STUDIES ON FISHES SPECIES DIVERSITY OF RIVER HADEJIA JIGAWA STATE NIGERIA

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ABSTRACT

The aim of the research was to study the abundance and diversity of fish in river Hadejia. The study was carried out from April to September, 2016. The fishing sites were Marke, Dingare and Hadejia-barrage. Data collection was done on monthly basis taking length and weight of fishes, using standard procedure and key for identification. Two hundred and twenty-five (225) fishes were sampled comprising twenty (20) genera belonging to fourteen (14) families. The families identified included: Bagridae, Centropomidae,Characidae,Cichlidae, Citharidae, Lariidae, Cyprinidae, Malapturidae, Mochochidae, Lepidoserinidae, Mormyridae, Osteoglossidae, Polypteridae, and Shilbeidae. The family Mormyridae has the highest genera. River Hadejia has high diversity of fishes as indicate by the Shannon wiener diversity index of 2.93 and the population evenness of average 0.98 in all the landing sites as well as Menhinick richness of average 2.35, these can be confirmed as the twenty-two species of commercial importance were recorded.

Keywords: River Hadejia, fish species diversity, morphometric features

INTRODUCTION

Inland water bodies have support rich and diversified assemblage of fishes and thus critically important to the people as source of protein and perennial means of livelihood. Inland fishes comprise approximately 40% of all fish species and 20% of vertebrate species (Helfman *et al*.,2009). However, the challenges in finding fishes in developing countries and remote areas, suggest that inland fishes are more diverse than the reported estimate. Additionally, 65% of the inland habitat is classified as moderately or highly threatened by anthropogenic stressors (Vorosmarty *et al*., 2010).

Fish occupy almost all major aquatic habitats (Helfman *et al*., 2009), they are among the most abundant class of vertebrates. Fish exhibit enormous diversity of size, shape and biology in the habitats they occupy. Inland fish can play critical roles in the function of their ecosystems (Dudgeon *et al*., 2006).

The diversity and distribution of fish species are determined by biotic and abiotic factors (Schlosser, 1987) operating on a range of spatial scales (Tonn, 1990). At the global scale, river (surface area of the drainage basin and mean annual river discharge) and energy availability (net primary production) are the most important factors influencing patterns of fish species richness (Oberdorff *et al*., 1995; Guegan *et al*., 1998). Climate (Hughes *et al*., 1987) along with historical factors such as speciation rates and dispersal, regulate the importance of local- scale factors (Oberdorff *et al*. , 1995).

On a local scale, species richness is related to biological factors like interspecific competition (Ross *et al*., 1985), predation (Moyle & Vondracek, 1985) and physical factors like habitat diversity (Bhat, 2004), water chemistry (Rahel, 1986), temperature, flow regime and channel morphology (Bhat, 2004). Thus the patterns observed in local communities are probably determined by both local mechanisms as well as large scale processes (Tonn, 1990).

Biodiversity of inland fishes at both species and population levels also confers important benefits. When people rely upon functioning ecosystem for their basic needs, natural disasters and other disturbances to those ecosystems can be devastating. Natural ecosystems that recover quickly from such disturbances have resilience. Ecosystems high species richness exhibit increased resilience (Downing & Leibold,2010). Highlighting the importance of a diverse inland fishes community.

The Hadejia-Nguru wetlands are exceptionally productive area in northern Nigeria formed by the Hadejia and Kano rivers flowing in from the west, and Jama'are River flowing in from south. The Hadejia wetland is a home of people most of whom primarily make their living from flood-recessional agriculture, grazing and fishing which is dependent on a strong seasonal rainfall regime. The natural flow regime of Komadugu-Yobe River is seasonal with high flows after the rainy season and low or zero flows during dry season. Virtually all of the rivers lose flow as they approach Lake Chad as a result of evaporation, transpiration and principally infiltration. There is no doubt that the ground water recharge comes mainly from the inundation of the swamps (Fadama) and floodplain rather than from the river channels themselves (NHI, 2015).

MATERIALS AND METHODS

Study Area

Jigawa state is situated in the north-western part of Nigeria between the latitudes 11.00° North to 13.00°North and longitudes 8.00° East to 10.15°East (12°00ˈN 9°45ˈE/12.000°N 9.750°E). Hadejia is one of the local governments of Jigawa State. It is located at 12.45°North latitude and 10.04°East longitude (12°27ˈN 10°2ˈE) and 337 meters elevation above the sea level. It lies on the northern bank of a river known as river Hadejia.

River Hadejia is a part of the Yobe river basin in northern Nigeria (*Goes*, 2001). It is a seasonal stream that flows through northeastward through Jigawa state.

A barrage has been constructed to provide a short-term storage of water to irrigate the Hadejia valley irrigation project. The hadejia- barrage landing site is located in the middle reach of Hadejia River at Auyo local government.

Average sunshine for the area is 8 hours while temperature is highest in April/May (ranging between 32° C and 40° C). Temperature is lowest in December and January ranging between 12° C and 17° C).

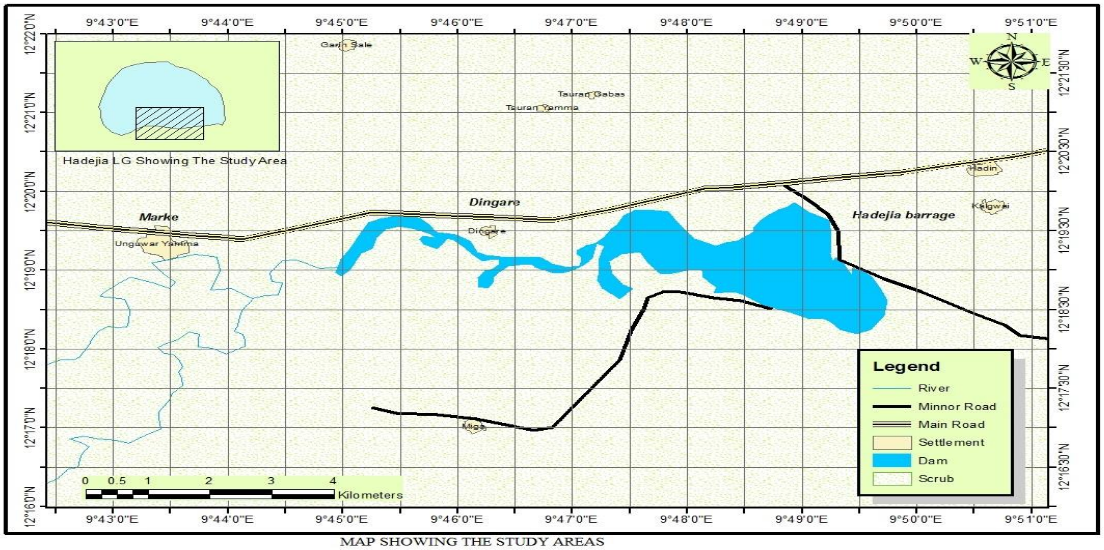

Figure 1: Map of river Hadejia showing the study areas

Sampling Technique

Preliminary survey of the landing sites was carried out, sampling of fishes' diversity from the study area was conducted on monthly basis for the period of six months (from April to September,2016), through direct observation and record of the fish species, fishers and fishing gears used. Three landing sites were selected; they are Marke (site 1), Dingare (site 2) and hadejia –barrage (site 3). At each site, three fishermen were identified based on the type of fishing gears they are using. Fish species were collected from fishers for identification using keys by Reed *et al.,* (1967).

Statistical Analysis

Shannon-Wiener diversity index (H) was used to evaluate species diversity and evenness (E). Menhinick richness index (D) was used to evaluate the species richness. Relative abundance of the fish species was also calculated. Descriptive statistics (mean and standard deviation) and one-way anova were used to analyze the data on morphometric features of the fish species.

RESULTS

The result of the study indicates that the total number of the fish sampled were 225 out of which 86 were from site 1 (Marke), 65 from site 2 (Dingare) and 74 from site 3 (Hadejia-barrage). Fourteen families were identified from the three landing sites including the following: Bagridae, Centropomidae, Characidae, Cichlidae, Citharinidae, Clariidae, Malapturidae, Mochochidae, Lepidoserinidae, Mormyridae, Osteoglossidae, Polypteridae and Shilbeidae. **Table 1:** The highest catch was observed in the month of June, July, August and September.

Table 1: List of fish families identified in three different landing sites of river Hadejia

SN	FISH FAMILY	GENUS	SPECIES	ENGLISH NAME	LOCAL NAME
1	BARIGADE	*Bagrus*	*Bagrus spp.*	Silver Catfish	Ragon ruwa
2	CENTROPOMIDAE	*Lates*	*Lates niloticus*	Nile Perch	Giwar ruwa
3	CHARACIDAE	*Alestes*	*Alestesbaremose*	Silver sides	Saro
			Alestes nurse	Silver sides	Kawara
		Hydrocynus	*Hydrocynus spp.*	Tiger fish	Tsage
4	CICHLIDAE	*Hemichromis*	*Hemichromis spp.*	Jewel fish	Kulkula
		Tilapia	*Tilapia spp.*	Mango fish	Karfasa
5	CITHARINIDAE	Distichodus	*Distichodus spp.*	Grass eater	Kausa
6	CLARIIDAE	*Clarias*	*Clarias spp.*	Mud fish	Tarwada
7	CYPRINIDAE	*Labeo*	*Labeo spp.*	African carp	Burdo
8	MALAPTURIDAE	*Malapterurus*	Malapterurus electricus	Electric fish	Minjirya
9	MOCHOCHIDAE	*Synodontis*	*Synodontis spp.*	Cat fish	Kurungu
10	LEPIDOSERINIDAE	*Protopterus*	*Protopterus spp.*	African Lungfish	Gaiwa
11	MORMYRIDAE	*Gnathonemus*	*Gnathonemus abadii*	Trunk Fish	Tatari
		Gnathonemus	*Gnathonemus niger*	Mormyrid	Dagari
		Hyperopisus	*Hyperopisus spp.*	Mormyrid	Kanzai
		Marcusenius	*Marcusenius spp.*	Mormyrid	Faya
		Mormyrops	*Mormyrops spp.*	Mormyrid	Milgi
		Mormyrus	*Mormyrus spp.*	Elephant-Snout Fish	Sawayya
12	OSTEOGLOSSIDAE	*Heterotis*	*Heterotis niloticus*		Bargi
13	POLYPTERIDAE	*Polypterus*	*Polypterus spp.*	Sailfins Of Bichirs	Gartsa
14	SHILBEIDAE	*Shilbe*	*Shilbe mystus*	Butter Fish	Lulu

Table 2: Diversity of fish species in river Hadejia

Sampled stations	Marke	Dingare	H-barrage
No. of sampling	6	6	6
No. of species	21	18	22
No.of individuals	86	65	74
Menhinick richness index (D)	2.27	2.23	2.56
Shannon wiener diversity index (H)	3.00	2.77	3.02
Evenness (E)	0.99	0.96	0.98

Table 2 indicates the diversity index calculated from the study sites. Site 3 (Hadejia-barrage) has the highest number of species with 22, followed by site 1 (Marke) with 21 and site 2 (Dingare) has the least number of species 18. Shannon-Wiener diversity index, diversity was maximum in site 3 (Hadejia-barrage) with value of 3.02, followed by site 1 (Marke) with value of 3.00 and site 2 (Dingare) had the least value 2.77. Evenness was highest in site 1, with value of 0.99, followed by site 3, with value of 0.98 and site 2 has the least value of 0.96. Menhinick richness index was highest in site 3 with value of 2.56, followed by site 1 with value of 2.27, and site 2 has the least richness value of 2.23.

Table 3 presents the distribution of the fish species in the sampled sites. All the fish species were well distributed in all the sampled sites with the exception of *Alestes baremose*, *Hydrocynus* Sp, *Marcusenius sp.*, *Heterotis niloticus* that were not found in site 2 (Dingare), and *Hemichromis* species in site 1 (Marke) during the period of the study.

Table 3: Fish Distribution per Landing sites

Species	Marke (%)	Dingare (%)	H-barrage (%)	Total (%)
Alestesbaremose	2 (0.89)	- (-)	1(0.44)	3(1.33)
Alestes nurse	5 (2.22)	2 (0.89)	3(1.33)	10(4.44)
Bagrus spp.	7 (3.11)	5 (2.22)	5(2.22)	17(7.56)
Clarias spp.	6 (2.67)	6 (2.67)	3(1.33)	15(6.67)
Distichodusspp.	4 (1.78)	2 (0.89)	5(2.22)	11(4.89)
Gnathonemu sabadii	5 (2.22)	3 (1.33)	2(0.89)	10(4.44)
Gnathonemus niger	2(0.89)	1 (0.44)	2(0.89)	5(2.22)
Hemichromis spp.	- (-)	1 (0.44)	1(0.44)	2(0.89)
Heterotis niloticus	5 (2.22)	-(-)	3(1.33)	8(3.56)
Hydrocynus spp.	1(0.44)	-(-)	2(0.89)	3(1.33)
Hyperopisus spp.	4 (1.78)	4 (1.78)	2(0.89)	10(4.44)
Labeo spp.	4 (1.78)	3 (1.33)	4(1.78)	11(4.89)
Lates niloticus	6 (2.67)	5 (2.22)	5(2.22)	16(7.11)
Malapterurus electricus	6 (2.67)	2 (0.89)	4(1.78)	12(5.33)
Marcusenius spp.	3 (1.33)	- (-)	2(0.89)	5(2.22)
Mormyrops spp.	4 (1.78)	3 (1.33)	4(0.89)	11(4.89)
Mormyrus spp.	4 (1.78)	5 (2.22)	4(0.89)	13(5.78)
Polypterus spp.	3 (1.33)	1 (0.44)	2(0.89)	6(2.67)
Protopterus spp.	1 (0.44)	3 (1.33)	2(0.89)	6(2.67)
Shilbe mystus	4 (1.78)	1 (0.44)	4(1.78)	9(4)
Synodontis spp.	4(1.78)	8 (3.56)	6(2.67)	18(8)
Tilapia spp.	6 (2.67)	10 (4.44)	8(3.56)	24(10.67)
Total	86(38.23)	65(28.86)	64(32.89)	225(100)

The genus Tilapia and Synodontis constituted the dominant fish genera with percentage of 10.67%, and 8.00%, followed by *Bagrus sp* with 7.56%, and *Lates niloticus* constituting of 7.11%. Other species identified were *Clarias sp.* with 6.67%, *Mormyrus sp.,* 5.78%, *Malapterurus electricus* 5.33%, *Distichodus,* sp., *Labeo sp.* and *Mormyrops sp.,* having 4.89% each, *Alestes nurse, Gnathonemusabadii sp.* and *Hyperopisus sp.* recording 4.44% each, *Shilbe* 4%, *Heterotis* sp. 3.56%, *Polypterus sp.,* and *Protopterus sp.* 2.67%, *Gnathonemus niger* and *Marcusenius* sp., 2.22%, each *Alestes baremose* and *Hydrocynus sp* similarly records of 1.33%.

DISCUSSION

The results obtained has shown that family Mormyridae and Characidae constituted the dominant fish families in the river, thus the result agreed with the other studies conducted on a number of rivers in Nigeria (Odo and Nwami,2008). This work agrees with the work of Wuraola and Adetola (2011) on Oni River and that recorded Mormyridae as the dominant fish family and the work of Odo and Nwani (2008) on Anambra river basin that also recorded Characidae and Mochochidae as the dominant fish families. The dominance of the Mormyrids may be due to the features that the environments possess which includes the presence of typha grass which makes the fish thrive better because it conforms to their basic ecological and biological requirements. They also feed on worms and detritus which occur more at the bottom. Mormyrids are typical bottom dwellers, and the majority of the species are most common in deep water around fallen trees where the current is not swift.

The higher occurrence of the Characidae could also be due to abundance of smaller fishes, insects and worms on which they feed on being a predator, (*Hydrocynus sp.,)* and the *Alestes* are numerous in rivers and ubiquitous throughout the region and they leave near the surface and reputed to feed on plankton, insects, larvae, water beetles, snails and plants.

The family Cichlidae and Mochochidae are the next second most abundant due to the high number of their species, this agreed with the work of Meye and Ikomi (2012) on river Orogodo, Niger Delta and Adams *et al.,* (2015) on river Hadejia that recorded Cichlidae as the most abundant fish family. The work is also similar to the result of work done by Odo and Nwani (2008) on Anambra river basin that found Mochochidae among the most dominant fish family.

The abundance of Cichlidae could be associated with it being highly prolific and especially when the habitat provides suitable shelter, breeding and feeding grounds for them, and their ability to utilize wide range of foods at the lower trophic level as herbivores, high fecundity, prolific nature, hardiness, easy to grow and parental care. Other important families by number were Bagridae, Centropomidae, and Clariidae.

Features between the three landing sites this variation between the three landing sites could be as a result of differences in the availability of food or differences of surface area, stage of maturity and sex. The nature of substratum as well as variation in dietary items, have been observed to influence morphometric features of species population. According to Turan *et al* (2005), Omoniyi and Agbon (2008) distinct environmental structure causes the high morphometric variation and plasticity which response to differences in environmental condition such as food abundance and temperature.

It can be concluded that River Hadejia has high diversity of fishes with fourteen families as indicate by the Shannon wiener diversity index of 2.93 and the population evenness of average 0.98 in all the three landing sites as well as menhinick richness of average 2.35, these can be confirmed as the twenty-two species of commercial importance were recorded.

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