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The Icthyofauna Composition, Abundance and Diversity of Fishes in Ogba River, Edo State, Nigeria

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Abstract:
The ichthyofauna composition, abundance and diversity of fishes' study in Ogba River, Edo state, Nigeria was carried out between February 2018and October 2018. Fish samples were collected from fishermen using gill nets, hook and lines, bamboo traps, mesh net and basket traps. 637 fish samples were caught belonging to 8 families and 17 species. Cichlidae, Clariidae and Channidae were the most abundant families with 17.8%, 14.4% and 11.1% and the least abundant family was Mochokidae with 0.4%. The fish biomass investigation showed Cichlidae (35.1%), Clariidae (26.9%) and Channidae (22.5%) as the dominant families. The dominant fish species were Chromidotilapia guentheri (17.8%), Clarias gariepinus (14.4%) and Parachanna obscura (11.1%). Twelve species were subdominant while two species Synodontis nigrita (0.5%) and Gnathonemus senegalensis (0.3%) were occasional, they were no rare species. The highest number of fish catch was in station 2 followed by station 3. This study has contributed to the existing knowledge of the different species of fish in Ogba River.

Keywords: Ichthyofauna, composition, species diversity, abundance, fish species

1. Introduction

The diversity and community structure of fishes in any water body are important parameters for characterizing the species richness for conservation and management purpose. The fish yield of most inland waters in Nigeria is generally on the decline and causes may range from inadequate management of the fisheries to degradation of water bodies [10]. Nigerian freshwater bodies are the richest in West Africa in terms of abundance []. Numerous studies carried out in the past on the riverine fish species composition in Nigeria concentrated mainly on the larger rivers [5], [7] to the neglect of smaller rivers (to which Ogba river falls into) which are many in the country. The freshwater fishes found in Nigeria are about 268 different species [4]. They inhabit over 34 well known freshwater bodies (rivers, lakes and reservoirs) which constitute about 12% of Nigeria's total surface area put at 94, 185 ha [3]. Fish serve as a source of protein, Omega-3 fatty acids (n-3 poly unsaturated fatty acid [PUFAs]), are rich in vitamins and contains various quantities of fat and minerals for human health and consumed as food all over the world. The study of Ichthyofauna composition, abundance and diversity of fishes In Ogba River will add to the knowledge of fish species composition of inland waters in Nigeria, provide the fish diversity status of Ogba River, and also provide baseline information useful for sustainability and management of the fish species of the river.

2. Materials and Methods

2.1. Study Area

Ogba River is located on the outskirts of Benin City, Edo State, Nigeria (Fig.1). The River rises at Ekewan and flows southeast to join the Ossiomo River and Benin River, which in turn empties into Atlantic Ocean. It lies between Latitude 6° 18'45.8982''N and Longitude 5° 35'6.7248E. Ogba River flows through a secondary rainforest belt. The study area is heavily shaded by forest and economic trees such as Brazilla joy weed (*Alternanthera brasiliana)*,ginger lily *(Costus afer)*, Bamboo *(Bambusa vulgaris), mass*fern, *(Dryopteris filix)*, Slender dayflower *(Commelina erecta)*, Cupscale grass *(Sacciolepis africana)*, Floss flower*(Chromolaena odorata)*, Mile -a- minute *(Mikania cordata)*, Berry *(Adenopus berriflorus)*, hornwort *(Ceratophywllum)*, cabbage tree *(Antholeleista vagell)*, Palm oil, *(Elaeis guineensis)* Pawpaw *(Carica papaya)* , Raphia palm *(Raphia hookeri)* and Shrub.On the river are floating vegetation such asWater moss (*Salvinia nymphellula)*, Duckweed

(Lemna pausicostata) and Water hyacinth (*Eichhornia crassipies),* Water lily *(Nymphaea lotus),* African mahogany (*Lasiosperma senegalensis*). Three sampling stations 1, 2 and 3 were selected for this study. This river serves as a source of bathing, washing and drinking water for the inhabitant of the area. The water in station 3 is also used for religious purpose. Human activities in the stations include fishing, bathing, swimming, farming and ritual purposes.
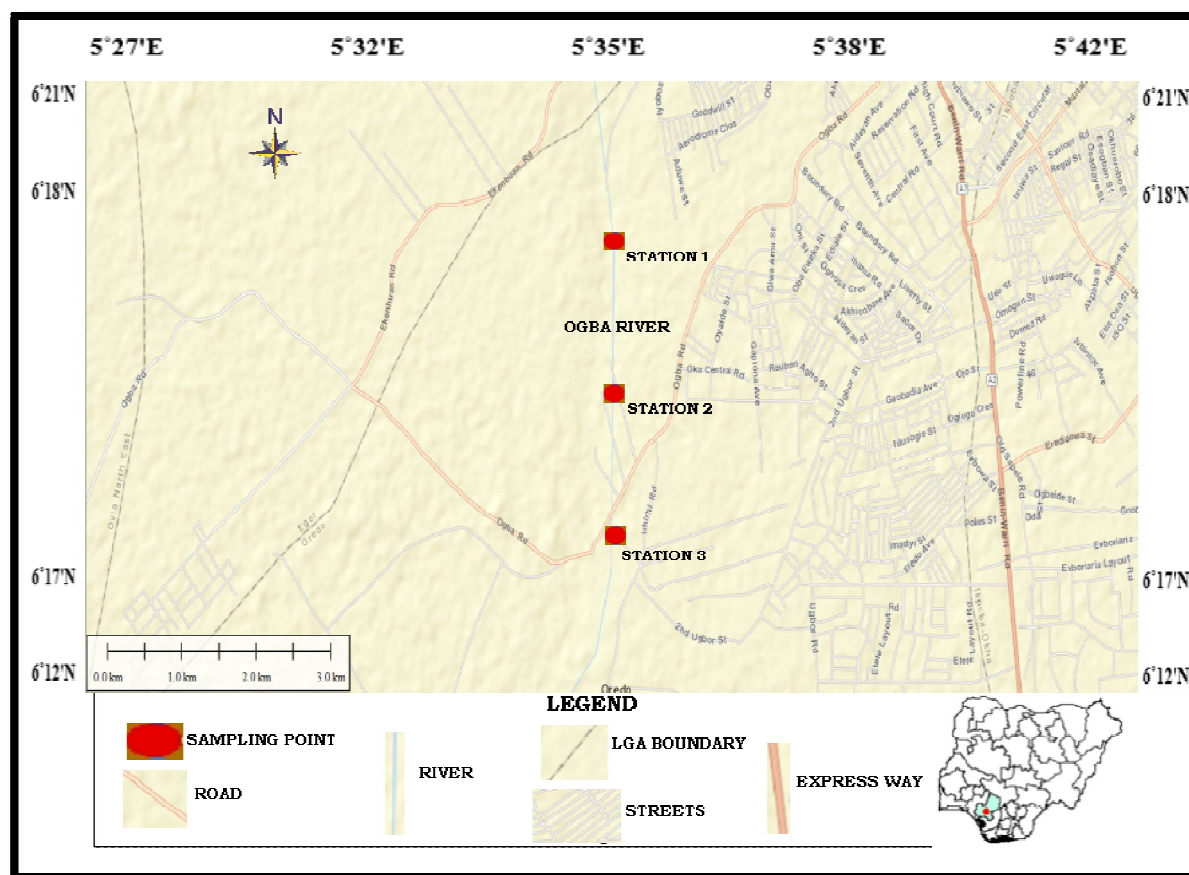

Figure 1: Map of the Study Area

2.2. Fish Sampling/Identification

Fish samples were collected from the three sampling stations between February and October 2018. Sampling was carried out monthly for a period of nine months by hired fishermen with the following gears, gill nets, hook and lines, bamboo traps, mesh net and basket traps. The fish samples were carried in a cooler and transported to the laboratory of University of Benin, where they were identified to species level using the guides of Olasebikan and Raji [13] and Idodo-Umeh [2].

2.3. Data Analysis

All fish species collected were counted to determine species abundance. The relative abundance was obtained by the formular R. A = S.A / T.A × 100. (where R.A is relative abundance, S.A is species abundance and T.A is total abundance) by Meye and Ikomi [7]. Margalef's index was used to calculate species richness, diversity was calculated by Shannon-Weiner and Evenness. Hierarchical cluster analysis was used to determine the similarities in species.

3. Results

A total of 637 fish specimens were caught belonging to 8 families and 17 species (Table 1). Three species attained the dominant status having a relative abundance of 10% and above. The species were cichlid, *Chromidotilapia guentheri* (17.8%), clariid, *Clarias gariepinus* (14.4%) and channidae, *Parachanna obscura* (11.1%). They were all ubiquitous in the stations. Twelve species were subdominant, having a relative abundance of 1 – 9% (Table 1). Among these, *Parachanna africana* (8.6%) was the most abundant, *Chromidotilapia pulcher* (1.3%) and *Isichthys henryi* (1.3%) was the least. Two species *Synodontis nigrita* (0.5%) and *Gnathonemus senegalensis* (0.3%). were occasional (species that are less than 1%). There were no rare species.

Family	Species	Stn 1	Stn 2	Stn 3	Total	R.A (%)
ANABANTIDAE	*Ctenopoma kingsleyae*	5	9	11	25	4.0
CHANNIDAE	*Parachanna africana*	17	19	18	54	8.6
	Parachanna obscura	17	30	23	70	11.1
CICHLIDAE	*Chromidotilapia guentheri*	28	46	38	112	17.8
	Chromidotilapia pulcher	4	4	0	8	1.3
	Hemichromis bimaculatus	4	4	4	12	1.9
	Tilapia mariae	9	11	7	27	4.3
	Tilapia zilli	18	20	11	49	7.8
	Oreochromis niloticus	12	16	6	34	5.4
CLARIIDAE	*Clarias anguillaris*	8	9	10	27	4.3
	Clarias gariepinus	28	25	43	96	14.4
	Clarias pachynema	23	12	15	50	7.9
MOCHOKIDAE	*Synodontis nigrita*	3	0	0	3	0.5
MORMRIDAE	*Gnathoemus senegalensis*	0	2	0	2	0.3
	Isichthys henryi	0	4	5	9	1.3
NOTOPTERIDAE	*Xenomystus nigri*	7	4	10	21	3.3
POLYPTERIDAE	*Erpetoichthys calabaricus*	13	16	9	38	6.6
Total		196	231	210	637	100
%		30.8	37.2	33		

Table 1: Ichthyofauna Composition, Distribution and Relative Abundance in Ogba River

The composition and abundance of fish families is shown in Table 2. The actual number of fish caught per family, the biomass and relative percentage is given. The total biomass of all the fish caught was 28,046.5 g. The three dominant families in number and biomass were Cichlidae (40% by number and 35.1% by biomass), Clariidae (27.2% by family and 26.9% by biomass) and Channidae (19.5% by family and 22.5% by biomass). The others families are subdominant in terms of number and biomass

S/N	FAMILY	No of Individual	R.A (%)	BIOMASS	%
1	Anabantidae	25	3.92	1002.5	3.6
2	Channidae	124	19.5	6299.5	22.5
3	Cichlidae	242	40	9830.8	35.1
4	Clariidae	173	27.2	7532.8	26.9
5	Mochokidae	3	0.4	135	0.48
6	Mormyridae	11	1.7	404	1.44
7	Notopteridae	21	3.3	905.9	3.23
8	Polypteridae	38	6.0	1936	6.90
Total		637	100	28,046.5	100

Table 2: Percentage Composition of Fish Families by Number and Biomass in
Ogba River (10% and Above Regarded as Dominant and 0 – 9% as Sub-Dominant)

Table 3 shows the indices calculated for taxa richness (d), General diversity (H), Shannon diversity (H') and Evenness in the study stations. Taxa richness was highest in station 2 and closely followed by station 1 and 3. Shannon-Weiner was highest in station 1 and lowest in station 3, evenness index was highest in station 1 and lowest in station 2. Dominance was highest in station 3 and lowest in station 1.

Parameters	Stations		
	1	2	3
Number of Taxa	15	16	14
Individuals	196	231	210
Margalef's index	2.666	2.756	2.433
Dominance	0.09092	0.1014	0.1147
Shannon H	2.522	2.488	2.382
Simpson 1-D	0.9091	0.8986	0.8853
Evenness index	0.8301	0.7522	0.7731
Equitability	0.9312	0.8973	0.9025

Table 3: Fish Diversity Indices in Different Stations of Ogba River

Figure 2 show a dendogram with four different clusters. *Hemichromis bimaculatus, Oreochromis niloticus, Xenomystus nigri, Tilapia zilli, Clarias gariepinus, Chromidotilapia guentheri, Clarias pachynema, Parachanna obscura* and *Parachanna africana* formed the first cluster. *Tilapia mariae, Ctenopoma kingsleyae, Clarias anguillaris* and *Erpetoichthys calabaricus* formed the second cluster. The third cluster was formed by *Isichthys henryi* and *Gnathonemus senegalensis.* The fourth cluster was formed by *Synodontis nigrita* and *Chromidotilapia pulcher.* The cluster analysis grouped fishes that have similarity in abundance in a cluster.
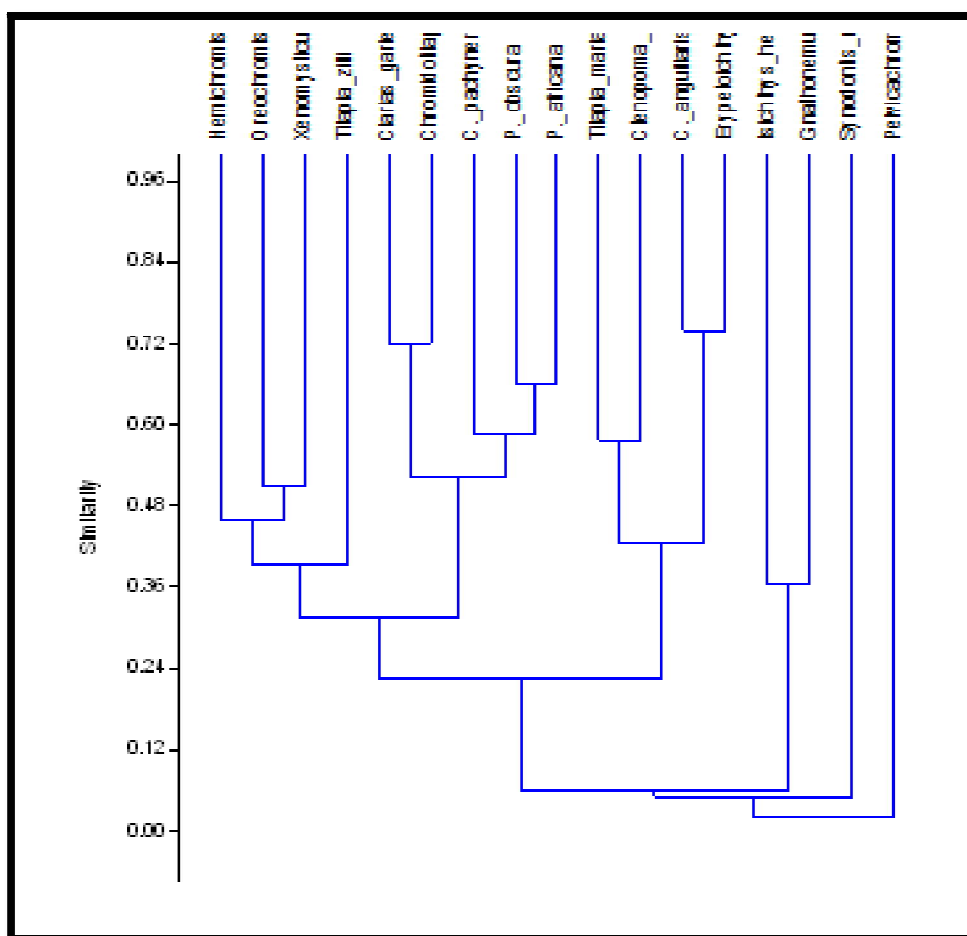

Figure 2: Cluster Analysis of Fish Species Distribution
Across The Three Stations

4. Discussion

A total of 637 individuals belonging to 17 species and 8 families were recorded in this study. The number of fish species recorded in this study varied considerably with rivers of the same size like, 38 species in Obueyinomo river [1] and 37 species from River Orogodo [6]. Differences in number of species inhabiting various river systems are largely influenced by the size of the river, availability of food, breeding grounds, depth of water, etc. Out of the eight families encountered in this study, Cichlidae, Clariidae and Channidaeattained a dominant status. The family Cichlidae was represented by 6 species; Clariidae was represented by 3 species, while the family Channidae was represented by2 species, while the lowest number was recorded in the family Synodontidaewith only one (1) species Synodontis nigrita. The family Cichlidae has severally been reported as dominant in many freshwater bodies both within and outside Edo/Delta states (Mohammed and Omoregie, 2004). Also, Ogbeibu and Ezeunara [12] reported cichlids as dominant in Ikpoba River (Edo state). The high abundance of cichlids in this river could be due to high abundance of detrital and associated algae inclusions in the river. Such food resources probably favoured the Cichlids that are basically bottom feeders [11], also the distribution of fish showed that station 2 was most diverse and had more species. This could be attributed to high organic loading resulting to abundance of plankton, macrophyte which has led to abundance of food material.

The indices calculated for taxa richness (d), Dominance (D), Shannon (H), Simpson, Evenness and Equitability showed that taxa richness was highest in station 2 with 16 species, followed by station 1 with 15 species while Station 3 had the lowest taxa with 14 species. The high species diversity in station 2 is an indication of abundant allochthonous materials carried by runoff into the station and a favourable environment, also station 3 had higher values than station 1, this is due to less human activities observed in the station.

The hierarchical clustering analysis indicated similarities among species across the stations except for Synodontis nigrita and Chromidotilapia pulcher. The high similarities of species across all the stations were an indication that fishes are known to migrate from other water bodies into Ogba River.

5. Conclusion

Though Cichlidae dominated in Ogba river, the low number of fish species in this river may be caused by negative impacts of too many anthropogenic activities in the river. This study has added to the knowledge of the species composition of another inland water of Nigeria.

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