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FISH SPECIES RICHNESS AND DIVERSITY IN OMUE STREAM OVU INLAND, ETHIOPE EAST, DELTA STATE

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Abstract
The present study was conducted at three stations along Omve stream, Ovu Inland Ethiope East LGA, for six month (January to July 2019). Total of 24 fish species, from 15 families and 19 genera were recorded Among the 24 species 62.56 occurred in station 1 while 72.2% occurred in station 2 and 50% occurred in station 3. Only 33.3% of the species were ubiquitous. The Cichlid family Tlapia Zillii and the family Clariid, Clarias syp were the most dominant in the stream, accounting for 18.46% and 12.02% of the total catch, respectively. The species richness and general diversity were relatively higher in station 2 than in any other station With good fishing management, the fishery resources of the stream can be profitably exploited. Beside the Cichlids had the highest condition factor values than any other fish family.

Introduction

Fish species are finite resource not only vital for the sustenance of life but also indispensible, to all socio-economic development of humankind. The fish resources in this stream are numerous and very diverse. There are different and closely related types found in different zone or region of the stream. However, the world species in this context implies group of fish that are identical or closely related and that which can inter breed with one another. Human diet is not balance without fish as a major components. The fish resources of streams, river and lakes have provided the basis for fisheries development in Nigeria.

The concept of biological fish species maybe defined as closely related organisms that occur together in space with time. It also implies fishes restricted to traits that may focus on taxonomic levels, groups scales or type of activity (e.g feeding, habitats and occupation Begon et al,1996; Stillings, 1996, Champinan and Reiss, 1997). Fish species richness and their diversity in streams, river and lakes have provided the basis for fisheries exploration and sustainable management of such aquatic resources. However the gradual alteration in habitat or ecosystem such as streams, rivers resulting, from physico-chemical and hydrological changes have posed problems on the energy flow between biotic and abiotic components of the system. This is due to changes in water level, current, temperature, dissolved Oxygen, substratum, water volume and channelization (Petts and Calow 1996;Welcomme 1994). The differences in fish species richness, diversity and values of such ecosystem together with the wide variety of useful function that they offers have been documented (Roberson 1986, Turner 1987, Singh 1987; Barley 1988, Currie 1991;Coates 1993).

Majority of these fresh water fishes that constitutes good diet and sources of income to local and commercial fisherman are housed in these bodies of water. This is why the water and the fishes are described as finite resources for sustainable development.

Omue stream is located in the Southern part of the Niger Delta, Nigeria. The stream through his fisheries activities has provided for the Indigenes and Migratory fisherman. Little or no enough scientific study has been concluded on this important stream.

This paper is therefore geared toward providing information and data on the fish species richness, abundance, diversity and fisheries Management, of the stream for future use in sustainable manner.

Materials and Methods

Omue stream lies between latitude 6'10-6'18^{0}N and longitude 6'10-6'15^{0}E in the rainforest belt of Southern Nigeria, Delta State. It takes its source from Ethiope River, Delta State. This stream is a very short one, less than 10km long. The study area shows the characteristic tropical climate of two distinct seasons; the dry (November-April) and the wet (May-October). The mean annual temperature is about 28^{0}C (22-34^{0}C) while the mean annual relative humidity is 85%. The stream also flows across a densely populated area hence it is affected by different human activities along its route.

Study Stations

Three stations 1, 2 and 3 about 5km apart were established and investigated along the stream during this study.

Sampling Design

Fish samples caught and used for this study were collected for seven months January to July 2019, from the three sampling stations. Fishing was carried out by the local fishman equipped with boat and fishing gears. At each station, three bottom set and three surface set-gill nets of mesh sizes of 1.0,3.3 and 1.5m apart were used for sampling in addition to these nets, one segmental cast net with pockets of stretch size 6.4cm was operated either from a boat or from the shore in the three stations to take care of the bottom dwellers, five sets each of fish basket or local traps with non-returning valve were used at each station. There was also a set of long-line of length 35.0m tied to a hook that was located at one end of the line baits with earthworm. The fish while trying to bite or swallow the bait will swallow the hook as well and become hooked.

All fish samples caught were washed, packaged and transported to the laboratory, where they were counted and recorded. Fish samples were identified up to the species level according to Reed(1967) and Idodo-Umeh (2003).

Data Analysis

Number of fish species caught at the three sampling stations of Omue stream (1,2,3) were analyzed using simple percentage, also, biodiversity was analyzed using Margalef's index for species richness (d), Shannon-Weiner index(H) for general diversity and Evenness index(E) of the fish community with PAST statistical package (Hammer et al, 2001).

No of fish species/Abundance

$$\frac{\text{No. of individual of a species x 100}}{\text{Total No. of all individuals in a 1 station}}$$

Condition Factor (K)

Fish samples from 15 abundant species were collected for condition factor determination. For each specimen,the individual length (cm) was recorded,using a measuring board, while the weight(g) was determined on a weighting balance. Condition factor(k) was then calculated as:

$$K = \frac{100w}{L^3}$$

Where w = fish weight in grams, L= fish length in cm as earlier described by Beganal (1978).

Results

Fish Distribution and Diversity

The fish species composition and their relative distribution in the three study stations are presented in Table 1 below. Many of the species captured were small-sized adults as well as fingerlings. Several fry (cichlids) were also observed within the grassy shores of the stream, but these were not captured in the nets. A total of 466 fishes made up of 24 species from 15 families and 19 genera were collected and examined. A total of 62.5% of the species occurred in Station 1 while Station 2 and 3 had 79.2% and 50% of the species respectively. Overall 33.3% were ubiquitous. The cichlid, *Tilapia zillii* and clariid. *Clarias* spp. were the most dominant species in the stream. they accounted for 18.46 and 12.02% respectively of the total catch; *Chromidotilapia guentherii* was mostly caught in station 1, while *Phractolaemus ansorgei* was found to be unbiquious along with *Tilapia zillii*, *Clarias spp.*, *Malapterurus electricus* and *C. gariepinus*.

Table 1: Percentage composition and Abundance of Fish caught from Omue Stream, (January-July 2019)

	Number (% of Fish caught)			Total abundance (%)
FAMILY/SPECIE	Station 1	Station 2	Station 3	
ANABANTIDAE				
Ctenopoma kingsleyae	-		1(0.88)	1(0.22)
CHANNIDAE				
Parchanna africana	-	-	3(2.63)	3(0.64)
Parachanna obscura	-	2(1.22)	-	2(0.43)
CHARACIDAE				
Brycinus longipinnis	29(15.43)	14(8.54)	2(1.75)	45(0.66)

CICHLIDAE				
Hemichromis fasciatus	16(8.51)	22(13.47)	-	38(8.15)
Chromidotilapia	34(18.08)	9(5.49)	35(30.70)	78(16.74)
guentheri	32(17.02)	25(15.24)	29(25.4)	86(18.46)
Tilapia dageti	4(2.13)	1(0.60)	-	5(1.07)
Tilapia guineensis	3(1.59)	-	-	3(0.64)
T.zilli	10(5.32)	4(2.44)	-	14(3.00)
Oreochromis fasciatus				
CLARIIDAE				
Clarias gariepinus	26(13.83)	20(12.19)	10(8.77)	56(12.02)
Clarias anguillaris	-	2(12.81)	5(4.39)	26(5.58)
Clarias jaensis	3(1.59)	-	-	3(0.64)
Heterobranchus	6(3.19)	1(0.60)	3(2.63)	10(2.15)
bidorsalis				
GYMNARCHIDAE				
Gymnarchus niloticus	-	(5(3.05)	-	5(1.07)
HEPSETIDAE				
Hepsetus odoe,	-	6(3.66)	-	6(1.29)
MALAPTERURIDAE				
Malapterurus electricus	3(1.59)	3(1.83)	3(2.63)	9(1.93)
NANDIDAE				
Polycentropsis	-	-	1(0.08)	1(0.22)
abbreviate				
NOTOPTERIDAE				
Xenomystus nigri	1(0.53)	4(2.44)	-	5(1.07)
PANTODONTIDAE				
Pantodon bucholzi	2(1.06)	1(0.60)	-	3(0.64)
PHRACTOPTERIDAE				
Phractolaemus ansorgei	17(9.04)	19(11.59)	9(7.89)	45(9.66)
POLYPTERIDAE				
Calamoicthys	2(1.06)	1(0.60)	-	2(0.43)
calabaricus				
SCHILBEIDAE				
Schilbe mystus	-	5(3.05)	13(11.40)	18(3.86
SYNODONTIDAE				
Synodontis sorex		1(0.60)	-	1(0.22)
TOTAL	**188**	**164**	**114**	**466(100)**

Family =15, Species = 24, Genera =19

Table 2 depicts the number of individual fish species caught, the Family Cichlidae recorded the highest number (224) fishes which accounted for 48.06% of the total catch. This was closely followed by the Families Clariidae, Characidae and Phractolaemidea in decreasing order of abundance. These families accounted for 20.39%,9.66% and 9.66% of the total catch respectively. Also, Cichlidae had the highest number of species

captured (6), accounting for 25.00% by species composition. This was closely followed by Clariiidae and Channidae with 4 and 2 species contributing 16.57% and 8.33% respectively of the total fish species captured. The Families Characidae, Hepsetidae, Malapteruridae Grymnarchidae, Anabantidae, Schilbeidae, Synodontidae, Nandidae and Polypteridae were respresented by one species each and contributed only 4.17% each of the total species captured. Table 3 shows some indices of diversity of fish species in the three sampling stations. Margalef's index depicts taxa richness. Station 2 with Margalef's index of 3.53 was richer than Station 1 and 3. For Evenness index, the closer is it to 1,the better the evenness. Station 1 and 2 share closely similar eveness values of 0.847 and 0.846. respectively while a much lower values was recorded at Station 3.

Table 3: Composition and Abundance of fish Species caught among various families encountered at Omue stream (January-July 2019)

FAMILIES	NO OF SPECIES	% COMPOSITION	NO OF FISH CAUGHT	% COMPOSITION
ANABANTIDAE	1	4.17	4	0.86
CHANNDAE	2	8.33	5	1.07
CHARACIDAE	1	4.17	45	9.66
CICHIDAE	6	25.00	224	48.06
CLARIIDAE	4	16.57	95	20.39
GYMNARCHIDAE	1	4.17	1	0.22
HEPSETIDAE	1	4.17	6	1.29
MALAPTERURIDAE	1	4.17	9	1.93
NANDIDAE	1	4.17	2	0.43
NOTOPTERIDAE	1	4.17	5	1.07
PANTODONTIDAE	1	4.17	3	0.64
PHRACTOPLAEMIDAE	1	4.17	45	9.66
POLYPTERIDAE	1	4.17	3	0.64
SCHILBEIDAE	1	4.17	18	3.86
SYNODONTIDAE	1	4.17	1	0.22
Total 15	**24**	**100%**	**466**	**100%**

Species diversity

The result of species richness and general diversity index are presented in Table 4. Species richness showed that station 2 was richer than stations I and 3 with station 2 having index value 3,5295,station 1 with

2,6736 and station 3 with 2.3225,General diversity also revealed that station 2 was more diverse in species composition than stations 1 and 3.

Evenness was higher in station 1 (0.84717), This is shown in Table 4

Table 4:Variation in species richness and diversity in the fish species in the three stations of Omue stream,(January-July 2019)

Diversity of Fish Species	Station 1	Station 2	Station 3
Number of samples	7	7	7
Number of Species	15	19	12
Number of Individuals	188	164	114
Margelef's species richness (D)	2.6736	3.5295	2.3225
Shannon-weiner index (H)	0.99635	1.08240	0.84714
Evenness index (E)	0.84717	0.84645	0.78499

Discussion

The result of this study in which 24 species from 15 families were obtained showed that fish species richness and diversity of Omue stream can be compared to some water bodies in Nigeria such as Lagos Lagoon with 23 species (Nwadukwe,1995), Udom rainforest Stream, (Akwa-Ibom) with 17 species (Udoidiong and King, 2000), Ikpoba River, (Edo State) with 28 species (Ogbeibu and Ezeunara, 2005). The appreciable occurrence of the cichlids in this study was as a result of aufwuchs which served as additional food for those groups of fishes (Ikomi et al,1997).However,the present result is relatively poor when compared to other smaller Nigerian water bodies such as Owere stream, Niger Delta with 42 species (Ikomi et al., 1997), Elechi creek fish assemblages (River State) Eastern Nigerian with 35 species Allison et al. (1997). The poor fauna composition of Omue stream might be as a result of anthropogenic activities which include agricultural land use, washing with detergents and soaps, bathing, refuse dumps among others, which may have effects on the habitat structure, food and feeding habits of the fishes. Ogidiaka et al (2013) reported similar activities affecting the distribution of fish species in Warri River,Niger Delta.

The presence of a single species of *C. kingsleyae, P.abbreviate* and *S. sorex* among other populations, suggested that these species in the water

body were rare or threatened and that there absence was not due to gear selectivity since several types of gears were used to capture fish during this study. This finding agrees with the report of Ikomi and Sikoki (1998) who observed that fishes show habitat preference with aquatic trends at the shore of a river. The low dissolved oxygen, high BODs (five-day Biological oxygen demand) and abnormalities in some physic-chemical parameters have synergistic effect on fish diversity and abundance (Idodo-Umeh, 2003). The high organic status of the water body would lead to low dissolved oxygen content and high BOD. Although, the values of these parameters were not reported in this study, it is assumed that this poor status of the water quality must have affected the distribution and abundance of Cichlidae, Clariidae Phractolaemidae and other sensitive fish species.

Table 4: Mean Monthly condition factor value for 15 abundant fish species caught in Omue stream (January-July, 2019).

Families Species	Mean (K values for individual species)
Cichlidae	
Hemichromis fasciatus	4.43
Chromidotilapia	4.96
Tilapia zilli	4.14
Tilapia guineensis	3.75
Oreochromis fasciatus	4.23
Clariidae	
Clarias anguillaris	1.40
Heterobranchus bidorsalis	1.60
Clarias jaensis	2.10
Characidae	
Brycinus longipinnis	2.60
Hepsetidae	
Hepsetus odoe	1.80
Notopteridae	
Xenomystus nigri	1.00

Phractpteridae	
Phractolaemus ansorgeii	1.51
Pantodontidae	
Pantodon bucholzi	1.45
Gymnarchidae	
Gymnarchus niloticus	1.70
Schilbeidae	
Schulbe mystus	2.90

The condition factor showed that the cichlids generally were more stable. This could be attributed to the availability of their food in the stream. fish is a main source of animal protein and play a vital role in the socio-economic life of the people (Dankwa and Gordon,2002) with the exception of C. kingsleyae, all other species were of high food values. The overall picture of the fish distribution in Omue stream showed increase species diversity from station 2,as revealed by the general diversity index. These differences can be accounted for by the differences in the flow velocity, dissolved oxygen, nutrient and the nature of the substratum in the stations.

The primary objective of a sampling survey of this nature are to investigate the type of fish species that exist in the stream and determine the factors governing their distribution. However, according to Benech et al. (1993) fish community studies are not generally equivalent to lethycoenoses 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 group of fishes in a particular environment at given time. Gear selectivity and sampling strategies are usual sources of these biases. However sampling programme involving the use of two or more gears as adopted in this study provide reliable information on the fauna quality of a river systems.

Conclusion

The fish species richness and diversity observed in this study indicted Omue stream may be potentially suitable for fishing .However, the poor waste disposal practices in this study area should be checked so that the continuous existence of fish in this water body will not be jeopardized.

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