



**FISH FAUNA OF TAGWAI RESERVOIR IN RELATION TO GEAR SELECTIVITY
IN MINNA, NIGER STATE, NIGERIA**

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ABSTRACT

Fish species abundance in Tagwai Reservoir, Minna, Niger State, Nigeria, was studied from February – May (2016). Fish sampling was carried out biweekly during the day using different gears (different types of fishing equipment). A total of 1,669 fish specimens were sampled. This consisted of 8 species in 7 genera and 6 families. Variation in the mesh size used greatly influenced catch in the reservoir. Cast net recorded the highest amount of catch (1,435), while gill net recorded the highest amount of fish species (6). Two *Cichlid* species, *Tilapia zilli* and *Sarotherodon galilaeus* were the most abundant in the catch, amounting to 33.01 and 26.06%, respectively. The families of *Cichlidae* and *Mormyridae* were the most abundant, constituting 59.18 and 29.95% of the total catch respectively. Fish abundance showed low catches during the rainy season (33.01%) and daytime.

Keywords :- Tagwai Reservoir, Fishing equipment, Fish species, Cichlid species, *Tilapia zillii*

INTRODUCTION

From time immemorial, fishes have been of great economic importance to man, with communities in the coastal as well as inland areas depending largely on fishery for their incomes and as source of animal protein (Espinosa–Lemus et al., 2009). To meet these needs, man had always depended on fishery from the wild. Initially, supply of fishery products from the wild was able to satisfy human needs, but with the recent explosion in human populations, environmental degradation, and habitat destruction, the production of fishery resources from the wild have declined severely, with tremendous negative impacts on human protein requirement and economy (Ajah et al., 2006).

Nigeria is blessed with abundant natural aquatic resources in marine, estuarine and fresh water environment. The fresh water bodies of Nigeria, with over 270 fish species, are the richest in



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fish diversity in West Africa (Tobor, 1992). Nigeria is blessed with over 14 million hectares of reservoirs, lakes, ponds and major rivers which are capable of producing over 980,000 metric tonnes of fish annually (FDF, 2007) However, majority of these reservoirs are built on seasonal rivers, with paucity of fish species composition, resulting in low fish productivity (Ita et al., 1982). Statistical surveys have shown that the demand for fish in the country exceeds supply, and also, the domestic production is still very low, considering the increasing human population. The annual fish consumption/demand in Nigeria has been estimated to be over 1.3 million metric tonnes and the total domestic production is just about 450,000 metric tonnes per annum (Tsadu *et al.*, 2006). Niger State is blessed with vast wetland resources totaling over 72,234 hectares of water surface area (Ita *et al.*, 1985). Among the people of this state, fish constitutes a major percentage of their protein intake diet or meal. Besides, fishing activities have become a source of employment for the teeming populace (Ibiwoye *et al.*, 2006).

However, fishing in Niger state is practiced on a very low scale, and is mainly for subsistence (Gabriel, 2000). Thus, over the years, the demand for fish has continuously outweighed supply as in most parts of Nigeria (Meye and Ikomi, 2008). Fishing activities in these water bodies are intense all year round with fishermen using all types of fishing gears and sometimes explosives / chemicals (though illegal) to increase their catches (Idodo-Umeh, 2003). In most cases, their fishing efforts are not commensurate with their catches. Therefore, if an inventory of the commercially important species, including the seasonal diurnal variations in abundance, as well as the gear selectivity of these species are studied and results made known to the fishermen, then they can target their fishing efforts at particular seasons, with the appropriate gear, to achieve better fish catches. Knowledge of fish biology and species composition of different water bodies is necessary to enhance the management of water resources (Meye and Ikomi, 2008).

The available published information on the fishes and fisheries of Niger state has mainly been on the Kainji reservoir basin at the expense of the numerous reservoir and rivulets in the area. This present study, therefore, will examine the fish species composition and relative abundance in relation to the influence of gear selectivity in Tagwai reservoir, Minna, Niger State, Nigeria.



MATERIALS AND METHODS

Study area

The study was conducted at Tagwai Reservoir about 10 km from Minna, located at latitude 6°39' to 6°44' East and longitude 9°34' to 9°37' North to South West of Minna - Suleja Road. The reservoir was constructed by the impoundment of Tagwai reservoir in 1978, for the purpose of domestic water supply to Minna metropolis. The reservoir has a catchment area of about 27,000 km². The average rainfall of the area was estimated to be about 60 inches per annum (Ibiwoye *et al.*, 2006). The area has a tropical climate with mean annual temperature of 30.2°C, relative humidity of 61 % and annual rainfall of 1,344 mm. The vegetative cover reflects that of Savanna zone, dominated by grasses, but a sparse distribution of tree and shrub species. The area is characterized by two distinct seasons, i.e. a rainy season between April and October and dry season between November and March (The Nigerian Congress, 2007).

The vegetation is varied. The river bank emanates from rocky base of hills surrounding a valley, and is characterized by a sparse population of trees, shrubs and dense grass cover. The surrounding environment is a savanna woodland vegetation interrupted in many places by cultivated farmlands (Alkali, 1994).

Fishing in the area is dominated by artisan fishermen that use manually operated hollowed – out wooden canoes, using mostly cast net, gill nets, driftnet and fishing traps

Fish sampling, preservation and identification

Fish samples were collected from the lake bi-weekly between the months of February and May, 2016. Fishing by two fishermen for seven hours duration per day (00:00-07:00 h) was maintained throughout the study period. The gears and methods used were in accordance with the recommendations of Gullard (1980), that reliable sampling should involve a combination of two or more gears. The gears used are cast nets (10-15 mm mesh size) and gill nets (2 mm) mesh size.

The fish specimens were collected into an iced box and transported to the laboratory immediately, where they were preserved in 10% for further examination (Meye and Ikomi, 2008).



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Fish identification was done as far as possible using available keys of Teugels *et al.* (1992), Olaosebikan and Raji (1998) and Idodo-Umeh (2003).

Determination of fish species relative abundance

The Relative abundance of the fish species was estimated using Benech *et al.* (1983) formula below:-

$$RA = \frac{SA}{TA} \times 100\%$$

Where:

RA = Relative abundance of each species (%)

SA = Species abundance

TA = Total Abundance for all species

The abundance of the fish species was categorized according to the criteria of Meye and Ikomi (2008):

- > 10% = Dominant
- 1 - 9% = Subdominant
- < 1 % (but caught more than once) = Occasional
- < 1 % (and caught only once) = rare

Statistical analysis

All fish species collected were counted to determine species abundance. The abundance score of the species was estimated by calculating the relative abundance (%) of each species as given above using Benech *et al.* (1983) formular.

RESULTS

Table 1 revealed the number of fish species caught in Tagwai reservoir to be eight with *Tilapia zillii* having the highest number of fish caught (2200) with percentage catch of 34.56%, followed by *Mormyrus rume* species with number 1900 and percentage catch of 29.85%. And the least catch during the sampling period was recorded in species *Clarias gariepinus* (09) with percentage catch of 0.14%.



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**Table 1: Species of Fish caught and their total catches during the study period
(February - May, 2016)**

Family	Number of fish catch	Percentage (%) Catch
<i>Tilapia zillii</i>	2200	34.56
<i>Sarotherodon galilaeus</i>	1505	23.64
<i>Hemichromis fasciatus</i>	13	0.20
<i>Synodontis nigrita</i>	650	10.21
<i>Auchenoglanis occidentalis</i>	37	0.58
<i>Clarias gariepinus</i>	09	0.14
<i>Mormyrus rume</i>	1900	29.85
<i>Alestes leuciscus</i>	52	0.82
Total Catch	6,366	100

Table 2 indicates the monthly catches of the fishes in relation to gear selectivity in Tagwai reservoir. Both cast net and gill net were the favourably selected gears compare to other gears that recorded zero catch during the sampling period. Thus, cast net recorded the highest catch during the month of February (1,435), while the lowest catch for cast net was recorded in the month of April (1,235). While in the situation of gill net, the highest catch was recorded in the month of March, while the least catch was in the month of February (99). However, the table also indicated the most selected gear by fishes in Tagwai reservoir to be cast nets.

**Table 2: Monthly Catch of the fishes showing the gear selectivity during the study period
(February – May, 2016)**

Month	Cast Net	Gill Net	Drift Net	Local Traps	Hooks and Line
February	1,435	99	-	-	-
March	2,035	247	-	-	-
April	1,235	238	-	-	-
May	1,400	295	-	-	-



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The highest monthly fish catch was recorded in the month of May by *Tilapia zillii* (751) (Table 3), followed by the month of March recording 663 by *Tilapia zillii*, while the least monthly fish catch was recorded by *Clarias gariepinus* (02) in the months of February, March and May (Table 3).

Table 3: Monthly species of fish caught during the sampling period (February – May, 2016)

Species	February	March	April	May
<i>Tilapia zillii</i>	551	663	460	751
<i>Sarotherodon galilaeus</i>	435	735	500	335
<i>Hemichromis fasciatus</i>	02	02	07	02
<i>Synodontis nigrita</i>	15	150	200	150
<i>Auchenoglanis occidentalis</i>	17	18	12	18
<i>Clarias gariepinus</i>	01	01	06	01
<i>Mormyrus rume</i>	500	700	500	200
<i>Alestes leciscus</i>	13	13	10	16

Table 4 shows that *Tilapia zilli* catch had a total number of 2200 individuals of 34.6% with cast net, and, using gill net recorded a total catch of 225 (23.03%) as the selective gears, *Sarotherodon galilaeus* catch was a total of 1505 (23.6%) with cast net, *Synodontis nigrita* total catch was 650 (10.2%), using gill net, *Auchenoglanis occidentalis* total catch was 37(0.5%), using Gill nets. *Clarias gariepinus* has a total of 09 (0.14%) using Gill net. *Mormyrus rume* has total catch of 1900 (29.9%) using cast net. *Alestes leciscus* had a total of 52 (0.82%) using Gill net. *Hemichromis fasciatus* had a total of 13 (0.2%) using Gill net.



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Table 4: Fishing gear selectivity of fish species in Tagwai Reservoir, Minna, Niger State, Nigeria (February – May, 2016)

Species	Cast Net		Gill Nets		Drift Net		Local Traps		Hook and Line	
	A	%	A	%	A	%	A	%	A	%
<i>Tilapia zillii</i>	2200	34.6	225	23.03	-	-	-	-	-	-
<i>Sarotherodon galilaeus</i>	1505	23.6	-	-	-	-	-	-	-	-
<i>Synodontis nigrita</i>	-	-	650	10.2	-	-	-	-	-	-
<i>Auchenoglanis occidentalis</i>	-	-	37	0.5	-	-	-	-	-	-
<i>Clarias gariepinus</i>	-	-	9	0.14	-	-	-	-	-	-
<i>Mormyrus rume</i>	1900	29.9	-	-	-	-	-	-	-	-
<i>Alestes leuciscus</i>	-	-	52	0.82	-	-	-	-	-	-
<i>Hemichromis fasciatus</i>	-	-	13	0.2	-	-	-	-	-	-

A = Number of fish catch

% = Percentage catch

DISCUSSION

The primary objective of a sampling survey of this nature is to attempt to find out what fish species exist in the water body and, possibly determine the factors governing abundance. Gear selectivity and sampling strategies are usual employ in this kind of study as documented by Meye and Ikomi (2008). Data obtained in the present study would be compared with that of related documented works.

A total of 8 species of Ichthyofauna of Tagwai Lake from 6 families appear to be lower than that of other water bodies compared. Nineteen species from 9 families were encountered in River Jamieson, Niger Delta, Nigeria (Ikomi and Sikoki, 1998). Reasons for the low fish species occurrence in Tagwai reservoir during the study period were as a result of large volume of water during the study period, available fish were now dispersed over a wider area, and fishing became more difficult. Also, during the wet season, the high level of water and



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subsequent flood favoured reproductive activities, hence fishes show restricted movement making them less vulnerable to catch (Offem *et al.*, 2011).

Gear selectivity was a predetermining factor in the fish catch from Tagwai reservoir, the variation in mesh size and gear used may have greatly influenced species composition and abundance in this study. Similar observation was reported by Meye and Ikomi, (2008). To support the above submission, Ufodike *et al.* (1989) opined that gill net technology and catch period or techniques are essential in maximizing fish catches. Both cast and gill nets constituted more than 50% of the total catch in this study, which were dominated mainly by the *Cichlids* and the *Mochochids*. This findings conforms with those of Meye and Ikomi (2008) on fish study of Urie Creek, Igbide, Niger Delta, Nigeria; Ockiya (1996) on studies of the Ichthyofauna of Kolo creek, River State, Nigeria. The gill net's high selectivity may be connected with the morphometric projections on the body of most species such as *Mochochids* (*S. nigrita*) and the presence of scales on most other species such as *Cichlids* (*T. zilli*). These projections make such fishes susceptible to gill net (Meye and Ikomi, 2008). In the case of cast net, it's very high selectivity may be connected with the heterogeneous mesh size of different panels used which made it possible to catch fishes of different sizes.

The low selectivity of local traps and hook and line reported in this study conforms with the earlier findings of Ockiya (1996) in Kolo Creek in Rivers State, Nigeria and Ikomi and Sikoki (1998) in River Jamieson. These gears were mostly used by fishermen in the flooded areas particularly during the wet season.

The low catches in fish abundance during the rainy season encountered in this study is contrary with the results of Idodo-Umeh (2003) in Asa River and Ikomi and Sikoki (1998) in Jamieson River, who observed more fish catches in the wet season than the dry season.



CONCLUSION

The results of this study have shown that Tagwai Reservoir, like most other water bodies in the state has a great potential for fisheries exploitation. The gear selectivity observed among the fish species showed that the use of multiple gears may probably be the best approach to such studies for fish composition in the nearest future.

RECOMMENDATION

Finally, since fish abundance in this study might show significant variations in season and time of the day, it is therefore recommended that these factors be put into consideration in future exploitation of the fish species of Tagwai reservoir. In addition, future research effort should be geared towards the investigation of the biology of the species of the reservoir, as a pragmatic approach to enhance their conservation.

This study could serve as base line data in assisting relevant bodies in the management and conservation of fisheries resources of Tagwai reservoir. Laws and orders should be enforced by relevant agencies in the state to ensure proper management and conservation of this water body.

REFERENCES

- Ajah, P.O., Georgewill, M. N., Ajayi, M. O. (2006). The food and feeding habits of five fresh water and brackish water fish species in Nigeria. *African Journal of Aquatic Science* 31:313-318.
- Espinosa – Lemus, V., Arredondo-Figueroa, J. L., Barriga – Sosa, L. A. (2009). Morphometric and generic characterization of Tilapia (Cichlidae) stock for effective fisheries management in two Mexican reservoirs. *Journal of Hydrobiology* 19 (2): 95-107
- FDF (2007). *Fishery Statistics of Nigeria*. Federal Department of Fisheries Publication. Abuja, FCT, Nigeria. 11- 24pp.
- Gabriel, A. O. I. (2000). Women in the Niger Delta : Environmental issues and challenges in third millennium. *Women %20in%20the%20niger%20delta.pdf*.
- Gullard, J.A. (1980). *General concept of sampling fish*. Fisheries Department, F.A.O. Rome, 7-12pp.



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- Ibiwoye, F. I. I., Owolabi, O. D., Ajala, A. A., Oketoki, T. O. and Adio, S. M.(2006). Helminth parasites in fresh water fish species from Jebba Lake and Bida Flood Plain areas of River Niger, Nigeria. *Proceedings of Conference of the Fisheries Societies of Nigeria, November 16-20, 2006, Nigeria, 13-20pp.*
- Idodo-Umeh, G.(2003). *Fresh water Fishes of Nigeria (Taxonomy, Ecological Notes, Diet and Utilization)*. Idodo-Umeh Publisher Limited, Benin City, Nigeria, 232 pp.
- Ikomi, R. B. and Sikoki, F. D. (1998). Fish communities of the River Jamieson, Niger Delta, Nigeria. *Tropical Fresh Water Biology, 7: 37-51.*
- Ita, E.O., Balogun, J.K and Adimula, A. (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 to the Sokoto Rima River Basin Development Authority. 87pp
- Ita, E. O., Sado, E. K., Balogun, J.K., Pandogari, A . and Ibitoye, B. (1985). Inventory survey of Nigeria Inland waters and their fishery resources. A preliminary checklist of inland water bodies in Nigeria with special reference to ponds, lakes, reservoirs and major rivers. *Kainji Lake Research Institute Technical Report Series No. 14. 51 pp.*
- Meye, J. A. and Ikomi, R. B. (2008). A study of the fish fauna of Urie Creek at Igbide, Niger Delta. *Zoologist, 6: 69-80.*
- Ockiya, J. F. A. (1996). Studies on the Ichthyofauna of Kolo Creek, Rivers State. *Niger Delta Biologia, 1: 24-28.*
- Offem, B. O., Ayotunde, E. O., Ikpi, G. U., Ochange, S. N. and Ada, F. B. (2011). Influence of seasons on water quality, abundance of fish and plankton species of ikwori lake, South-Eastern Nigeria. *Fish Aquatic Journal, 2: 6 - 11pp*
- Olaosebikan, B. D. and Raji, A. (1998). *Field Guide to Nigerian Freshwater Fishes*. Federal College of Freshwater Fisheries Technology, New Bussa,106pp
- Teugels, G. G., Reid, G. M. and Kings, R. D. (1992). Fishes of the Cross River Basin (Cameroon- Nigeria): Taxonomy, Zoogeography, Ecology and Conservation. *Ann. Sci. Zoologiques, 6:1-5.*
- The Nigerian Congress, (2007). The 774 local government areas in Nigeria,
- Tobor, J. G.(1992). Fish and shellfish of conservation interest in Nigeria. *Nigerian Institute of Oceanographic and Marine Research, Technical Paper No. 79, 30pp.*



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Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

Ufodike, E. B. C., Anthony, A. D. and Abda, G. S. (1989). Studies on the influence of Gill net technology and Diurnal variations on fish catches in Ouree Reservoir Miango, Plateau State. *Journal of Aquatic Science*, 4: 17-19.