



STOMACH CONTENT ANALYSIS OF *Barbus occidentalis* (CYPRINIDAE) from RIVER UKE, NASARAWA STATE, NIGERIA



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Abstract: Analysis of the stomach contents of *Barbus occidentalis* from River Uke, Nasarawa State, Nigeria was studied using 219 *Barbus occidentalis* samples collected between March – August 2017. Food and feeding habit of the sample was done using numerical, frequency of occurrence and volumetric methods. The result showed that the fish fed mostly on phytoplankton (Cyanophyceae (15.84%), Chlorophyceae (12.29%), Filamentous algae (1.09%), three groups of zooplankton encountered were copepods (0.41%), cladocerans (5.56%) and nematode (20.94%), and they also fed substantially on anthropods (7.16%), fish remains, insect larval (1.19%) and benthos organisms (5.68%), the study indicated that the fish is omnivores. There was no significant difference ($p > 0.01$) on the item consumed in wet and dry seasons. The information gathered from this present study serves as a guideline for further research on the river.

Keywords: Analysis, *Barbus occidentalis*, omnivores, stomach content, River Uke

Introduction

The stomach content analysis of an organism in its environment enriches the knowledge of their growth, distribution, reproduction, abundance, and trophic relationships of such organism (Fagbenro *et al.*, 2000; Duarte and Araujo, 2002). Studies on diet composition are important in community ecology because the use of resources by organisms has a major influence on population interaction, thus the study could provide useful information with regards to positioning of fishes in food web in their environment and in formulating management strategy option in multispecies fishery (Adeyemi *et al.*, 2009).

Barbus occidentalis is an important part of the commercial fishery in Nigeria freshwaters, especially in River Uke, where it has high commercial value. Despite this, no work has been carried out on the food and feeding habits of this species in the river. The objectives of this study was to determine the feed and feeding habits of *Barbus occidentalis* in River Uke in

order to contribute to the existing knowledge of the biology of the fish.

Materials and Methods

Study area

This study was carried out in River Uke in Karu Local Government Area, of Nasarawa State. This River is located in the North Central of Nigeria on longitude 8°32'N 8°18'E and Latitude 8.533°N 8.300°E and stands at an elevation of 295 m above the sea level (Fig. 1). It is characterized by a tropical trop humid climate with two distinct seasons; wet ranges from (May to October) and dry (November to April) seasons. Monthly temperature ranges from 20 to 34°C and its annual rainfall ranges from 1100 mm to about 2000 mm (Opaluwa *et al.*, 2012). Fish from this water body serve as major source of protein for the populace of Uke community (Opaluwa *et al.*, 2012).

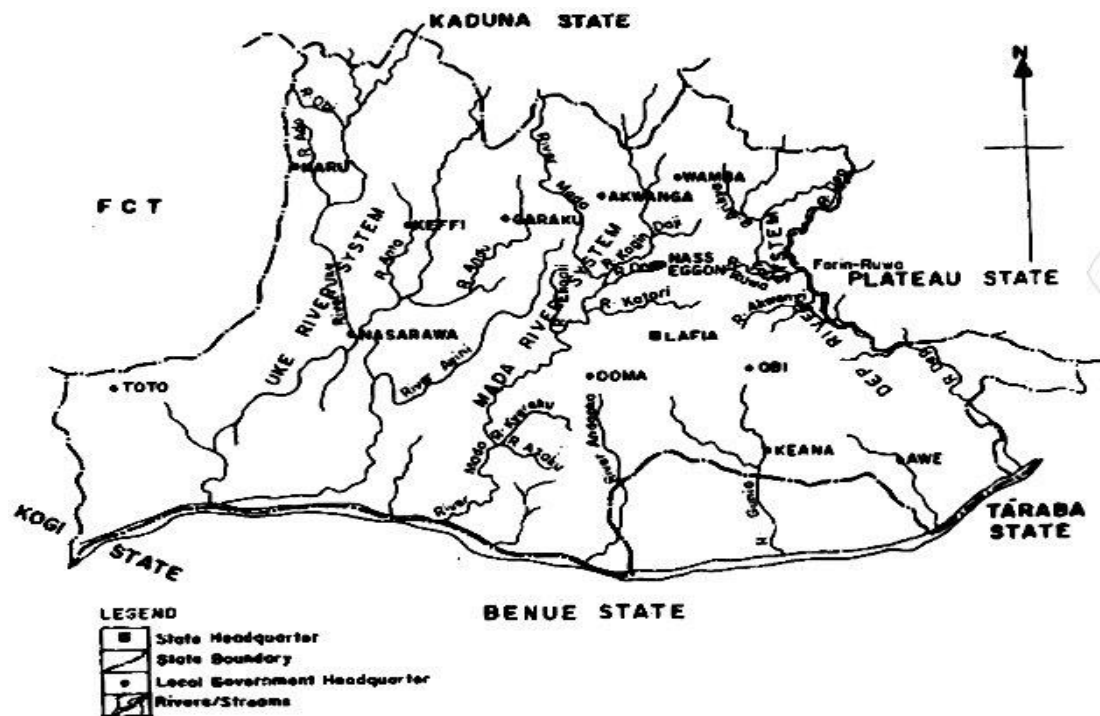


Fig. 1: Map of Drainage system in Nasarawa showing River Uke (Source: NIMET, 2005)

Collection of fish samples

A total number of 219 *Barbus occidentalis* were purchased from the landings of fisher folks of River Uke using fishing gears such as cast nets, traps, hook and line three times monthly from March to August 2017 covering the wet and dry season. The fish were transported in an insulated box containing ice box block to the Zoology laboratory of Nasarawa State University. The sex of the fish were determined, fish were cut open length wise from the cloaca region to the ventral origin of the opercula to expose the visceral content immediately so that none of the food will be regurgitated or further digestion. The stomach content was placed on a pile of filter papers to dry away most of the water content then placed in petri dish and were sorted, identified and counted under a microscope. The stomach contents that were not examined immediately were preserved in 5% formalin. The entire stomach contents of the specimens were analyzed using numerical and frequency of occurrence methods (Hyslop, 2001; Hoggarth 2005; Wootton, 1990).

The numerical method

In the numerical method, each food item was counted to give total for each kind of food item in the whole sample, these are summed and the total number of specimens expressed as percentages representation by number of each type of food item. This method was used to indicate the proportion of fish eating a particular food item.

The frequency of occurrence method

Food content of individual organism was examined, identified and sorted. The method gave no information on quantities or numbers and does not take into consideration the accumulation of food or organism resistant to digestion. It only demonstrated what the organisms fed on. The fish stomach in which different food items that was found were counted as number of occurrence and expressed as percentage of the total number of stomach was identified.

Results and Discussion

In River Uke, it was observed that 120 fish stomach caught had food items, while the remaining 99 fishes had empty stomachs. More fish were caught in the months of March, April and May. Table 1 showed that (39.3%) were male and (60.7%) were female. March-April catches had higher percentage of fish with empty stomach than May-August catches. This might be related to availability and abundance of food items in the River. Abundance of feed in item during these months might probably be due to the fact that water volume increased during the raining season due to flooding, thus making fish population widely dispersed. Flooding also led to influx of food organisms from catchment area, thus explaining the increase in the percentage of stomach fullness during the raining season. The mean weight of the fish was 157.08 g, with a range of 15.1-996.9, mean total length was 21.74 cm, with a range of 10.7-43.5 and mean standard length was 17.64, with a range of 8 – 36.8.

Table 1: Monthly abundance of *Barbus occiendalis* in River Uke

Month	No of Male	%	No of Female	%	Total No of Both sexes	%
March	32	37.2	46	34.6	78	35.6
April	19	22.1	27	20.3	46	21.0
May	11	12.8	20	15.0	31	14.2
June	8	9.3	17	12.8	25	11.4
July	7	8.1	13	9.8	20	9.1
August	9	10.5	10	7.5	19	8.7
Total	86	39.3	133	60.7	219	100

No. = Number; %= Percentage

Table 2: Frequency of occurrence and percentage number of food items observed in *Barbus occidentalis* in River Uke

Dietary items	Frequency of occurrence	%	Number counted	%
Phytoplankton				
1. Cyanobacteria	120	100	1353	15.84
2. Chlorophyceae	101	84.2	1050	12.29
3. Filamentous algae	119	99.2	2329	27.27
Higher plant	10	8.3	24	0.28
Antropods	60	50	612	7.16
Insect remain and larvae	22	18.3	102	1.19
Fish scales				
Zooplankton				
1. Copepods	13	10.8	35	0.41
2. Nematoda	83	69.2	1789	20.94
3. Cladocera	49	40.8	475	5.56
Benthos organism	32	26.6	93	5.68
Desmid	37	30.8	485	5.68
Diatom	22	18.3	195	2.28

The items encountered in the stomach of the *B. occidentalis* are shown in Table 2, these includes phytoplankton, plant materials, arthropod parts, insect remains, zooplankton, nematode, worms, benthos and organism. *B. occidentalis* fed majorly on phytoplankton (Cyanophyceae, Chlorophyceae and Filamentous algae). Cyanophyceae was the major phytoplankton food item of the species. Cyanophyceae frequency of occurrence was 100% with 1353 counted, Chlorophyceae occurred 84.2% with 1050 counted while filamentous algae occurred 99.2% with 2329 counted. Phytoplankton was the food item that contributed high no of diet by volume in the fish. The fish exhibited the characteristics of an omnivore in River Uke, the most frequent food component in this study was the phytoplankton (family Cyanophyceae, Chlorophyceae and Fillamentous). The results were similar to the observation of Yalcin *et al.* (2001) and Adeyemi *et al.* (2009) for *C. gariepinus* diets in Asi River and Gbedikere Lake. *Barbus occidentalis* exploit on more than one feed item. Having the ability to utilize different varieties of food makes *B. occidentalis* omnivores in nature.

It was observed that higher plants parts were also represented in the stomach of the specimens in small quantity with 8.3% frequency of occurrence and 24 counted. Arthropods tends to be one of the insects remains observed with frequency of occurrence 50% and 612 counted, fish scales frequency of occurrence was 18.3% with 102 counted. Zooplanktons which included Copepods frequency of occurrence 10.8% with 35 counted nematode worm frequency of occurrence 69.2% with 1789 counted and Cladocera frequency of occurrence 40.8% with 475 counted. Benthos organism were also observed in the stomach with frequency of occurrence 26.6% with 93 counted, desmid frequency of occurrence was 30.8% with 485 counted, diatom frequency of occurrence was 18.3% with 195 counted. This study is also in line with Househan *et al.* (2016) who reported that cichlids exploit more than one source of food item.

Food is the main source of energy and plays an important role in determining the rate of growth and condition of fishes. Data on different food items consumed by fish may eventually result in identification of stable food preference and in creation of trophic models as a tool to understand complex ecosystems (Lopez-Peralta and Arcila, 2002; Bachok *et al.*, 2004).

Studies of species stomach content can be used in understanding factors controlling the distribution and abundance of organisms in an ecosystem. Food and feeding habits of fishes is of great importance, it helps in selection of species of fishes which will utilize all the available potential food resources of the water bodies, with less competition with each other (Begum *et al.*, 2008).

Conclusion

The study revealed the importance of phytoplankton, zooplankton, insects and benthic organism as food materials in the diet of fish. Feeding habit of *B. occidentalis* based on stomach content analysis revealed that planktons form useful diet in the food web of the fish in River Uke. This is not surprising, since phytoplankton is known to thrive well in the river. The number of empty stomach were more of female than male, this gender bias could be due to intra-specific competition for the available food in the habitat. However, this finding will serve as a guideline to further research on the river.

Conflict of Interest

Authors declare there is no conflict of interest related to this study.

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