EFFECTS OF RAINFALL ON FISH COMMUNITY STRUCTURE IN AGAIE-LAPAI DAM RESERVOIR OF NIGER STATE, NIGERIA

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ABSTRACT

The effects of rainfallon fish biodiversity in Agaie-lapai dam reservoir were studied by monthly samplings and measurements taken from 2013 to 2014. The reservoir is situated at 9^0 39′ N latitudes and 6^0 33′ E longitudes located near Bakaje at the confluence of the Jatau River. The reservoir was constructed for irrigation, fisheries and tourism purposes. Samples of fish was collected from the fishermen in two landing sites where catcheswere done using cast nets, seine nets and hooks and lines in designated stations. Eleven families were identified during the study belonging to Brigridae 2 species, Characidae 2 species, Schilbeidae 2 species,Cichlidae 5 species, Clariidae 2 species Cyprinidae 3 species, Chanidae, Hepsetidae, Malapteruridae, Mochokidae and Mormyridae had 1 specie each respectively. The species diversity was at its peak in the wet season, coinciding with favourable conditions such as highwater level and abundance natural food. The reverse was the case in the dry period as a result of low level of the water in the reservoir, insufficient food items and uncontrolled fishing practices. The highest species richness value (1.08) was recorded for Schilbeidae while the lowest record of (0.56) value for Hepsetidae. Lapai dam reservoir is a small, unpopular, unmanaged and unmonitored.To correct these abnormities, an urgent need to reverse the trend by government is paramount.

KEY WORDS: Hydrological factors, Fish biodiversity, Fish fauna and Species diversity.

INTRODUCTION

The role of diversity index in the structure of fish communities in lakes and reservoirs has been the focus of many studies (Castillo-Rivera, 2013). These studies have shown changes in species diversity which may be influenced by constant fluctuations in hydrological factors such as rainfall, inflow rate of water and the depth of the reservoirs (Zarate-Hernandez*et al.*,2012). Fisheries and aquaculture sectors are crucial to food security, poverty alleviation and wellbeing of the developed and developing countries of the world.It forms the administrative policy of most government of the developing countries including Nigeria (Olashinde and Abeke, 2010).

MATERIALS AND METHODS

Study Area

Agaie/ Lapai dam is located at latitude 9°39'N and longitude 6° 33'E southwest of Minna. It has a capacity of 38 million cubic meters and a crest length of 1.600 meters. Its average depth is about 10.8 meters and becomes progressively shallower towards the inflow part, where it measures less than 1.64 meters. The shore is not easily accessible during wet season. There are three tributaries and then one spillway on the side of the embankment of the dam.
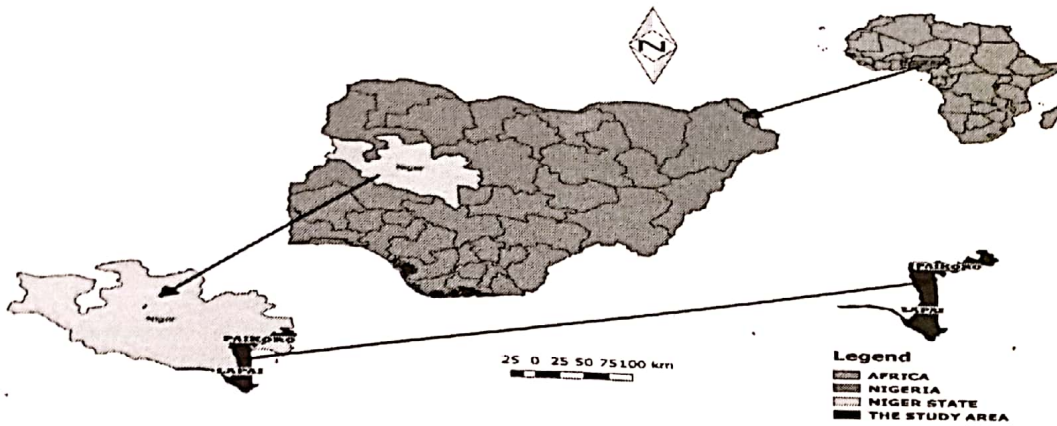
Figur e 1: The location of Lapai dam reservoir (inset map of Nigeria and Africa)

Measurement of rainfall: Daily rainfall measurement was taken using standard rain gauge stationed at the dam site.

Sampling:Fish sampling

Samples of fish were collected from the fishermen intwo chosen landing sites (Bakajiba and TuganGana) southwest and Northeastern part of the reservoir respectively. Fishermen caught fishes with castnets,seine netsand hooks and lines. Passive netwas set in the designated sampling stations in the reservoir. The fishes collected werebrought to laboratory and preserved in 10 % formalin solution in separate specimen jars according to the size of fish species. Small fishes were placed in 10 % formalin directly, while larger fishes were given an incision of formalin in their abdomen and preserved. The fishes were identified following the procedures and description contained in the standard books and keys.

Community structure Analysis: The calculations of all the indices were done online at http://www.alyoung.com/labs/biodiversity_calculatio r.html

Water Physical and Chemical parameters

Water physical and chemical parameters were measured following the methods described by the America Public Health Association (APHA, 2008).

RESULTS

Fish species composition and abundance

The total results of the abundance of fish species per month from May, 2013 to October, 2014inLapai reservoir. The result shows *Tilapia zilli*had the highest number of four thousand, nine hundred and seventy-five (4975) individual species and distantly followed by*Hemichromisfasciatus* with one thousand six-hundredand fifty-six species. The least species counted within the period were*Hepsetusodeo,Malapteruruselectricus,Schilbeur anoscopus,*and*Labeo senegalensis* with ten (40), thirty-two(56), thirty-nine (63) and one hundred and nineteen (119) species. The species were groups into eleven families and twenty-three genera (Table 2).

Table 2: Fish composition in Lapai dam reservoir between May, 2013 and October, 2014

Fish family	Genus	Species	Abundance	Percentage
Bagridae	Auchanoglanis	occidentalis	679	4.6
	Bagrus	bayad	517	3.5
Chanidae	Parachanna	obscura	513	3.45
Characidae	Alestes	macrophthalmus	597	4
	Micralestes	elongates	320	2.15
Cichlidae	Hemichromis	faciatus	1,656	11.14
	Hemichromis	bamaculatus	335	2.25
	Oreochromis	niloticus	677	4.55
	Tilapia	zilli	4,975	33.48
	Sarotherodon	galilaeus	514	3.45
Clariidae	Clarias	gariepinus	517	3.5
	Heterobranchus	bidorsalis	144	0.96
Ccyprinidae	Garra	waterloti	214	1.44
Hepsetidae	Labeo	senegalensis	119	0.8
	Raiamas	senegalensis	162	1.09
Hepsetidae	Hepsetus	odeo	40	0.27
	Hepsetus	pictus	472	3.18
Malapteruridae	Malapterurus	electricus	56	0.37
Mochokidae	Synodontis	nigrita	1,227	8.25
Mormyridae	Mormyrus	rume	239	1.6
Schilbeidae	Petrocephalus	soudanensis	496	3.3
	Petrocephalus	bane	327	2.3
	Schilbe	uranoscopus	63	0.42
		TOTAL	14,859	100

Fish diversity and species richness in Lapai dam reservoir

The diversity of the family of fish in Lapai dam reservoir reveal variations in the Margalef species richness and Shannon/Weaver values between 0.17 and 0.54, and 0.38 and 0.95 (Table3). The lowest value for species richness was recorded for the family of Claridae, while the highest was recorded for Cichlidae. The diversity values showed that the family of Cyprinidae had the lowest value and the highest value was recorded for the family of Cichlidae.
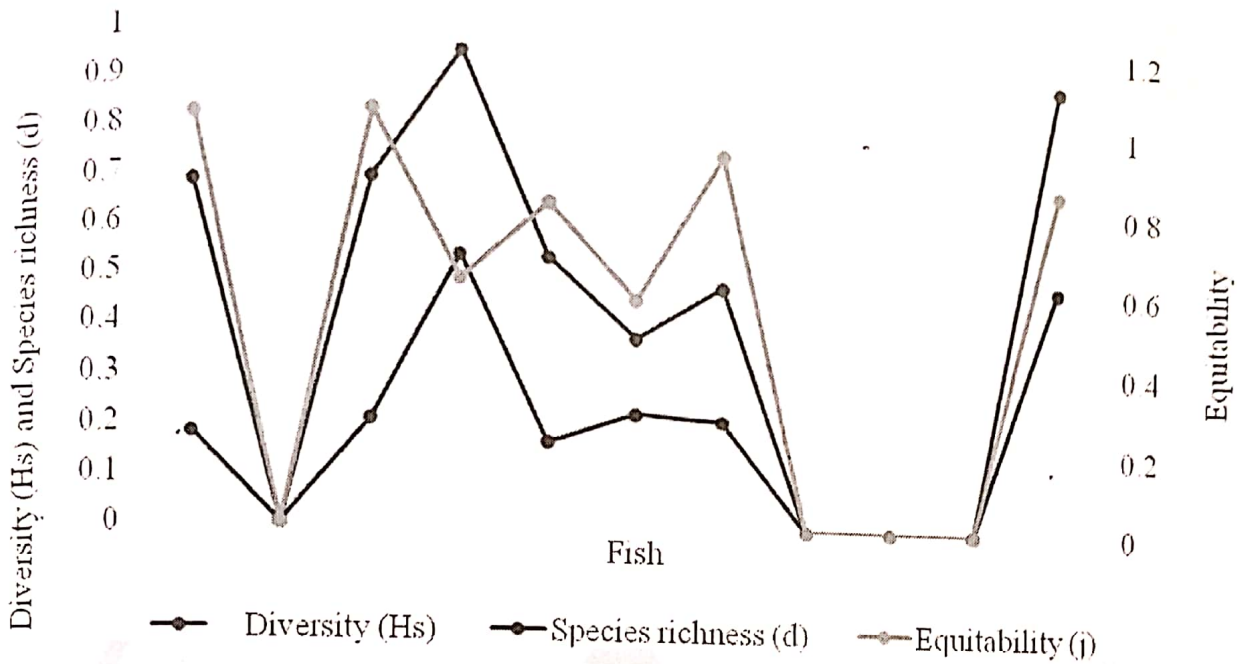
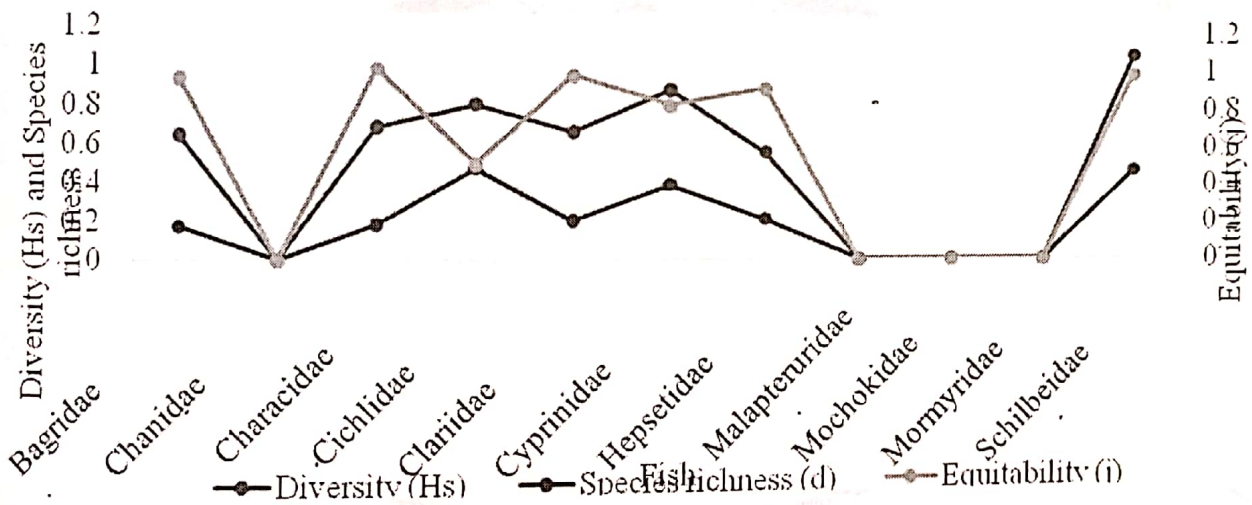Figure 1: Biodiversity of fish in Lapai dam reservoir in the wet season of 2013

Figure 2: Biodiversity of fish in Lapai dam reservoir of the dry season in 2013

DISCUSSION

The role of diversity in the structuring of fish communities in lakes and reservoirs has been the focus of many studies (Perbiche-Neves et al., 2012; Zhou et al., 2012; Adesalu,2013; Veradharajan and Soundarapandian, 2013; Dimowo, 2013, and Dalal and Gupta, 2013). These studies have shown changes in species diversity which may be influenced by constant fluctuations of rainfall.The family like the Schilbedae and Cichlidae were more dominant. This is in contrast with the findings of Thirumala et al., 2011, who reported the species of Cirrhinus, Salmostoma, Rasbora and Puntius to be more dominant in Bhadra reservoir in India.The species of Schilbedae and Cyprinidae were highly diversified in the dry period whilst the species richness of Cichlidae and Schilbedae top the groups studied. In contrast,Castillo-Rivera, 2013,identified Anchoamitchilli, Oreochromis mossambicusand

Anchoafelis as the most abundance and diversified in a Tropical Estuary, Mexico.

CONCLUSION

There are rich diverse cultivable species of fish in the reservoir. These species are in numerous small reservoirs across the country which should be incorporated into the value system of Nigeria society.

RECOMMENDATIONS

i. Regular fish stock assessment should be mentained.
ii. Identify conservation plan for effective monitoring.
iii. There is urgent need to protect the existing indigenous fish stocks.
iv. Enhance the fish quality and incorporate them into the value chain system of the society.

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