Journal of Agriculture, Environmental Resources and Management
ISSN2245-1800(paper) ISSN 2245-2943(online)
6(4)1-800:**July**.2024; pp98- 108

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Biodiversity and Abundance of Fish in River Ibi, Ibi Local Government Area of Taraba State

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Abstract

Fish is very important for human utilization in terms of animal proteins. Their presence and distribution is key in sustainable development of a country. The aim of the work, was to carry out biodiversity and abundance of fish species in the study area. The study sites were divided in to five stations (A, B, C, D and E). The catch composition assessment was conducted at the landing sites three times a week and fish species were separated and identified using identification guide. Descriptive statistical tools and Shannon –Weiner index were used to analyze the data collected. The result revealed a total of 26,069±2.34 fishes belonging to 12 families with 20 species were identified in the local fishers catch areas. The Diversity parameters of Shannon-Weiner Index showed station E landing site was more diverse and evenly distributed. Station E stood out in terms of species abundance richness with 6,036±0.02. This could be as a result of abundant vegetation and sufficient organic matter which provided a good habitat for their reproduction, while the least was Station A with 4,395±1.05 fish abundance. This could be due to the fact that the vegetation cover around Station A area of the river was less compared to Station E area of River Ibi Taraba. The analysis revealed that Synodontis gambiensis species was significantly (P<0.05) diversed and abundanc than all other species. Laws should be promulgated by government to guide fishing in respect to size and age as a means for sustainability.

Key words: Biodiversity, Abundance, Shannon-Weiner Index, Fish species, Families.

Introduction: Fish are important because they provide not only employment but also a global animal protein production of about 17% for human utilization (Leonard, 2019). Fisheries industries also provide fish products for other animals like in poultry feeds and omega-3 that boost the health status of many people in the rural and urban areas of developing countries (Amos and Linus, 2017). These authors maintained that fish, are increasingly being threatened by man-made induced environmental changes, like pollution: habitat alteration such as river impoundment, poor management which creates unsustainability risks in the developed and developing countries due to decreases in the resources available, Nyong and Nweze (2012).

There are abundant surface waters in Taraba State, which are endowed with the potentials of fish culture that can provide enough fish to the country and can even export some (TSEEDS, 2004). These surfaces include streams along Rivers Benue, Taraba, Ibi, Donga and their tributaries. There are about 500,000 hectares of water bodies and 142 natural ponds in Taraba state which are not taped to their maximum potentials as reported by TSEEDS (2004). Another unutilized trend of fish potential is along the pattern of River Taraba flow, through Gashaka, Bali and Gassol Local Government Areas (LGAs) before emptying into Benue system. Oruonye, (2014) reported an average fish catch of about 1,987 metric tonnes per annum in the water surfaces with daily fishing each, in some LGAs like Ibi, Lau and Donga to be about 3000kg (that is 9000kg for the three sites). In a month, it is estimated to be 270,000kg from this

route alone. There are over 30,000 human families in the state that are fully engaged in fishing for their daily need (Oruonye, 2014) ; Nyong and Nweze (2012); . This is very key for fish sustainability in Taraba State and the country at large.

The fish species composition and abundance can be altered due to indiscriminate or over exploitation, thus creates, negative impact on the fishery industries (Jamieson and Yancy, 2012; Igbani, Abhulimen and Samaila, 2024). These authors opined that, the study of fish species composition is very crucial in the stocking dynamics and their management. Diversities indices are often used in the multi-species assessment, ecosystem studies and in studies of economically important fish species, which is often necessary to be of absolute size of the stock (Ahmad, Shagari and Sani, 2014). The species richness and the relative species abundance described the key elements of the diversity. Biodiversity is a measure of species that make up a biological community, considered to be one of the most important aspects of community organization and structure (David Wahedi and Zaku, 2016) and Nyong,and Bassey, 2019).

According to Norton and Bainerd. (2013), species richness, evenness and diversity are all used in the study of biology and can be used to compare different populations. Biodiversity has become very important in recent years as a result of a world- wide high rate of extinction of some species of animals including fish. According to Abiodun and John (2017), the diversity of fishes is depended upon the biotic, abiotic factors, types of ecosystem, Age of water body, mean depth, water level fluctuation and morphometric features that can have great ecological implications. Fish biodiversity can shift over time though the shift may not be clearly related to factors such as increases in water clarity, macrophytes, growth and benthic invertebrate communities as reported by Trumpickas, Smith, Robillard, Rose and Jake (2012).

Investigations into the biodiversity of fish species of Nigerian inland water bodies have been carried out by David *et al.* (2016) ; Nyong,and Bassey, (2019) and Abiodun and John (2017) species diversity, be it in the wild or domesticated within a geographical area.

The aim of this research was to evaluate the biodiversity and abundance of Fishes in River Ibi, along the stream of Ibi Local Government area, Taraba State.

Diversity of Fish.: Fish are very diverse animals and are categorized in to many ways, although most fish species have probably been discovered and described, are about 250 new ones and are still being discovered every year (Ahmad *et al.*, 2014). According to Fish Base (2022) about 34,800 species of fish had been described which is more than the combined total of all other vertebrate species: amphibians, reptiles, birds and mammals put together.

Fish species diversity is roughly divided equally between marine (oceanic) and freshwater ecosystems (Fish Base, 2022). In addition, Coral reefs in the Indo-Pacific constitute the Centre of diversity for many marine fishes, whereas the continental freshwater fishes are the most diverse in large river basins of tropical rainforests, especially the Amazon, Congo, and Mekong basins. Again, more than 5,600 fish species inhabit Neotropical freshwaters alone, such that Neotropical fishes represent about 10% of all vertebrate species on the Earth. Exceptionally rich sites in the Amazon basin, such as Cantão State Park, can contain more freshwater fish species than occur in all of Europe (Estudo, Ícticas, Estadual das Espécies, 2009)

Human Use: Man search for fish because of their values, in terms of commercial assets and food, recreational sport, decorative aquarium and for tourism. In human history, the important fisheries have been based on forage fish (Piper, 2007). Forage fish are small fish which are eaten by larger predators. They usually school together for protection. Typical ocean forage fish feed near the bottom of the food chain on plankton, often by filter feeding. They include the family Clupeidae (herrings, sardines, menhaden, hilsa, shad and sprats), as well as anchovies, capelin and halfbeaks.

Important herring fisheries have existed for centuries in the North Atlantic and the North Sea. Likewise, important traditional for anchovy and sardine fisheries have operated in the Pacific, the Mediterranean, and the southeast Atlantic (Leonard, 2019) The world annual catch of forage fish in recent years has been around 25 million tonnes, or one quarter of the world's total catch.

Higher in the food chain, Gadidae (cod, pollock, haddock, saithe, hake and whiting) also support important fisheries. Concentrated initially in the North Sea, Atlantic cod was one of Europe's oldest fisheries, later extending to the Grand Banks (Norton *et al.*, 2013); Nyong,and Bassey, 2019) Declining numbers led to international "cod wars" and eventually the virtual abandonment of these fisheries. In modern times, the Alaska pollock supports an important fishery in the Bering Sea and the north Pacific, yielding about 6 million tonnes, while cod amounts to about 9 million tonnes (Lauder, 2019). The diversity and abundance study in our local water streams is therefore, critical with the aim to avert the unsustainability of our indigenous fish species.

Materials and Methods: The study was carried out along River Ibi, in Ibi Local Government Area of Taraba State. Ibi is one of the sixteen local government areas of Taraba State, and is governed by an elected chairman. It is a town and administrative district in Taraba State, Nigeria. The town is on the south bank of the Ibi River opposite the influx of the much smaller Shemankar River in plateau state. Taraba and Donga Rivers flow into the River Benue within Ibi. It has a population of 84,054 (2006 census), and annual rainfall of 1277mm (50.3 inches). They are mostly farmers and fisher men with a major market day on Fridays every week.

Methods of Data Collection: Fishes were collected from five (5) sample stations A (Kwatan Sule), B (kwatan Dampar), C (Kwatan Kabawa), D (Kwatan Baji) and E (Kwatan Nyonwo) three times a week during the study period of eight (8) weeks (July and August 2022) with the help of local fishers using different types of gears namely gill nets, cast nets (>3.8cm mesh sizes), hook and line and local traps with detailed examination, actual counting and recording of all fishes caught by the local fishers. Photographs were immediately taken prior to preservation, because formalin decolorizes the fish color on long preservation. Further, Fish identifications was carried out with the aid of the keys of Olaosebikan and Raji (2004), and Fishbase database (Reed, Burchad, Hopson, Jenness and Yaro, 2017). Rare specimens were difficult to identify on the spot were then preserved in 5% formalin for laboratory observation. Both morphometric measurements and meristic counts were used in the identification. All members of a species were physically counted in order to establish relative abundance and recorded accordingly every collection day. Those taken in the laboratory were picked with forceps and placed on petri dish and the identification guide was used to identify.

Data Analysis: The Simpson's Dominance index, *C*, Shannon-Weiner Diversity index, *H'*, and Margalef's species richness, *d*, as in (Ryan, 2007) were used to evaluate the trend in fish community structure.

Results: The summary of fish species gotten after week 5 was presented in Table 1 and the result revealed that, the highest number of fish species in station A, was *S. gambiensis* (2648±0.21), followed by *T. zilli* (550±1.02), *P. annectens* (518±2.01), *C. gariepinus* (436±2.23), *Momyrus* spp (335±2.01), *T. galilaeus* (142±0.12), *L. niloticus* (83±0.05), *S. vermiculate* (81±2.01), *G. niloticus* (50±0.21), *P. similis* (36±0.20), *D. rostratus* (15±0.00), *M. electricus* (14±0.10), *Auchenolanis spp.* (14±0.10), *H. niloticus* (12±0.12), *C. citharus* (10±0.00), *O. niloticus* (9±0.00), *S. intermedium* (5±0.04), Toad fish (4±0.01) and the lowest was *H. longifilis* (0±0.00) and were all significantly ($P<0.05$) different from each other.

In station B in the same Table 1, the highest fish spp was *S. gambiensis* (3428±1.22), followed by *Tilapia zilli* (631±2.23), *C. gariepinus* (545±2.32), *P. annectens* (360±2.01), *Momyrus spp* (228±1.02), *H. longifilis* (198±1.04), *L. niloticus* (109±0.20), and were not significantly ($P>0.05$) different from each other but were significantly ($P<0.05$) different from other species, *D. rostratus* (29±0.12), *C. citharus* (20±0.03), *S. vermiculata* (19±0.10), *G. niloticus* (17±0.07), *O. niloticus* (13±0.06), *P. similis* (11±0.01), *S. intermedium* (7±0.00), *T. galilaeus* (6±0.00), *Auchenolanis spp.* (5±0.04), and the lowest was Toad fish (4±0.20).

In station C in the same Table 1, the highest was *S. gambiensis* (3081±3.10), followed

by *T. zilli* (393±2.01), *Momyrus spp* (365±3.12), *C. gariepinus* (285±0.32), *H. longifilis* (239±2.01), *P. annectens* (212±0.40), *L. niloticus* (197±2.01), *P. similis* (96±0.31), *L. niloticus* (67±0.40), *H. niloticus* (56±0.31), *G, niloticus* (41±0.21), *M. electricus* (39±0.01), *T. galilaeus* (35±0.00), *D. rostratus* (25±0.03), *S. intermediu* (21±0.10), *C. citharus* (12±0.00), *Auchenoglanis* spp. (5±0.00), Toad fish (2±0.00), *S. vermiculata* (2±0.00), and the lowest was *O. niloticus* (0±0.00) and they were all significantly (P<0.05) different from each other.

Still in Table 1 in station D, the highest fish species was *S. gambiensis* (2221±2.12), followed by *P.* anucetens (415±0.12), T. *zilli* (367±1.00), *C. gariepinus* (360±1.00), *Momyrus* spp (345±0.01), *H. longifilis* (196±1.00), *L. niloticus* (153±0.20), *L. niloticus* (124±1.00), and which were not significantly (P>0.05) different from each other but were significantly (P<0.05) different from other treatments, *T. galilaeus* (43±0.03), *H. niloticus* (38±0.00), *D. rostratus* (33±0.20), *G. niloticus* (32±0.20), *S. intermedius* (13±0.10), *P. similis* (11±0.00), *M. electricus* (10±0.01), Toad fish (10±0.01), *C. citharus* (9±), *O. niloticus* (8±0.03), *S. vermiculata* (3±0.10) and the lowest was *Auchenoglanis spp.* (4±0.04) and they were all significantly (P<0.05) different from each other.

In station E in the same Table 1, the highest was *S. gambiensis* (4005±), followed by *T. zilli* (871±), *P. annectens* (315±), *H. longifilis* (255±), *L. niloticus* (172±), *Momyrus* spp (171±), *C. gariepinus* (87±), *G. noliticus* (37), *P. similis* (35±), *O. niloticus* (25±), *L. noliticus* (22±), *S. vermiculata* (18±), *S. intermedius* (14±), *H. noliticus* (13±), *T. galilaeus* (13±), *D. rostratus* (12±), *C. citharus* (8±), *M. electricus* (5±), Toad fish (4±) and the lowest was *Auchenoglanis spp.* (1±) and they were all significantly (P<0.05) different from each other.

Discussion: The result showed that, there were significant different in fish biodiversity and their abundance in the study area with a total of 26,069±2.34 fishes belonging to 14 families with 20 species from July – August 2023. This is compared to 60,574 fishes belonging to 20 families with 50 species identified in Taraba rivers (Danba, Afaru, Abubakar, Zira, Kefas and Barau, 2021) from Nov, 17 - April, 2019. By implication, there was high fish biodiversity and abundance in Ibi River when we are looking at it alone. Similar work was carried out at Lake Ribadu, Adamawa State, North East, Nigeria by kwaji *et al*. (2015). They reported 5,572 fishes belonging to 10 families with 19 species caught between June to August, (2015). The low fish diversity here could be because, as the river water flows from North-East through Ibi, more fishes were carried along the water flow. However, the result of this work is not in line with the report of David *et al.* (2016) from two lacustrine wetlands of the upper Benue Basin, which showed 5,044 fishes belonging to 13 families and 18 species caught between June and August, 2014; Abiodun and John (2017) gave a report of (18) species from (12) families of fish caught between November 2014 and June 2015 from lower Niger River Idah, Kogi State, Nigeria; Amos and Linus (2017) reported an estimate of seventeen (17) species from fifteen (15) families caught between June and August, 2014 at Njoboliya Lake, Adamawa State, Nigeria. Furthermore, Zira *et al.* (2017) observed (47) species of fish belonging to fifteen (15) families from Kiri Reservior caught between June 2016 and May, 2017 in Shelleng, Adamawa State, Nigeria; Iber and Ojutiku (2018) gave a report of Twenty (20) species belonging to Twenty (20) families caught between January and December, 2016 from River Fete, Benue State, Nigeria.

The reason for the high fish species in River Ibi Taraba, could be because of lotic water current down-stream or river. River Ibi is a fish multi-species water resource with the family Cichlidae dominating the catch as observed in this work. The dominance of the family Cichlidae agree with work reported by Kwaji *et al. (*2015). It is also in line with work of Ayanwale *et al. (*2013) who reported the dominance of Cichlidae family in Lake Ribadu, Adamawa State, Nigeria (Lower Usama Reservior (Dan-Kishiya, 2012); Iber and Ojutiku (2018) in Tagwai Lake and River Fete, Benue State, Nigeria. The fish dominance could be attributed to their adaptation to lotic environment and changes in the hydrological regime of the River habitat, and their high prolific breeding nature coupled with good parental care given to the fishes which was

a considerable advantage in the colonization of this River. *Tilapia galilaeus* tops the Cichlidae family in number.

The dominance of *Tilapia galilaeus* was also reported in Lake Ribadu (Kwaji, Sogbesan and Peter, 2015). The dominance could be as a result of their ability to protect their fertilized eggs by mouth brooding, thus producing more fries than other fishes. The presence of *P. annectans* in the River could be due to their adaptive nature to macrophytes acting as shelter and provides food by decaying vegetation. The presence of the family Schilbedae in the river could be as a result of abundance detritus, insects and fish. The family Mochochidae recorded high number. This might be due to their diverse feeding habits, low predation and good spawning ground in the river for their breeding. The population of *Auchenoglanis spp, G. niloticus, T. lineatus, G. niloticus, P. similis, S. intermedius, H. niloticus, L. niloticus and M. electricus* recorded below 1.0%. The result supported what was reported by Ekundayo, Sogbesan and Haruna. (2014) on the low number of some of these fishes. Their very low abundance could be as a result of heavy exploitation which is known to cause a delay in maturity and abundance of many fishes.

Low population of these fishes could also be as a result of poor management practices like using unapproved mesh sizes as seen used by the fishers, unrestricted fishing, use of poisonous leaves for fishing, non-enforcement of fishing laws. The degradation of water body such as removal of water for irrigation and domestic use, herbicides washed into the river could affect the population of these fishes and hence be described as threatened and endangered fish species in River Ibi, Taraba state. The Diversity parameters of Shannon-Weiner Index showed station E landing site was more diverse and evenly distributed H'2.881; E 0.280, this could be due to downstream migration of fishes from Atlantica hills on the Nigeria-Cameroon border while the least was Station A with H'2.432; E 0.243.

This could be because of high exploitation of fishes around that area of the river which lead to reduction or extinction of some species. Station E stood out in terms of species abundance richness with 6083. This could be as a result of abundant vegetation and sufficient organic matter which provided a good habitat for their reproduction, while the least was Station A with 4,395. This could be due to the fact that the vegetation cover around Station A area of the river was less compared to Station E area of River Ibi Taraba. This finding is in agreement with what was reported by Iber and Ojutiku (2018) that variation exist in fish species among the stations in River Fete, Benue State, Nigeria.

Conclusion: From the study, it can be concluded that River Ibi, in Taraba state has about 12 families of fish belonging to 20 species. The most dominant family was Mochochidae, followed by Cichlidae Clariidae and, Distichodontidae. Station E was more diverse and evenly distributed and also stood out in terms of species richness. This shows that River Ibi in Taraba State, Nigeria is blessed with abundant fish species like most freshwater bodies.

Recommendations: The state or federal government of the country should promulgate laws and guides in ensuring the sustainability of the fish species. There should be low if not total eradication of anthropogenic activities which leads to water pollution. There should be selected against indiscriminate fishing.

TABLE 1: SUMMARY O F FISH GOTTEN FOR ALL THE WEEKS

s/n	Family	Species	English Name	Local Name (Hausa)	Local Name (Jukun)	STATIONS					Total Fishes
						A	B	C	D	E	
1	Cichlidae	*Tilapia zilli*	Tilapia	Mai janbindi	Akpyi	367±1.00	631±2.34	393±2.01	550±1.02	871±2.22	2,812±21.00
2	Mochokidae	*Synodontis gambiensis*	Updown catfish	Kurungu	Agangu	2221±2.12	3428±1.22	3081±3.10	2648±0.21	4005±1.21	15,384±2.34
3		*Synodontis vermiculata*	African squeaker fish	Kaya tara	Agangu	3±0.10	19±0.10	2±0.02	81±2.01	18±0.12	123±4.34
4	Claridae	*H. longifilis*	Catfish	Mari	Abwi	196±1.00	198±1.04	239±2.01	-	255±2.01	888±2.32
5		*Heterobranchus bidorsalis*	African Bonytongue	Bargi	Anusa, Tokwa	38±0.00	8±0.04	56±0.31	12±0.12	13±0.21	127±1.223
6		*Clarias gariepinus*	Catfish	Tarwada	Anga	360±1.00	545±2.32	285±0.32	436±2.23	87±0.20	1,713±4.34
7		*Procatapus similis*	Large finned lamprey	Data	Tsofu	11±0.00	11±0.01	96±0.31	36±0.20	35±0.21	189±1.04
8	Centropomidae	*Lates niloticus*	Nile perch	Giwan Ruwa	Akwinje	124±1.00	90±0.34	67±0.40	43±1.00	22±0.10	346±2.02
9	Protopteridae	*protopterus annectens*	African lungfish	Mai mama	Akoro,	415±0.12	360±2.01	212±0.40	158±2.01	315±1.01	1,460±0.12
10		*Gymnarchus niloticus*	Aba	Yauni	Anwa	32±0.20	17±0.07	41±0.21	50±0.21	37±1.02	177±0.12
11	Cichlidae	*Oreochromis niloticus*	Nile Tilapia	Karpasa		8±0.03	13±0.06	-	9±0.00	25±0.21	55±2.02
12	Mormyridae	*Momyrus spp*	Trunk fish	Miligi	Apyon	345±0.01	228±1.02	365±3.12	335±2.01	171±1.02	1,444±0.01
13		*Distichodus rostratus*	Distichodus	Chichiyawa	Fojibyen	33±0.20	29±0.12	25±0.03	15±0.00	12±0.12	114±0.23
14	Cichlidae	*Tilapia galilaeus*	Mango tilapia	Gargaza		43±0.03	6±0.00	35±0.00	142±0.12	13±0.21	239±0.21
15	Centropomidae	*Lates niloticus*	Perch	Ragon ruwa		153±0.20	109±0.20	197±2.01	83±0.05	172±1.20	714±0.12
16		*Schilbe intermedius*	Silver catfish	Karaya	Anda	13±0.10	7±0.00	21±0.10	5±0.04	14±0.01	60±1.00
17	Citharinidae	*citharinus citharus*	moon fish	Paliya	Bebene	9±0.00	20±0.03	12±0.00	10±0.00	8±0.02	59±0.01

18	Malapterurid ae	*Malapterurus electricus*	Electric catfish	Mijiriya		10±0.01	44±0.10	39±0.01	14±0.01	5±0.03	112±1.02
19	Claroteidae	*Auchenoglanis spp*	Catfish	Buro	Ako	4±0.04	5±0.01	5±0.00	14±0.10	1±0.00	29±0.00
20		*Tetraodon lineatus*	Toadfish			10±0.01	4±0.20	2±0.00	4±0.01	4±0.01	24±0.00
Total	12	20				4,395±1.00	5,772±2.02	5,173±1.23	4,665±1.03	6,083±2.05	26,069±2.34

Table 2. Shannon-Weiner diversity parameters of the station sites

Diversity parameters	A	B	C	D	E
H’	2.432	2.732	2.612	2.881	2.881
E	0.243	0.273	0.261	0.280	0.280
S	4395	5772	5173	4665	6083

Where H’ = Shannon entropy E = Evenness S = Species richness (Abundance)

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