

Fish Species Diversity and Abundance of Kiri Reservoir, Shelleng Local Government Area, Adamawa State, Nigeria

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ABSTRACT

The present study investigates the diversity and abundance of fish species in Kiri Reservoir. Specimens were collected monthly with the assistance of artisanal fishermen using fishing gears such as gill net, hook and line, cast net and drag net from June, 2016 - May, 2017. A total of 2179 fish were sampled. Forty seven (47) species representing fifteen (15) families were identified. The family Characidae, has the highest species with eight (8) species representing the family followed by the families Momyridae and Bagridae which has six (6) species each. The remaining families (Astacidae, Centroponidae, Protopteridae, Distichodontidae, Polypteridae, Cyprinidae, Cichlidae, Citharinidae, Schilbeidae, Clariidae, Mochokidae) had between one (1) and four (4) species representing each of the families. *Oreochromis niloticus* which belong to Cichlidae family has the highest percentage composition (11.29%) and crawfish (Crustacea) has the least percentage composition (0.14%). In term of relative abundance, month of August, 2016 and May, 2017 has the highest relative abundance of 378 and 348 fish respectively, while the month of December has the lowest relative abundance of 38 fish.

Keywords: Abundance, Distribution, Fishing gears, Fish Species, Kiri, Reservoir

INTRODUCTION

Kiri reservoir has the potential natural resources which if well managed can supply fish to the people of Adamawa State as well as the entire neighbouring states. For sustainability of fisheries resources in the reservoir, a crucial management tool is a comprehensive understanding of the fish species composition as well as their distributional pattern. Distribution and abundance are important variables of fish population dynamics studies that will help in evaluating the effect of fishing on a fishery as a basis of fishery management decisions (Sissenwine *et al.*, 1979). Throughout Africa and Nigeria in particular, the occurrence of a large number of inland or freshwater Reservoirs, Lakes, Rivers and other aquatic habitats such as swamps and flood plains, of different sizes and forms, and containing a wide variety of fish populations, have provided mankind with the opportunity to exploit fish for food, income and livelihoods in general for many centuries (Neiland, 2005).

As a natural resource, fish is a good source of animal protein. In Africa, fish is an important source of animal protein, constituting 23% of human daily animal protein intake as reported by Konstapel and Noort (1995) and FAO, (1991). It is an important food for over 400 million Africans, contributing essential proteins, minerals and micronutrients to their diets. Tobor (1992) reported that over 270 fish species are endemic in Nigeria numerous fresh water bodies, making it the richest in fish diversity in West Africa. Nigeria fresh water bodies are the richest in West Africa in terms of fish distribution (Meye and Ikomi, 2008). Waters (1992) reviewed the biodiversity of fresh water fish in relative habitat. Boulenger (1901-1916) listed 976 species of African freshwater fishes comprising 185 genera and 43 families. The fish resource in Nigeria, apart from being a major source of cheap and quality animal protein for man provide employment opportunities to many rural dwellers and raw materials for some industrial activities as well as recreational purposes (Yakubu, 2012).

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MATERIALS AND METHOD

Study Area

KiriReservoir as shown in Figure 1 is built on River Gongola and is located in Kiri village; Shelleng Local Government Area of Adamawa state, which is about 20km from Numan town. It has an estimated terrain elevation of 158metres above sea level. It is located on Latitude 9°40'47''N and longitude 12°0'51.01''E. The Reservoir has a Dam which is 1.2kmlong, 20m high zoned embankment with an internal clay blanket and has a capacity of 615 million m³. Construction were done by Nigeria Construction Company in 1982. It serves as a source of water supply to Savannah Sugar Company for irrigation of its 6,000ha plantation (Institutional Civil Engineers.1990).

Fish Sampling

Artisanal fishermen mainly exploit the fishery. The fish were collected on monthly basis between the months of June, 2016 to May, 2017, with the assistance of artisanal fishermen. The boats were manned by an average of two men per boat, to which the fishing nets are attached. The specimens were immediately preserved in iced packed cooler and transferred to the Zoology Laboratory, ModibboAdama University of Technology, Yolawehere the identification were done.

Species Identification

The specimens were sorted into different groups and identified to specific level using the FAO Species Identification Sheets and Babatunde and Raji (1998). The most abundant species was determined by sorting out fishes according to species and counting them.

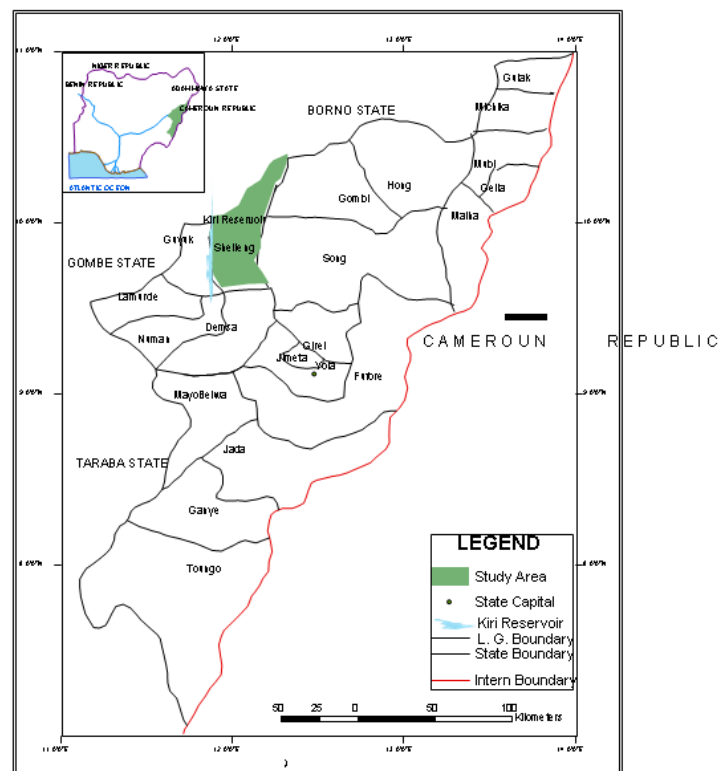


Figure1. Map of Adamawa State Showing the Location of Kiri Reservoir (GIS Laboratory Dept. of Geo.. MAUTECH. 2015)

RESULT AND DISCUSSION

Result

The result of the fish species identified is presented on table 1. A total of forty seven (47) species representing fifteen (15) families were identified. It also revealed that the family' Characidae, has the highest species with eight (8) species representing the families. The families Momyridaeand Bagridae has six (6) species respectively, Schilbeidae, Clariidaeand Mochokidae has four (4) species each, Cichlidae

and Citharinidae has three (3) each, while Polypteridae and Cyprinidae has two (2) species each. The remaining families (Astacidae, Centroponidae, Protopteridae and Distichodontidae) had only one (1) species representing each of the families as presented on table 1 below.

The percentage composition of the species identified at Kiri Reservoir is shown on Table 2. The table reveals that, *Oreochromis niloticus*, *Synodontis clarias*, *Claria gariepinus* and *Oreochromis aureus* had 11.29%, 10.74%, 6.88

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and 5.97% of the total fish species identified. *synodontisnigerita*, *Schilbeinter medius*, *Schilbebuffei* and *Clariaslazera* had 3.97%, 3.26%, 3.21% and 3.03% respectively. Crawfish which is a Crustacean has the lowest percentage composition of all the species of species identified with 0.14%. The remaining fish species had percentage composition between 0.28% and 2.89% as shown on table 2.

Table 3 present the relative abundance and distribution of various fish species identified at Kiri Reservoir. The result reveals that, the reservoir had its high relative abundance in the month of August, 2016, May, 2017, April 2017 with relative abundance of 378, 348 and 277 respectively. It's least relative abundance were in the month of November-December, 2016 and January, 2017 with relative abundance of 71, 38, and 69 respectively.

Table 1. Fish Species Identified at Kiri Reservoir

Families	Species		
	Scientific Name	English Name	Local Name (Hausa)
Schilbeidae	<i>Schilbeintermedius</i>	Butterfish	Nalanga
	<i>Schilbeuranoscopus</i>	Butterfish	Nalanga
	<i>Schilbemystus</i>	Butterfish	Nalanga
	<i>Schilbebuffei</i>		
Characidae	<i>Alestesdentex</i>	Characin	Shemani
	<i>Alestesmacrophthalmus</i>		Shemani
	<i>Brycinusleuciscus</i>		Kawara
	<i>Brycinusintermedius</i>		
	<i>Hydrocynusforskalii</i>	Tiger fish	Zawai
	<i>Hydrocynusbevis</i>	Tiger fish	Zawai
	<i>Hydrocynusvittatus</i>	Tiger fish	Zawai
Clariidae	<i>Hydrocynuslineatus</i>		Chinciyawa
	<i>Clariasgariepinus</i>	North Africa catfish	Tarwada
	<i>Clariaslazera</i>		Tarwada
	<i>Clariasanguillaris</i>		Tarwada
Mochokidea	<i>Heterobranchuslongifilis</i>		Tarwada
	<i>Synodontisclarias</i>	Catfish	Kurungu
	<i>Synodontisnigrita</i>	Catfish	Kurungu
	<i>Synodontissorex</i>	Catfish	Kurungu
Astacidae	<i>Synodontiscourteti</i>	Catfish	Kurungu
	<i>Crawfish(Crustacean)</i>	Crayfish	
Centropomidae	<i>Latesniloticus</i>	Nile perch	Giwanruwa
Cichlidae	<i>Oreochromisniloticus</i>	Nile tilapia	Gargaza
	<i>Oreochromisaureus</i>	Blue tilapia	Gargaza
	<i>Tilapia zilli</i>	Tilapia	Gargaza
Citharinidae	<i>Citharinuslatus</i>	Moonfish	Falia
	<i>Citharinuscitharus</i>	Moonfish	Falia
	<i>Citharinopsdistichoides</i>		Falia
Momyridae	<i>Mormyrusrume</i>	Trunkfish	Milligi
	<i>Campylomormyrustamandua</i>		Shindagi
	<i>Hyperopisusbebe</i>		Kuma
	<i>Petrocephalus bane</i>		Faya
	<i>Petrocephalusbovei</i>		Faya
	<i>Mormyrusmacropthaunus</i>		Sole
Protopteridae	<i>Protopterusannectens</i>	African lungfish	Mai mama
Bagridae	<i>Auchenoglanisbiscutatus</i>	Catfish	Buro
	<i>Auchenoglanisaccidentalis</i>	Catfish	Buro
	<i>Bagrusdocmak</i>	Silver catfish	Dinko
	<i>Bagrusbayadmacropterus</i>	Silver catfish	Dinko
	<i>Bagrusbajad</i>		Doza
	<i>Claroteslaticeps</i>		Sarkinkwata
Polypteridae	<i>Polypterusbichirbichir</i>	Bichir	Gwando
	<i>Polypterusnegalus</i>	Bichir	Gwando
Gymnarchidae	<i>Gymnarchusniloticus</i>		Dansarki or yauni
Cyprinidae	<i>Labeocoubie</i>	African carps	Bakindumi
	<i>Labeosenegalensis</i>	African carps	Farindumi
Distichodontidae	<i>Distichodusbrevipinnus</i>		Chihaki

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Sources: Field Survey June, 2016- May, 2017 (15 Families & 47 species)

Table 2. Percentage Composition of Fish Species Identified at Kiri Reservoir

Fish Species	Number Identified	Percentage (%)
<i>Schilbeintermedius</i>	71	3.26
<i>Schilbeuranoscopus</i>	12	0.55
<i>Schilbemystus</i>	20	0.92
<i>Schilbebuffei</i>	70	3.21
<i>Alestesdentex</i>	30	1.38
<i>Alestesmacrophthalmus</i>	24	1.10
<i>Brycinusleuciscus</i>	37	1.70
<i>Brycinusintermedius</i>	39	1.79
<i>Hydrocynusforskalii</i>	18	0.83
<i>Hydrocynusbevis</i>	31	1.42
<i>Hydrocynusvittatus</i>	27	1.24
<i>Clariasgariiepinus</i>	150	6.88
<i>Clariaslazera</i>	66	3.03
<i>Clariasanguillaris</i>	16	0.73
<i>Heterobranchuslongifilis</i>	63	2.89
<i>Synodontisclarias</i>	234	10.74
<i>Synodontisnigrita</i>	86	3.95
<i>Synodontissorex</i>	13	0.60
<i>Synodontiscourteti</i>	77	3.53
Crawfish (Crustacean)	3	0.14
<i>Latesniloticus</i>	14	0.64
<i>Oreochromisniloticus</i>	246	11.29
<i>Oreochromisaureus</i>	130	5.97
<i>Tilapia zilli</i>	20	0.92
<i>Citharinuslatus</i>	35	1.61
<i>Citharinuscitharus</i>	44	2.02
<i>Citharinopsdistichodoides</i>	44	2.02
<i>Mormyrusrume</i>	47	2.16
<i>Campylomormyrustamandua</i>	22	1.01
<i>Hyperopisusbebe</i>	9	0.41
<i>Petrocephalus bane</i>	15	0.69
<i>Petrocephalusbovei</i>	13	0.60
<i>Protopterusannectens</i>	11	0.50
<i>Auchenoglanisbiscutatus</i>	61	2.80
<i>Auchenoglanisaccidentalis</i>	40	1.84
<i>Bagrusdocmak</i>	25	1.15
<i>Bagrusbayadmacropterus</i>	59	2.71
<i>Bagrusbajad</i>	29	1.33
<i>Polypterusbichirbichir</i>	6	0.28
<i>Polypterussenegalus</i>	17	0.78
<i>Gymnarchusniliticus</i>	47	2.16
<i>Labeocoubie</i>	10	0.46
<i>Labeosenegalensis</i>	53	2.43
<i>Hydrocynuslineatus</i>	15	0.69
<i>Distichodusbrevipinnus</i>	18	0.83
<i>Claroteslaticepssarkinkwata</i>	14	0.64
<i>Mormyrusmacrophthalmus</i>	48	2.20
TOTAL	2179	99.99

Sources: Field Survey June, 2016- May, 2017

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Table 3. Relative Abundance and Distribution of Fish Species Identified at Kiri Reservoir

Fish species	Months												Total
	2016							2017					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Ma	
<i>Schilbeintermedius</i>	3	-	7	5	-	-	-	-	6	11	21	18	71
<i>Schilbeuranoscopus</i>	-	-	4	-	-	-	-	-	-	-	3	5	12
<i>Schilbemystus</i>	1	-	-	-	3	5	-	-	2	3	1	5	20
<i>Schilbebuffei</i>	11	8	15	7	3	-	-	-	2	5	9	10	70
<i>Alestesdentex</i>	-	-	-	7	1	-	-	-	-	7	9	6	30
<i>Alestesmacrophthalmus</i>	-	1	-	3	4	1	-	-	-	1	5	9	24
<i>Brycinusleuciscus</i>	2	5	8	4	-	-	1	-	3	7	2	5	37
<i>Brycinusintermedius</i>	-	-	12	7	5	-	-	-	2	6	4	3	39
<i>Hydrocynusforskalii</i>	-	-	3	7	3	2	-	-	-	-	2	1	18
<i>Hydrocynusbevis</i>	2	-	5	3	-	-	-	1	-	7	5	8	31
<i>Hydrocynusvittatus</i>	-	-	4	3	7	-	1	-	-	3	7	2	27
<i>Clariasgariepinus</i>	12	13	25	15	11	-	-	12	21	11	17	13	150
<i>Clariaslazera</i>	3	13	21	1	5	1	-	2	6	3	4	7	66
<i>Clariasanguillaris</i>	-	-	2	3	-	-	-	2	5	-	3	1	16
<i>Heterobranchuslongifilis</i>	1	11	23	13	-	-	-	-	-	3	1	11	63
<i>Synodontisclarias</i>	16	37	40	23	12	13	11	17	16	15	16	18	234
<i>Synodontisnigrita</i>	3	1	26	13	-	-	-	1	-	2	19	21	86
<i>Synodontissorex</i>	-	-	-	3	-	-	-	2	3	-	-	5	13
<i>Synodontiscourteti</i>	10	16	8	-	-	-	-	-	-	15	11	17	77
<i>Crawfish (Crustacean)</i>	1	-	-	-	-	-	-	-	-	1	-	1	3
<i>Latesniloticus</i>	2	-	3	1	-	2	-	-	1	3	-	2	14
<i>Oreochromisniloticus</i>	12	28	22	16	15	23	11	19	18	18	33	31	246
<i>Oreochromisaureus</i>	7	11	21	8	-	6	-	4	14	16	21	22	130
<i>Tilapia zilli</i>	1	-	-	-	3	5	-	-	2	3	1	5	20
<i>Citharinuslatus</i>	2	-	7	11	2	-	-	2	-	6	5	-	35
<i>Citharinuscitharus</i>	-	3	5	8	3	1	-	-	2	5	4	13	44
<i>Citharinopsdistichodoide s</i>	-	-	7	9	11	-	-	-	1	-	5	11	44
<i>Mormyrusrume</i>	6	5	9	4	4	-	-	-	5	4	3	7	47
<i>Campylomormyrustaman dua</i>	3	2	5	1	-	2	1	-	-	2	1	5	22
<i>Hyperopisusbebe</i>	1	-	3	-	-	-	-	-	-	1	3	1	9
<i>Petrocephalus bane</i>	2	1	5	-	1	-	-	-	2	1	-	3	15
<i>Petrocephalusbovei</i>	1	1	5	1	-	-	-	-	-	-	2	3	13
<i>Protopterusannectens</i>	4	1	-	-	-	-	-	-	3	1	2	-	11
<i>Auchenoglanisbiscutatus</i>	10	12	15	4	7	-	-	-	-	-	4	9	61
<i>Auchenoglanisaccidental is</i>	-	-	3	1	-	-	-	-	1	9	10	16	40
<i>Bagrusdocmak</i>	2	1	4	-	-	2	-	-	-	6	3	7	25
<i>Bagrusbayadmacropteru s</i>	3	6	15	12	-	-	2	-	-	-	11	10	59
<i>Bagrusbajad</i>	-	-	-	3	2	-	-	-	5	7	4	8	29
<i>Polypterusbichirbichir</i>	-	-	-	2	-	-	-	-	-	1	-	3	6
<i>Polypterusenegalus</i>	1	-	-	-	-	-	2	4	-	3	1	6	17
<i>Gymnarchusniloticus</i>	3	13	24	5	-	-	-	-	-	2	-	-	47
<i>Labeocoubie</i>	2	1	5	-	-	-	-	-	-	-	1	1	10
<i>Labeosenegalensis</i>	5	8	2	-	-	-	-	3	8	9	11	7	53
<i>Hydrocynuslineatus</i>	-	3	-	-	-	-	-	-	-	4	6	2	15
<i>Distichodusbrevipinnus</i>	1	5	2	-	-	-	-	-	1	3	2	4	18
<i>Claroteslaticeps</i>	1	2	3	-	-	-	-	-	-	2	1	5	14
<i>Mormyrusmacrophthaln us</i>	-	2	11	7	5	8	9	-	-	3	4	1	48
TOTAL	134	212	378	210	107	71	38	69	129	209	277	348	2179

Sources: Field Survey June, 2016- May, 2017 (47 species)

Discussion

The ichthyofauna of Kiri reservoir with 47 fish species from 15 families appears to be richer than those of 26 fish species reported by Ja'afaru and Abubakar (2015) in DadinKowa Dam, Gombe State, Nigeria, 31 reported by Dan-Kishiya (1991) and 36 species reported by Abubakar, (2006) in lake Geriyo respectively, but were closely related to 41 fish species by Alfred-Ochiya, (1996) in Kolo creek 45 fish species by Meye&Ikomi (2008) at Urie creek. Its lower in species richness than 85 fish species by Sydenham (1977) in Ogun River, 81 fish species by Odikoet *al.* (2010) in River Ovia, Edo State, and 98 fish species by Nwadiora (1989) in Oguta Lake all in Southern Nigeria which experience twice rainy season a year.

In term of the relative abundance, of the 47 species identified, *Oreochromis niloticus* of the family Cichlidae were the most dominant species constituting 11.29% of the total catch, this result agreed with the work of Dan-Kishiya *et al.* (2012) who reported that fish family Cichlidae was the most dominated species in lower Usuma Reservoir and Abubakar (2006) who reported *O. niloticus* as the most abundant species in lake Geriyo. Abiodun and Miller (2005) also reported *O. niloticus* and *Sarotherodon* as the most abundant species in Lake Geriyo. Adeyemi *et al.* (2010) also reported *O. niloticus* as the most abundant in Gbedikere Lake, Bassa, Kogi State. The dominance of the cichlids could be attributed to their prolific breeding habit. The Cichlids are found to breed about three to four times in the year (Bankole *et al.*, 1994).

Higher wet season than dry season catches and species observed in this study have also been reported by Idodo-Umeh (1987) at Ase River and Ikomi and Sikoki (1998) in Jamiesson River and Ja'afaru and Abubakar (2015) in DadinKowa Dam, Gombe State, however, this finding disagrees with that of Alfred-Ochiya (1997) in Kolo creek, Allison *et al.*, (1997) in Elechi creek, both in River state and Meye&Ikomi (2008) in Urie creek at Igbide in Delta state who reported higher dry season than rainy season catches and species identified. The reason for the higher wet season catches may be attributed to the ability of the fishers during the wet season, with their canoes able to access further parts of the fishing grounds because of increased water depth and increased available space which are otherwise inaccessible during the dry season.

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REFERENCES

- [1] Abiodun, J.A. and Miller, J.W. (2005). Assessment of inland waters fisheries in Nigeria with implications for fresh water fish production, poverty alleviation and food security. Proceeding of the 19th Annual Conference of Fisheries Society of Nigeria. Lagos: FISON. pp15-16.
- [2] Abubakar, K.A. (2006). *A study of Aspects of Productivity and Stock Status of Oreochromis niloticus and Clarias gariepinus in Lake Geriyo, Yola Adamawa State, Nigeria.* Unpublished Doctoral Thesis, Federal University of Technology, Yola, Nigeria.
- [3] Adeyemi, S. O., Akombu, P. M. and I. A. Adikwu (2010). Diversity and Abundance of Fish Species in Gbedikere Lake, Bassa, Kogi State. *Journal of Research in Forestry, Wildlife and Environment. volume 2 NO.1: pp1-6*
- [4] Allison, M. E., Gabriel, U. U., Inko-Tariah, M. B., Davies and Udeme-Naa, B. (1997). The fish Assemblage of Elechi Creek Rivers State, Nigeria. *Niger Delta Biol.*, 2(1):90-96.
- [5] Babatunde, D. O and Raji, A. (1998). Field guide to Nigerian fresh water fishes: Federal College of fresh water fisheries technology New- Bussa, Nigeria.
- [6] Bankole, N.O., Sule, O.D., Okwundu, E.C., Umoru, I and Balogun, I. (1994). Preliminary investigation on the frame and catch assessment of Kainji Lake, New Bussa Niger State. *N.I.F.F.R. Annual report.* pp 134 -147.
- [7] Dankishiya, A.S. (1991). Species diversity of fishes in lake Geriyo, Yola, Gongola State. B.Tech. project, FUT Yola. 72pp.
- [8] Dan-kishiya, A.S., Olatunde, A.A. and Balogun, J.K. Fish Species Distribution in a Domestic Water Supply Reservoir: A Case Study of Lower Usuma Reservoir, Bwari, Nigeria. *Researcher.* 2012;4(2):56-60]. (ISSN: 1553-9865). <http://www.sciencepub.net>.
- [9] Food and Agriculture Organization, 1991. *Fish for Food and Development.* FAO, Rome. pp: 49.
- [10] Idodo-Umeh, G. (1987). Studies on the fish community of River Ase, Bendel State with special emphasis on the food and feeding habits of Citharinidae, Bagridae, Schilbeidae and Mochokidae. Ph.D. Thesis, University of Benin, Benin-City, Nigeria.
- [11] Ikomi, R.B. & Sikoki, F.D. (1998). Fish communities of the River Jamieson, Niger Delta, Nigeria. *Tropical Freshwater Biology*, 7, pp.37-51.

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- [12] Ja'afaru, A. and Abubakar U.M. (2015). Fish species Diversity and Abundance of DadinKowa Dam, Gombe State, Nigeria. *International Journal of Innovative Research and Development*, Vol. 4 Issue 6: p374-378.
- [13] Konstapel, K and L. Noort, 1995 *Fisheries in Developing Countries. Towards Sustainable Use of Living Aquatic Resources*. Sectoral Policy Document of Development Cooperation. Ministry of Foreign Affairs. The Hague. pp: 96.
- [14] Meye, J. A. and Ikomi, R. B. (2008) A study on the fish Fauna of urie creek at igbide, *Niger Delta the Zoologist*, 6: 69-80.
- [15] Neiland, A. E. (Ed) (2005). Incorporating fish market and trade information into Policy making for sustainable livelihoods and poverty reductions. Methods and lessons from the Lake Chad basin. Report. Sustainable fisheries livelihoods programme. Rome:FAO.
- [16] Nwadiora, C.S. (1989). Ichthyofauna of Lake Oguta, a shallow lake in Southern Nigeria. *Arch. Hydrobiol.* 115(3), pp. 463-475.
- [17] Odiko, A. E. Fagbenro O. A. and Fasakin, E.A (2010). Fish Fauna Resources in River Ovia, Edo State, Nigeria. A publication of the School of Agriculture and Agricultural Technology, The Federal University of Technology, Akure, Nigeria. *Applied Tropical Agriculture Vol 15, Nos 1 & 2, PP 12-17*,
- [18] Sissenwine, M.P., Brown, B. E. and Berman-Hopkins, J. (1979). Brief history and the state of the arts of fish production models and some applications of fisheries of the North-Eastern United States. In: Climate and Fisheries Workshop. Centre for Ocean Management Studies University of Rhodes Island. 25-28.
- [19] Sydenham, D.H.J. (1977). The quantitative composition and longitudinal zonation of the fish fauna of the River Ogun, Western Nigeria. *Rev. Zool. Afr.* 91, pp. 974 – 996.
- [20] Tobor, J.G. (1992) Fin and shellfish of conservation interest in Nigeria. Nigerian Institute for Oceanography And Marine Research Technical Paper 79, 30 pp.
- [21] Yakubu A. S. (2012) A survey of Fish Fauna of lower Ogun Rivers at Ishasi, Ogun State, Western Nigeria *Continental Fisheries and Aquatic Science*, 6(2): 1-7.

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