Nigerian Journal of Science and Environment 2024 Volume 22 (1) 125 – 139 ISSN: 1119 – 9008
https://doi.org/10.61448/njse2212410

COMPOSITION, ABUNDANCE AND DISTRIBUTION OF NON-CICHLID FISH COMMUNITY IN OGBO STREAM AND ITS FLOODPLAIN, ENHWE, DELTA STATE, NIGERIA

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ABSTRACT

A preliminary survey of the composition, abundance and distribution of non-cichlid fish community was carried out at Ogbo stream and its floodplain in Enhwe, Delta State Nigeria. Water samples and fishes were sampled and analyzed using APHA methods and standard fishing gear respectively. The physicochemical parameters revealed distinct values for station 1 (Temperature: 25.63°C, Transparency: 25.09 cm, Sulphate: 7.56 mg/L) and station 2 (Temperature: 23.60 °C, Transparency: 19.90 cm, Sulphate: 6.68 mg/L). Among the parameters, only Temperature, Transparency, and Sulphate exhibited a noteworthy difference ($p<0.05$) between the two stations. Transparency had a negative correlation with other parameters in Station 1. A total of 725 individual fish species belonging to eight families and genera were sampled. Among the notable findings, Clariidae emerged as the most abundant family, constituting 82.90% of the total relative abundance across both stations. *Clarias camerunensis* exhibited the highest abundance, comprising 62.20% of the total individuals sampled. *Parachanna africana* and *Clarias pachynema* also demonstrated significant presence, contributing 15.00% and 13.20% to the total relative abundance, respectively. ANOVA indicates a significant difference in the composition and abundance of fish species between the stream and floodplain ($p < 0.05$), emphasizing the influence of habitat-specific factors. The Margalef's richness (1.67), dominance (0.64), diversity (1.32) and evenness (0.34) index of fishes was higher in the stream than in the floodplains. Magnesium, sulphate, temperature, and transparency were positively correlated to the distribution patterns of *Pantodon bucholzi*, *Clarias jaensis*, *Phractolaemus ansorgei*, and *Heterotis niloticus* in station 1, with the exception of *P. africana* and *Polypterus senegalus.* There was a negative association between dissolved oxygen, nitrate, pH, and Iron, and the distribution of fishes in station 2. Ogbo stream and its floodplain have low abundance and distribution of fish species. Therefore, it demands for sampling efforts and long-term studies to unravel the checklist of species.

Keywords: Abundance, Composition, Distribution, Floodplain, Non-cichlid fishes, Ogbo Stream

INTRODUCTION

Fishes, encompassing both non-cichlid and cichlid species, face the influence of anthropogenic and environmental factors that delineate their composition, abundance, biology, and reproductive capabilities within their natural habitat (Admassu *et al*., 2015; Ito and Egwunyenga, 2024). The fecundity of fishes can be significantly impacted by water level fluctuations, flooding and parasitic infection (Ito, 2017). Streams and adjacent floodplains play a crucial role in supporting sustainable fish populations, prompting a heightened focus on biodiversity studies of these species due to the growing reliance on fishes as a protein source. In 127 developing nations, fishes contribute approximately 20% to the consumption of animal proteins (Ito and Utebor, 2018; FAO, 2005). The capture of fishes from local streams and rivers not only provides an affordable source of protein

but also supplies essential nutrients such as iron, vitamins, calcium, and omega-3 fatty acids. Moreover, this practice contributes about 0.48% to Nigeria's Gross Domestic Product (FAO, 2016). As the demand for fishes in Nigeria continues to increase, reaching approximately 41% of animal protein consumption (Federal Department of Fisheries, 2010), there is a pressing need for conservation measures, necessitating periodic sampling of fish species (UNEP, 2012).

Fish communities in various water bodies in Nigeria are often underreported, given the current environmental challenges such as climate changes, human activities, and habitat degradation (Badejo & Oriyomi, 2015; UNEP, 2012). These factors have significant implications for the health, abundance, distribution, and overall well-being of fish populations (Adedokun *et al*., 2013; Kareem *et al*., 2015; Ito, 2017). Diverse elements, including water depth, current patterns, food availability, substrate composition, pollution runoff, waste deposition, and urbanization, pose threats to aquatic ecosystems, influencing water quality fluctuations and subsequently impacting fish composition, abundance, and distribution (Bisht *et al*., 2009; Soyinka *et al*., 2010; Ito and Ugbomeh, 2017).

The abundance and distribution patterns of non-cichlid fish species are influenced by their specific ecological niches, habitat requirements, and interactions with other species. These factors contribute to variations in population sizes and geographical ranges among different non-cichlid fish species, which are commonly found in freshwater rivers, lakes, streams, and marine environments. The presence and abundance of these species are closely tied to physicochemical parameters within defined streams, which play crucial roles in determining their distribution and abundance (Bisht *et al*., 2009; Soyinka *et al*., 2010; Ito *et al*., 2023).

The fascination of scientists with the biodiversity of non-cichlid fishes in Nigeria has persisted for decades, as evidenced by the works of Victor and Tetteh (1988), Ikomi (1996), Idodo-Umeh (2003), Ibrahim *et al*. (2012), and Ogidiaka *et al*. (2013). The interest in the diversity of non-cichlid fishes in Nigerian waters is substantial due to the plethora of species present. Studying and conserving these fishes play a crucial role in maintaining ecological balance and preserving Nigeria's natural heritage. Previous research has predominantly focused on aspects such as the length and weight relationship, as well as the food and feeding habits of fishes, as documented by Imam *et al*. (2010), Ogunola *et al*. (2018), Famoofo *et al*. (2020), and Jisr *et al*. (2018). Additionally, certain studies in Nigeria have delved into the impact of human disturbance on non-cichlid fish populations, as explored by Anene (2005) and Oribhabor (2016).

While the status of non-cichlid fishes in Warri River and its surroundings has been evaluated (Ogidiaka *et al*., 2013), the specific analysis of the composition, abundance, and distribution of fishes in Ogbo stream and its floodplains is notably absent. Ogbo stream, along

with its floodplain, represents a significant river in Enwhe town, Delta State. Given the extensive stretch and size of this water body, it is presumed to be rich in fish species across all trophic levels, yet it remains unassessed. This study is aimed to: determine the composition, abundance, and distribution of fishes in Ogbo stream and its floodplains; explored the impact of physicochemical parameter on non-cichlid fish community in Ogbo Stream and its floodplain, Enhwe, Delta State and also serve as a foundational investigation for future research.

MATERIALS AND METHODS

Study area

Ogbo stream and its floodplain (latitude 5.222967^{o}N and longitude 6 .638345^{o}E) is located in Enhwe town, Isoko South Local Government Area, Delta State, Nigeria (Figure 1). The residents of Enhwe often utilizes Ogbo stream and its flood plains for agricultural activities specifically crop and fish farming and anthropogenic activities such as swimming, washing, and so on as primary livelihood. The region is equally endowed with a riparian forest characterized by emergent trees that form canopies, along with shrubs and grasses. This forest serves as a vital source of primary productivity of the Ogbo stream and its floodplain. The Ogbo stream and its floodplain have interconnected canal which connects the adjoining ponds. These ponds are utilized for intensive fish farming, both for commercial and domestic purposes. Furthermore, the floodplain doubles as a location for gathering firewood, catering to the energy needs of the local population. In order to have an effective sampling, the Ogbo Stream and its floodplain were divided into two on the basis of anthropogenic impact and also illumination. Station 1 is located 3.5 km from the stream while station 2 is located 2.4 km.

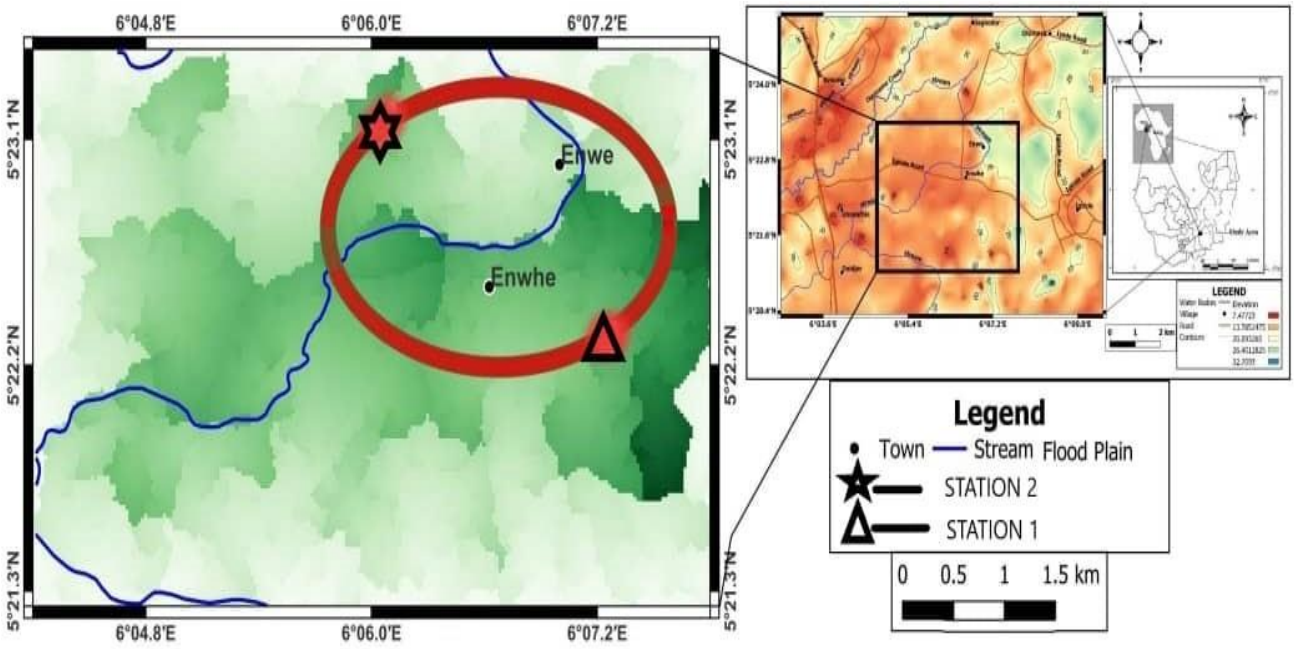

Fig 1. Map of Study area showing sampling location.

Water sample collection and analysis

Water samples for the purpose of physicochemical parameters was collected in a clean four (4) glass sampling container which was rinsed with the Ogbo stream and its floodplain water before collection. The sampling bottles were immersed into the water to collect water samples. Dissolved Oxygen, potassium, sodium, Nitrate, Phosphate, sulphate, iron, magnesium, calcium and Biological Oxygen demand was analyzed in the Advanced Research Center of Delta State University, Abraka Delta State while Water temperature, Hydrogen Ion Concentration (pH), Transparency, determined in-situ using multipurpose instrument and secchi disc respectively. Dissolved oxygen was according to the standard method for examining water and waste water (APHA, 1989), while spectrophotometric method was used to determine the phosphate and nitrate.

Sampling Procedure and preservation

Fishes were captured within a period of 10 months from September 2021 to August, 2022. This was done using a wide range of fishing methods including gillnets with mesh sizes of 3 inches, 2 ½ inches, and 1 ½ inches, basket nets, hooks of sizes 13, 16, and 18, and scoop nets with a mesh size of 300µm, specifically designed for capturing fry and juvenile fishes. Plastic buckets containing 20% formalin solution, taken to the field was used to collect and preserve the fish, after which they were taken to the laboratory for identification.

Fish Identification, Treatment and Preservation

Fish catch of the stream were identified and confirmed to generic and species levels where possible using the standard taxonomic key of Olaosebikan and Raji (2004) and Idodo-Umeh (2003). Collected fish were then sorted into species and families prior to data collection. The weighed fish species were preserved in formalin of 20% concentration prior to identification.

Estimation of Fish Diversity

Simpson's dominance index was used to compare the abundance of the commonest species in each station. Simpson's Index (d) = $\frac{\Sigma n(n-1)}{N(N-1)}$

Simpson's Reciprocal Index = 1/d; Simpson's Index of Diversity = 1-d; Shannon diversity was calculated according to:

Diversity $H = -\sum_{i=1}^{S} Pi\ In\ (Pi)$

Where: S is the number of species present in the community, Pi is the proportional abundance of the ith species.

Evenness (E) = $\frac{e^H}{S}$

Data Analysis

The data obtained from the laboratory analysis were used as variable inputs for the descriptive statistics such as mean, minimum, maximum and standard deviation. Data collected were also subjected to analysis of variance (ANOVA) and t-test. ANOVA was used to measure the variance between qualities of water from in each site. All statistical significance level were set at 0.05. All statistical methods used in analyzing the water quality parameters and fish community were adapted from Zar (1984) and

Magurran (1988), including taxa richness, diversity and evenness indices, using the Computer Basic Programme. Canonical correspondence analysis was was also employed and used to check for relationship within physicochemical parameters and between fish abundance and distribution.

RESULTS

Physicochemical Parameters of Ogbo stream and its floodplain

The summary of the water quality of the two (2) sampling stations in Ogbo stream and its floodplain are shown in Table 1. The physicochemical parameters results showed the mean and standard deviation values in the studied stream ranged as follows: Temperature (station 1: 25.63±1.27 and station 2: 23.60±1.47 ^{0}C), Transparency (station 1: 25.09±6.18 and station 2: 19.90±1.86 cm) BOD (station 1: 9.23±0.56 and station 2: 9.04±1.00 mg/L), pH (station 1: 5.87±0.39 and station 2: 6.09±0.43), Sulphate (station 1: 7.56±0.62 and station 2: 6.68±0.67 mg/L), DO (station 1: 4.56±0.32 and station 2: 4.65±0.42 mg/L), Phosphate (station 1: 1.03±0.35 and station 2: 0.96±0.35 mg/L); Nitrate (station 1: 0.19±0.31 and station 2: 0.19±0.31 mg/L) etc. ANOVA on the physicochemical parameter data-set showed that there was a significant difference ($p>0.05$) only in Temperature, Transparency and Sulphate out the thirteen (13) water quality analyzed in the Ogbo stream and its flood plain (Table 1).

Table 1: Mean ± S.E values of physicochemical parameters of Ogbo stream and its floodplain from September 2021 – August 2022 [minimum and maximum values in parenthesis]

Parameters	Station 1	Station 2	p-value	F-value	WHO Limits
1. Temperature (ºC)	25.6±1.27 (24.0-28.3)	23.6±1.47 (21.8-26.0)	0.003*	11.324	20-50°C
2. Transparency (cm)	25.09±6.18 (15.0-34.0)	19.9±1.86 (15.0-22.0)	0.015*	7.069	-
3. pH	5.87±0.39 (4.90-6.30)	6.09±0.43 (5.20-6.90)	0.234	1.509	6.5 to 8.5
4. BOD (mg/L)	9.23±0.56 (8.40-9.85)	9.04±1.0 (7.10-10.41)	0.600	0.284	1-5
5. DO (mg/L)	4.56±0.32 (4.10-4.99)	4.65±0.42 (4.10-5.32)	0.565	0.342	>5
6. Calcium (mg/L)	19.48±1.68 (17.63-22.25)	19.20±2.08 (15.40-22.10)	0.733	0.119	6.5-8
7. Magnesium (mg/L)	26.0±0.85 (24.86-27.24)	24.87±1.63 (22.10-27.39)	0.056	4.117	50
8. Iron (mg/L)	1.09±0.33 (0.10-1.30)	1.36±0.28 (1.10^{-1}.96)	0.062	3.917	0.3
9. Sulphate (mg/L)	7.56±0.62 (6.65-8.22)	6.68±0.67 (5.43-7.90)	0.005*	9.987	200
10. Sodium (mg/L))	23.21±1.55 (21.68-26.20)	22.52±1.44 (20.90-25.10)	0.291	1.177	200
11. Potassium (mg/L)	12.8±1.55 (10.12-14.60)	12.78±1.77 (10.11-15.20)	0.986	0.000	12mg/L
12. Phosphate (mg/L)	1.03±0.35 (0.58-1.31)	0.96±0.35 (0.48-1.28)	0.631	0.238	1mg/L

13. Nitrate (mg/L)	0.19±0.31 (0.02-1.10)	0.19±0.31 (0.02-1.10)	0.989	0.000	3.7mg/L

Relationship between Physicochemical Parameters and the Sampled Stations in the Ogbo Stream and its Floodplain.

The principal component analysis (PCA) biplot show relationship between physicochemical parameters and the sampled stations in the Ogbo Stream Floodplain is shown in Figure 2. PCA analysis revealed total variance in components 1 and 2 within the biplot. Component 1, characterized by an eigenvalue of 28.0605, captured the largest portion of variance at 66.863%, while component 2, with an eigenvalue of 8.30557, explained 19.791% of the overall variance in the PCA. Station 1 represented component 1 and Station 2 represented component 2. Transparency had a negative correlation with other parameters in Station 1. However, calcium, potassium, sodium, temperature, sulphate, dissolved oxygen, iron, and pH (hydrogen ion concentration) had positive correlation with other parameters in station 1. There is no correlative effect on physicochemical parameters in station 2.

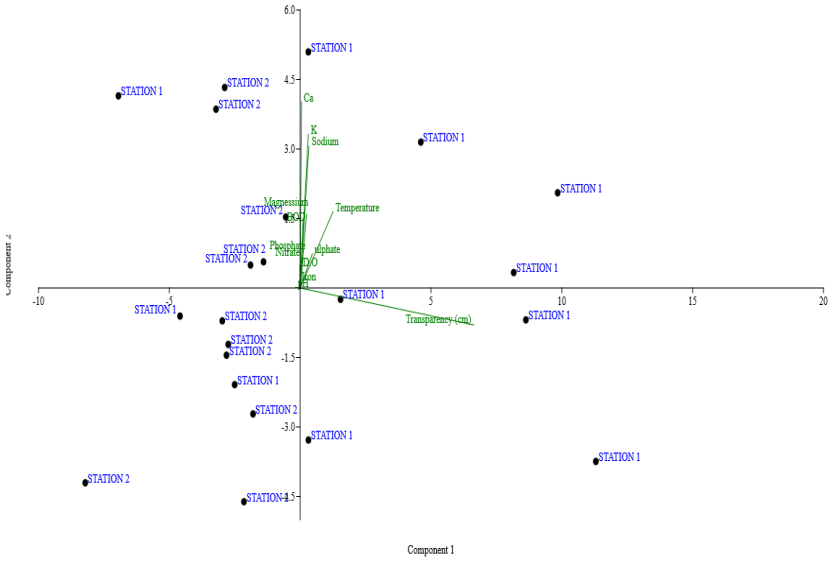

Fig. 2. Principal component analysis (PCA) scatter showing relationship between physicochemical parameters and the Sampled Stations in the Ogbo Stream Floodplain.

Fish Assemblages of the Ogbo Stream and its floodplain

The checklist of fish species caught in Ogbo Stream and its floodplain is shown in Table 2. Fishes in six different orders; Lepidosireniformes, Siluriformes, Ophiocephaliformes, Polypteriformes, Osteoglossiformes, and Gonorynchiformes, eight families, including Protopteridae, Clariidae, Channidae, Polypteridae, Osteoglossidae, Phractolaemidae, Notopteridae, and Pantodontidae belonging to eight genera viz; *Protopterus, Clarias, Parachanna, Polypterus, Heterotis, Phractolaemus, Xenomystus* and *Pantodon* were recorded in this study. More fishes were captured in station 1 than in station 2

within the Ogbo Stream and its floodplain. Of the 11 species of fishes recorded in this study, nine (9) were captured from station 1 and three (3) from station 2. The relative abundance of *Clarias camerunensis* was highest in this study. This was closely followed by *Clarias pachynema.* The relative abundance of *Polypterus senegalus* was the lowest. *Parachanna africana, Clarias camerunensis* and *Clarias pachynema* are dominant fish species in the stream and floodplain. *Xenomystus nigri, Pantodon bucholzi, Clarias jaensis, Clarias gariepinus* were permanent fish species. *Heterotis niloticus, Phractolaemus ansorgei, Protopterus annectens* were present in the stream. *Polypterus senegalus* was rare in the stream and floodplain.

Table 2. Fish Assemblages/Checklist of species caught in Ogbo Stream and its floodplain

Families /Species	Stn 1	Stn 2	R.A (%)	Index
Protopteridae				
Protopterus annectens (Owen, 1839)	-	✓	0.80	**
Clariidae				
Clarias gariepinus (Burchell, 1822)	-	✓	3.30	***
Clarias camerunensis (Lonnberg, 1895)	✓	✓	62.20	****
Clarias pachynema (Boulenger, 1903)	✓	-	13.20	****
Clarias jaensis (Boulenger, 1909)	✓	-	1.40	***
Channidae				
*Parachanna africana (*Steindachner, 1879)	✓	-	15.00	****
Polypteridae				
Polypterus senegalus (Cuvier,1829)	✓	-	0.10	*
Osteoglossidae				
Heterotis niloticus (Cuvier,1829)	✓	-	0.70	**
Phractolaemidae				
Phractolaemus ansorgei (Boulenger, 1901)	✓	-	0.70	**
Notopteridae				
Xenomystus nigri (Gunther, 1868)	✓	-	1.10	***
Pantodontidae				
Pantodon bucholzi (Peters, 1877)	✓	-	1.40	***

Note: Stn (Station), * signifies Rare (< 0.5%), ** signifies Present (> 0.5%), *** signifies Permanent (> 1.0%), **** signifies Dominant (>10%), (✓) signifies Present (-) signifies Absent

Composition, Abundance and Distribution of Fish Species

The percentage composition, abundance and distribution of fish species in Ogbo Stream and its floodplain is shown in Table 3. The analysis revealed a diverse array of fish families inhabiting Ogbo Stream and its floodplain. Among the notable findings, Clariidae emerged as the most abundant family, constituting 82.90% of the total relative abundance across both stations. *Clarias camerunensis* exhibited the highest abundance, comprising 62.20% of the total individuals sampled. *Parachanna africana* and *Clarias pachynema* also demonstrated significant presence, contributing 15.00% and 13.20% to the total relative abundance, respectively. Other families such as Notopteridae (1.10%) and Pantodontidae (0.80%) were represented by *Xenomystus nigri* and *Pantodon bucholzi,* albeit in lower proportions. Station 2 showed higher overall relative abundance compared to Station 1.

Table 3. Percentage Composition, abundance and distribution of Fish Species in Ogbo Stream and its Floodplain

Families /Species	Station 1 (R.A)	Station 2 (R.A)	Total no. of Ind.	Total R.A (%)
Protopteridae				
P. annectens	0(0.00)	6(1.55)	6	0.80
Clariidae				
C. gariepinus	0(0.00)	24(6.20)	24	3.30
C. camerunensis	94(27.81)	357(92.25)	451	62.20
C. pachynema	96(28.40)	0(0.00)	96	13.20
C. jaensis	10(2.96)	0(0.00)	10	1.40
Channidae				
P. Africana	109(32.25)	0(0.00)	109	15.00
Polypteridae				
P. senegalus	1(0.30)	0(0.00)	1	0.10
Osteoglossidae				
H. niloticus	5(1.48)	0(0.00)	5	0.70
Phractolaemidae				
P. ansorgei	5(1.48)	0(0.00)	5	0.70
Notopteridae				
X. nigri	8(2.37)	0(0.00)	8	1.10
Pantodontidae				
P. bucholzi	10(2.96)	0(0.00)	10	1.40
Total	**338(46.60)**	**387(53.40)**	**725**	**100.00**

Note: R.A: Relative Abundance

Table 4 reveals a total of 399 individuals in the stream, with Clariidae (52.63% R.A) and Channidae (26.56% R.A) being the dominant families. Conversely, the floodplain exhibited a different pattern, with Clariidae (73.93% R.A) emerging as the most abundant family. *C. camerunensis* demonstrated a ubiquitous presence across both habitats. Next on the relative abundance scale was *P. africana* with a relative abundance of 26.56% in the waters of Ogbo stream. Generally, the R.A of fish catch in the stream (55.03%) was higher compared to the flood plains (44.96%) as sown in Table 4. Statistical analysis indicates a significant difference in the composition and abundance of fish species between the stream and floodplain ($p < 0.05$), emphasizing the influence of habitat-specific factors.

Table 4. Composition, abundance and distribution of fishes in relation to Ogbo Stream and its Floodplain

Families /Species	Streams		Floodplain		Total no. of Ind.
	No. of Species	R.A	No. of Species	R.A	
Protopteridae					
P. annectens	5	1.25	1	0.31	6
Clariidae					
C. gariepinus	14	3.51	10	3.08	24
C. camerunensis	210	52.63	241	73.93	451
C. pachynema	49	12.28	47	14.42	96
C. jaensis	4	1.00	6	1.84	10
Channidae					

P. Africana	106	26.56	3	0.92	109
Polypteridae					
P. senegalus	1	0.25	0	0.00	1
Osteoglossidae					
H. niloticus	3	0.75	2	0.61	5
Phractolaemidae					
P. ansorgei	1	0.25	4	1.23	5
Notopteridae					
X. nigri	5	1.25	3	0.92	8
Pantodontidae					
P. bucholzi	1	0.25	9	2.76	10
Total	**399**		**326**		**725**
Relative Abundance		**55.03**		**44.96**	

(Note: R.A: Relative Abundance; No. of Specie: Number of species)

Abundance and seasonal variation of fish species

Abundance and seasonal variation of fish species in Ogbo Stream and floodplain is shown in Table 5. The species composition and relative abundance varied between the wet and dry seasons. Table 5 presents the findings, showing the number of species and relative abundance for each fish species during the wet and dry seasons. The most abundant species during the wet season was *C. camerunensis* (52.6% R.A), followed by *P. africana* (26.6% R.A). In contrast, during the dry season, *C. camerunensis* remained abundant (73.9% R.A), with *C. gariepinus* also contributing significantly (3.1% R.A). During the wet season, a total of 399 individuals were recorded across various species, constituting 55.03% of the total abundance. Conversely, during the dry season, 326 individuals were observed, representing 44.96% of the total abundance.

Table 5. Abundance and seasonal variation of fish species in Ogbo Stream and floodplain

Families /Species	**Wet Season**		**Dry Season**		**Total No. of Individuals**
	No. of Species	**R. A**	**No. of Species**	**R. A**	
P. annectens	5	1.3	1	0.3	6
C. gariepinus	14	3.5	10	3.1	24
C. camerunensis	210	52.6	241	73.9	451
C. pachynema	49	12.3	47	14.4	96
C. jaensis	4	1.0	6	1.8	10
P. africana	106	26.6	3	0.9	109
P. senegalus	1	0.3	0	0.0	1
H .niloticus	3	0.8	2	0.6	5
P. ansorgei	1	0.3	4	1.2	5
X. nigri	5	1.3	3	0.9	8
P. bucholzi	1	0.3	9	2.8	10
Total	**399**		**326**		**725**
Relative abundance (%)	**55.03**		**44.96**		**100.00**

Note: R.A: Relative Abundance

Fish diversity Indices

The diversity indices of fishes sampled from Ogbo stream and its flood plain is shown in Table 5. There were more species and individual fishes in the stream than in the floodplain. Fishes from Ogbo stream recorded more dominant (0.637), Shannon index (1.315) and Margalef''s index (1.67) than in the floodplain. The species evenness was generally low but a higher evenness was recorded in the stream than the floodplain (0.339).

Table 6. Diversity indices of fishes sampled in Ogbo stream and its floodplain

	Stream	**Floodplain**
Number of species	11	10
Number of individuals	399	326
Simpson (1-D)	0.637	0.432
Shannon index (H)	1.315	0.985
Evenness	0.339	0.268
Margalef's index	1.670	1.555

Canonical correspondence plot

The relationship between physicochemical parameters and fish distribution patterns of the two sampled station in Ogbo stream and its floodplain is shown in Figure 3. There were positive correlations among magnesium, Biological Oxygen Demand, Phosphate, and Nitrate. Conversely, Phosphate, Biological Oxygen Demand, Potassium, and Calcium demonstrated negative correlations along this axis. Sodium, however, positioned itself neutrally in this context. Furthermore, magnesium, sulphate, temperature, and transparency were positively correlated to the distribution patterns of *P. bucholzi*, *C. jaensis*, *P. ansorgei*, and *H. niloticus* in station 1, with the exception of *P. africana* and *P. senegalus.* There was a negative association between dissolved oxygen, nitrate, pH, and Iron, and the distribution of fishes in station 2. These factors, however, influenced the distribution of *P. annectens* and *C. gariepinus* in station 2 (Figure 3).

Nigerian Journal of Science and Environment 2024 Volume 22 (1) 125 – 139 ISSN: 1119 – 9008
https://doi.org/10.61448/njse2212410

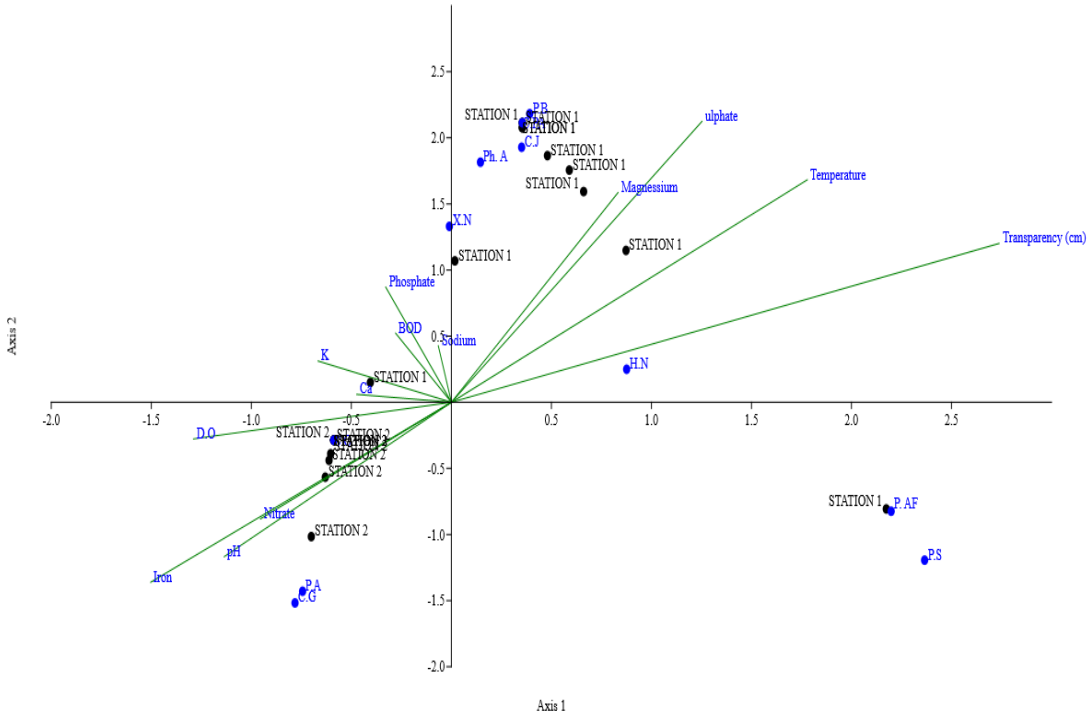

Fig. 3. CCA ordination triplot between physico-chemical parameters and Fish distribution patterns of the two sampled station in Ogbo stream and its floodplain.
Legend: P.A= *P. annectens*, C.G = *C. gariepinus*, C.C= *C. camerunensis*, C.P= *C. pachynema*, C.J= *C. jaensis*, P. Af = *P. africana*, P.S= *P. senegalus*, H.N= *H. niloticus*, Ph. A= *P. ansorgei*, X.N = *X. nigri*, P.B= *P. bucholzi*.

DISCUSSION

A proper understanding on the physicochemical characteristics of water would provide valuable insights into ecosystem metabolism as well as establishing a foundation for comprehending the fundamental health of the waterbody in relation to the organisms therein (Ito *et al*., 2023; Kjelland *et al.,* 2015). Fluctuations in physicochemical parameters of monthly samples is common in studies. Fluctuation in water parameter was observed in this present study. Significant differences were only recorded with temperature, transparency, and sulphate as others were insignificant between the stations. Temperature, transparency, biological oxygen demand, calcium, magnesium, sulphate, sodium, potassium, and phosphate was higher in station 1 compared to station 2. Similarly, hydrogen ion concentration (pH), dissolved oxygen, and iron was higher in station 2 than in station 1. This may be due to a combination of natural factors, including availability of macrobenthic insects, geology and seasonal variations, as well as potential anthropogenic influences such as industrial discharges, agricultural runoff, and land use practices like sand dredging as asserted by Ito and Ugbomeh (2017). Many factors are responsible for the changing physicochemical parameters of water bodies. Studies conducted in Nigeria have pointed out that industrial effluents are a major source of surface water pollution, which can significantly impact water quality parameters (Nwilo and Badejo, 2005). In the Niger Delta region of Nigeria, oil exploitation and refining activities have notably reduced the

water quality of adjoining rivers, due to oil spills severely damaging the mangrove ecosystem (Nwilo and Badejo, 2005; Osibanjo *et al.,* 2011; Ekiye and Zejiao, 2010).

Fish composition and survival in different water bodies is well defined by wide variety of physical properties to water chemistry, as emphasized by Cheng *et al.*, (2010). In this study, a total of 725 fishes were collected from the sampled locations. Fishes were from six different orders including Lepidosireniformes, Siluriformes, Ophiocephaliformes, Polypteriformes, Osteoglossiformes, and Gonorynchiformes, eight families, including Protopteridae, Clariidae, Channidae, Polypteridae, Osteoglossidae, Phractolaemidae, Notopteridae, and Pantodontidae belonging to eight genera viz; *Protopterus, Clarias, Parachanna, Polypterus, Heterotis, Phractolaemus, Xenomystus* and *Pantodon.* More fish species were encountered in this study probably because the location is not so disturbed, the sampling efficiency, the multiple methods applied and that the exploration of fishes in the habitat is not intense. The finding of this present study that fishes were recorded in eight families did not corroborate the study of Tiogué *et al.* (2018) whereby four fish species were observed in three families Clariidae, Cichlidae and Channidae. In this present study, eleven species of fish were recorded in this study, nine fish species were collected from station 1 and only three was gotten from station 2 within the Ogbo Stream and its floodplain. The number of species recorded in this study was lower than those reported in the study of Ogidiaka *et al*. (2012) with twenty-six species recorded from more families (sixteen) and genera (twenty-one) in similar region with this present study. More species was recorded in the study of Masai *et al*. (2023) compared to this present study.

There are no much current studies on the abundance and distribution of non-cichlid fishes in Nigeria. *Clarias camerunensis* is a species of catfish found to be the most abundant and dominating non-cichlid species in the Ogbo stream and its floodplain. In the study of Masai *et al.* (2023), *Clarias gariepinus* was the most occurring and it is not in line with the finding of this study. Similar trend was observed in the study of Lawal and Nafiu (2021). Cichlid fishes are more commonly reported than non-cichlid species. The finding of this study where by C. *camerunensis* dominated the abundance of the stream constituting 62.2% of the total abundance. The reason for their dominance and high abundance in this study may be linked to that they are able to withstand stressors from the environment as well as biological impacts as supported by the study of Jacques *et al.* (2020). The composition of *C. gariepinus* in this study was low in both stations probably due to the substratum of the stream and its floodplain and this did not correspond to the study of Lawal and Nafiu (2021) where a composition of 16.2% was recorded in a reservoir in Kaduna.

C. *camerunensis* was the only fish species found in both the stream and floodplain which suggests that they are migratory fish species. This may suggest that the fish species are highly

distributed colonizing other areas in the stream and its floodplain to conquer the hindrances of the environment in terms of food sources and mates. In sampling the Ogbo stream and its floodplain, *X. nigri, P. bucholzi, C. jaensis,* and *C. gariepinus* were discovered to be permanent fish species and *H. niloticus, P. ansorgei,* and *P. annectens* are commonly present. *P. senegalus* is rarely found. This finding did not correspond to previous study carried out in the Warri River by Ogidiaka *et al*. (2013). None of these species were linked and suggest that the Ogbo stream and the floodplains are close ended. *P. annectens* was the least encountered fish species in the floodplain as *P. ansorgei, P. senegalus* and *P. bucholzi* were the least encountered species in the stream. The low abundance of fish species in this study may be linked to the natural food, physicochemical parameters of water that affected the abundance of food supply and fish diversity and distribution (Yaseen *et al.* 2022). Similarly, the nitrate levels in both locations were equal and high and can correspond to the low species encountered in this study (Gharti and Liping, 2023). This suggests why the negative association between dissolved oxygen, nitrate, pH, and Iron, and the distribution of fishes in station 2 corresponds to low fish abundance.

CONCLUSION

This study revealed that has shown that temperature, transparency and sulphate concentration were significant physicochemical parameters influencing the abundance and distribution of fishes in Ogbo Stream and its floodplain. Seven hundred and twenty-five individuals classified in six orders, eight families and eight genera. Eleven fish species were encountered in total which is somewhat low in terms of diversity. *C. camerunensis* was the most abundant and dominant species in this study. This implied that the Ogbo stream and its floodplain has low abundance and distribution of fish species. Thus, it demands for sampling efforts and long-term studies to unravel the checklist of species.

Acknowledgment

We would like to express our gratitude to Delta State University, Abraka, for creating conducive research environments that facilitated this investigation. Special thanks to Dr. Ed.' E. Ito for assisting in drafting the manuscript. The role played by the fisher men in the fish catch is highly appreciated.

Competing Interests

No relevant conflict of interests to disclose.

REFERENCES

Adedokun, M. A., Fawole, O. O. and Ayandiran, T. A. (2013). Allometry and condition factors of African pike *Hepsetus odoe* Actinopterygii in a Lake. *African Journal of Agricultural Research, 8*, 3281–3284.

Admassu, D., Aberal, L. and Tadesse, Z. (2015). Fecundity and breeding season of African cat fish *C. gariepinus* (Burchell), in Lake Babogaya. *Global Journal of Agriculture and Agricultural Sciences, 3*(8): 295–305.

Anene, A. (2005). Condition factors of four cichlid species of a man-made lake in Imo state, Southwest, Nigeria. *Turkish Journal of Fish and Aquatic Science,* 5: 43–47.

Badejo, O. A. and Oriyomi, O. (2015). Seasonal variation, abundance and condition factor of fish species in erinle reservoir. *American*

Scientific Research Journal for Engineering, Technology, and Sciences, 12(1): 136–142.

Bisht, B., Badoni, A.K. and Bahuguna, S.N. (2009). Seasonality distribution and relative abundance of fish fauna of a Small Hill-Stream Dangchaura (Takoli) Gad along with River Alaknanda. *Our Nature* 7: 182-186.

Famoofo, O.O., and Abdul, W.O. (2020). Biometry, condition factors and length-weight relationships of sixteen fish species in Iwopin fresh-water ecotype of Lekki Lagoon, Ogun State, Southwest Nigeria. *Heliyon*, 6(1):e02957.

FAO. (2005). Increasing the contribution of small-scale fisheries to poverty alleviation and food security. FAO Technical Guidelines for Responsible Fisheries (pp. 79). Rome: FAO.

FAO. (2016). *Food and Agricultural Organization of the United Nations*. FAO Yearbook: Fisheries and Aquaculture Statistics, (pp. 105).

FDF. (2010). *Fisheries and Aquaculture Statistics of Nigeria*. Abuja: Federal Department of Fisheries (pp. 45)

Gharti, K and Liping, L. (2023). Assessment of aquatic environmental parameters of the pond aquaculture system. Our Nature, 21(1): 16-28.

Ibrahim, B. U., Auta, J. and Balogun, J. K. (2012). Survey of Fish Biodiversity of Kontagora Dam, Niger State, Nigeria. *Nigerian Journal of Fisheries Science and Technology*, 1: 47-54.

Idodo-Umeh. G. (2003). Freshwater fishes of Nigeria (taxonomy, ecological notes diet and utilization). Idodo Umeh publishes limited, Benin City, Nigeria. 112pp.

Ikomi, R. B. (1996). Studies on the Growth Pattern, Feeding Habits and Reproductive Characteristics of the *Mormyrid brienomyrus longianalis* (Boulenger 1901) in Upper Warri River. *Nigeria Fisheries Research*, 26: 187-198.

Imam, T. S., Bala, U., Balarabe, M. L. and Oyeyi, T. I. (2010). Length-weight relationship and condition factor of four fish species from Wasai Reservoir in Kano, Nigeria. *African Journal of General Agriculture*, 6 (3): 125-130.

Ito E.E and Ugbomeh I.L. (2017). Environmental Effect of Resort Centres on the Distribution of Aquatic Insect Fauna in River Ethiope, Delta State, Nigeria. *Journal of Coastal Life Medicine,* 5(11): 468 – 473.

Ito E.E. (2017). Survey of parasites of two fish species (*Tilapia zillii* and *Clarias gariepinus*) in Ase River Catchment, Delta State, Nigeria. *Journal of Coastal Life Medicine,* 5(10): 417-421

Ito E.E., and Utebor E.K. (2018). Insecticidal Toxicity of Goat Weed, *Ageratum conyzoides*, Linn. (Asteraceae) on Smoked Fish Weevil, *Dermestes maculatus*, Degeer (Coleoptera: Dermestidae). *Jordan Journal of Biological Sciences*, 11(2): 223 – 229.

Ito, E.E., Eze, C.N., and Nduka, F.O. (2023). Geospatial Seasonal Environmental Impacts on the Distribution and Abundance of *Schistosoma haematobium* Vectors in Two Districts of the Ase River Catchment, Delta State, Nigeria. *Tropical Freshwater Biology*, *32,* 19-36.

Jacques, N., Didier, B.B.E., Jonathan, M. and Felix, B.B.C. (2020). Parasitism of *Clarias camerunensis* Lonnberg, 1895 (Siluriformes, Clariidae) by monogeneans in a dense tropical humid forest (Southern Cameroon-Africa) gives more arguments for fish quarantine in breeding using native species. *International Journal of Innovation and Applied Studies,* 29(3): 456-464.

Jisr, N., Younes, G., Sukhn, C. and El-Dakdouki, M.H. (2018). Length-weight relationships and relative condition factor of fish inhabiting the marine area of the Eastern Mediterranean city, Tripoli-Lebanon, *The Egyptian Journal of Aquatic Research,* 44 (4): 299-305

Kareem, O. K., Olanrewaju, A. N. and Orisasona, O. (2015). Length-weight relationship and condition factor of *Chrysichthys nigrodigitatus* and *Schilbe mystus* in Erelu Lake, Oyo State, *Nigeria. Journal of Fisheries and Livestock Production,* 3: 150.

Lawal, N. and Nafium M.I. (2021). A survey of fish fauna distribution and abundance in Gwaigwaye Reservoir Katsina State, Nigeria. *Journal of Applied Sciences and Environmental Management*, 24: 12

Masai, D.M., Ojuok, J.E. and Ojwang, W. (2023). Fish species composition, distribution and abundance in Lake Victoria basin, Kenya. Kenya Marine and Fisheries Research Institute. http://hdl.handle.net/1834/6913

Ogidiaka, E., Asagbra, M. C. Arimoro, F. O. and Edegbene, A.O. (2013). non-cichlid fish communities of Warri River at Agbarho Niger Delta Area, Nigeria. *Journal of Aquatic Sciences* 28 (1): 17-23.

Ogunola, O.S., Onada, O.A. and Falaye, A.E. (2018). Preliminary evaluation of some aspects of the ecology (growth pattern, condition factor and reproductive biology) of African pike, *Hepsetus odoe* (Bloch 1794), in Lake Eleivele, Ibadan, Nigeria. *Fish Aquatic Science* 21:12.

Oribhabor, B.J. (2016). Impact of human activities on biodiversity in Nigerian aquatic ecosystem. *Science International* 4(1): 12-20.

Tiogué, C.T., Nguenga, D., Tomedi-Tabi, M.E., Tekwombuo, J., Tekou, G. and Tchoumboué, J. (2018). Alien fish speicies in the Mbo floodplain rivers in Cameroon. *International Journal of Biodiversity*, 2018: 5349341

UNEP. (2012). *The UN-water Status Report on the application of integrated approaches to Water Resources Management.* DEP/1532/NA. Nairobi, Kenya: UNEP, Division of Communications and Public Information.

Victor, R. and Tetteh, J.O. (1988). Fish communities of a perturbed stream in Southern Nigeria. Journal of Tropical Ecology 4(1): 49-59.

Yaseen, T., Bhat, S.U., and Bhat, F.A. (2022). Study of the vertical distribution dynamics of zooplankton in a thermally stratified warm monomictic lake of Kashmir Himalaya. *Ecohydrology*, 15 (2): e2389.