Assessment of Fish Fauna and Water Quality in Ogbaru River, Nigeria

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Abstract- *This study evaluated fish diversity and water quality in the Ogbaru River, Nigeria. Fish samples were collected monthly from April to July 2023 at three stations, and multiple physicochemical parameters were measured. A total of 188 fish specimens were identified, representing 18 species and 6 families. Tilapia zilli was the most abundant species (13.3%), followed by Clarias gariepinus (11.7%). Variations in species abundance were observed among stations. The measured water quality parameters were within normal ranges. These findings provide baseline data for managing the river's fishery resources.*

Keywords- *Tilapia zilli, water quality, Ogbaru River, Clarias gariepinus, Fish*

I. INTRODUCTION

Fish are a diverse assemblage of vertebrates adapted to life in water[1]. They possess backbones, gills for breathing, and fins for locomotion, with streamlined bodies adapted for efficient swimming[2]. Fish range in size from the whale shark (Rhincodon typus), reaching 12 m in length, to the stout infantfish (Schindleria brevipinguis), only about 7 mm long[23]. They inhabit marine, brackish, and freshwater environments across a wide range of depths[3]. Fishes are ecologically and commercially important; they provide a significant source of protein globally ($\approx$6.5% of dietary protein)[3].

West African inland waters support vital fisheries for local communities. The Ogbaru River in Anambra State, Nigeria, is an important waterway used for navigation, fishing, and domestic activities. However, anthropogenic activities such as agriculture and laundry can impact water quality, potentially affecting aquatic life. For example, detergents add phosphates to the river, and warm, stratified conditions may reduce dissolved oxygen. Understanding water quality and fish communities is essential for sustainable management. Water covers about 71% of Earth's surface[9], but only a small fraction is freshwater available for human use.

Effective fisheries management in Nigeria requires knowledge of the fish fauna and the environmental conditions of inland waters.

This study aims to characterize the fish fauna and water quality of the Ogbaru River. Specific objectives are to determine key physicochemical parameters of the river, document fish species composition and abundance, and evaluate relationships between environmental conditions and fish distribution.

II. MATERIALS AND METHODS

Study area: The Ogbaru River (Ogbaru LGA, Anambra State) was surveyed from April to July 2023. Ogbaru is bordered by the Niger River to the west and the Orashi River to the east. The region has a tropical climate and is dominated by agriculture and fishing. Local communities practice crop farming (rice, yam, cassava) and depend on the river for fishing and daily water needs.

Fish sampling: Three stations along the river were sampled. Local fishermen collected fish bi-weekly using various gears (cast nets, gill nets, traps, hook-and-line, scoop nets) to sample different habitats. A total of 188 fish specimens were collected over the study period. Each specimen was counted and preserved in 10% formalin for laboratory analysis.

Species identification: In the laboratory, fish were identified to species using standard taxonomic keys (Olaosebikan and Raji 1998[14]; Sikoki and Francis 2007[15]). Identifications were based on morphological characters and verified against reference materials. Species richness, abundance, and composition were recorded for each station.

Physicochemical sampling: Water quality was monitored monthly at each station (April–July 2023). Parameters measured in situ included water

temperature, air temperature, pH, and dissolved oxygen using calibrated meters or thermometers. Additional analyses were performed in the lab: biochemical oxygen demand (BOD, 5-day incubation), transparency (Secchi disk), alkalinity (titration with sulfuric acid), nitrate and phosphate (spectrophotometric methods at wavelengths 523 nm and 525 nm, respectively).

Data analysis: Diversity indices were calculated for each station: Margalef's richness index (d), Shannon–Wiener diversity index (H′), and evenness (E) (Zar 1984[16]). A species accounting for ≥10% of the total catch at a station was considered dominant. Analysis of variance (ANOVA) tested for significant differences in fish abundance and water quality parameters among stations. Pearson correlation examined relationships between fish abundance and environmental variables. Statistical significance was assessed at $p < 0.05$.

III. RESULTS

Fish sampling yielded 188 specimens representing 18 species in 6 families. The most abundant species were Tilapia zilli (25 individuals, 13.3% of total), Clarias gariepinus (22, 11.7%), Synodontis nigrita (17, 9.0%), and Tilapia mariae (17, 9.0%). The least abundant species was Labeo senegalensis (1, 0.5%). Station 3 had the highest catch (87 fish, 46.3%), followed by Station 2 (64, 34.0%) and Station 1 (37, 19.7%). These differences were statistically significant (ANOVA, $p < 0.05$).

Water quality parameters remained within normal ranges. Water temperatures ranged from 25.0 to 29.7 °C across months. pH values were near neutral (6.8–7.5). Dissolved oxygen averaged 5.5–6.8 mg/L. Mean BOD values ranged from 1.2 to 2.8 mg/L. Nitrate and phosphate concentrations were low (<1.0 mg/L). No toxic levels were observed. Spatial variation among stations was minimal and did not appear to limit fish survival.

IV. DISCUSSION

The Ogbaru River fish community is dominated by a few hardy species. Tilapias (family Cichlidae) and catfish (Clariidae, Mochokidae) are typical of Nigerian river systems. Historically, Nwadiora (1989[18]) reported 19 fish families in the Ogbaru River, whereas only 6 families were found in the present survey. Several families recorded in 1989 (e.g. Tetraodontidae, Malapteruridae) were absent in 2023, suggesting a possible decline in diversity. However, the dominant families (Cichlidae, Mochokidae) were consistent with past findings. Similar riverine surveys in Nigeria report family level richness around 17–25 (Yemefack et al. 2013[19]), indicating that the true diversity in Ogbaru may exceed our record of 18 species, which is likely conservative due to the short sampling period.

Stations differed in fish abundance, likely reflecting local habitat conditions. Station 3's higher catch suggests more favorable habitat or connectivity at that site. All measured water parameters were within ranges suitable for freshwater fish, indicating no immediate toxicity. However, chronic inputs of nutrients or waste could lead to long-term changes in community structure. In other systems, fish community shifts have been attributed to eutrophication and human impacts (Trumpickas et al. 2012[20]). Continued monitoring and pollution control are advisable to conserve the Ogbaru River ecosystem.

V. CONCLUSION

The Ogbaru River supports at least 18 species (6 families) of freshwater fish, with Tilapia zilli, Clarias gariepinus, Synodontis nigrita, and Tilapia mariae as the most abundant species. Water quality parameters were generally within acceptable ranges for fish health. Compared to historical records, fish diversity appears reduced, possibly due to anthropogenic pressures. Management actions should focus on limiting pollution and protecting habitat. Longer-term surveys are recommended to capture full seasonal diversity and inform sustainable management of the river's fishery.

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