African Multidisciplinary
Journal of Sciences and Artificial Intelligence

ISSN : 3434-9871

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/AMJSAI.v1i1.3517

Fish Diversity, Abundance and Gear Usage in the Lower River Benue, Ibi Local Government Area, Taraba State, Nigeria

Flourizel Igbani[1], Ronald Winifred Abhulimen[2], and Fwaseh Samaila[3]
Federal University Wukari, Taraba State, Nigeria
igbani@fuwukari.edu.ng

Article Info:

Submitted:	Revised:	Accepted:	Published:
Jun 26, 2024	Jul 12, 2024	Jul 26, 2024	Jul 31, 2024

Abstract

The Lower River Benue is one of the largest inland ecosystems in Nigeria and has suffered depletion of fisheries resources which attest to the increasing rate of anthropogenic activities. The study therefore evaluates the fish diversity, composition, abundance and fishing activities in the Lower River Benue. The study was designed to have three (3) sampled stations, the selected stations were: *A-Baruwana, B-Gugu-audulahi* and *C- Basibi*. The stations were sampled for fish with the fisherfolk, two times a week for three (3) months, from October to December, 2022. Fish caught were identified with the aid of identification keys. A total catch of 17,400 comprising of 55 fish species belonging to 23 families, 14 orders and 42 genera were recorded, including two (2) amphibians *(Chelonoidis niger* and *Pelophylex kl. esculentus);* species family diversity recorded the highest with the family *Mormyridae (14.55%)* with 8 species, while *Dischondontidae, Bagridae, Protopteridae, Malapteruridae, Ariidae, Hepsetidae, Latidae, Osteoglossidae, Channidae, Nephropidae, Tetraodontidae, and Ampullariidae (*1.82% each) were recorded the least with 1 species respectively; relative abundance was recorded highest with *L. Senegalensis* (8.57%), while least in *C. zillii* and *T. lineatus* with (0.01%) each. Six (6) traditional fishing gears were identified from the local fisherfolk with their local names (in Hausa): Long Line (Mari-mari), Gura net trap (Mali), Scoop net (Hooma), Cast net (Birgi), Gill net (Raga-bilili)

and Hook and line (Kugiya). Catch Per Unit Effort (CPUE) recorded highest kilograms (17.83kg/day) in Station A, while the least kilograms (5.82kg/day) was recorded in Station C. Analysis of variance (ANOVA, $P<0.05$), showed that there was no significant difference in fish species diversity and relative abundance within groups (stations). It is highly recommended that the anthropogenic activities along the River should be monitored to avoid overfishing of its fishery resource for biodiversity management, conservation, water quality for survival and reproduction towards fish sustainability.

Keywords: Biodiversity, Abundance, Fishing Activities, Overfishing, Management, Conservation

INTRODUCTION

It has been estimated that approximately 12.5 million people are employed in fishery-related activities, and in recent years global production of fish from capture fisheries has tended to vary between approximately 85 and 90 million tons. The products from these fisheries are used in a wide variety of ways, ranging from subsistence use to international trade as highly sought-after and highly-valued items. The value of fish traded internationally is approximately US$40 billion per year (Cochrane, 2000; Igbani and Uka, 2019). Despite the importance, fisheries resources are on the decline in Nigeria due to over exploitation and inadequate management of the coastal and inland 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).

Artisanal fisheries have been increasingly threatened or even disrupted by manmade induced environmental changes, such as pollution: clearance for farmlands and cutting of trees for firewood (deforestation), habitat alteration like river impoundment poor management and over exploitation, these decrease in resources availability, does not only resulted in poor income, but also in well-being of fishing households and the community (Williams, 2007). Since fishing communities in Nigeria are generally still far from development the fishers folks are categorized among the poorest of the poor (Tafida *et al.*, 2011). This important sector has been faced with several constraints, such as fishers having low income, no properties, weak political influences where these are prominent (Raji and

Ovie, 2007). Livelihood diversification has been identified as good option that lessens vulnerability, enhance wellbeing and improve rural economy of the fishers (Tafida *et al*., 2011).

A review of the Nigerian fish fauna reveals that there are about 511 families of fish species in Nigeria (FDF. 2015) About 34% of these species are restricted to exclusive economic zone (EEZ) while approximately 44% are freshwater fisheries inhabiting water of very low salinity (below 1 parts per thousand or conductivity of 1000µs/cm). The occurrence of *Potamotrygeon garouensis* in the waters of Northern Nigeria and River Ase in Delta State of Nigeria, are of scientific interest because *Potamotrygeongarouensis* (*Dasyatidae*) occur in both brackish and freshwaters, this is unique and require protection (Idodo-Umeh, 2003; Stephen, 2014).

The most important fishes in terms of species diversity are the teleost (Oyewo, 2015). Among the *Carangidae*, only *Trachinotus goreensisa* marine species that has been reported in southern freshwaters in Lekki lagoon. This species appear to be restricted in distribution and need to be protected. The Mudskipper, *Periopthalmus papillio* (*Periopthalmidae*) is a fish of great biological and evolutionary significant/importance. The continued existence of this fish is seriously threatened by pollution from oil spills and land reclamation exercise especially in the mangrove and Lagos Lagoon beaches (Tafida *et al*., 2011).

Aim and Objectives

This study was aimed to evaluate the fish diversity, abundance and fishing activities in the Lower River Benue, Ibi Local Government Area, Taraba State, Nigeria.

The specific objectives are to:

i. Determine fish species diversity in the Lower River Benue.

ii. Determine fish species abundance in the lower river Benue.

iii. Identify the fishing gears used in the Lower River Benue.

Test of Hypotheses

Research hypotheses for identification of fishing gears based on the research objectives, the following hypotheses were tested:

Ho: There is no significant relationship between socio-economic characteristics of the fisher folks;

Ha: There is significant relationship between socio-economic characteristics of the fisher folks.

Ho: There is no significant relationship between the catch and gear used;

Ha: There is significant relationship between the catch and the gears used.

Danba et al. (2017) reseached on fish biodiversity and abundance in River Taraba, Taraba State Nigeria. They reported a total number of 60,574 fishes belonging to 20 families and 50 species were identified in the local fishers catch. The family Cichlidae dominated the catch in number with (22.96%), followed by *Clariidae* (14.26%), *Distichodontidae* (12.61%), *Morchochidae* (10.55%), *Characidae* (9.57%), *Schilbeidae* (7.29%), *Bagridae* (6.11%), *Mormyridae* (5.79%), *Alestidae* (2.52%), *Claroteidae* (2.43%), *Cyprinidae* (1.33%), *Protopteridae* (1.23%), *Osteoglossidae* (1.20%), while the families *Polypteridae, Citharinidae, Centropomidae, Hepsitidae, Gymnarchidae, Channidae,* and *Malapteruridae* each contributed less than (1%) to the total fishes caught. *Mormyridae was the most diversed family and was represented by 7 species; Mormyrus rume* (3.88%), *Petrocephalus bane* (0.52%), *Hyperopisus bebe* (0.42%), *Marcusenius abadii* (0.30%) *Mormyrus anguilloides* (0.25%), *Mormyrus macrothalmus* (0.23%), *Hippopotamyrus psittacus* (0.19%). They reported that the most abundant species was *Tilapia galilaeus* (10.13%) while the least are *Labeo coubie and Malapterurus electricus* which contributed (0.12%) each to the total catch.

Ibim and Igbani (2014) researched on the fish species composition, diversity and abundance of the Lower New-Calabar River, Rivers State. They reported a total catch of 54,404 fish species, composing of 36 individual species from 29 families, with diversity highest in *cichlidae* (11.1%) and least in *Cyprinidintidae* (2.8%), and relative abundance highest from *Sardinella maderensis* (32.29%) and least for *Polycentropis abbreviata* (001.84%) and *Aplocheili chthysspilauchen* (001.84%). They stressed that the river is rich in fish species composition but vary in diversity and abundance due to differences in physicochemical characteristics and fishing pressure. They also stated that certain fish species were endangered such as *Litjanus spp* and *Aplocheili chthysspilauchen.*

Abiodun and John (2017) researched on biodiversity and abundance of fish species and some processing techniques in the Lower Niger River, Idah; they recorded 42 species of fish belonging to 18 families. They also reported the dominant fish species as *Hyperopisus bebe* (10.61%) and in terms of species diversity the family *Mormyridae* had the highest (18.29%) with 7 species including H. *bebe.* Obasohan and Oronsaye (2006) researched on

biodiversity and sustainability of freshwater fishes of Nigeria. They identified 181 species of fish from the major river systems and Lakes of Nigeria, including some estuarine and marine fish species which are frequent in the ecosystems. Oyewo (2015) carry out a survey of fish species diversity and abundance in Dogon, Ruwa water body of Kamuku National Park, Birni Gwari, Kaduna State, Nigeria. He reported eighteen species which are endangered. He observed a sharp decline on a larger fish species such as *Gymnarchus niloticus, Lates niloticus, Heterobranchus bidorsalis* and *Protopterus annectens*.

Ekundayo *et al.* (2014) researched on fish exploitation pattern of Lake Geriyo, Yola, Adamawa State. They reported *Hydrocynus brevis, Lates niloticus*, *Protopterus aethiopicus* and *Heterotis niloticus as* rare species found in Njoboliyo station which confirm the characteristics of those fish adaptive to where there are macrophytes acting as shelter and provide available food generated by the decaying vegetation.

Amos and Linus (2017) reseached on fish biodiversity and fishing activities at Njoboliyo Lake, Adamawa State, Nigeria. They identified Seventeen (17) species from fifteen (15) families; the family Clariidae has more species appearance with (54.8%), while the least species appearance with (1.6%) was Citharinidae. The fishes were caught with mesh nets and hooks by the fisher folks. Drag net has highest gear utilization, while gill net had the lowest. The highest threatened species observed during the research peroid was *Bagrus (*Musku and Denko (Hausa native name), followed by *Polypterus, Tetradon, Gymmnarchus* with the least threatened (*Latesniloticus, Malapterurus, Mormyrus, Citharinus and Hydrocynus).*

Elijah and Lamidi (2019) researched on fish species composition and abundance in River Taraba in Bali axis, Taraba state, Nigeria. They identified nineteen (19) species, belonging to seventeen (17) genera and twelve (12) families. They stated that the family Cyprinidae had the highest number of species (4), followed by Mormyridae with three (3) species while Alestidae and Cichlidae with two (2) species each. The remaining families *(Bagridae, Citharinidae, Clariidae, Claroteidae, Distichodontidae, Malapteruridae, Mochokidae and Schilbeidae*) had only one (1) species representing each of the family.

NIFFR. (2002) carry out national surveys of fishing gears and crafts on Nigerian inland water bodies; they reported that majority of the craft used in inland water of Nigeria are generally non-motorized, due to high cost of outboard engine. Abdul (2005) researched on fishing gear design and production. He recorded various types of fishing gear and the way

they are used on Nigerian water depends on fisher's financial status, water depth, shoreline patterns, targeted fish species and seasons of the year.

Dienye and Olopade (2017) researched on fishing method and gear use in Niger Delta, Nigeria. They identified fishing gear based on mode of operation with passive gear, the captured fish species were generally based on movement of the target species towards the gear such as trap set, hook and line, gill net, drift net, while with active gears captures were generally based with the aim to chase the target species such as cast net, beach seine net, hand net, clap net, lift/atalla net, and trawl net. Hence, hook and line, trap, wire, gill net, among others were effectively use.

MATERIALS METHODS

Study Area

Location

This study was conducted at the Lower River Benue, Ibi axis, Taraba State, Nigeria. Ibi is located at latitude 8° 38' 00" North and longitude 10° 46' 00" East. The vegetative area is mainly comprise of secondary forest, forbs re-growth and swamp. There are two seasons, April to October are raining season, while November to March are dry season. The annual rainfall ranges from 130 cm to 266.30 cm/year with temperature between 32°C and 36°C. The area has a population over 244,749 with a scattered settlement of many small to large villages throughout the area and is mainly drained by the Tela River (into the Atlantic Ocean) in Gassol Local Government. The majority of the people are farmers and fisher folks.

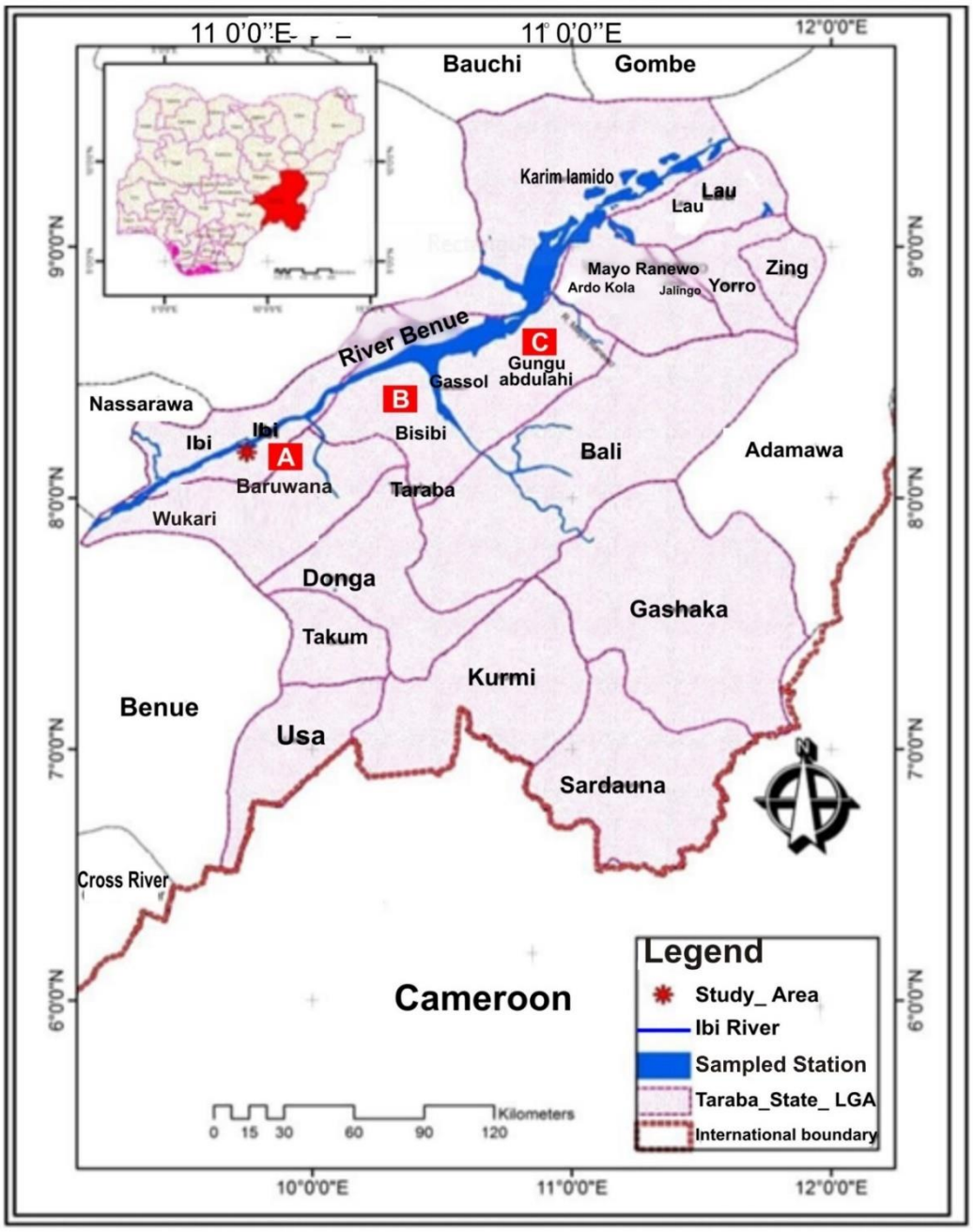

Fig 3.1: Map of Taraba State showing Sampling Stations in the lower River Benue Ibi Axis Station A - Baruwana B - Bisibi C - Gungu abdulahi

Experimental Procedure

Sample Location

The study was designed to have three (3) sampling stations covering some parts of the Lower River Benue, Ibi axis, the selected stations were labeled as Station A-Baruwana,

Station B- Gugu-audulahi and Station C- Basibi., The stations were sampled for fish at the landing sites with the fisher folks two times a week (Tuesdays and Saturdays) for three (3) months from October to December 2022.

Collection and Identification of Samples

Fish Identification

Fish samples were identified by collecting harvested fish species from the fisher folks while working with them, and each fish species was properly positioned, snap shots were taken to capture their physical features using a digital camera and also study their morphology by looking at fish shapes (head type, body form, tail type, mouth part, spines, scales, fins, colour (genetic interactions), rays and branched rays); Identification keys such as Sikoki and Francis (2007); Froese and Pauly (2020); Olaosebika and Raji (2004), and Idodo-Umeh (2003) were used. A 10% formalin was used to preserve the samples, immediately after collection, fishes were preserved in the formalin solution or 96% ethanol and taken to the laboratory and were identified to the level of species.

Determination of Fish Species Diversity

Fish diversity was determined using the formula below:

$$Fsi\ (\%) = \frac{si}{\sum fsi} \times \frac{100}{1}$$

F = family or number of species families,

si = individual number of fish species family (Igbani and Uka, 2019).

Determination of Fish Species Abundance

Relative Abundance is calculated as the number of organisms of a particular kind as a percentage of the total number of organisms of a given area or community; the number of fish of a particular species as a percentage of the total fish population of a given area (Krohne, 2001; Oyewo, 2015).

Abundance was determined by relative abundance method which involved counting the total number of fish species caught per sample site, per time which will be recorded and the relative abundance score of the species will be estimated, thus: 1-50 = Rare (R), 51-100 = Few (F), 101-200 = Common (C), 201-400 = Abundant (A) and > 400 = Dominant (D) (Allison *et al.*, 2003).

Determination of Physicochemical Characteristics

The physicochemical parameters such as Water Temperature, Dissolved Oxygen, Power of Hydrogen (pH), Electrical Conductivity, Turbidity and Total Dissolved Solid were measured in-situ using water quality measurement meters by probing into the water samples for 3 to 5 minutes (APHA. 2005).

Determination of Fishing Gears

The fishing gears in the study were classified based on their mode of operation (passive or active) gears, their local names were named/known by the fisher folks, while their English names were provided with the use of questionnaire (Dienye and Olopade, 2011).

Catch Per Unit Effort

The Catch Per Unit Effort (CPUE) is the fish catch per unit of effort over a time interval in relationship to the fishing gear and is defined as, thus:

$$CPUE = C/f = q.B$$

Where, C = Catch rate, f = Fishing effort or intensity, q = The catchability coefficient; B = The stock abundance, or standing biomass (Rothschild 1977).

Data Analysis

Analysis of Variance (ANOVA: P=0.05), Catch Per Unit Effort [c/f or (CPUE)]; Randomized Completely Block Design (RCBD) and Pearson correlation (at 0.01 level, (2-tailed) were used to analyze the species diversity, relative abundance and catches.

RESULTS

Fish Species Composition

The species composition (Table 1) showed a total of 55 individual fish species belonging to 23 families, 42 genera and 14 orders. The family Mormyridae is the highest, comprising of *C. tamandua* (122), *M. rume* (786), *B. longianalis* (182), *H. bebe* (756), *M. kainjii* (738), *P. bovei* (1087), *M. anguilloides* (161), and *M. macrophthalmus* (171); followed by the families Cyprinidae: *L. coubie* (856), *E. chlorotaenia* (3), *E. callipterus* (16), *B. occidentalis* (16), *R. senegalensis* (6) *and L. niloticus* (512); followed by Cichlidae: *O. niloticus* (879), *O. aureus* (263), *C. guineensis* (9), *S. galilaeus* (11); *C. zillii* and *H. bimaculatus* (11); followed by Clariidae: *C. gariepinus* (713), *C. batrachus* (261), *C. anguillaris* (265) *and H. bidorsalis* (105); followed by Alestidae: *H. vittatus* (415), *B. macrolepidotus* (243), *B. lecuciscus* (64) *and A. dentex* (23); followed by Mochokidae: *S. budgetti* (1345), *S. nigrita* (593) and *S. membranaceus* (559); followed by Schilbeidae: *P. occidentalis* (255), *S. mystus* (687) and *S. uranoscopus* (845); followed by Claroteidae: *A. occidentalis* (331) and *C. nigrodigitatus* (69); followed by Anabantidae: *C. kingsleyae* (16) and *C. patherici* (17); followed by Citharinidae: *C. citharinus* (87), *C. Latus (127)*; followed by Polypteidae: *P. birchir* (72), and *P. senegalus* (61); followed by Bagridae: *B. bajad* (487); followed by Distichondontidae: *D. rostratus* (160); followed by Protopteridae: *P. annectens* (333); followed by Malapteridae: *M. electricus* (109); followed by Ariidae: *A. arius* (111); followed by Hepsetidae: *H. Odoe* (591); followed by Latidae: L. niloticus; followed by Osteoglossidae: *H. niloticus* (21); followed by Channidae: *P. obcura* (25); followed by Nephropidae, *H. gammarus* (9); followed by Amularidae: *P. globosa* (47) and Tetraodontidae is the least, comprising of *T. lineatus* (1). A bar chart (Fig. 2) showing fish species station composition and recorded highest scores in station A (8201), followed by station B (5452); and the least in station C (3747).

Table 4.1: Fish Species Composition of the Lower River Benue, Ibi Axis

S/N	Species	Total Individual Catch	Weekly Total Catch											
			1	2	3	4	5	6	7	8	9	10	11	12
1	*Labeo coubie*	856	53	98	104	65	56	76	98	43	131	31	45	56
2	*Labeo Senegalensis*	1491	187	273	229	86	101	97	124	63	67	76	94	94
3	*Enteromius chlorotaenia*	3	0	0	0	0	0	0	0	0	0	0	1	2
4	*Barbus occidentalis*	16	2	1	1	1	1	1	1	3	1	1	2	1
5	*Enteromius callipterus*	16	0	0	0	0	0	1	2	3	4	2	1	3
6	*Raiamas Senegalensis*	6	0	0	0	0	0	0	0	1	1	2	1	1
7	*Leptocypris niloticus*	512	23	52	27	38	47	51	48	48	19	57	55	47
8	*Campylomormyrus tamandua*	122	14	12	17	6	4	8	6	17	3	11	7	17
9	*Mormyrus rume*	786	0	86	87	79	44	73	79	57	63	65	65	88
10	*Brienomyrus longianalis*	182	26	15	49	8	4	12	3	35	17	3	6	4
11	*Hyperopisus bebe*	756	73	93	72	69	57	61	64	46	49	65	58	49
12	*Marcusenius kainjii*	738	67	74	74	47	74	58	59	56	48	58	78	45
13	*Petrocephalus bovei*	1087	98	159	87	76	89	98	127	37	65	68	115	68
14	*Mormyrops anguilloides*	161	0	0	0	0	0	0	0	0	45	55	11	50
15	*Mormyrus macrophthalmus*	171	0	0	0	0	0	0	0	0	0	67	35	69
16	*Oreochromis niloticus*	879	69	223	131	56	57	67	78	48	15	34	32	67
17	*Oreochromis aureus*	263	1	62	17	34	43	9	17	34	4	14	14	14
18	*Coptodon zillii*	1	0	0	0	0	0	0	0	0	0	0	0	1
19	*Tilapia guineensis*	9	0	0	0	0	0	0	0	0	1	3	1	4
20	*Hemichromis bimaculatus*	11	0	0	0	0	0	0	0	0	0	0	5	6
21	*Sarotherodon galilaeus*	11	0	0	0	0	0	0	0	0	0	0	7	4
22	*Clarias gariepinus*	713	223	131	45	46	31	56	34	35	34	13	31	34
23	*Clarias batrachus*	261	0	0	42	35	7	15	32	17	10	34	24	45
24	*Clarias anguillaris*	265	0	57	22	31	1	14	42	17	9	13	14	45
25	*Heterobranchus bidorsalis*	105	3	5	6	7	45	3	18	4	1	5	4	4
26	*Hydrocynus vittatus*	415	13	148	25	36	13	13	34	13	13	17	45	45
27	*Brycinus macrolepidotus*	243	19	9	6	19	43	40	10	17	12	11	23	34
28	*Brycinus leuciscus*	64	1	1	1	2	45	2	2	2	1	2	1	4
29	*Alestes dentex*	23	0	0	0	0	0	0	0	0	0	13	8	2
30	*Synodontis budgetti*	1345	254	148	97	104	115	95	123	78	82	60	98	91
31	*Synodontis nigrita*	593	3	88	64	74	48	42	34	73	43	47	32	45
32	*Synondotis membranaceus*	559	51	13	84	43	56	48	45	28	34	31	79	47
33	*Parailia occidentalis*	255	0	0	0	0	0	0	37	34	46	37	47	54
34	*Schilbe mystus*	687	27	85	19	78	86	51	87	47	7	57	67	76
35	*Schilbe uranoscopus*	845	51	64	67	87	69	69	93	95	45	56	82	67
36	*Auchenoglanis occidentalis*	331	12	37	39	46	31	34	19	26	30	23	24	10
37	*Bagrus bajad*	487	65	18	33	40	65	37	15	65	65	32	18	34
38	*Chrysichthys nigrodigitatus*	69	19	12	3	6	4	4	3	7	1	3	3	4
39	*Ctenopoma kingsleyae*	16	0	0	0	2	1	1	3	1	2	1	1	4
40	*Ctenopoma patherici*	17	0	0	0	1	0	2	1	1	3	5	2	2
41	*Citharinus citharus*	87	12	24	6	6	4	2	5	15	3	2	6	2

42	*Citharinus latus*	127	8	4	35	7	10	10	14	3	4	7	21	4
43	*Distichodus rostratus*	160	14	30	36	8	4	10	13	14	14	1	5	11
44	*Polypterus birchir*	72	9	15	3	1	3	14	11	4	1	3	2	6
45	*Polypterus senegalus*	61	0	0	4	5	1	6	17	2	2	9	2	13
46	*Protopterus annectens*	333	12	20	37	31	41	39	33	25	24	32	22	17
47	*Malapterurus electricus*	109	8	10	4	12	5	12	10	24	1	2	4	17
48	*Arius arius*	111	21	42	7	6	1	3	6	2	2	6	6	9
49	*Hepsetus odoe*	591	66	26	45	69	65	67	32	49	8	34	45	85
50	*Lates niloticus*	276	16	6	45	18	6	34	16	7	45	42	9	32
51	*Heterotis niloticus*	21	0	0	0	0	0	0	0	0	0	0	0	21
52	*Parachanna obscura*	25	0	0	0	0	0	0	0	0	0	13	8	4
53	*Homarus gammarus*	9	0	0	0	0	0	0	2	1	1	1	1	3
54	*Tetraodo lineatus*	1	0	0	0	0	0	0	0	0	0	0	0	1
55	*Pila globosa*	47	0	0	0	0	0	0	0	0	0	0	0	47
Total Number of Catches		**17400**	**1520**	**2141**	**1670**	**1387**	**1377**	**1335**	**1497**	**1197**	**1076**	**1224**	**1367**	**1609**

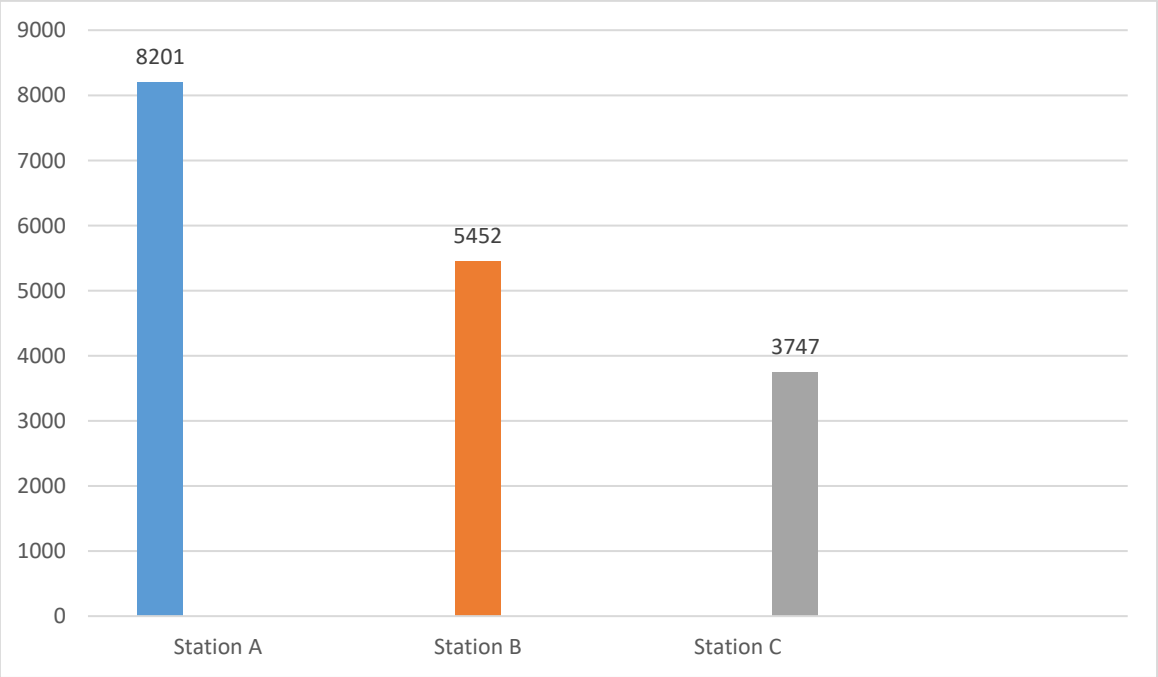

Figure 4.1: Bar Chart Showing Fish Species Station Composition

Table 4.2: Fish Species Family Percentage Diversity of the Lower River Benue, Ibi Axis

S/N	Species	Family	Order	Number of Fish Caught	Percentage Diversity (%)
1	*Labeo coubie*	Cyprinidae	Cypriniforms	856	12.73
2	*Labeo Senegalensis*	//	//	1491	//
3	*Enteromius chlorotaenia*	//	//	3	//
4	*Barbus occidentalis*	//	//	16	//
5	*Enteromius callipterus*	//	//	16	//
6	*Raiamas Senegalensis*	//	//	6	//
7	*Leptocypris niloticus*	//	//	512	//
8	*Campylomormyrus tamandua*	Mormyridae	Osteoglossiformes	122	14.55
9	*Mormyrus rume*	//	//	786	//
10	*Brienomyrus longianalis*	//	//	182	//
11	*Hyperopisus bebe*	//	//	756	//
12	*Marcusenius kainjii*	//	//	738	//
13	*Petrocephalus bovei*	//	//	1087	//
14	*Mormyrops anguilloides*	//	//	161	//
15	*Mormyrus macrophthalmus*	//	//	171	//
16	*Oreochromis niloticus*	Cichlidae	Cichliformes	879	10.91
17	*Oreochromis aureus*	//	//	263	//
18	*Coptodon zillii*	//	//	1	//
19	*Tilapia guineensis*	//	//	9	//
20	*Hemichromis bimaculatus*	//	//	11	//
21	*Sarotherodon galilaeus*	//	//	11	//
22	*Clarias gariepinus*	Clariidae	Siluriformes	713	7.27
23	*Clarias batrachus*	//	//	261	//
24	*Clarias anguillaris*	//	//	265	//
25	*Heterobranchus bidorsalis*	//	//	105	//
26	*Hydrocynus vittatus*	Alestidae	Characiformes	415	//
27	*Brycinus macrolepidotus*	//	//	243	//
28	*Brycinus leuciscus*	//	//	64	//
29	*Alestes dentex*	//	//	23	//
30	*Synodontis budgetti*	Mochokidae	Siluriformes	1345	5.45
31	*Synodontis nigrita*	//	//	593	//
32	*Synondotis membranaceus*	//	//	559	//
33	*Parailia occidentalis*	Schilbeidae	//	255	//
34	*Schilbe mystus*	//	//	687	//
35	*Schilbe uranoscopus*	//	//	845	//
36	*Auchenoglanis occidentalis*	Claroteidae	//	331	3.64
37	*Bagrus bajad*	Bagridae	//	487	//
38	*Chrysichthys nigrodigitatus*	Claroteidae	//	69	1.82
39	*Ctenopoma kingsleyae*	Anabantidea	Anabantiformes	16	3.64
40	*Ctenopoma patherici*	//	//	17	//
41	*Citharinus citharus*	Citharinidae	Characiformes	87	//
42	*Citharinus latus*	//	//	127	//

43	*Distichodus rostratus*	Distichodontidae	//	160	1.82
44	*Polypterus birchir*	Polypteridae	Polypteriformes	72	3.64
45	*Polypterus senegalus*	//	//	61	//
46	*Protopterus annectens*	Protopteridae	Ceratodontiformes	333	1.82
47	*Malapterurus electricus*	Malapteruridae	Siluriformes	109	//
48	*Arius arius*	Ariidae	//	111	1.82
49	*Hepsetus odoe*	Hepsetidae	Characiformes	591	1.82
50	*Lates niloticus*	Latidae	Perciformes	276	1.82
51	*Heterotis niloticus*	Osteoglossidae	Osteoglossiformes	21	1.82
52	*Parachanna obscura*	Channidae	Anabantiformes	25	1.82
53	*Homarus gammarus*	Nephropidae	Decapoda	9	1.82
54	*Tetraodo lineatus*	Tetraodontidae	Tetraodontiformes	1	1.82
55	*Pila globosa*	Ampullariidae	Architaenioglossa	47	1.82
	Total Number of Catches			17400	

Fish Species Diversity

Fish species diversity (Table 4.2) showed a total of 55 fish species belonging to 23 families, 14 orders 42 genera. The species diversity amongst the families found in the river during the research work was reported in descending numerical order: Mormyridae had the highest family percentage diversity (14.55%); followed by Cyprinidae (12.73%); followed by Cichlidae (10.91%); followed by Clariidae and Alestidae (7.27 %) each; followed by Mochokidae and Schilbedae (5.45%) each; followed by Claroteidae, Anabantidae, Cithrinidae and Polypterdae (3.64%) each; followed by Dischondontidae, Bagridae, Protopteridae, Malapteruridae, Ariidae, Hepsetidae, Latidae, Osteoglossidae, Channidae, Nephropidae, Tetraodontidae, and Ampullariidae were the least family percentage diversity (1.82%) each.

Species Abundances

A total of 17,400 fish species were caught along the Lower River Benue at Ibi axis, during the period of sampling. The relative abundance (Table 4.3) of all species is as reported in a descending numerical order: *L. Senegalensis* (8.57%); *S. budgetti* (7.73%); *P. bovei* (6.25%); *O. niloticus* (5.50%); *L. coubie* (4.92%); *S. uranoscopus* (4.86%); *M. rume* (4.52%); *H. bebe* (4.34%); *M. kainjii* (4.24%); *C. gariepinus* (4.10%); *S. mystus* (3.95%); *S. nigrita* (3.41%); *H. odoe* (3.40%); *S. membranaceus* (3.21%); *L. niloticus* (2.94%); *B. bajad* (2.80%); *H. vittatus* (2.39%); *P. annectens* (1.91%); *A. occidentalis* (1.90%); *L. niloticus* (1.59%); *C. anguillaris* (1.52%); *O. aureus* (1.51%); *P. occidentalis* (1.47%); *B. macrolepidotus* (1.40%); *C. batrachus* (1.24%); *B.*

longianalis (1.05%); *M. macrophthalmus* (0.98%); *M. anguilloides* (0.93%); *D. rostratus* (0.92%); *C. latus* (0.73%); *A. arius* (0.64%); *M. electricus* (0.63%); *H. bidorsalis* (0.60%); *C. citharus* (0.50%); *P. birchir* (0.41%); *C. nigrodigitatus* (0.40%); *B. leuciscus* (0.37%); *P. senegalus* (0.35%); *P. globosa* (0.27%); *P. obscura* (0.14%); *A. dentex* (0.13%); *H. niloticus* (0.12%); *C. patherici* (0.10%); *C. kingsleyae* and *E. callipterus* (0.09%) each; *C. tamandua* (0.07%); *H. bimaculatus* and *S. galilaeus* (0.06%) each; *T. guineensis* and *H. gammarus* (0.05%) each; R. *Senegalensis* (0.03%); *E. chlorotaenia* (0.02%); *C. zillii* and *T. lineatus* (0.01) each.

In (Table 4.3) as shown the fish species abundance scores, thus: *L. Senegalensis* (D); *L. coubie* (D); *E. chlorotaenia* (R); *E. callipterus* (R); R. *Senegalensis* (R); *L. niloticus* (D); *C. tamandua* (C); *M. rume* (D); *B. longianalis* (C); *H. bebe* (D); *M. kainjii* (D); *P. bovei* (D); *M. anguilloides* (C); *M. macrophthalmus* (C); *O. niloticus* (D); *O. aureus* (A); *C. zillii* (R); *T. guineensis* (R); *H. bimaculatus* (R); *S. galilaeus* (R); *C. gariepinus* (D); *C. batrachus* (A); *C. anguillaris* (A); *H. bidorsalis* (C); *H. vittatus* (D); *B. macrolepidotus* (A); *B. leuciscus* (F); *A. dentex* (R); *S. budgetti* (D); *S. nigrita* (D); *S. membranaceus* (D); *P. occidentalis* (A); *S. mystus* (D); *S. uranoscopus* (D); *A. occidentalis* (A); *B. bajad* (D); *C. nigrodigitatus* (F); *C. kingsleyae* (F); *C. patherici* (F); *C. citharus* (F); *C. latus* (C); *D. rostratus* (C); *P. birchir* (F); *P. senegalus* (F); *P. annectens* (A); *M. electricus* (C); *A. arius* (C); *H. odoe* (D); *L. niloticus* (A); *H. niloticus* (R); *P. obscura* (R); *H. gammarus* (R); *T. lineatus* (R); *P. globosa* (R). *C. zillii* and *T. lineatus* (0.01) each.

Table 4.3: Relative Abundance of Fish Species In The Lower River Benue, Ibi Axis

No	Species	Family	Order	Numbers of Fish Caught	Relative Abundance (%)	Abundance Scores
1	*Labeo coubie*	Cyprinidae	Cypriniforms	856	4.92	D
2	*Labeo Senegalensis*	//	//	1491	8.57	D
3	*Enteromius chlorotaenia*	//	//	3	0.02	R
4	*Barbus occidentalis*	//	//	16	0.09	R
5	*Enteromius callipterus*	//	//	16	0.09	R
6	*Raiamas Senegalensis*	//	//	6	0.03	R
7	*Leptocypris niloticus*	//	//	512	2.94	D
8	*Campylomormyrus tamandua*	Mormyridae	Mormeriforms	122	0.70	C
9	*Mormyrus rume*	//	//	786	4.52	D
10	*Brienomyrus longianalis*	//	//	182	1.05	C
11	*Hyperopisus bebe*	//	//	756	4.34	D

12	*Marcusenius kainjii*	//	//	738	4.24	D
13	*Petrocephalus bovei*	//	//	1087	6.25	D
14	*Mormyrops anguilloides*	//	//	161	0.93	C
15	*Mormyrus macrophthalmus*	//	//	171	0.98	C
16	*Oreochromis niloticus*	Cichlidae	Cichliciforms	879	5.50	D
17	*Oreochromis aureus*	//	//	263	1.51	A
18	*Coptodon zillii*	//	Perciforms	1	0.01	R
19	*Tilapia guineensis*	//	//	9	0.05	R
20	*Hemichromis bimaculatus*	//	//	11	0.06	R
21	*Sarotherodon galilaeus*	//	//	11	0.06	R
22	*Clarias gariepinus*	Claridae	Siluriforms	713	4.10	D
23	*Clarias batrachus*	//	//	261	1.24	A
24	*Clarias anguillaris*	//	//	265	1.52	A
25	*Heterobranchus bidorsalis*	//	//	105	0.60	C
26	*Hydrocynus vittatus*	Characidae	Characiforms	415	2.39	D
27	*Brycinus macrolepidotus*	//	//	243	1.40	A
28	*Brycinus leuciscus*	//	//	64	0.37	F
29	*Alestes dentex*	//	//	23	0.13	R
30	*Synodontis budgetti*	Mochokidae	Siluriforms	1345	7.73	D
31	*Synodontis nigrita*	//	//	593	3.41	D
32	*Synondotis membranaceus*	//	//	559	3.21	D
33	*Parailia occidentalis*	Schilbedae	//	255	1.47	A
34	*Schilbe mystus*	//	//	687	3.95	D
35	*Schilbe uranoscopus*	//	//	845	4.86	D
36	*Auchenoglanis occidentalis*	Bagridae	//	331	1.90	A
37	*Bagrus bajad*	//	//	487	2.80	D
38	*Chrysichthys nigrodigitatus*	Clateidae	//	69	0.40	F
39	*Ctenopoma kingsleyae*	Anabatidea	Anabaniforms	16	0.09	R
40	*Ctenopoma patherici*	//	//	17	0.10	R
41	*Citharinus citharus*	Citharinidae	characiforms	87	0.50	F
42	*Citharinus latus*	//	//	127	0.73	C
43	*Distichodus rostratus*	Distichodontidae	//	160	0.92	C
44	*Polypterus birchir*	Polypteridae	Polypteriforms	72	0.41	F
45	*Polypterus senegalus*	//	//	61	0.35	F
46	*Protopterus annectens*	Protopteridae	//	333	1.91	A

47	*Malapterurus electricus*	Malapteridae	Siluriforms	109	0.63	C
48	*Arius arius*	Ariidae	//	111	0.64	C
49	*Hepsetus odoe*	Hepsectidae	Characiforms	591	3.40	D
50	*Lates niloticus*	Latidae	Perciforms	276	1.59	A
51	*Heterotis niloticus*	Osteoglosidae	Osteoglossiform	21	0.12	R
52	*Parachanna obscura*	Anabanitiforms	Anabanitiforms	25	0.14	R
53	*Homarus gammarus*	Nephropidae	Decapoda	9	0.05	R
54	*Tetraodo lineatus*	Tetraodotidae	Tetraodontiforms	1	0.01	R
55	*Pila globosa*	Ampullariidae	Archtaenioglasa	47	0.27	R
	Total Number of Catches			**17400**		

Abundance scores: 1-50 = Rare (R), 51-100 = Few (F), 101-200 = Common (C), 201-400 = Abundant (A) and >400 = Dominant (D) Allison *et al* (2003).

Respondent Demographic Characteristics

Result showed the demographical characteristics of fisher folk in Lower River Benue, Ibi axis (table 4.6). Gender: 137 (91.3%) of the respondents were male and 13 (8.7%) were female. Marital status: 78 (52%) of the respondents were single; 55 (36.7%) were married; 12 (8.0%) were Divorce and 5 (3.3%) were widow/widower. Age: 65 (43.3%) were between 15-29 years; 46 (30.7%) were aged 30-40 years; 34 (22.7%) were 41-50 years and 5 (3.3%) were 50 and above. Qualification: 21 (14%) had No education; 48 (32%) had primary education; 70 (46.7%) had secondary education and 11 (7.3%) had tertiary education. Years of experience in fishing gears: 4 (2.7%) were within 1-5 years; while 54 (36%) were 5-9 year; 70 (46.7%) were within 10-14 years; 25 (13.7%) were 15 and above year, and 2 (1.3%) has No year experience at all. Household size: 4 (2.7%) were within 1-4; while 26 (17.3%) were within 5-9; while 62 (14.3%) were within 10 – 14 and 58 (38.7%) were 15 and above.

Respondent on Fishing Gear Usage

Do you used fishing gear? 130 (86.7%) respondents used fishing gear, while 20 (13.3%) do not use fishing gear. Gear usage in stations: station A (Baruwana) used 50 (33.3%) gura net trap; while 25 (16.7%) used cast net; 15 (10%) used gill net; while 38 (25.3%) used drag net; while 20 (13.3%) used hook and line; 2 (1.3%) used scope net; Do your fishing gear catch fish very fast, with less effort? 135 (90%) respondents used less effort to catch fish and 15

(10%) do not use less effort to catch fish; If yes, how many hours? 85 (56.7%) respondents used 1-2 hours to catch fish; while 31 (20.7%) used 1-3 hours to catch fish, while 25 (16.7%) used 1-6 hours to catch fish, while 6 (4.0%) used 1-12 hours to catch fish, while 3 (2.0%) used 12-24 hours to catch a fish and 0 (0.0%) use more hours to catch fish. Station B (Gungu Adbulahi) used 50 (33.3%) gura net trap; while 25 (16.7%) used cast net; 15 (10%) used gill net; while 38 (25.3%) used drag net; while 20 (13.3%) used hook and line and 2 (1.3%) used scope net; Do your fishing gear catch fish very fast, with less effort? 135 (90%) respondents used less effort to catch fish and 15 (10%) do not use less effort to catch fish; If yes, how many hours? 85 (56.7%) respondents used 1-2 hours to catch fish; while 31 (20.7%) used 1-3 hours to catch fish, while 25 (16.7%) used 1-6 hours to catch fish, while 6 (4.0%) used 1-12 hours to catch fish, while 3 (2.0%) used 12-24 hours to catch a fish and 0 (0.0%) use more hours to catch fish. Station C (Basibi) used 40 (26.7%) gura net trap; while 30 (20.0%) used cast net; 17 (11.3%) used gill net; while 53 (35.3%) used drag net; while 10 (6.7%) used hook and line 0 (0.0%) used scope net; Do your fishing gear catch fish very fast, with less effort? 120 (80%) respondents used less effort to catch fish and 30 (20%) do not use less effort to catch fish; If yes, how many hours? 10 (6.7%) respondents used 1-2 hours to catch fish; while 80 (53.3%) used 1-3 hours to catch fish, while 50 (33.3%) used 1-6 hours to catch fish, while 10 (6.7%) used 1-12 hours to catch fish, while 0 (0.0%) used 12-24 hours to catch a fish and 0 (0.0%) use more hours to catch fish.

Gears Used During The Research Work

Six (6) traditional fishing gears were identified from the local fisherfolk with their local names (in Hausa): Long Line (Mari-mari), Gura net trap (Mali), Round net (Hooma), Cast net (Birgi), Gill nets (Raga-bilili) and Hook and line (Kugiya).

Data Analysis

Result are expressed as Mean±SD for riplicate measurements. Values on the same rows with same superscripts do not differ significantly at $p<0.05$. The result of the analysis (Table 5) shows the highest mean (0.53 ± 0.32^{a}) in station A and the least mean (0.23 ± 0.13^{c}) in station C of Fish Diversity, while Relative Abundance the highest mean (4.29 ± 2.48^{a}) in station A and the least mean (0.67 ± 0.39^{c}) in station B.

The Catch Per Unit Effort (CPUE) was calculated with the following results thus, station A recorded (17.83kg/day), station B recorded (11.85kg/day); station C recorded (5.82kg/day). This showed that there is low biomass in this ecosystem per fish species catchability, fishing efforts and fishing efficiency.

An analysis of variance (ANOVA) at a probability, $P<0.05$ as shown in (Appendix I) was carried out within stations for species diversity and relative abundance in their significant levels. It shows that there was no significant difference in fish species diversity and relative abundance within groups (stations).

Table 4.4: Respondent Demographic Characteristics

S/N	RESPONDENTS	FREQUENCY	PERCENTAGE (%)
1	GENDER		
	Male	137	91.3
	Female	13	8.7
			100%
2	MARITAL STATUS		
	Single	78	52.0
	Married	55	36.7
	Divorce	12	8.0
	Widow/widower	5	3.3
			100%
3	AGE		
	15-29	65	43.3
	30-40	46	30.7
	41-50	34	22.7
	50 and above	5	3.3
			100%
4	Qualification		
	No education	21	14
	Primary	48	32
	Secondary	70	46.7
	Tertiary	11	7.3
			100%
5	Year of experience in fishing gear		
	1-5	4	2.7
	5-9	54	36
	10-14	70	46.7
	15 and above	25	13.7
	No experiences at all	2	1.3
			100%
6	HOUSE SIZE		
	1-4	4	2.7
	5-9	26	17.3
	10-14	62	41.3

	15 and above	58	38.7
			100%
7	Do you use fishing gear?		
	Yes	130	86.7
	No	20	13.3
			100%
8	Gears usage		
	Station A = Baruwana		
	Gura net trap	50	33.3
	Cast net	25	16.7
	Gill net	15	10
	Drag net	38	25.3
	Hook and line	20	13.3
	Clap net	2	1.3
			100%
9	Do your fishing gear catch fish very fast, with less effort?		
	Yes	135	90
	No	15	10
			100%
10	If yes how many hours?		
	1-2 hours	85	56.7
	1-3 hours	31	20.7
	1-6 hours	25	16.7
	1-12 hours	6	4.0
	12-24 hours	3	2.0
	More hours	0	0.0
			100%
	Station B =Gungu Adbulahi		
	Gura net trap	50	33.3
	Cast net	25	16.7
	Gill net	15	10.0
	Drag net	38	25.3
	Hook and line	20	13.3
	Clap net	2	1.3
			100%
	If yes how many hours?		
	1-2 hours	85	56.7
	1-3 hours	31	20.7
	1-6 hours	25	16.7
	1-12 hours	6	4
	12-24 hours	3	2
	More hours	0	0.0
			100%
	Station C =Basibi		
	Gura net trap	40	26.7
	Cast net	30	20.0
	Gill net	17	11.3

Drag net	53	35.3	
Hook and line	10	6.7	
Clap net	0	0.0	
		100%	
If yes how many hours?			
1-2 hours	10	6.7	
1-3 hours	80	53.3	
1-6 hours	50	33.3	
1-12 hours	10	6.7	
12-24 hours	0		0.0
More hours	0	0.0	
		100%	

Table 4.5 Data Analysis within Station on Fish Diversity and Relative Abundance on the Lower River Benue

Stations	Diversity (± S .E)	Relative Abundance (± S.E)
A	0.53 ± 0.32^{a}	4.29 ± 2.48^{a}
B	0.38 ± 0.22^{b}	0.67 ± 0.39^{c}
C	0.23 ± 0.13^{c}	3.46 ± 2.00^{b}

Station A: Baruwana; Station: B-Gugu-abdulahi; Station C: Bisibi

Pearson Correlation Between The Fishing Gear And The Fishing Hours

There was positive correlation (Table 6) with gear usage in station A and gear usage in station B; as well as fishing hour in station A, gear usage in station B and gear usage in station C; as well as gear usage in station B and fishing hour in station C; as well as fishing hour in station B, gear usage in station A and fishing hour in station A; as well as gear usage in station C and fishing hour in station B; as well as fishing hour in station C, gear usage in station A and gear usage in station B.

Pearson correlation of species abundance, diversity and physico-chemical characteristics within stations (Appendix III) showed a negative correlation of pH in station B and fish species diversity; it was also observed that there was a negative correlation of EC in station C and DO in station C.

Table 4.6: Pearson Correlation between the Fishing Gear and the Fishing Hours

	Gear Usage Station A	Fishing Hours Station A	Gears Usage Station B	Fishing Hours Station B	Gears Usage Station C	Fishing Hours Station C
Gear Usage Station A	1	0.714	0.899*	0203	0.657	0.517
Fishing Hours Station A	0.714	1	0.812*	0.754	0.0928**	0.736
Gear Usage Station B	0.203	0.754	1	0.500	0.500	0.925**
Fishing Hours Station B	0.899*	0.812*	0.500	1	0.406	0.478
Gear Usage Station C	0.294	0.736	0.478	0.925**	1	0.500
Fishing Hours Station C	0.886*	0.657	0.928**	0.406	0.500	1

*Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

Fish species composition recorded a total of 17,400 catch belonging to 23 families, 14 orders, 42 genera comprising of 55 fish species; also recorded two (2) amphibian species (edible frog, *Pelophylex* kl. *esculentus*: Ranidae) and Giant Galapagos tortoise (*Chelononoidis niger*: Testudinidae) and reported that they were very abundant in the aquatic ecosystem. Fish species station composition, recorded the highest scores in Station-A (8201), while the least in Station-C (3747). This shows that the fish composition and diversity in this lower part of the River was quite high regarding to the short period of sampling. Even though some species identified were higher in diversity values than others, there is no visible

existing research work carried out in this part of the river for direct comparison. The family Mormyridae was recorded the highest, comprising of *C. tamandua* (122), *M. rume* (786), *B. longianalis* (182), *H. bebe* (756), *M. kainjii* (738), *P. bovei* (1087), *M. anguilloides* (161), and *M. macrophthalmus* (171), while the family Tetraodontidae was recorded the least, comprising of *T. lineatus* (1) (Damba *et al*., 2017; Elijah and Lamidi, 2019; Abiodum and John, 2017; Odiko *et al*., 2019).

Fish species diversity reported the family Mormyridae was the highest family percentage diversity (14.55%), while Dischondontidae, Bagridae, Protopteridae, Malapteruridae, Ariidae, Hepsetidae, Latidae, Osteoglossidae, Channidae, Nephropidae, Tetraodontidae, and Ampullariidae were the least fish family percentage diversity with (1.82% each) (Igbani and Uka, 2019; Danba *et al*.,2017; Abiodun and John, 2017).

Fish species abundance reported a total of 17,400 fish species were caught along the Lower River Benue at Ibi axis, during the period of sampling. The relative abundance was recorded highest with *L. Senegalensis* (8.57%), while least in *C. zillii* and *T. lineatus* with (0.01%) each (Igbani and Uka, 2019; Elijah and Lamidi, 2019; Udo *et al*., 2014).

Fish species abundance scores recorded dominant (D) with *L. Senegalensis*; *H. odoe*; *B. bajad*; *S. uranoscopus*; *S. mystus*; *S. budgetti*; *S. nigrita*; *S. membranaceus*; *H. vittatus*; *C. gariepinus*; *O. niloticus*; *H. bebe*; *M. kainjii*; *P. bovei*; *M. rume*; *L. niloticus* and *L. coubie* were with (D) each, while others were recorded with rare (R) and shows that the species were threatened such as *E. chlorotaenia*; *E. callipterus*; *R. Senegalensis*; *T. guineensis*; *H. bimaculatus*; *S. galilaeus*; *A. dentex*; *H. niloticus*; *P. obscura*; *H. gammarus*; *P. globosa*; the most endangered fish species were *C. zillii* and *T. lineatus* (Igbani and Uka, 2019).

Fishing gears were reported and six (6) traditional fishing gears were identified from the local fisher folk with their local names (Hausa): Long Line (Mari-mari), Gura net trap (Mali), Clap net (Hooma), Cast net (Birgi), Gill net (Raga-bilili) and Hook and line (kugiya). Catch per Unit Effort (CPUE) recorded highest kilograms (17.83kg/day) in Station-A, while the least kilograms (5.82kg/day) were recorded in Station-C (Igbani and Uka, 2019; Henry and Alaba, 2017; Debarshi *et al*., 2017; Ali et al., 2014).

Data analysis results were expressed as Mean±SD for duplicate measurements. Values on the same rows with sames superscripts do not differ significantly at $p<0.05$. The results of the analysis showed the highest mean (0.53 ± 0.32^{a}) in station-A and the least mean (0.23 ± 0.13^{c}) was observed in station-C of the fish species diversity, while relative

abundance was recorded the highest mean (4.29 ± 2.48^{a}) in station-A, and the least mean (0.67 ± 0.39^{c}) was recorded in station-B.

CONCLUSION

The Lower River Benue could be said to be rich in fish fauna as there are a lot of species represented here regarding to the short period of sampling. The diversity among most families like the Mormyridae, Cyprinidae and Cichlidae is quite different; although, this is not for other families like Ariidae, Hepsetidae and Centroponidae. Notwithstanding, there is high diversity of fish species, the abundance of fish recorded was also high; although, they varied. However, their biodiversity and abundance seems to be associated more with fish exploitation, human activities, gear types such as gill net, drag net, cast net, hook and long line; gura-net trap and adaptation to their natural aquatic ecosystem.

This study could serve as a baseline data to relevant bodies in the management and conservation of fisheries resource. The ecosystem should be monitored from illegal fishing and overexploitation of juvenile fishery by the fisher folk and educating them on the effects of using non-selective fishing gears (that is, with mesh size less than 0.05 – 1.99 cm) in capture fisheries to aid fish population dynamics.

Recommendations

In the above data collection and findings, it is strongly recommended that more durable time research should be carried out, especially covering the wet and dry seasons on the fish species assemblage and assessment in the study area; it is also paramount that constant monitoring of the river of its anthropogenic activities such as river bathing and dumping; washing of plates/clothes and defecating; illegal fishing (by the use of plant extract poisoning, other chemicals (such as gamalyn) and the use of dynamite should be stopped forthwith) to protect the aquatic natural resources from threat and extinction; it will also be of a great benefit to also conserve these fish species for biodiversity sustainability for food self-reliance, sovereignty and security to better the health of the inhabitants amidst endangered fish species, wetland disappearance and climate change.

The identified fish species could be used by students, scholars and specialists in the field of Science, Agriculture, Fisheries, Aquaculture, Fish Biology, Zoology and Hydrobiology. It was also reported in Appendix IV that Edible frog (*Pelophylex kl. esculentus*: Ranidae) and

Giant Galapagos tortoise (*Chelononoidis niger*: Testudinidae) were very abundant in the aquatic ecosystem.

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