spp.), Tilapias (*Oreochromis niloticus* and *Tilapia zilli*), Nile perch (*Lates niloticus*), Freshwater sardines (clupeids) and others (*Alestes* spp., *Citharinus* spp. and *Synodontis* spp.). Ita *et al.* (1983) reported seven commercially important fishes from Jebba Lake.

The hydrobiological features of the data collection zones play an important role in fisheries output to a great extent. At Jebba Lake, three strata were classified according to their biological and limnological characteristics. Stratum I (upstream zone) exhibits riverine conditions, with rapid water currents and contributed 35.1% of the total catch. Stratum II

(midstream zone) represents low water currents and contributed 12.5% of the total fish catch. Stratum III (reservoir zone), which exhibits lentic habitat and contributed 52.4% of the total fish catch, due to ecological changes in the aquatic environment that provided abundant fish food supply.

The clupeids dominated as a group in the upstream zone (stratum I) and contributed 72.6% by number and 48% by weight to the catches in that area. In the midstream zone (stratum II), *Synodontis* contributed 36.5% by number and 24.3% by weight while *Citharinus* contributed 19.2% by number and 27.8% by weight to the total stratum catches. In terms of number *Synodontis* dominated but was next to *Citharinus* in terms of weight. In the reservoir zone (stratum III), dominance shifted to the *Chrysichthys*, which made up 29.2% of the catches by number but also next to *Citharinus* in terms of weight. *Lates*, though not important by number, contributed significantly to the weight of fish exploited in the upstream section of the lake, but were minor component in the midstream (stratum II) and reservoir parts (stratum III). Clupeids, which contributed 48% and 29.4% to the weight of fish caught in the stratum I and in the lake as a whole respectively, were not represented across the zones.

The catch per unit effort (CPUE) for this reservoir varied between 1.05 to 6.22 kg/boat with highest in June at Rimaye while lowest was in February at Faku. Turner (1994) reported

CPUE values ranged from 21.57 to 31.0 kg/boat at Kainji Lake. Abiodun, *et al* (2005) recorded CPUE values ranged from 6.37 to 8.43 kg/boat at Sabke Lake in Katsina State, Nigeria. When compared with the above cited observations, Jebba Lake shows less value.

A number of fishermen were found using small mesh nylon monofilament gillnets and fish traps less than 1 inch mesh sizes to catch fish. Many of the fishermen know that, it is a bad method to fish with such type of nets but they believed small mesh nets have higher catch rate than bigger mesh sizes. This has a negative impact on Catfish, Tilapia and almost all the fish species in the lake as many juveniles were found in the landed catches.

### CONCLUSION

Lake Jebba is blessed with abundant fish species like most freshwater bodies in Nigeria and Africa at large. The diversity of these species of fish in the lake is still high regardless of the changes that have taken place over the years in terms of abundance and species composition. The abundance and diversity of plants and animals communities in the lake provide abundant and varieties of food to fishes apart from serving as sites for breeding which makes the environment favourable for these fishes to thrive well. The fishing pressure, in terms of number of fishermen and the kinds of fishing gears in use on the lake, has a depleting effect on the abundance and sizes of commercially exploited species. A training workshop on fisheries management is suggested for the fishermen and also establishment of an effective community based management system that will control the number of fishermen, access to resource exploitation and type of gears used for fish catch.

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