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A Study of the Fish Fauna of Tagwai Lake Minna, Nigeria, in Relation to Gear Selectivity

[1]A.V. Ayanwale, [1]M.T. Shokunbi, [1]I.K. Olayemi, [1]V.I. Chukwuemeka, [2]F.M. Falusi and [3]O.F. Erhabor
[1]Department of Biological Sciences, Federal University of Technology Minna, Niger State, Nigeria
[2]Department of Water Resources and Aquaculture Fisheries Technology,
Federal University of Technology Minna, Niger State, Nigeria
[3]Department of Biology, College of Education, Warri, Delta State, Nigeria

Abstract: The fish fauna of Tagwai Lake Minna, Nigeria, was studied from July to September, 2010. Sampling was carried out during the day using different gears. A total of 1,669 specimens were sampled made up of 8 species in 7 genera and 6 families. Variation in the mesh size used greatly influenced catch in the lake. Cash net recorded the highest amount of catch (1,435) and gill net recorded the highest amount of fish species (6). Two *Cichlids* 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 raining season (33.01%) and daytime.

Key words: Abundance, fauna, fish, gear, species, tagwai lake

INTRODUCTION

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 fish diversity in West Africa (Tobor, 1992). 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. Besides, fishing activities have become a source of employment for the teeming populace (Ibiwoye *et al.*, 2006).

However, fishing in this state is practiced on a very low scale, 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 (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).

Hitherto, published information on the fishes and fisheries of Niger state have mainly been on the Kainji reservoir basin at the expense of the numerous lakes and rivulets in the area (Ita *et al.*, 1985). This present study, therefore, was carried out to elucidate the fish fauna species composition and relative abundance in relation to the influence of gear selectivity in Tagwai Lake, Minna, Nigeria.

MATERIALS AND METHODS

Study area: This study was conducted in Minna, located within Latitude 6°33' E and Longitude 9°3' N, covering a land area of 88km^2. 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 grass but with scattered trees 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).

Tagwai Lake is about 10 km away 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 lake was constructed by the impoundment of Tagwai Lake in 1978 for the purpose of domestic water

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Corresponding Author: I.K. Olayemi, Department of Biological Sciences, Federal University of Technology Minna,
Niger State, Nigeria

supply to Minna metropolis. The dam 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 vegetation is varied; the river bank emanates from rocky base of hills forming a valley and is characterized by sparse growth of trees, shrubs and dense grasses. The surrounding environment shows savanna woodland vegetation interrupted in many places by cultivated areas (Alkali, 1994).

Fishing in the area is dominated by artisanal fishermen that use manually operated wooden (dug-out) canoes, using mostly cast net, gill nets, driftnet and traps for fishing.

Fish sampling, preservation and identification: Fresh samples were collected from the lake bi-weekly between the months of July and September, 2010. A uniform fishing effort of 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).

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

Determination of fish species relative abundance: The Relative abundance of the fish species was estimated using the formula:

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

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 as adopted from Benech *et al.* (1983).

RESULTS

Ichthyo fauna: The fish fauna encountered in Tagwai Lake during the study period are presented on Table 1. A total of seven species, belonging to seven (7) genera and six (6) families were recorded in this study.

The highest number of species (59.18%) was observed in the family *Cichlidae*; followed by *Mormyridae* (29.95%), *Mochokidae* (8.98%), *Bagridae* (1.01%) while *Clariidae* and *Alestidae* each constituted less than 1% of the total catch.

The three most dominant species of fish encountered in this study were T. *zilli*, *M. rume* and *S. galilaeus* having a relative abundance of 33.01, 29.95 and 26.06% respectively. The sub-dominant species included *Synodontis nigritis* with 8.98%, while the occasional and rare species were *A. occidentals* with 1.01%, *C. gariepinus* with 0.05% and *A. leciscus* with 0.77%.

Gear selectivity: Table 2 shows the species composition of fishes harvested with the different gears used. The cast net recorded the highest number of individuals (1,435) with three species and distantly followed by gill net with

Table 1: A check list of fish fauna in Tagwai Lake showing abundance and relative abundance (%) during the rainy season

Family/Species	Total catch	Relative abundance (%)
Cichlidae		
Tilapia zilli	551	33.01
Sarotherodon galilaeus	435	26.06
Hemichromis fasciatus	02	0.11
Sub-total		59.18
Mochokidae		
Synodontis nigrita	150	8.98
Sub-total		8.98
Bagridae		
Auchenoglanis occidentalis	17	1.01
Sub-total		1.01
Clariidae		
Clarias garcepinus	01	0.05
Sub-total		0.05
Mormyridae		
Mormyrus rume	500	29.95
Sub-total		29.95
Alestidae		
Alestes leciscus	13	0.77
Sub-total		0.77

Table 2: Gear selectivity of fish species in Tagwai Lake (July-September)

Species	Cast net A	Cast net %	Gill nets A	Gill nets %	Drift net A	Drift net %	Local traps A	Local traps %	Hook and line A	Hook and line %
Tilapia zilli	500	35.21	51	21.79	-	-	-	-	-	-
S. galilaeus	435	29.25	-	-	-	-	-	-	-	-
S. nigrita	-	-	150	64.10	-	-	-	-	-	-
A. occidentals	-	-	17	7.26	-	-	-	-	-	-
C. gariepinus	-	-	01	0.42	-	-	-	-	-	-
M. rume	500	35.21	-	-	-	-	-	-	-	-
A. leciscus	-	-	13	5.55	-	-	-	-	-	-
H. fasciatus	-	-	02	0.85	-	-	-	-	-	-

234 individuals made up of 6 species. Drift net, local trap and hook and line yielded no catch during the study period. *T. zilli*, *M. rume* and *S. galilaeus* were vulnerable only to cast net, while *T. zilli*, *Synodontis nigritis*, *A. occidentals*, *C. gariepinus*, *A. leciscus* and *Hemichromis fasciatus* were vulnerable to gill net and interestingly, *T. zilli* is the only fish species that was vulnerable to both cast and gill nets respectively. During this study period, the fish species encountered or caught were not vulnerable to drift net, local trap and hook and line.

DISCUSSION

The primary objective of a sampling survey of this nature is to attempt to find out what fish species exist in the lake and, perhaps, elucidate the factors governing abundance. However, according to Benech *et al.* (1983) fish community studies are not generally equivalent to Ichthyocoenosis because the description of any fish community is a biased image arising from the sampling of a group of fishes in a particular environment at a given time. Gear selectivity and sampling strategies are usual sources of these biases as documented by Meye and Ikomi (2008). Despite these obstacles, attempts will be made to compare data obtained in this study with that from related works.

The Ichthyofauna of Tagwai Lake during the rainy season encountered 8 species from 6 families appear to be lower than that of most water bodies in the state. Ninteen species from 9 families were encountered in Shiroro dam (Ikomi and Sikoki, 1998). It is also low when compared with other water bodies in the country. Elechi Creek in Rivers state had 35 species from 20 families (Allison *et al.*, 1997) and 23 species from 17 families in the mangrove habitat of the Lagos Lagoon (Nwadukwe, 1995). The present study is also lower than that of Urie Creek in Igbide, Niger Delta with 45 species from 24 families (Meye and Ikomi, 2008).

Reasons for the low fish species occurrence in the lake during the study period were ascribed to the large volume of water during the wet season, 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 subsequent flood favoured reproductive activities, hence fishes show restricted movement making them less vulnerable to catch (Offem *et al.*, 2011).

Gear selectivity was observed in the fish catch from Tagwai Lake, the variation in mesh size and gear used may have greatly influenced species composition and abundance in this study as 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 catch in this study, which were dominated mainly by the *Cichlids* and the *Mocholcids*. These results agree with those of Meye and Ikomi (2008), Ockiya (1996) and Udolisa (1982) in the Lagos Lagoon. The gill net's high selectivity may be connected with the morphometric projections on the body of most species such as *Mocholcids* (*S. nigirita*) 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, its 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 agrees with the earlier findings of Ockiya (1996) in Kolo Creek 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 disagrees 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 Lake 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 as fish composition in the nearest future.

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 Lake. In addition, future research effort should be geared towards the investigation of the

biology of the species of the lake, as a pragmatic approach to enhance their conservation.

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