



EVALUATION OF SEASONAL OCCURRENCE OF CAT FISH FAMILIES IN EBONYI RIVER, NIGERIA

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ABSTRACT

An evaluation of the seasonal occurrence of catfish families in Ebonyi River was conducted from September 2006 to February 2008. An aspect of the biological integrity of the river to promote effective biodiversity conservation of the aquatic living resources was studied. One thousand and eighty (1080) fishes were caught using hook and line, gill nets, cast nets, bag nets and traps of mesh sizes ranging from 50 mm to 100 mm. Two hundred and ninety seven were catfishes belonging to five families namely Amphilidae, Ariidae, Bagridae, Clariidae and Mochokidae. Analysis of variance (ANOVA) was used to determine their seasonal differences. Means recorded for family Amphilidae were not significantly different ($P > 0.05$) from each other. The highest value for Bagridae was recorded in dry season. Monthly values were significantly different ($P < 0.05$) from each other. The Mean values recorded for Clariidae across months were significantly different ($P < 0.01$) from each other, with the highest recorded in wet season. The mean values recorded for Mochokidae across months were significantly different ($P < 0.01$; with the highest value recorded towards the end of dry season. The resources of Ebonyi River present strong economic potential for the sustenance of the rural populace and promotion of their nutritional status if management strategies to enhance healthy biological integrity are implemented.

Keywords: tropical freshwater, inland fisheries, climate change

INTRODUCTION

Scientists are faced with the challenge to provide baseline studies on freshwater biodiversity at regional and global scales, to international policy makers (Postel, 2001). Indeed monitoring the status and trends of freshwater biodiversity is essential to quantify impacts of human activities on freshwater systems and to improve freshwater biodiversity conservation. Estimating global trends for freshwater biodiversity will also be a critical asset for management strategies considering that studies on climate change and water resources and data management systems are currently being developed at a global scale (Leveque *et al.*, 2005). They added that the magnitude of the response of freshwater systems to global change will depend on a complex array of physical and biological factors. These changes are likely to affect the survival, reproduction, and growth of organisms as well as the distribution, persistence and diversity of species.

Welcome (1988) listed 237 inland animal species that have been introduced into 140 countries worldwide, but the total number is now much higher. One of the major problems of the freshwater introductions is its irreversibility, at least at the human lifetime scale. Once introduced and established, it is difficult given current technology to eradicate a fish, mollusc or plant species from a large natural water body. Consequentially, we are likely to see a continued impoverishment of native aquatic

species diversity and an increased homogenization of the world's freshwater biota.

Catfishes command high value in most tropical African countries because of their good taste, size and availability within the rivers that transverse many communities whose inhabitants depend on the aquatic living resources for sustaining their livelihoods. A number of authors (Pringle, 2000; Dudgeon *et al.*, 2006) have reviewed modern-day threats to rivers. Allan and Castillo (2007) outlined some of the threats to include habitat alteration, contaminants, overexploitation, climate change and invasive species. The biodiversity of inland aquatic ecosystem has received some attention in recent years and several factors responsible for its decline are well-recognized (Stiassny, 1999; Keddy, 2000; Revenga *et al.*, 2000; Gopal, 2005). Not much is known about seasonal occurrence of fish families in Ebonyi River, to enhance strategic planning for fish conservation. This work is aimed at providing baseline information to unveil an aspect of the biological integrity of the river to promote effective biodiversity conservation of its aquatic living resources.

STUDY AREA

The area of study is Ebonyi River (Fig. 1) which is a freshwater system that has its source from lower Benue River and opens into Cross River, but transverses the old Abakaliki Zone of Ebonyi State, Nigeria. Abakaliki is situated between $06^{\circ} 19.370'$

North latitudes and 008° 07.692' East longitudes. There are two distinct seasons within the zone; a wet season that starts from April to August and the dry season.

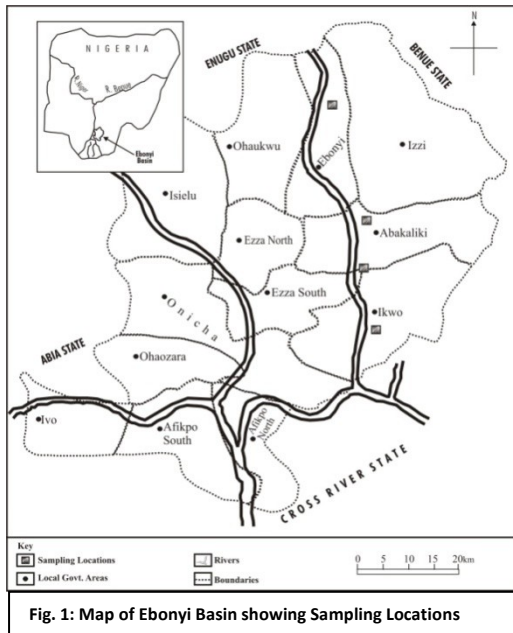


Fig. 1: Map of Ebonyi Basin showing Sampling Locations

MATERIALS AND METHOD

Completely randomized design with three replicates was employed in the experiment. Fish samples were purchased three times monthly from September 2006 to February 2008, from fishers who used hook and line of size 13, gill nets and unselective fishing gears such as cast nets, bag nets and traps of diverse mesh sizes ranging from 50mm to 100 mm, to catch the fish. They 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 pooled data of catches by all gear types in each sampling station was used in assessing abundance by calculating the index of preponderance (IP), which is expressed as percentages of the total weight and number of the fish caught (Moses 1987).

$$IP = \frac{\%N\%W}{\sum (\%N\%W)} \times 100$$

Fishes with IP values less than 0.50 were regarded as being of relatively insignificant contribution while those with IP values greater than 0.50 were regarded as being of significant contribution (Moses 1987).

Analysis of variance was employed to determine the overall significance of the monthly, seasonal, and spatial means of the numbers recorded in different locations in order to depict their seasonal differences. Fisher's Least Significant Difference (F-LSD) was used to separate the mean; and the

differences in mean were ranked using Duncan Multiple range.

RESULTS

One thousand and eighty fishes (Table 1) were caught using unselective gears, out of which 297 were catfishes belonging to five families, namely Amphilidae, Ariidae, Bagridae, Clariidae and Mochokidae at 0.2%, 1.9%, 0.7%, 20.3% and 4.5% percentage occurrence. Their various indices of preponderance (IP) are presented. Family Clariidae had the greatest (66.63) IP. The co-occurring species were from families Characidae, Cichlidae, Cyprinidae, Hepsetidae, Mormyridae, Osteoglossidae, Palaemonidae and Schilbedae.

The monthly mean occurrence of family Amphilidae along Ebonyi River are presented in Table 2. No significant monthly, spatial or seasonal differences ($P > 0.05$) were recorded. The fish family Amphilidae was recorded only in October 2006 and December 2007 during the study period.

The abundance of fish family Ariidae (Table 3) showed significant ($P < 0.01$) distribution. It increased at the onset of the rainy season in the month of March, peaked in May, declined in June and was absent in artisanal catches at the peak of the rainy season and throughout the dry season. Station 2 recorded a significant ($P < 0.01$) occurrence of Arid Catfishes compared to other locations

The distribution of the Bagridae and their fluctuations in Ebonyi River are highlighted in Table 4. The highest occurrence was recorded in February 2008, followed by May 2007. Both were significantly different ($P < 0.05$) from each other, and also varied significantly ($P < 0.05$) from values recorded for other months of the study period. Station 2 recorded a significant ($P < 0.01$) occurrence of Bagrid catfishes compared to other locations.

The monthly mean occurrence and trend of the family Clariidae along Ebonyi River is shown in Table 5. Clarids occurred throughout the year along the River unlike other catfish families in this study. The fish displayed significant spatial and monthly differences ($P < 0.01$) particularly in the months February to May annually. There was also significant ($P < 0.01$) interaction between locations and months.

The trend and monthly mean occurrence of family Mochokidae along Ebonyi River is presented in Table 6. The fish occurs from October to May annually with the highest mean occurrence (1.00) in March and April 2007. Station 2 recorded a significant ($P < 0.01$) occurrence of family Mochokidae compared to other locations. There was also significant ($P < 0.01$) interaction between locations and months.

The trend and monthly mean occurrence of family Malapteruridae along Ebonyi River is presented in Table 7. The fish displayed significant spatial and monthly differences ($P < 0.01$) particularly in the months of December to May

annually. Station 2 recorded a significant ($P < 0.01$) occurrence of family Malapteruridae compared to other locations There was also significant ($P < 0.05$) interaction between locations and months.

Table 1: Fish families of Ebonyi River and their index of Preponderance

FAMILY/SPECIES	TOTAL NUMBER COLLECTED (n)	% OCCURRENCE (COMPOSITION PER SPECIES)	% NUMBER (N) PER FAMILY	% WEIGHT(Wt) (g) PER FAMILY	INDEX OF PREPONDERANCE (IP)
AMPHILIDAE					
Unidentified species	2	0.2	0.2	0.4	0.005
ARIIDAE					
<i>Arius gigas</i>	13	1.2			
<i>Arius heudeloti</i>	8	0.7	1.9	0.6	0.07
BAGRIDAE					
<i>Chrysichthys longifilis</i>	7	0.7	0.7	0.3	0.01
CHARACIDAE					
<i>Alestes nurse</i>	37	3.4			
<i>A. imberi</i>	15	1.4			
<i>A. longipinis</i>	19	1.8			
<i>A. chaperi</i>	14	1.3	12.9	7.7	6.44
<i>A. macrolepidotus</i>	32	3.0			
<i>A. bravis</i>	17	1.6			
<i>Bryconathips quenquesquamae</i>	4	0.4			
CICHLIDAE					
<i>Tilapia Zilli</i>	43	4.0			
<i>Tilapia guineensis</i>	41	3.8			
<i>T. dageti</i>	92	8.5	24.2	7.8	12.24
<i>Oreochromis niloticus</i>	55	5.1			
<i>Hemicromis facatus</i>	30	2.8			
CLARIIDAE					
<i>Clarias aboienensis</i>	17	1.6			
<i>C. ebriensis</i>	27	2.5			
<i>C. anguillar</i>	40	3.7	20.3	50.6	66.63
<i>C. gariepinus</i>	66	6.1			
<i>Heterobranchus longifilis</i>	32	3.0			
<i>H. bidorsalis</i>	37	3.4			
CYPRINIDAE					
<i>Barbus accidentalis</i>	12	1.1			
<i>Barilius niloticus</i>	9	0.8			
<i>Labeo coubie</i>	7	0.7	3.4	2.0	0.44
<i>Labeo brachypoma</i>	9	0.8			
HEPSETIDAE					
<i>Hepetus Odoe</i>	83	7.7	7.7	11.2	5.59
MALAPTERURIDAE					
<i>Malapterurus electricus</i>	6	0.6	0.6	0.8	0.03
MOCHOKIDAE					
<i>Syndontis gambiensis</i>	14	1.3			
<i>S. melanopterus</i>	4	0.4			
<i>S. Omias</i>	11	1.0	4.5	1.5	0.44
<i>S. Clarias</i>	19	1.8			
MORMYRIDAE					
<i>Mormyrus hasselquisti</i>	35	3.2			
<i>M. macrophthalmus</i>	25	2.3	8.3	7.4	3.98
<i>M. rume</i>	30	2.8			
OSTEOGLOSSIDAE					
<i>Heterotis niloticus</i>	12	1.1	1.1	1.2	0.09
PALINURIDAE					
<i>Macrobrachium vollenhovenii</i>	73	6.8	6.8	4.3	1.90
SCHILBEDAE					
<i>Schilbe mystus</i>	41	3.8	7.8	4.2	2.13
<i>Siluranodon auritus</i>	43	4.0			
TOTAL NUMBER	1,080				
NUMBER OF FAMILIES	14				
NUMBER OF SPECIES	39				

Table 2: Monthly Means of Family Amphilidae in relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.0000	0.0000	0.0000	0.0000	0.0000
October 2006	0.0000	0.5000	0.0000	0.0000	0.1250
November 2006	0.0000	0.0000	0.0000	0.0000	0.0000
December 2006	0.0000	0.0000	0.0000	0.0000	0.0000
January 2007	0.0000	0.0000	0.0000	0.0000	0.0000
February 2007	0.0000	0.0000	0.0000	0.0000	0.0000
March 2007	0.0000	0.0000	0.0000	0.0000	0.0000
WET SEASON					
April 2007	0.0000	0.0000	0.0000	0.0000	0.0000
May 2007	0.0000	0.0000	0.0000	0.0000	0.0000
June 2007	0.0000	0.0000	0.0000	0.0000	0.0000
July, 2007	0.0000	0.0000	0.0000	0.0000	0.0000
August 2007	0.0000	0.0000	0.0000	0.0000	0.0000
DRY SEASON					
September 2007	0.0000	0.0000	0.0000	0.0000	0.0000
October 2007	0.0000	0.0000	0.0000	0.0000	0.0000
November 2007	0.0000	0.0000	0.0000	0.0000	0.0000
December 2007	0.0000	0.0000	0.0000	0.0000	0.0000
January 2008	0.0000	0.5000	0.0000	0.0000	0.1250
February 2008	0.0000	0.0000	0.0000	0.0000	0.0000
Mean	0.0000	0.0556	0.0000	0.0000	0.0000

F- LSD ($p < 0.05$);

Locations = NS;

Months = NS;

Locations x Months = NS

NS = not significant

Table 3: Monthly Means of Family Ariidae in Relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.000	0.000	0.000	0.000	0.000 ^d
October 2006	0.000	0.500	0.000	0.000	0.125 ^c
November 2006	0.000	0.000	0.000	0.000	0.000 ^d
December 2006	0.000	0.000	0.000	0.000	0.000 ^d
January 2007	0.000	0.500	0.000	0.000	0.125 ^c
February 2007	0.000	0.000	0.000	0.000	0.000 ^d
March 2007	0.000	1.500	0.000	0.000	0.375 ^b
WET SEASON					
April 2007	0.000	1.500	0.500	0.500	0.625 ^a
May 2007	0.000	1.500	1.000	0.500	0.750 ^a
June 2007	0.000	1.000	0.000	0.500	0.375 ^b
July, 2007	0.000	0.000	0.000	0.000	0.000 ^d
August 2007	0.000	0.000	0.000	0.000	0.000 ^d
DRY SEASON					
September 2007	0.000	0.000	0.000	0.000	0.000 ^d
October 2007	0.000	0.000	0.000	0.000	0.000 ^d
November 2007	0.000	0.000	0.000	0.000	0.000 ^d
December 2007	0.000	0.000	0.000	0.000	0.000 ^d
January 2008	0.000	0.000	0.000	0.000	0.000 ^d
February 2008	0.000	1.000	0.000	0.000	0.250 ^{bc}
Mean	0.000 ^b	0.417 ^a	0.083 ^b	0.083 ^b	

F- LSD ($p < 0.05$);

Locations = 0.118**;

Months = 0.249**;

Locations x Months = 0.498**

Levels of significance: ** = $p < 0.01$

Means followed by the same letter(s) are not significantly different.

Table 4: Monthly Means of Family Bagridae in relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.000	0.000	0.000	0.000	0.000 ^c
October 2006	0.000	0.000	0.000	0.000	0.000 ^c
November 2006	0.000	0.000	0.000	0.000	0.000 ^c
December 2006	0.000	0.000	0.000	0.000	0.000 ^c
January 2007	0.000	0.500	0.000	0.000	0.125 ^{bc}
February 2007	0.000	0.500	0.500	0.000	0.250 ^{ab}
March 2007	0.000	0.000	0.000	0.000	0.000 ^c
WET SEASON					
April 2007	0.000	0.000	0.000	0.000	0.000 ^c
May 2007	0.000	0.500	0.000	0.000	0.125 ^b
June 2007	0.000	0.000	0.000	0.000	0.000 ^c
July, 2007	0.000	0.000	0.000	0.000	0.000 ^c
August 2007	0.000	0.000	0.000	0.000	0.000 ^c
DRY SEASON					
September 2007	0.000	0.000	0.000	0.000	0.000 ^c
October 2007	0.000	0.000	0.000	0.000	0.000 ^c
November 2007	0.000	0.000	0.000	0.000	0.000 ^c
December 2007	0.000	0.000	0.000	0.000	0.000 ^c
January 2008	0.000	0.000	0.000	0.000	0.000 ^c
February 2008	0.000	1.500	0.000	0.000	0.375 ^a
Mean	0.000 ^b	0.167 ^a	0.028 ^b	0.000 ^b	

F- LSD ($p < 0.05$): Locations = 0.0876^{**}; Months = 0.1857^{*}; Locations x Months = 0.3715^{**}

Levels of significance: * = $p < 0.05$; ** = $p < 0.01$

Means followed by the same letter(s) are not significantly different

Table 5: Monthly Means of Family Clariidae in Relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.00	1.00	0.00	0.00	0.25 ^f
October 2006	0.00	2.50	0.00	0.00	0.62 ^{ef}
November 2006	0.00	3.50	0.50	0.00	1.00 ^{de}
December 2006	0.00	3.00	0.50	0.00	0.88 ^e
January 2007	0.00	5.50	2.00	0.50	2.00 ^c
February 2007	0.50	7.00	3.00	1.50	3.00 ^b
March 2007	0.00	7.00	3.00	3.50	3.38 ^a
WET SEASON					
April 2007	0.50	4.00	1.50	0.50	1.62 ^{cd}
May 2007	1.00	8.00	4.50	2.00	3.88 ^a
June 2007	0.00	4.00	0.50	0.00	1.12 ^d
July, 2007	0.00	4.00	0.00	0.00	1.00 ^{de}
August 2007	0.00	0.50	0.00	0.00	0.12 ^f
DRY SEASON					
September 2007	0.00	1.00	0.00	0.00	0.25 ^f
October 2007	0.00	3.50	0.00	0.00	0.88 ^e
November 2007	0.00	5.00	0.00	0.00	1.25 ^d
December 2007	0.00	3.50	0.00	0.00	0.88 ^e
January 2008	0.00	5.00	0.00	0.00	1.25 ^d
February 2008	1.00	7.00	3.00	2.00	3.25 ^{ab}
Mean	0.17 ^d	4.17 ^a	1.03 ^b	0.56 ^c	

F- LSD ($p < 0.05$): Locations = 0.298^{**}; Months = 0.633^{**}; Locations x Months = 1.265^{**}

Levels of significance: ** = $p < 0.01$;

Means followed by the same letter(s) are not significantly different

Table 6: Monthly Means of Family Mochokidae in Relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.000	0.500	0.000	0.000	0.125 ^{cd}
October 2006	0.000	0.000	0.000	0.000	0.000 ^d
November 2006	0.000	0.000	0.000	0.000	0.000 ^d
December 2006	0.000	1.000	0.000	0.000	0.250 ^c
January 2007	0.000	1.000	0.500	0.500	0.500 ^b
February 2007	0.500	1.000	0.000	0.000	0.375 ^{bc}
March 2007	0.000	3.500	0.500	0.000	1.000 ^a
WET SEASON					
April 2007	0.000	3.000	0.500	0.500	1.000 ^a
May 2007	0.500	2.000	0.000	0.000	0.625 ^b
June 2007	0.000	0.000	0.000	0.000	0.000 ^d
July, 2007	0.000	0.000	0.000	0.000	0.000 ^d
August 2007	0.000	0.000	0.000	0.000	0.000 ^d
DRY SEASON					
September 2007	0.000	0.000	0.000	0.000	0.000 ^d
October 2007	0.000	0.500	0.000	0.000	0.125 ^{cd}
November 2007	0.000	1.000	0.000	0.000	0.250 ^c
December 2007	0.000	1.000	0.500	0.000	0.375 ^{bc}
January 2008	0.000	0.500	0.000	0.000	0.125 ^c
February 2008	0.000	2.000	0.000	0.000	0.500 ^b
Mean	0.056 ^b	0.944 ^a	0.111 ^b	0.056 ^b	

F- LSD ($p < 0.05$): Locations = 0.175^{**}; Months = 0.372^{**}; Locations x Months = 0.743^{**}Levels of significance: $** = p < 0.01$

Means followed by the same letter(s) are not significantly different

Table 7: Monthly Means of Family Malapteruridae in Relation to Locations in Ebonyi River

Months	Locations				Mean
	1	2	3	4	
DRY SEASON					
September 2006	0.000	0.000	0.000	0.000	0.000 ^b
October 2006	0.000	0.000	0.000	0.000	0.000 ^b
November 2006	0.000	0.000	0.000	0.000	0.000 ^b
December 2006	0.000	0.000	0.000	0.000	0.000 ^b
January 2007	0.000	0.500	0.000	0.000	0.125 ^{ab}
February 2007	0.000	1.000	0.000	0.000	0.250 ^a
March 2007	0.000	0.000	0.500	0.000	0.125 ^{ab}
WET SEASON					
April 2007	0.500	0.500	0.000	0.000	0.250 ^a
May 2007	0.000	0.000	0.000	0.000	0.000 ^b
June 2007	0.000	0.000	0.000	0.000	0.000 ^b
July, 2007	0.000	0.000	0.000	0.000	0.000 ^b
August 2007	0.000	0.000	0.000	0.000	0.000 ^b
DRY SEASON					
September 2007	0.000	0.000	0.000	0.000	0.000 ^b
October 2007	0.000	0.000	0.000	0.000	0.000 ^b
November 2007	0.000	0.000	0.000	0.000	0.000 ^b
December 2007	0.000	0.000	0.000	0.000	0.000 ^b
January 2008	0.000	0.000	0.000	0.000	0.000 ^b
February 2008	0.000	0.000	0.000	0.000	0.000 ^b
Mean	0.028 ^b	0.111 ^a	0.028 ^b	0.000 ^b	

F- LSD ($p < 0.05$): Locations = 0.078^{*}; Months = 0.166^{*}; Locations x Months = 0.332^{*}Levels of significance: $* = p < 0.05$

DISCUSSION

The high value of catfishes in most parts of Nigeria makes it imperative to conserve the biodiversity of Ebonyi River, whose living resources present strong economic potential for the sustenance of the rural populace if management strategies that will enhance healthy biological integrity are implemented. The abundant representation of catfish

families recorded in this study (Ariidae, Bagridae, Clariidae and Mochokidae), except Amphilidae, is similar to those recorded in Ita (1993) for some renowned tropical rivers, showing an indication of the potential of Ebonyi River to serve as a source of enhanced nutrition of the people within the vicinity and the state in general. The greatest IP yielded by Family Clariidae is an indication of the rich economic promise of Ebonyi River to enhance the

livelihood of the rural fishers who may depend on the resource for income. Over the years, the State Government has neglected the River and its resources, except for using it as source of municipal water supply. The poor rural dwellers occasionally use noxious chemicals and unselective fishing gears to harvest fishes of all age groups from the River, thereby creating a bleak future for the River biodiversity and survival of the people themselves.

CONCLUSION

The low level of occurrence of Family Amphilidae may be because of anthropogenic threats on the river, and agrees with Leveque *et al.* (2005). This implies that adopting appropriate management strategies geared towards the conservation, enhancement and planned utilization of the aquatic living resources of Ebonyi River will not only improve the socioeconomic life of the people but also enhance biodiversity conservation for species perpetuation.

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