EVALUATION OF FISH BIODIVERSITY INTEGRITY OF EBONYI RIVER

UDE, E. F.

Department of Fisheries and Aquaculture,
Ebonyi State University, P. M. B. 53, Abakaliki-Nigeria

ABSTRACT

A study of the fish biodiversity integrity of Ebonyi River was conducted from September 2006 to February 2008 to generate fundamental data needed in Fisheries policy formulations and to assess the potential of the Fishery in enhancing quality food protein production. A total number of 1,080 fishes (comprising Fin-fish and shell-fish) were caught with hooks and lines of size 13, cast nets, gill nets and traps of mesh sizes of 50mm, 75mm and 100mm and identified using taxonomic keys. There were 39 species belonging to 20 genera and 14 families. Percentage gear catch composition was 43.6%, 23.8%, 17.7% and 15.3% for castnets, gillnets, hooks and traps respectively. Zooplankton samples were also collected identified and analyzed using standard plankton analysis protocol. Cladocerans, rotifers, copepods and protozoans were represented in the identified species. Analysis of Variance (ANOVA) was used to determine the overall significance of the monthly means of all parameters and in locations and also to establish their correlation characteristics. Fisher's Least Significant Difference (F-LSD) was used to separate the means and to rank them. Family Amphilidae and Malapteruridae were not significant (p□0.05) in monthly occurrence. Family Bagridae, Cichlidae and Clariidae showed highly significant ($p<0.01$) monthly differences while the remaining fish families exhibited significant ($p<0.05$) differences in months. It was observed that artisanal fisherfolks used fishing gears whose mesh sizes deplete juvenile fish. It was concluded that there is an urgent need for improved management strategies to enhance sustainable productivity of the inland river system.

INTRODUCTION

A significantly large proportion of the earth's biodiversity, representing nearly all kinds of organisms – from microorganisms to mammals – inhabits inland waters (Revenga and Kura, 2003). In spite of covering about 1% of the total land surface, inland waters are habitat to about 100,000 aquatic species, including 10, 000, or 40% of all fish species (FAO, 1997).

During the past decade, there has been great concern over the rapid loss of biodiversity. The causes and consequences of the growing loss have been discussed in numerous publications. The biodiversity of inland aquatic ecosystems has also received some attention in recent years and several factors responsible for its decline are well recognized (Groombriedge and Jenkins, 1998, Revenga and Kura, 2003 and Gopal, 2005).

Lool (2006) reported that removing just one fish species from a tropical river can have major effects on the ecosystem's health. The biodiversity of inland aquatic ecosystems, and in some cases the very existence of the ecosystems, is increasingly threatened by a variety of factors all of which are related to humans. Ever increasing human population places a direct pressure on the limited resources through increasing demand to meet the basic needs (e.g., domestic, drinking and agriculture), yet less attention is given to in-depth research on inland aquatic ecosystems to influence policies that govern activities in the environment and to achieve economic development via fisheries.

MATERIALS AND METHODS

Fish samples (fin-fish and shell-fish) were obtained three times monthly at 10 days interval from September 2006 to February 2008, from fishermen who used hook and line of size 13, gill nets, cast nets, bag nets and traps of various mesh sizes to catch the fish. The collected species were taken to the laboratory, sorted and identified to families, genera and species levels, using the identification keys of Reed *et al.* (1967) and Olaosebikan and Raji (1998). The species collected were weighed to the nearest 0.1g using digital scale; total and standard lengths were determined to the nearest 1mm using graduated meter rule on a measuring board. Zooplankton samples were also collected, identified and analyzed using plankton analysis protocol as prescribed in APHA (1999), Edmondson (1959), Pennak (1978) and Mergeay *et al.* (2005). Analysis of Variance (ANOVA) was used to determine the overall significance of the monthly means of all parameters and their interactions in locations. Fisher's Least Significant Difference (F-LSD) was used to separate the means and to rank them.

RESULTS AND DISCUSSION

Values recorded for all fish families (Table 1) indicated that fish abundance was highest between the months of December 2006, 2007 and also March 2007; this may be attributed to low water level resulting from reduced or absence of precipitation and increased evaporation thereby making fish more vulnerable and easier to catch in the season. It could also be as a result of breeding during the season. The total weight of fish collected during the study period was 81, 940.31g. Family Clariidae recorded the highest value (50.6%) followed by family Characidae and Cichlidae which recorded 7.9% each.

Family Bagridae recorded the least value in percentage composition by weight (0.3%). Further research will also establish the status of this family in terms of endemicity.

Clarias gariepinus recorded the highest percentage composition of fish by weight per species (24. 4%). This value is significant considering the economic value of the species and aquaculture promise, for Ebonyi State. This was followed by *Hepsetus odoe* which recorded 11.2% by weight. It was discovered that the caudal fin of *Hepsetus odoe* in Ebonyi River is biforkated with pointed lobes. This differs from the diagram of same species presented in Reed *et al.*, (1967), which has rounded lobes. *Arius heudloti, Alestes chaperi,* and *Synodontis melanopterus* each recorded 0.1% composition by weight per species. Percentage gear catch composition per fish family indicates that fish catch with cast nets, gill nets, hooks and other traps were 43.6%, 23.8%, 17.7% and 15.3% respectively(Table 2). This reflects the catch efficiency of the gears over different fish families inhabiting different zones of the water body. Cast net recorded highest while traps recorded the least.

Table 2: Percentage gear catch composition per fish family

Months (M)	Rotifers	Cladocerans	Copepods	Protozoan	Nauplii
September 2006	2.750	24.00	13.75	0.125	0.000
October 2006	2.500	23.25	15.38	0.000	0.000
November 2006	2.375	22.88	17.25	0.125	0.125
December 2006	2.375	25.38	19.12	0.750	0.750
January 2007	2.625	26.88	20.00	0.375	0.375
February 2007	4.500	35.12	25.12	1.000	1.000
March 2007	5.500	47.00	61.50	1.000	1.000
April 2007	3.750	49.25	50.38	0.625	0.625
May 2007	1.375	22.00	7.25	0.000	0.000
June 2007	0.875	19.50	4.50	0.000	0.250
July, 2007	0.625	13.62	2.37	0.250	0.000
August 2007	1.000	4.00	4.75	0.000	0.000
September 2007	0.000	5.62	4.00	0.000	0.000
October 2007	1.375	22.25	9.38	0.375	0.250
November 2007	2.125	20.62	17.62	0.375	0.375
December 2007	0.875	21.75	20.12	0.375	0.375
January 2008	2.250	27.12	20.50	0.500	0.500
February 2008	3.125	33.00	24.00	1.000	1.125
$FLSD_{(0.05)}$	0.8552**	4.805**	4.221**	0.5572**	0.5120**
Stations (S)					
1	2.194	25.64	18.53	0.250	0.250
2	2.917	27.92	22.00	1.000	0.944
3	1.972	22.92	17.25	0.111	0.139
4	1.806	22.03	17.11	0.167	0.167
$FLSD_{(0.05)}$	0.4031**	2.265**	1.990**	0.5572**	0.2414**

Levels of significances: * = $p<0.05$; ** = $p<0.01$ and NS = non significant

Table 1 : .Summary of Monthly Means of Fish abundance of Ebonyi River in relation to locations

Months (M)	Aphilid-ae	Ariida e	Bagrid ae	Characi dae	Cichli dae	Clarii dae	Cypri nidae	Hepse tidae	Malapteri idae	Mochoki dae	Mormy ridae	Osteoglo ssidae	Palaem onidae	Schilbedae
September 2006	0,0000	0.000	0.000c	0.38	2.50	0.25	0.000	0.00	0,000	0.125	0.38	0.000	0.38	0.00
October 2006	0.1250	0.125	0,000c	0.25	1.38	0.62	0.125	0.25	0.000	0.000	1.12	0.000	0.38	0.25
November 2006	0.0000	0.000	0.000c	1.12	3.12	1.00	0.000	0.38	0.000	0.000	1.62	0.000	0.62	0.12
December 2006	0.0000	0.000	0.000c	1.50	3.50	0.88	0.000	0.50	0.000	0.250	0.25	0.125	0.62	0.75
January 2007	0.0000	0.125	0.125bc	2.12	2.00	2.00	0.250	1.00	0.125	0.500	0.50	0.000	0.62	1.88
February 2007	0.0000	0.000	0.250ab	1.38	0.75	3.00	0.375	0.75	0.250	0.375	0.88	0.000	1.25	0.00
March 2007	0.0000	0.375	0.000c	2.25	0.88	3.38	0.625	1.25	0.125	1.000	0.88	0.000	1.75	1.62
April 2007	0.0000	0.625	0.000c	2.87	0.50	1.62	0.375	1.75	0.250	1.000	0.25	0.125	1.38	1.12
May 2007	0.0000	0.750	0.125b	0.00	0.38	3.88	0.500	1.12	0.000	0.625	0.38	0.000	0.75	1.38
June 2007	0.0000	0.375	0.000c	0.13	0.12	1.12	0.000	0.50	0.000	0.000	0.25	0.125	0.00	0.12
July, 2007	0.0000	0.000	0.000c	0.00	0.50	1.00	0.000	0.12	0.000	0.000	0.12	0.250	0.00	0.25
August 2007	0.0000	0.000	0.000c	0.00	0.50	0.12	0.000	0.25	0.000	0.000	0.12	0.750	0.00	0.25
September 2007	0.0000	0.000	0.000c	0.00	1.00	0.25	0.000	0.00	0.000	0.000	0.00	0.000	0.00	0.12
October 2007	0.0000	0.000	0.000c	0.13	4.25	0.88	0.125	0.12	0.000	0.125	0.00	0.000	0.00	0.00
November 2007	0.0000	0.000	0.000c	0.62	4.00	1.25	0.000	0.38	0.000	0.250	0.00	0.000	0.12	0.12
December 2007	0.1250	0.000	0.000c	0.75	2.50	0.88	0.375	0.62	0.000	0.375	1.00	0.000	0.38	0.50

Levels of significance: * = $p<0.05$; ** = $p<0.01$ and NS = non significant

Shell fish caught were *Macrobrachium vollenhovenii* belonging to family Palaemonidae. The values of catch recorded in the months of the rainy season were lower for all species. This may be due to high water volume and surface area during this season; providing hiding places for the fish and making them difficult to catch. This assertion agrees with Mitch and Groselink (2000); Leveque *et al.* (2005) and Moses (1983a). It was observed that there was general lack of awareness on the implications of obnoxious fishing practices within the area; and this may be contributory to the unregulated use of nets and traps of various mesh sizes and perhaps overfishing.

The zooplankton identified were cladocerans, rotifers, copepods and protozoans (Table 3). Cladoceran species were more abundant and predominantly occurred in all months of the study period. Rotifers are described as the most important natural food of the fish fry (Woynarovich and Horvath, 1980). Five species were identified. The remarkable representation of this group in the river holds great promise for promoting rich fish diversity of the river. Copepods were represented by five (5) species all of which predominantly occurred in all months during the study period. Protozoa showed the least representation in terms of species diversity and occurrence. The monthly means of all the groups showed significant ($p<0.01$) difference from each other as well as in different locations. There was also significant interaction ($p<0.05$) between protozoan and nauplii.

Table 3. Summary of Monthly Means of Zooplankton assemblage of Ebonyi River

	CASTNET (%)	GILL NET (%)	HOOK (%)	OTHER TRAPS (%)
Amphilidae	-	0.2	-	-
Ariidae	-	1.2	0.7	-
Bagridae	0.7	-	-	-
Characidae	8.2	3.0	0.4	1.3
Cichlidae	11.5	6.1	2.8	3.8
Clariidae	2.6	4.6	9.8	3.3
Cyprinidae	1.9	0.8	-	0.7
Hepsetidae	4.3	2.0	1.0	0.4
Malapteruridae	0.4	0.2	-	-
Mochokidae	1.8	1.7	1.0	-
Mormyridae	5.5	-	1.0	1.8
Osteoglossidae	1.1	-	-	-
Palinuridae	2.8	-	-	4.0
Schilbeidae	2.8	4.0	1.0	-
	43.6	**23.8**	**17.7**	**15.3**

CONCLUSION

Ebonyi River fishery has potential biological indices that can facilitate increased fish production if properly harnessed. There is therefore an urgent need for improved management strategies to enhance sustainable productivity of the inland river system. This will promote better nutrition and economic wellbeing of the people who live within the vicinity of the river and depend on the resources for sustenance.

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