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SURVEY OF FISHERIES RESOURCES OF NGURU LAKE

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ABSTRACT

The study was aimed at estimating the fisheries potential of the lake with a view to optimum exploitation of the lakes resources.The data on the fisheries of Nguru Lake was studied over a period of one year. Fish samples were collected monthly from the five sampling stations using gill nets of various mesh sizes, with the assistance of the fishermen. A total of twenty four fish species belonging to 13 families were identified. The family Cichlidae dominated the fish fauna with 64%. The families Claridae and Osteogossidae constituted 6% each, while the family Malapteruridae was the least with only 0.17%. The mean weight of fish caught per day was 540.17kg, from three landing sites, with 14 fishermen operating averagely from each site. The study also revealed that the lake was not over-fished.

Key Words: *Fisheries, Frame survey, Hydrology, Resources*

INTRODUCTION

Water bodies differ in origin, function and geographical locations and exhibit marked differences in fish production. Many workers have carried out studies on the effect of different physico-chemical parameters on fish production at different times and in different areas of the world. Such works include those on Temperature (Balarin and Hatton, 1979) pH (Boyd 1985) salinity (Payne, 1983) turbidity (Hickling, 1974) and dissolved oxygen (Kolo, 1996). A positive correlation between phytoplankton, zooplankton and productivity in lakes has been described and used to estimate fish yield (Melack, 1976). According to FAO (1998), the basic purpose of fish stock assessment is to provide advice on the optimum exploitation of aquatic resources such as fish. Living resources are limited but renewable, and fish stock assessment may be described as the search for the exploitation level, which in the end gives the maximum yield in weight from the fishery. The term "stock" in fish stock assessment means a sub-set of one species having the same growth and mortality parameters and inhabiting a particular geographical area. Larkin (1972) defined a stock as "a population of organisms which, sharing a common gene pool is sufficiently discrete to warrant consideration as a self-perpetuating system which can be managed" while Ihssen *et al.,* (1981) defined stock as "an intraspecific group of randomly mating individuals with temporal or spatial integrity. Perhaps the most suitable definition in the context of fish stock assessment, was given by Gulland (1983) who stated that for fisheries management purposes, the definition of "unit stock" is an operational matter, i.e. a sub-group of a species can be treated as a stock. If possible differences within the group and interchanges with other groups can be ignored without making the conclusion reached invalid. Fish stock assessment should be made for each stock separately. The results may (or may not) subsequently be pooled into an assessment of a multispecies fishery. Fish stock assessment involves some basic steps. The first step is to collect data on the fishery, which often have to

be supplemented by assumptions or qualified guesses. The data is then processed by applying a model to estimate the growth and mortality parameters. The data on the fishery i.e. original data may be research survey data(Frame survey), data from samples drawn from the commercial fisheries or a combination of both. The objective of this study is to determine the diversity and abundance of fish in the lake with the aim of estimating the fisheries potential of the lake with a view to optimum exploitation of the lakes resources.

MATERIALS AND METHODS

Hydrology of Nguru Lake

Floods in the wet season play a critical role in recharging groundwater. However, the Nguru Lake primarily receives water from the Hadejia River, which in turn receives from it tributaries, the Kano and Challawa Rivers. The Hadejia river, near Madachi swamps gives up distributary called the Burum Gana River, which also gives up to further distributaries the Marma channel and Wazagal Goroje both of which drain into the Nguru Lake. According to Schultz (1976), over 50% of the flow in the Hadejia River finished up flowing towards Nguru Lake and 63% of the flow in the Hadejia, flow along the Burum Gana rather than along the Hadejia River itself. The Nguru Lake has an area of about 37km^2 with a water volume of 58million m^3.The average depth in the Marma channel is 2.5 meters while the deepest point in Nguru Lake is 7meters at the peak of floods in a very wet year. The mean pH for Nguru Lake is 6.5.(Abubakar and Balarabe, 2008).

Socio-Economic uses of Nguru Lake

Over half a million people depend upon the lake and the surrounding wetlands for their livelihoods, especially for water supply. Lafiagi (1997) has identified about 65 species of fishes. Therefore, majority of the people living around the lake are either fishermen, or processors and marketers of fish. The land around the lake is irrigated in both dry and wet season for vegetables and rice. The lake is also used for livestock grazing, for recreation and research, since it has a large biodiversity of birds, insects, wildlife and flowering plants. In fact the lake and the surrounding wetlands is particularly a good representative of a natural or near-natural wetlands, which embodies all the diverse flora and fauna at both the Sahel and the Sudan in a single location; hence the area is important for ecotourism.

Fish Sampling

Fish samples were collected monthly for a one year period, from the five sampling stations using gill nets of various mesh sizes (3, 4, 5, 6, 7, 8 centimeters), with the assistance of the fishermen. The sampling stations were selected based on the intensity of human activity and the infestation by *Typha* sp. Fish samples were identified and weighed fresh, at landing sites to the nearest gram. Fish identification was done using various reference materials such as Reed *et al.*, (1967) and Leveque *et al.*, (1992). Standard and total lengths were taken using a measuring board as described by Lagler *et al.,* (1977). The numbers of fishermen operating on the lake were counted and the types of gears they used were identified.
Oral interviews were also conducted with the fishermen to estimate the fish stock of the lake.

RESULTS

A total of twenty-four fish species belonging to 13 families were identified (result presented in table 1). The list of fishes is presented in appendix i. The results of mean number of fishes caught are presented in table 2. The family Cichlidae dominated the fishes of Nguru Lake with 64%. The families Claridae and Osteoglosidae constituted 6% each, while the family Malapteruridae was the least with 0.17%. According to their weights, the family Cichlidae had 53.87% followed by Osteoglosidae with 18.57% and Claridae had 6.17%. The mean weight of fish caught at Nguru Lake is presented in table 3. Nguru Lake had three main fish landing sites at Garbi, Gashua road and Dabar Magini with an average of 14 fishermen operating everyday. The fishing gears used were mainly gillnets and detachable basket traps with non-return valve. The mean weight of fish caught from the lake per day was 540.17kg.

Table 1: Fishes of Nguru Lake

Fish	Family	Local name
Oreochromis niloticus **Linnaeus 1758**	*Cichlidae*	Sakiya
Sarotherodon galilaeus **Pellegrin 1903**	*Cichlidae*	Farar wala
Tilapia zilli **Gervais 1848**	*Cichlidae*	Kurwa
Synodontis vermiculatus **Daget 1954**	*Mochokidae*	Kurungu
Synodontis courteti **Pellegrin 1906**	*Mochokidae*	kurungu
Synodontis nigrita **Valenciences 1840**	*Mochokidae*	Karamin karaya
Synodontis membranaceus **Geoffr. 1809**	*Mochokidae*	Karaya
Gnathonemus petersii **Gunther 1862**	*Mormyridae*	Faya
Marcusenius cyprinoides **Ruppell 1832**	*Mormyridae*	Tatar
Shilbe mystus **Linnaeus 1758**	*Shilbedae*	Lulu
Siluranodon auritus **Geoffr 1809**	*Shilbedae*	Lafar
*Auchenoglanis occidentalis Pelleg***. 1909**	*Bagridae*	Gwami
Bagrus bayad **Forskal 1775**	*Bagridae*	Musko
Leptocypris niloticus **Joannis 1835**	*Icthyboridae*	Saro
Barbus occidentalis **Boulenger 1911**	*Icthyboridae*	Burdo
Hydrocynus brevis **Gunther 1864**	*Characidae*	Tsage
Citharinus citharus **Geoffr. 1809**	*Citharinidae*	Kausa
Brycinus nurse **Ruppell 1832**	*Characidae*	Kawara
Protopterus annectens **Owen 1839**	*Lepidosirenidae*	Gaywa
Mormyrops anguilloides **Linnaeus 1758**	*Mormyridae*	Mulgi
Clarias gariepinus **Burchell 1822**	*Claridae*	Tarwada
Lates niloticus **Linnaeus 1758**	*Centroponidae*	Barya
Heterotis niloticus **Cuvier 1829**	*Osteoglossidae*	Bargi
Malapterurus electricus **Gmelin 1789**	*Malapteruridae*	Minjirya

Table 2. Monthly mean number of fish recorded at Nguru Lake

Months	**Species**					
	O.niloticus	***S. gallilieus***	***T. zillii***	***C. gariepinus***	***H. niloticus***	**Others**
May	412	924	56	44	116	404
Jun	409	742	73	56	121	419
Jul	377	712	81	142	128	491
Aug	386	678	109	286	133	512
Sep	381	692	98	298	122	493
Oct	399	718	98	192	109	489
Nov	397	736	104	108	121	487
Dec	349	742	98	92	96	458
Jan	389	761	92	78	101	428
Feb	402	876	86	62	112	412
Mar	412	861	76	58	112	408
Apr	405	731	64	46	103	401

There was significant variation in the number of *O. niloticus, S. galileus* and all the other fishes caught in the lake. In addition there is significant variation between the weights of all the groups of fishes recorded at the lake during the study period. The average catch per fisherman in the lake was 38.58kg per day. While an average of 1956 pieces of fish, which are of commercial value are caught daily by the commercial fishermen. The mean length of fish caught is presented in table 3.

Table 3. Monthly mean weight of fish recorded at Nguru Lake

Months	**Species**					
	O.niloticus	***S. gallilieus***	***T. zillii***	***C. gariepinus***	***H. niloticus***	**Others**
May	132.8	121.6	26.5	10.2	98.5	80.8
Jun	138.4	111.5	31.8	12.8	102.3	84.4
Jul	126.9	109.2	36.4	28.9	108.2	92.6
Aug	127.9	103.7	48.9	84.3	124.5	192.2
Sep	126.6	106.2	43.8	86.3	106.6	121.1

Oct	128.2	112.2	46.8	86.4	94.4	138.2
Nov	130.2	109.9	48.4	48.9	119.8	181.8
Dec	126.6	114.6	43.7	42.6	102.2	162.4
Jan	129.7	116.4	41.6	36.6	104.1	141.6
Feb	129.7	119.6	31.8	28.8	99.6	83.2
Mar	132.3	116.7	29.8	12.4	96.5	84.4
Apr	128.9	114.5	27.2	12.2	94.4	81.1

Table 4. Mean length of fishes caught at Nguru Lake

Fish	**Mean length**
O. niloticus	24.5cm
S. galileus	22.3cm
T. zillii	23.8cm
C. gariepinus	29.4cm
H. niloticus	53.8cm
Others	17.8cm

DISCUSSION

It was obvious from the results that Nguru Lake showed fish abundance in terms of number and weight, and there was relatively high species diversity. The mean catch of 12.86±0.23kg per fisherman was an indication of high productivity, which was also higher than the 5.8kg observed by Henderson and Welcomme (1974) for 31 African Lakes. The fish diversity of 13 fish families and 24 different fish species was also higher than fish diversities observed from small lakes such as Bakalori, Goronyo and Tiga, (Ita 1979). Kangimi (Balogun and Auta, 2001), Dan-Zaria, (Lamai and Kolo, 2003), Doma, (Mohammed and Omoregie, 2004).

The dominance of fish family Cichlidae in Nguru Lake compares favorably with dominance of the cichlids in Lakes Kainji, Tiga, Bakalori and other African Lakes (Ita *et al,*. 1982, Balogun, 2005, Balogun and Auta, 2001, Mohammed and Omoregie, 2004). The order Cichlidae, Bagridae, Characidae and Cyprinidae reported for Lakes Kainji, Tiga and Bakalori (Balogun, 2005) was in contrast to the order of Cichlidae, Claridae, Osteoglosidae and Mormyridae observed in Nguru Lake. The use of gillnets by the majority of fishermen in Nguru Lake, and their use of certain mesh sizes indicates that the fishermen are to a certain extent enlightened on the conservation of fish species. The fishes caught at Nguru Lake are relatively larger than the average at Kainji Lake. This is attested to, by the studies of Ahmed *et al*., (2005) who opined that 96% of the fishes caught in Kainji Lake contravened the fifth schedule section 11 of the Kebbi and Niger States fisheries Edict of 1997. The Edict prohibits the catching of individual fishes shorter than 12cm. According to Ahmed and Ipinjolu (2005), some important factors influencing the efficiency and selectivity of gillnets are mesh size, exposed net area, floatation, mesh shape and hanging ratios, visibility and type of netting material in relation to stiffness and breaking strength. Ahmed *et al.,* (2005) suggested that the existing minimum limits of gillnets mesh size (76.2mm) should be reviewed, in view of

the small sizes of fish caught in Lake Kainji. The difference in mean fish catch between the stations with open water and those infested with *Typha* sp.was an indication that there was decrease in productivity. This may not be unconnected with changes in physico-chemical properties brought about as a result of infestation by aquatic macrophytes. Birnin-Yauri *et al.,* (2006), showed that there was reduced fish yield in water bodies that are infested by *Typha.*

CONCLUSION AND RECOMMENDATIONS

The diversity of fish recorded in this study indicates that the lake has a relatively high fish diversity. The number and biomass of fish caught during the study is considered high, when compared to other Nigerian lakes.The sizes of fish recorded also indicate that the lake is not overfished. It is therefore recommended that the government and other donor agencies should provide support for research and studies to collect analyze and synthesize information and harmonize existing policies, edicts and byelaws that conform to Integrated Water Resources Management (IWRM) principles, including establishing criteria for water –use. The artisanal fishermen should also be encouraged to maintain the use of mesh size regulation.

REFERENCES

Abubakar, M.M. and Balarabe, M.L. (2008). Effect of physicochemical factors and phytoplankton on the abundance of zooplankton in Nguru lake, North eastern Nigeria*. Biological and Environmental Sciences Journal for the Tropics* **5** *(1):* 110- 112.

Ahmed, Y.B. and Ipinjolu, J.K. (2005). Selectivity of gillnets and baited longlines in the southern basin of Lake Kainji, Nigeria. Fisheries Society of Nigeria, Conference Proceedings 2005.

Ahmed, Y.B., Ipinjolu, J.K. and Hassan, W.A. (2005) Catch composition of Gillnets and Baited longlines in the Southern basin of lake Kanji, Nigeria. Fisheries Society of Nigeria, conference proceedings 2005.

Balarin,J.D.and Hatton,J.P.(1979). Tilapia: A guide to their biology and culture in Africa. *Aquaculture* **20***:* 250-261.

Balogun, J.K. (2005). Fish distribution in Kainji domestic water supply reservoir. A case study of Kangimi reservoir, Kaduna state, Nigeria. *Journal of Applied Sciences* **1:** 50-56

Balogun,J.K. and Auta, J.(2001). Fisheries resources and development potential of Lake Kangimi, Kaduna state, Nigeria. *Nigerian Journal of Biological Sciences* **1***:.*50-56.

Birnin-Yauri, Y.A., Daddy, F. Ahmed, Y.B. and Owotunse, S. (2006): Impact of *Typha* on fish catch in Kebbi State. Fisheries Society of Nigeria, conference proceedings 2006.

Boyd, C.E.(1985). Pond evaporation. *Transactions of the American Fisheries Society,* **144***:* 299-303

FAO,(1998). Introduction to tropical fish stock assessment.manual part 1. *FAO fisheries*

Gulland,J.A.(1983). Fish stock assessment: a manual of basic methods. Chichester, UK, Wiley interscience, FAO/Wiley and sons Ltd: 422.

Henderson, H.F. and R.L. Welcome (1974). The relationship of yield to morpho-edaphic index and numbers of fishermen in African inland fisheries. C.I.F.A. Conference paper. 19.

Hickling, E.F.(1974). The farming of fish. Pergramon Press Ltd. Oxford, UK. 88.

Ihsen,P.E., Booke,H.E., Casseman, J.M., McGlade,J.M., Payne, N.R., and Utter, F.M. (1981). Stock identification: Materials and methods. *Can. Jour. Fish. Aquat. Sci***. 38***:* 1838-1855.

Ita, E.O. (1979). Some perspective in reservoir fishery management and development. The Kainji Experience. International Conference on Kainji Lake and River Basin Development in Africa, 2, New-Bussa, Nigeria. 266-277.

Ita,E.O., J.K. Balogun and A. Adimula (1982). A preliminary report of pre-impoundment fisheries survey of Goronyo Reservoir, Sokoto state, Nigeria. *A report prepared by the fisheries division of Kainji Lake Research Institute*. 87.

Kolo, R.J. (1996). The Assessment of physico-chemical parameters of Shiroro Lake and its major tributaries. Fisheries Society of Nigeria Conference Proceedings, 260-268.

Lafiagi, A. (1997) A Report of fish biodiversity inventory in the Hadejia-Nguru Wetlands.HNWCP Nguru Nigeria.

Lagler,K.F., Bardach,J.E., Miller,R.R. and Passino, D.R.M.(1977).*ICHTHYOLOGY. 2ND ED*.John Wiley and sons New york.

Lamai, S.L. and R.J. Kolo (2003). Biodiversity and abundance of fish and plankton of Dan-Zaria dam, Niger state, Nigeria. *Journal of Aquatic sciences* **18** *(2)* 141-148

Larking,P.A.(1972). The stock concept and management of pacific salmon. H.R. MacMillan lectures in fisheries. Vancouver, university of British Colombia press: 231

Leveque, C.D. Paugy, and G.G Teugels (eds) *Fauene des poisons d'eaux douces et saumatres de L'Afrique de I'Ouest (Tome)* ORSTOM et MRAC Tervuren and Paris. 902.

Melack, J.H.(1976). photosynthetic rates in four tropical freshwaters. *Freshwater Biology* **9***:* 555-571

Mohammed, S.U. and Omoregie (2004). A preliminary investigation into the fisheries potential of Doma Lake, Nassarawa state, Nigeria. *Journal of Aquatic sciences* **19** *(2): 59-64*

Payne, A.K.(1983). Estuarine and salt tolerant Tilapia. In: Proceeding of international symposium on Tilapia in aquaculture. Nazareth. 534-543

Reed, W., Burchard, J., Hopson, A. J., Jennes, J. and Yaro, I. (1967) *Fishes of northern Nigeria*, Ministry of Agriculture Northern Nigeria. Gaskiya corporation, Zaria Nigeria.

Schultz C. (1976). *Hadejia river basin study*. Canadian International Development agency. Montreal.