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Determination of Fish Species Diversity of Tagwai Lake, Minna, Niger State, Nigeria

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Abstract

This study investigates the fish species diversity of Tagwai Lake, Minna, Niger State, Nigeria, over a four-month period from August to November 2020. A total of seven fish species were identified during the study. *Clupeid sierrathrissa* was the most abundant, accounting for 4,780 individuals (43.30%), followed by *Allestes macrolepidotus* with 2,500 individuals (22.65%), and *Oreochromis niloticus* with 2,494 individuals (22.60%). Other species included *Synodontis courteti* (935; 8.47%), *Clarias gariepinus* (316; 2.86%), *Mormyrus hasselquisti* (13; 0.12%), and *Labeo senegalensis* (1; 0.01%). Analysis of sex ratios revealed a predominance of females in *Tilapia*, *Allestes macrolepidotus*, *Clarias gariepinus*, *Clupeid sierrathrissa*, and *Mormyrus hasselquisti* (ratios of 1:3, 1:7.3, 1:11.1, 1:5.6, and 1:2 respectively). *Labeo senegalensis* showed no female representation (1:0), while *Synodontis courteti* exhibited a slightly male-biased ratio (1.3:1). The study found that fish species diversity in Tagwai Lake is influenced by intensive fishing activities involving a variety of gear types, including different mesh sizes, traps, and hook-and-line methods. These findings highlight the need for sustainable fishing practices to preserve biodiversity in the lake ecosystem.

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Keywords: Fish Species Diversity; Tagwai Lake; Species Abundance; Sex Ratio; Fishing Pressure

INTRODUCTION

Nigeria is blessed with over 14 million hectares of reservoirs, lake, ponds and major rivers capable of producing over 980,000 metric tonnes of fish annually (FDF, 2003). The demand for fish in the country exceeds supply (FDF, 2007). Fish are important in that they contribute as much as 17% of the world's animal protein (Olusola and Arawomo, 2008).

Studies of fish biodiversity, distribution, abundance and yield of most of the inland lacustrine water bodies had been limited to large sized water bodies (Balogun, 2006). FDF (2008) estimated the fish production from small water bodies in Africa as two million tonnes annually Fisheries resources are on the decline in Nigeria due to over exploitation and inadequate management of the coastal waters. For sustainability of these resources, an adequate knowledge of species composition, diversity and relative abundance of the water bodies must be understood and vigorously pursued (Lawson and Olusanya, 2010).

Biodiversity is the number of different species in a given area, which is the fundamental unit in which to assess the homogeneity of an environment (Lawson and Olusanya, 2010). The diversity of fish species in any water body is attributed to favourable condition, and fish populations 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). Due to a general lack of data, it is difficult to access the status of the inland water biodiversity. According to Adaka *et al.,* (2014) environmental awareness to educate the fishers and other stakeholders on the danger of extinction of the species and the need for its conservation was necessary. No work has been done on the determination of fish species diversity of Tagwai lake Minna, Niger State, Nigeria except that of Ibrahim *et al.,* (2012) on Kontagora Dam, Niger State, Nigeria. Therefore the need for this study on determination of fish species diversity of Tagwai Lake Minna, Niger State, Nigeria to generate a base line scientific data on this Lake for subsequent studies is paramount.

MATERIALS AND METHODS

On the 13th of June 1978, Infiouest international limited was invited by the Niger state Government to inspect and give suggestion on the drying reservoir of Tagwai Lake in Minna, Niger State. Tagwai Lake was constructed about 42 years ago in (1978) to supply water to the state capital city of Minna, with a design life of 20 years (the active period within which all structural element of the dam remain fully functional). The water supply was also projected for the 20 years, period in accordance with population growth of Minna town and environs. The reservoir capacity, impoundment and the rate of recharge (water inflow) are functions of rain fall and catchment area will take a very long time to set filled up with normal rainfall-but if the rainfall intensity happen to increase, the reservoir may get filled up within a shorter period. Rain intensity itself is a function of water, which for now is difficult to determine due to the incident of global warming currently being experienced all over the world.

Tagwai Lake is located at longitude 6^0 39' to $6^0$44'E and on Latitude 9^0 34' to 9^0 37'N (Fig.1). North to the southwest of Minna, about 10 km from Minna town, off Minna-Suleja road. The lake has a total surface area of 440 hectares and storage capacity of 28.3 million (Alkali, 1994). It had a main water depth of 25 meter and a length of 1.8 (45,000m^2) with two uncontrolled concrete and emergency spill ways of 100 and 170m long respectively (Alkali, 1994). The Dam has a catchment area of about 27,000.The average rain area was estimated to be about 60: per annum and total evaporation of about 13" during the dry season period.

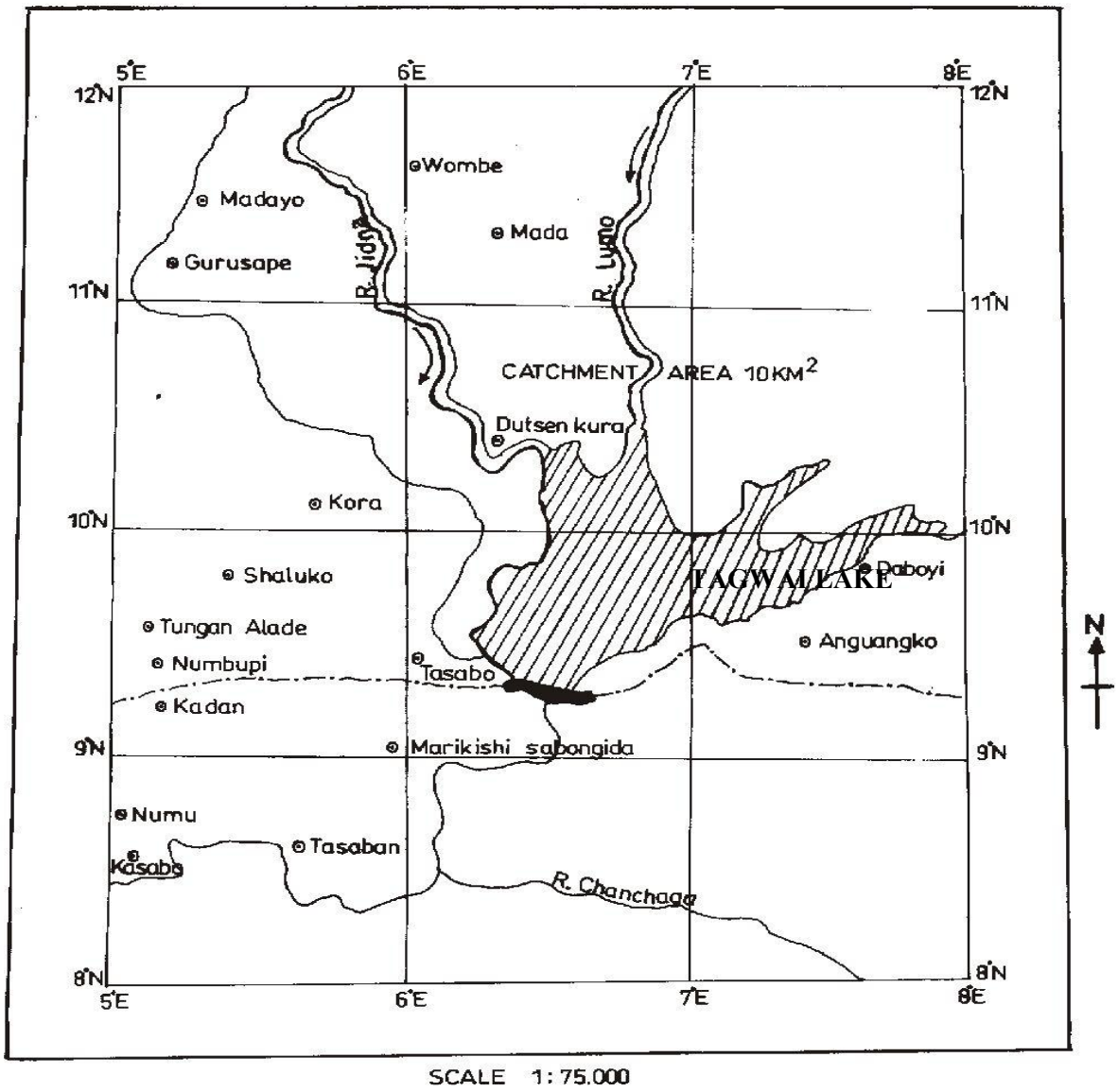


Fig. 1: **Detail map of Tagwai Lake showing the catchment area and lake site**

Source: Journal of Science, Technology, Mathematics and Education (JOSTMED) (2011).

Fish Sampling Techniques

Collection, Identification and Measurement of Fish

The fish caught with nets and traps were transferred into large separate bowls, by the fisher according to species, size and types. The following morphometric characteristics of each fish were taken: total fish weight measured to nearest 0.1g using weighing balance (Hanna mechanical spring measuring scale- 20kg capacity), standard length (SL) from the

snout to the point of attachment of the caudal pedicle and the hypural bones, and total length (TL) from the tip of the snout to the tip of the longest lobe of the caudal fin using measuring rule. Fish samples were collected fortnightly from August to November, 2020. The total number of individual fish species caught from the water body was recorded; this enabled the determination of the relative abundance of the various fish species in the water body. Fishes were identified using guide/hand books by Reed *et al.,* (1967) in Olaosebikan and Raji (1998), Idodo-Umeh (2003), Froese and Pauly (2015). Sex of fish was determined by visual observation according to Offem *et al.,* (2011).

Sampling Period

Samples were collected twice between 7th and 27th of every month from each of the five sampling station in Tagwai lake during morning hours (7:30am – 9:00am), for a period of 4 months (August – November, 2020).

RESULTS

Distribution, Abundance and Sex Ratios of the various Species of Fish in the Lake

The fish species diversity of the various species of fish obtained from the Lake during the period of study (August to November, 2020) are presented in Table 1.

Distribution and Abundance

Seven species were encountered during the study period. The most abundant specie was *Clupeid* 4780 (43.30 %), followed by *Alestes*species 2500 (22.65%), *Tilapia* species 2494 (22.60%), species of *Synodontis* 935 (8.47%), *Clarias gariepinus* 316 (2.86%), *Mormyrus* species 13 (0.12%) and *Labeo* species 1 (0.01%).

Sex Ratio

Tilapia species*, Alestes species, Clarias gariepinus, Clupeid* and *Mormyrus species* had more females than males (1:3, 1:7.3, 1:11.1, 1:5.6, and 1:1.2 respectively). *Labeo* had no females at all. *Synodontis* species had slightly more males than females (1.3:1) (Table 2).

Table 1: Fish species diversity of Taqwai Lake Minna Niger State between the months of August to November, 2020

SN	Order	Family	Genus	Species
1.	*Perciformes*	*Cichclidae*	*Tilapia*	*Oreochromis niloticus*
2.	*Siluriformes*	*Mochokidae*	*Synodontis*	*Synodontis courteti*
3.	*Cypriniformes*	*Cyprinidae*	*Labeo*	*Labeo senegalensis*
4.	*Clupeiformes*	*Clupeidae*	*Clupeid*	*Clupeid sierrathrissa*
5.	*Mormyriformes*	*Mormyridae*	*Mormyrus*	*Mormyrus hasselguisti*
6.	*Siluriformes*	*Claridae*	*Clarias*	*Clarias gariepinus*
7.	*Characiformes*	*Clupeidae*	*Alestes*	*Alestes macrolepidotus*

Table 2: Distribution, abundance and sex ratios of the various species of fish in the lake

Species	Male (M)	Female (F)	Total	% Abundance	Sex Ratio (M:F)
Tilapia species	614	1850	2494	22.60	1:3
Synodontis species	534	401	935	8.47	1.3:1
*Alestes*species	300	2200	2500	22.65	1:7.3
Clarias gariepinus	30	334	316	2.86	1:11.1
Labeo species	1	0	1	0.01	1:0
Clupeid species	600	3380	4780	43.30	1:5.6
Mormyrus species	6	7	13	0.12	1:1.2
Total	**2085**	**8172**	**11039**	**100.00**	

DISCUSSION

The findings of the study in Table 1 revealed that seven species of fishes and seven families were encountered during the study period from August to November 2020. These species include; *Tilapia*, *Synodontis*, *Labeo*, *Clupeid*, *Clarias*, Alestes and *Mormyrus*. This finding is in line with (Mohammed *et al.*, 2019) who studies biodiversity of fishes of Tagwai reservoir and encountered seven species of fish and five families between the periods of January to April 2018.

The study was also in consonance with other reservoirs in Niger State such as Kontangora reservoir where six different fish species belonging to five families were recorded (Ibrahim *et al.,* 2009). A similar study was carried out by (Ayanwale *et al.*, 2013), who study Ichthyofauna of Tagwai lake during the rainy season where he encountered eight species of fish from six families. The reason for the low fish species occurrence in the lake during this study could be attributed to large volume of water during the wet season which made fishing difficult and over exploitation of the lake, contributing to the low fish species occurrence and catch (Offem *et al.,* 2011). The findings also revealed that *Tilapia species, Alestes*, *Clarias gariepinus, Clupeid* and *Mormyrus species* had more females than males (1:3, 1:7.3, 1:11.1, 1:5.6, and 1:1.2 respectively). *Labeo* species had no females at all. *Synodontis species* had slightly more males than females (1.3:1). The dominance of family cichlidae and clupeidae in Tagwai Lake could be as a result of their feeding habit and high rate of Reproduction (Balogun *et al.,* 2000).

CONCLUSION

The fish species diversity of Tagwai Lake Minna, Niger State was not much affected by monthly variation while fish species diversity was affected by fishing activities and these may be due to overfishing and inappropriate used of fishing gears on the lake.

In final, fish species diversity of Tagwai Lake was seriously influenced by fishing activities.

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