



Original article

## FEEDING HABITS AND FOOD PREFERENCES OF *Auchenoglanis occidentalis* FROM TAGWAI LAKE, MINNA, NIGERIA

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### ABSTRACT

The temporal variation in the food, feeding habits and food preference of *Auchenoglanis occidentalis* from Tagwai Lake, Minna, Nigeria were investigated from January 2013 to December 2014 using the frequency of occurrence method. In 2013, seven different food items were found in the diet namely; insect parts, plant materials, parts fish parts, protozoans, phytoplankton, sand particles and crustaceans. The same trend was observed in 2014. Insect materials were fed upon the most irrespective of year and season of sampling. When a comparison was done for both years using a T-test, the result revealed that insect parts valued about  $24.00 \pm 2.00$  in 2013 which was the highest value recorded while parts of fish had the highest frequency of occurrence in 2014 ( $22.50 \pm 3.50$ ). The frequency of occurrence of protozoan for 2013 was  $8.00 \pm 2.00$  while that of 2014 was  $11.00 \pm 2.00$ . From both years it is seen that although *Auchenoglanis occidentalis* from Tagwai Lake Minna is an omnivore, which fed on both plant and animal materials, it had tendency to feed more on animal materials.

Key words: Feeding Habits, Food Preference, *Auchenoglanis occidentalis*

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### INTRODUCTION

In recent times the study of food and feeding habits of freshwater fish species is a subject of continuous research since it constitutes the basis for the development of a successful

fisheries management program on fish capture and culture [1]. Nature offers a great diversity of organisms that are used as food by fish and these differ in size and taxonomic groups [2]. The dietary analysis of organisms in their

natural habitat enhances the understanding of the growth, abundance, productivity and distribution of organisms [3]. The diet of cultured fish species does not provide precise and reliable information on the food, feeding ecology and condition factor of such species. Hence most studies which are aimed at obtaining such information are based on the analysis of gut content of organisms caught from their natural habitat [4].

Interestingly, the success of aquaculture must be based on a sound knowledge of the biology, ecology and habitat of targeted species. Experts have alluded to the strong positive relationships that exist between the biology, ecology and environmental requirement of fish species and productivity performance in captivity. Understanding these aspects of fish requirements for successful domestication will enhance the domestication of cost effective management protocol for the targeted fish species thus increasing productivity, commercial domestication and improved nutrition status of the populace. *Auchenoglanis occidentalis* is one of those fishes of great economic importance. Its biology and environmental requirements for host of effective production in captivity could be easily harnessed and domesticated.

The Bagrid catfish are among the dominant fish families in Nigerian waters, contributing enormously to fish landing. This family also contributed about 42.5% of the total fish caught in Lekki Lagoon for 2 years [5]. Members of this family are widely distributed in swamp [6] in shore areas of lake, sweeping of flood plains [7].

Most studies on the biology of Bagridae in Nigeria has been conducted in Kanji, in manmade lake of River Niger, and in Brackish Lagoon of Lekki Lagos and in River Orogodo, Delta State, Nigeria where some aspect of the reproductive biology of *Auchenoglanis biscutatus* was studied [8]. However, little is known about the biology of Bagridae in general and *Auchenoglanis occidentalis* in particular in Nigerian Rivers. Published information on the genus *Auchenoglanis* includes that of [9; 5; 10; 11; 12]. There is paucity of information on the present status of *Auchenoglanis occidentalis* in terms of food and feeding in Tagwai Lake [13]. Enhanced fish production is one of the cardinal strategies for meeting the ever increasing human demand for animal protein (fish diet and fish oil), since fisheries resources are on the decline in Nigeria due to over exploitation and inadequate management of fresh water bodies. The need may not be met by over dependence on unexplored wild fishery resources and domestication of the very few species such as Tilapia, Carp and Clarias. There is therefore an urgent need for studies such as this to generate baseline information on the biology of this fish species, since in Tagwai Dam Minna, this fish species *Auchenoglanis occidentalis* form a significant portion of the catch by local fishermen, throughout the year, with no known widespread threats. The fish is also known to exhibit good growth rate and size and has tremendous market value [10]. Thus, good knowledge of the biology and ecology and feeding of this fish species will shed more light on culturing this commercially important Bagrid in artificial pond or enclosures.

The proposed study is actually intended to look at the feeding habit

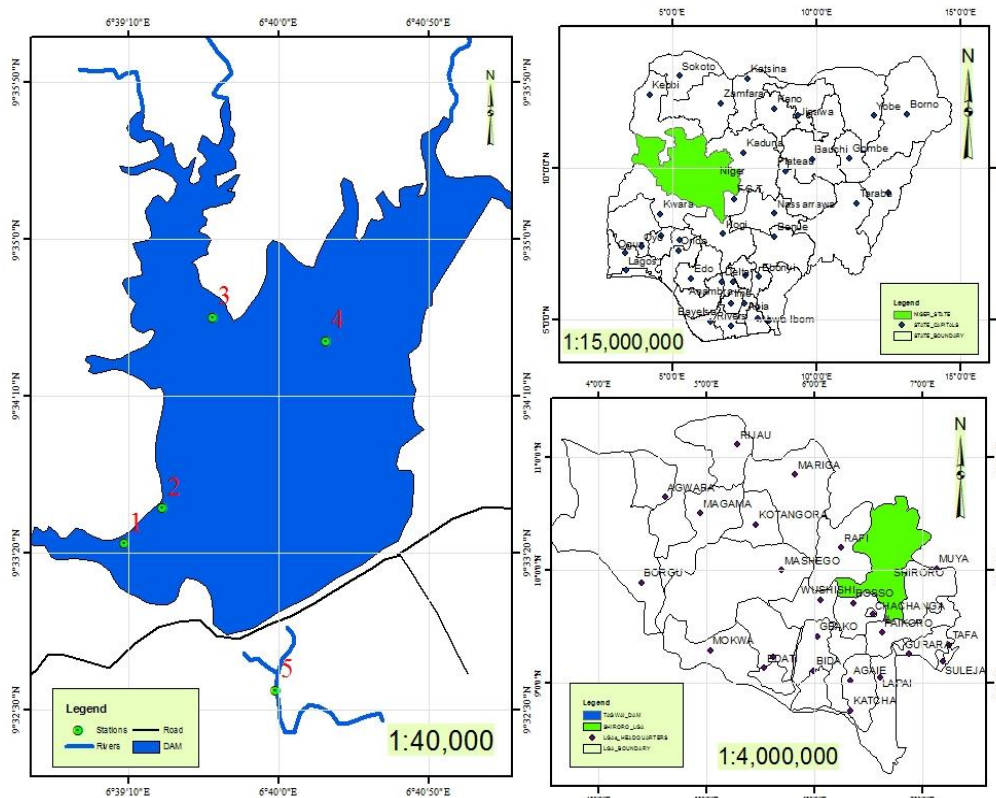
and food preferences of *Auchenoglanis occidentalis* with a view to provide information on probable changes in feeding habits with season. The findings of this study will contribute meaningfully to building the information gaps in literatures, regarding preliminary data in terms of feeding habits of *Auchenoglanis occidentalis*.

## **MATERIALS AND METHODS**

### **Study Area**

The study was carried out in Minna, Niger State, located within longitude 6°33'E and latitude 9°37'N, covering a land area of 88km<sup>2</sup> (Fig 3.1) with an estimated human population of 1.2 million. The area has a tropical climate with mean annual temperature, relative humidity and rainfall of 30°C, 61.00% and 1334.00mm, respectively. The climate presents two distinct seasons, a rainy season (between April

to October), and a dry season (between November and March). The vegetation in the area is typically grass dominated savannah with scattered tree species. Tagwai Lake is about 10km away from Minna town. Mean maximum temperature remain high throughout the year having about 30°C, particularly in March and June. The vegetative cover is characterised by woodland and tall grasses inter spread with tall dense species. In some areas, traces of rain forest species can be seen of Sudan Savannah alongside the plain of the river [14]. The secondary benefits from this dam include fishing, recreation and wild life conservation. The occupation of the people of the area is fish farming. The study sites are characterised by different fishing gears. Tagwai settlement is dominated by Nupe and Gwari people [15].



**Figure 1. Map of the study site (Tagwai Lake) in Niger State, Nigeria**

Source: The Department of Geography, FUT, Minna. Centre for Remote Sensing (2018).

### Collection of samples for morphometric measurement and Feeding Habit

*Auchenoglanis occidentalis* were collected randomly from the total catch landed by fishermen at Tagwai Lake. The fish were transported to the laboratory for further processing in containers with ice blocks in order to arrest further degradation of the gut content. This was done bi-weekly.

#### Stomach Content Weight

This followed the techniques of [16]. It involved evacuating the content from the stomach and spreading it on a filter paper. The hard visible components were sorted out into kinds, using unaided eyes, while small components were examined under a

compound microscope at X40 magnification.

Dietary components were identified to class taxonomically using aids provided by [17]. The frequency of occurrence method was used to identify the different types of food items in the gut of the fish.

#### Data Analysis

Data collected were subjected to standard statistical analysis using SSPS (15.0 version). This was used to calculate mean and standard deviation of each variable per species. Significant differences in a variable among members of a species were obtained using linear correlation coefficient. Relative abundance of dietary components of species was established using simple percentage

proportions. All statistics test was carried out at  $p = 0.05$  level of significance.

## RESULTS

### Temporal Variation in the Food and Feeding Habits of *Auchenoglanis Occidentalis*

The food items present in the stomach content of *Auchenoglanis occidentalis* from Tagwai Lake Minna in 2013 is shown in Table 1. From this table, parts of insect, fish parts and sand particles were present throughout all

the months (January to December) i.e. in both the rainy and dry season. Plant materials were present all through the year also, except in the last months of the dry seasons which included January, February and March. Protozoans were present in all the months except in May. Phytoplankton were present in all the rainy season months of October only and in the dry periods November, December and January. Crustaceans were absent in July, August, October, November and December, but were present in all the other months.

**Table 1: Food Items in Stomach Content of *Auchenoglanis occidentalis* from Tagwai Lake (2013)**

	Parts insect	of Chyme	Plant materials	Fish parts	Protozoan	Phytoplankton	Sand particles	Crustacean
January	+	+	--	+	+	--	+	+
February	+	+	--	+	+	+	+	+
March	+	+	--	+	+	+	+	+
April	+	+	+	+	+	+	+	+
May	+	+	+	+	--	+	+	+
June	+	+	--	+	+	+	+	+
July	+	+	+	+	+	+	+	--
August	+	--	+	+	+	+	+	--
September	+	+	+	+	+	--	+	+
October	+	+	+	+	+	--	+	--
November	+	+	+	+	+	--	+	--
December	+	+	+	+	+	--	+	--

**Key**

+ = Present

- = Absent

Table 2, shows the food items in the stomach content of *Auchenoglanis occidentalis* from Tagwai Lake Minna in 2014. Also like in 2013, insect parts, fish parts and sand particles were present all through the year in both seasons. Crustaceans were also present all through the year except in January. Chyme was absent from the

stomach content in February, April, June, July, November and August. Plant materials were not present in January, February and June. Protozoans were presents in all the months except in September and December. Phytoplanktons were present all year round except in September and December.

**Table 2: Food Items in Stomach Content of *Auchenoglanis occidentalis* from Tagwai Lake (2014)**

	Parts insect	of Chyme	Plant materials	Fish parts	Protozoan	Phytoplankton	Sand particle	Crustacean
January	+	+	--	+	+	+	+	--
February	+	--	+	+	+	+	+	+
March	+	+	+	+	+	+	+	+
April	+	--	+	+	+	+	+	+
May	+	+	+	+	+	+	+	+
June	+	--	+	+	+	--	+	+
July	+	--	+	+	+	+	+	+
August	+	+	+	+	+	+	+	+
September	+	+	+	+	--	+	+	+
October	+	+	+	+	+	--	+	+
November	+	--	+	+	+	+	+	+
December	+	+	+	+	--	+	+	+

**Key**  
+ = Present  
- = Absent



The average seasonal frequency of occurrence of food items in *Auchenoglanis occidentalis* stomach content for 2013 and 2014 is shown in table 5.0. Comparison for both years using a T-test, the result revealed that insect parts and parts of fish had the highest frequency of occurrence although, insect parts was highest in 2013 (24.00), whereas part of fish had the highest in 2014 compared to 2013. The frequency of occurrence of protozoan for 2013 ( $8.00 \pm 2.00^a$ ) was not significantly different from 2014. From both years it is seen that although *Auchenoglanis occidentalis* from Tagwai Lake Minna is an

omnivore which fed both on plant and animal material, it prefer animal materials to plant materials since it fed more on them.

Fig 4.3 clearly shows the frequency of occurrence of the food items in the gut of *Auchenoglanis occidentalis* in both the dry and rainy seasons. It reveals that all the food items earlier identified were present in both seasons in the gut of the fish. The frequency of occurrence of insects, fish and sand were not significantly different.

**Table 5: Average Seasonal frequency of occurrence of food items in *Auchenoglanis occidentalis* stomach content 2013 and 2014**

Sample	2013	2014
Insect	$24.00 \pm 2.00^b$	$16.50 \pm 2.50^a$
Chyme	$11.00 \pm 1.00^b$	$4.00 \pm 0.00^a$
Plant Materials	$12.50 \pm 2.50^b$	$9.50 \pm 1.50^a$
Part of Fish	$17.50 \pm 3.50^a$	$22.50 \pm 3.50^b$
Protozoan	$8.00 \pm 2.00^a$	$11.00 \pm 2.00^a$
Phytoplankton	$2.50 \pm 0.50^a$	$11.00 \pm 4.00^b$
Sand	$16.50 \pm 1.50^a$	$20.00 \pm 5.00^b$
Crustacean	$5.00 \pm 2.00^a$	$15.50 \pm 3.50^b$

Values are Mean  $\pm$  Standard Error of Mean (SEM). Mean values followed by the same letter in the same row are not significantly different ( $p > 0.05$ )

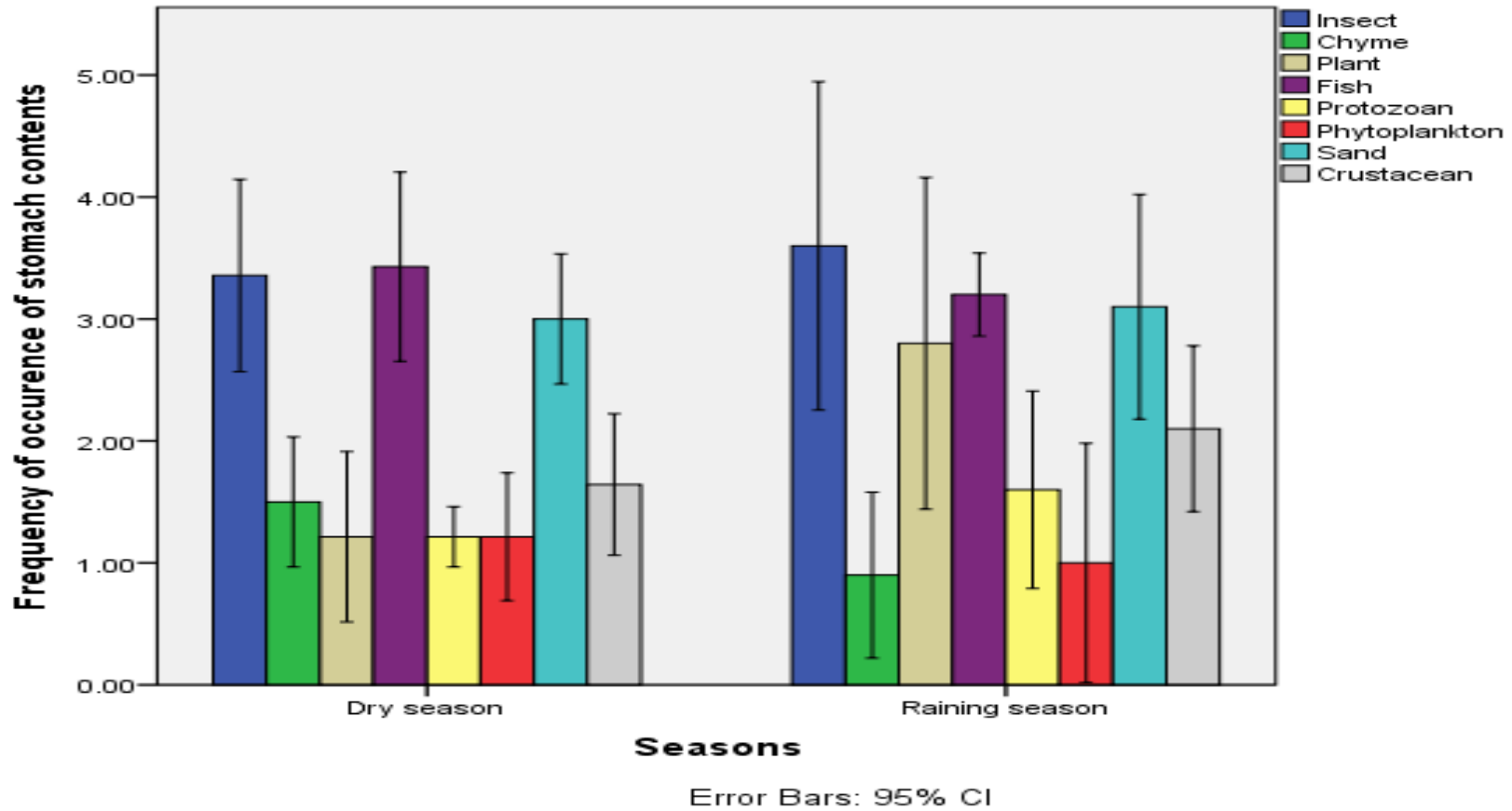


Figure 4.3 The Seasonal Variation in the Frequency of Occurrence of the Dietary Component of *Auchenoglanis Occidentalis* from Tagwai Lake Minna.

## DISCUSSION

The results for the food and feeding habits of *Auchenoglanis occidentalis* from Tagwai Lake Minna in this study revealed that the fish species has a broad spectrum of food ranging from insects, fish, sand, plant materials, crustacean, protozoa and phytoplankton. [8] reported same for *Auchenoglanis biscutatus* in River Orogodo, Delta State. The broad food spectrum of this fish suggests that they feed both in surface water column and even near the substratum.

The sand which was found in the gut of this fish would have been accidentally ingested while feeding. The discovery of sand in the gut of *Auchenoglanis* species was reported by [8; 10]. *Auchenoglanis occidentalis* fed on both plant and animal materials with insect, fish and sand dominating its food. Similar finding had being reported by [8]. The same trend was also observed in 2014, where insect dominated the food items in the gut in both seasons. [18], who worked in Lake Akata in Benue State also reported that insect materials dominated the food items of the same fish.

Feeding increased from the month of May to October. The reason could be that the season coincides with the periods when there is availability of plenty of food due to the presence of rain. Also, the feeding pattern of the dry and rainy season were not remarkably different except in the month of January, where no plant was found in the diet of the fish, this could also be attributed to lack of rains.[8] and [10] also reported same. The high feeding intensity in the month of May to October coincides with the rains which bring in different materials into the water bodies.

Insect parts were found in all the months of study which could be due to the fact that they are able to withstand adverse environmental conditions. This results agrees with the work of [18] who reported that insect in this study carried out in Lake Akata in Benue State, dominated the dietary components of *Auchenoglanis occidentalis*.

The presence of both plants and animal materials in the gut of this fish species presents it as an omnivore i.e. one which feeds on both plant and animal materials. [8]; [10]; [19] also agreed with this result.

In conclusion, the study revealed that *Auchenoglanis occidentalis* from Tagwai Lake Minna is an Omnivore, which fed on both plant and animal materials, although it predated more on animal materials (Insect parts and fish parts) than on plants. However, its feeding habit in the dry season months was not remarkably different from the rainy season months. Its wide range of food items found in the gut makes it a good aquaculture candidate.

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