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Current diversity and abundance of fish species in a sampling site on Lake Kainji

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ABSTRACT: The diversity and abundance of fish species was studied in a sampling site on the Lake Kainji over a period of three months. A total number of four hundred and thirteen (413) fish from forty (40) species and fifteen (15) families were recorded during the study. The family bagridae dominated the catches with 18.37% in terms of abundance by number followed by Mochokidae with 13.5%% while Channidae had the lowest with 0.24%.

The highest number of different species (8) was from bagridae followed by Mormyridae (6), then Characidae (5) and Mochokidae (4). In terms of ponderal abundance the family Centropomidae accounted for the highest with 27.22%. Distichodontidae (18.13%) was next and Channidae had the lowest (0.11%). Analysis of variance showed significant difference between families and species in each family during period of study. There was also significant difference between species of fish within family at > 0.05. The total number of fish families and species recorded in the sampling site is an indication that the species diversity in the Lake is still high.

Key words: Fish abundance; Fish diversity; Lake Kainji; Nigeria.

Introduction

Kainji Lake was created in 1968 and is located in the Northwestern portion of Nigeria, formed by the damming of river Niger with an estimated area of 1280sq.km when full. The Lake harbors different species of fish that belong to different families, which reflect the composition of Niger River.

Studies of changes in species composition and distribution over the years carried out by Turner (1972), Lelek (1972), Ita (1978) and Lewis (1974), assessed the status of fishery based on composition of individual species and families.

The diversity of fish species in any water body is attributed to favourable conditions and fish population respond to factors such as fishing, pollution and eutrophication among others, which can bring about series of changes in size, species composition and abundance in the aquatic environment (Welcomme, 1999).

Imewvbore (1970) reported that ecological nature of the lake provide abundant food supply that gave rise to fish population explosion in recent years and the relatively shallow depth, fairly high primary productivity, high standing crop of phytoplankton, small mean retention time of water and large draw-down that prevent permanent stratification in the lake allows fish to florish. Lewis (1974) reported that changes in composition and abundance of both plankton and benthic communities affect food supplies of any species of fish, either favourably or adversely in Lake Kainji.

Banks *et al*., (1965), Reed *et al*., (1967), Ita (1978) studied fish species diversity in rivers, lakes and reservoirs where different species were identified from these water bodies. Ita (1993) compared this diversity in major rivers, natural lakes, reservoirs, wetlands and their tributaries. Similar work has been done by Bukar and Gubio (1985) in Lake Chad, Matthes (1990) in Hadejia-Nguru wetlands, Kuznetsor and Galanin (2000) in Kuibysher reservoir, and Haruna (2000) in Jakara Lake.

This study assesses the diversity of fish species that is occurring in a landing site. The study area was chosen because of its accessibility, location down stream where most species of fish are expected to be found due to low water current and food. There is a high level of fishing activities in the area, which possibly suggests a high level of fish abundance.

Materials and Methods

Gangs of experimental gill nets of various mesh sizes ranging from 1½, 2½, 3 to 4 inches in a fleet where two fleets of the nets were used to catch the fish. The nets were set on shore, surface and bottom of the sampling site. Sampling was done four times per month between the months of August and October 2003. Fish caught were identified to species. Standard length and total length were measured and taken in centimetres while weights were taken in kilograms. Fish identification was done using an illustrated key of fishes of Lake Kainji (Lewis, 1974) and West Africa fresh water fish handbook (Holden and reed, 1990).

Data obtained were analysed for species diversity. The variations in the mean abundance of fish were tested by the analysis of variance.

Results

The fish obtained from the Lake over the period were a total of 413 individual fish, a total of fifteen families were recorded (Table 1).

The family Bagridae recorded the highest number in terms of different species. It is followed by Mormyridae and then Characidae (Table 1). It also depicts the percentage composition by number and weight of each family. Figure 1 depicts that Centropomidae dominated in terms of weight followed by Distichodontidae then Mormyridae. Figure 2 shows that Bagridae dominated in terms of number with a total of 76 followed by Mormyridae (59) then Mochokidae (55). Channidae recorded the lowest number (1). Figure 1 depicts that Centropomidae dominated in terms of weight followed by Distichodontidae then Mormyridae.

Analysis based on the relative abundance of species and among fish families shows that there was a significant and no significant difference respectively (Table 2).

Discussion

Fifteen families and forty species of fish recorded during the period of study corroborate the fact that Lake Kainji still has a high variety and abundance of fish species. Lelek (1972) recorded 99 species, while Ita (1978) recorded 104 species in the lake. A total number of 413 fish were recorded in the study (Table 1).

Family Bagridae was the most abundant making up 18.37% in terms of number, followed by Mochokidae (13.55%). Osteoglossidae and Gymnarchidae have the same abundance (0.48%) while Channidae had the lowest at 0.24% of the total. Ita (1978) reported that the family Characidae dominated in terms of abundance by number (23.09%), followed by Mochokidae with 18.31%, Cichlidae 11.75% and Cyprinidae. Bagridae recorded only 8.89% abundance, which is different from what has been found in this study.

Table 1: Percentage Abundance by Number and Weight in each Family

Family/ Species	No.	%	Wt.	%
Osteoglossidae				
Heterotis niloticus	2	0.48	0.65	0.16
Mormyridae				
Mormyrus rume	32	7.74	22.74	5.61
Mormyrops oudoti	1	0.24	0.35	0.08
Mormyrops deliciosus	16	3.87	12.45	3.07
Mormyrops macropthalmus	1	0.24	0.2	0.05
Hyperopisus bebe occidentalis	7	1.69	2.3	0.57
Gnathenamus abadii	2	0.48	0.25	0.06
Gymnarchidae				
Gymnarchus niloticus	2	0.48	3.7	0.91
Characidae				
Hydrocynus forskalii	18	4.35	10.8	2.66
Hydrocynus brevis	5	1.21	11.6	2.86
Alestes macrolepidotus	5	1.21	6.1	2.86
Alestes baremose	14	3.39	2.74	3.45
Alestes leuciscus	1	0.24	0.001	0.003
Citharinidae				
Citharinus citharus	35	8.47	22.44	5.53
Distichodontidae				
Distichodus rostratus	22	5.33	45.15	11.13
Distichodus engycephalus	3	0.73	5.25	1.29
Distichodus brevipinnis	9	2.18	23.15	5.71
Cyprinidae				
Labeo senegalensis	12	2.90	6.5	1.60
Labeo coubie	11	2.66	25.6	6.31
Bagridae				
Bagrus bayad	33	7.99	16.74	4.13
Bagrus docmac	8	1.93	12.2	3.01
Chrysichthys furcatus	6	1.45	2.0	0.49
Chrysichthys nigrodigitatus	1	0.24	0.2	0.05
Clarotes laticeps	18	4.35	11.04	2.72
Clarotes macrolepidotus	1	0.24	1.5	0.37
Auchenoglanis occidentalis	7	1.69	3.45	0.85
Auchenoglanis biscutatus	2	0.48	0.5	0.12
Schilbeidea				
Silurondon auritus	4	0.97	0.31	0.08
Eutropius niloticus	4	0.97	0.12	0.03
Clariidae				
Clarias anguillaris	12	2.90	33.9	8.35
Malapteruridae				
Malapterurus electricus	9	2.18	6.7	1.65
Mochokidae				
Synodontis membranaceus	40	9.68	25.75	6.35
Synodontis budgetii	8	1.93	2.75	0.68
Synodontis clarias	4	0.97	1.15	0.28
Synodontis schall	4	0.97	0.6	0.16
Channidae				
Channa obscurus	1	0.24	0.45	0.11
Centropomidae				
Lates niloticus	28	6.78	110.42	27.22
Cichlidae				
Oreochromis niloticus	14	3.39	2.9	0.71
Sarotherodon galilaeus	10	2.42	1.38	0.34
Pelmatochromis guentheri	1	0.24	0.25	0.06
Grand Total	413		405.6	

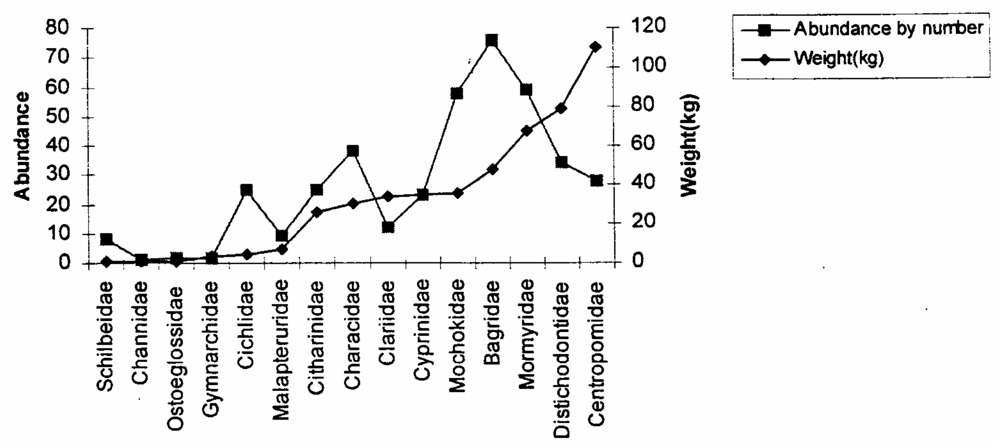

Figure 1: Abundance: by number and weight of fish families

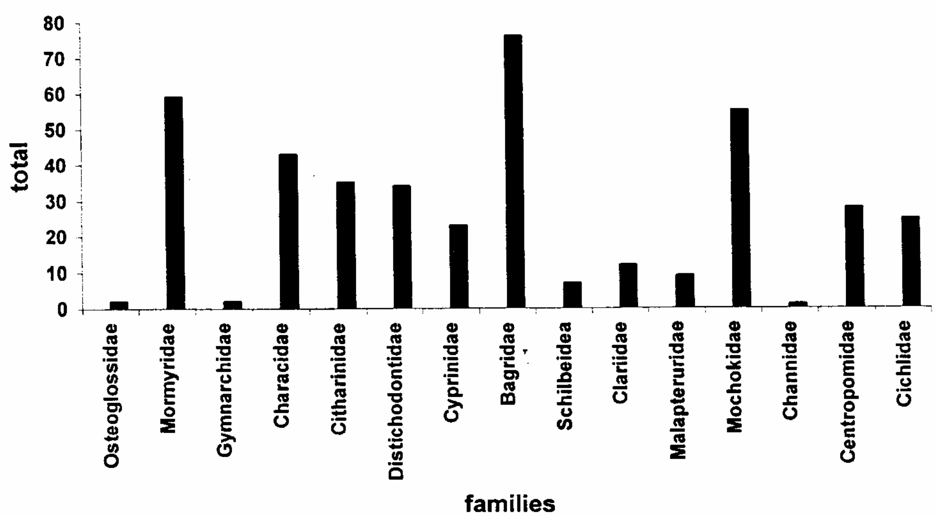

Figure 2: Total number of fish recorded for each Family.

Table 2: Analysis of variance among families

Degree of freedom between and within = 14 and 30 respectively. F = 3.22; P = 0.003 at 5%.

Family	Sum	Average	Variance
Osteoglossidae	2	0.67	1.3
Mormyridae	59	19.67	2.3
Gymnarchidae	2	0.67	0.3
Characidae	43	14.33	72.3
Citharinidae	35	11.67	200.3
Distichodontidae	34	11.33	90.32
Cyprinidae	23	7.67	8.3
Bagridae	76	25.33	265.3
Schilbeidae	8	2.67	10.67
Clariidae	12	4	7
Malapteruridae	9	3	7
Mochokidae	56	18.66	34.4
Channidae	1	0.33	0.3
Centropomidae	28	9.33	42.3
Cichilidae	25	8.33	86.3

Balogun (1986) reported that the dominant family was Cichlidae (28.85%), Bagridae (20.22%) ansd Characidae (13.44%). Cyprinidae and Mormyridae accounted for 12.28% and 2.47% respectively. In regular gill net catches Balogun (1985) reported that family Bagridae had an abundance of 19.9% which is in agreement with the present study. Schilbeidae followed with 19.6% and Citharinidae/Distichodontidae with 16.3%, while Mormyridae recorded the lowest with 1.6%. The abundance of individual species could be due to adequate spawning and a high survival rate of the young fish (Turner, 1972) and could also be related to the adaptability of these families over others.

Bagridae also recorded the highest number in terms of different species abundance within a family. It is followed by Mormyridae, then Characidae and Mochokidae (Fig. 2). This may be as a result of their ability to cover all habitats. Ajayi (1972) reported that members of the family Bagridae were found to frequent both inshore and offshore shallow waters apart from shore and bottom of deep waters.

The family Centropomidae takes the lead in terms of weight at 27.22% of the total catch, followed by Distichodontidae with 18.13% and Mormyridae with 9.44%. Channidae has the lowest with 0.11% of the total weight (Table 1). This is at variance with the report of Turner (1972) that the family Citharinidae had the highest at 35.6% of the total weight followed by Characidae (17.7%), Centropomidae (13.0%) and Cichlidae accounting for only 0.7%. Similarly, Lekel (1972) reported that Citharinidae had the highest total by weight, followed by Chracidae. Lewis (1974) reported that Characidae is the dominant family, followed by Citharinidae (October, 1970 – September, 1971) and Characidae maintained the lead but was followed by Mochokidae (October , 1971 – September, 1972).

Analysis of variance carried out shows that there is significant difference between families at 95% (Table 2). Bazigos (1972) observed a significant correlation between catches and water level fluctuations which may also contribute to such difference. On the other hand, families Characidae, Citharinidae, Bagridae and Mochokidae were significantly different while families Osteoglossidae, Gymnarchidae and Channidae did not show any significant difference as a result of the number recorded during the study.

Almost all the species in each family was recorded during each month throughout the period of study. Ita (1978) also reported that there was no significant difference in the catches of members of these families in their distribution and percentage composition or abundance in the lake.

The changes observed could be attributed to the continual changes in the environment whereby a particular family could adapt better than others within a period or span of time. The result further confirms that the diversity of species in Lake Kainji is still high. This is coupled with the fact that not all were recorded due to the selectivity of the gill-net gear used.

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