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FOOD AND FEEDING HABIT OF *AUCHENOGLANIS OCCIDENTALIS* (VALLENCIENNCE, 1840) IN ZARIA, NIGERIA

[1*]Onimisi, H.U., [2]Oniye, S.J., [2]Balogun, J.K. and [2]Aken'Ova, T.O.L.

[1]National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria. Kaduna State.

[2]Department of Biological Sciences, Ahmadu Bello University, Zaria. Kaduna State.

Abstract

The stomachs of 226 *Auchenoglanis occidentalis* obtained from Zaria Reservoir were examined for food items. 59 (22.18%) had empty stomachs while 207 (77.82%) contained food items. Identified food items included chironomid larvae (25.71%), organic detritus (22.03%), insect remains (19.51%) and plant remains (12.43%) were the most important constituents. Others of secondary importance included *Chaoborus* larvae (3.4%), Chironomid pupae (2.78%) Ceratopogonidea (2.31%) and dragonfly nymphs (0.4%). *A. occidentalis* fed on a variety of items ranging from insect larvae and pupae to plant material and detritus, hence the A. *occidentalis* in Zaria Reservoir can be considered as omnivorous. There was no significant difference ($p>0.05$) in the food items consumed in wet and dry seasons. There was also no distinct qualitative variation in food items consumed among the size groups of *A. occidentalis.*

Key words: Food and feeding habits, Auchenoglanis occidentalis, Zaria Reservoir

Introduction

Auchenoglanis occidentalis is fairly common, especially in swamps, lakes and rivers throughout Africa (Reed *et al*., 1967; Lewis, 1974; Risch, 1986), and in catches of fishermen throughout the year in Zaria. It forms an important commercial catch. Its flesh is rich and oily; the carbohydrate, lipid and protein contents are in the ratio of 1:3:4, the moisture content is high (74.6-78.04g/100g net weight), and the mineral content is dominated by calcium (Abdullahi, 2002). Irrespective of these, information on its biology is scarce and limited to those of Reed *et al*. (1967), Lewis (1974), and Risch (1986). Published information on the biology of *A. occidentalis* is limited to basic description and taxonomy (Reed *et al*., 1967, Lewis, 1977). This is in contrast to appreciable work on various aspects of the biology of several fish species in Nigeria (Fagade and Adebisi, 1977; Olatunde, 1978; 1979; 1989; Ikomi, 1978; Nwadiaro, 1986; Ikomi and Odum, 1998; Eyo, 2002; Oniye *et al*., 2004).

Information on the present status of *A. occidentalis* in terms of food habits is not available for Zaria. This study therefore was undertaken to provide information on food and feeding habit of *A. occidentalis* in Zaria reservoir.

*Corresponding author:
Email: onimisihas@yahoo.com

Materials and methods

Specimens of *A. occidentalis* were purchased monthly, from December 2005 to November 2006. The fish were transported in an insulated box containing ice to the postgraduate laboratory of the, Ahmadu Bello University, Zaria. The total length, standard length and weight of the fish were determined as described by Olatunde (1978). The stomachs of the fish were removed and preserved in 5% formalin prior to examination. The stomach contents were analysed by numerical and frequency of occurrence methods (Olatunde, 1978; Hyslop, 1980; Balogun, 1980; Hoggarth, 1982; Wootton, 1990).

In the numerical method, the number of individuals of each food type in each stomach was counted after slitting open the preserved stomachs. These were added to give totals for each kind of food item in the total number of specimens examined and expressed as percentages. This method was used to indicate the proportion of fish eating a particular food item. In the frequency of occurrence method, the number of fish stomachs in which different food items were found were counted and expressed as percentage of the total number of stomach were identified to generic level using manuals by Prescott (1944); Pennak (1953); Macan (1979); Mellanby (1979) and Jeje and Fernando (1986).

Results

Food and feeding

Out of the 266 stomachs of *A. occidentalis* examined for food items, 59 (22.18%) had empty stomachs while 207 (77.82%) contained food items. Numerically, identified food items include chironomid larvae (25.71%), organic detritus (22.03%), insect remains (19.51%) and plant remains (12.43%) as the most important constituent. Others of secondary importance include *Chaoborus* larvae (3.4%), Chironomid pupae (2.78%) Ceratopogonidae (2.31%) and dragonfly nymphs (0.4%) (Table 1).

Seasonal variation in the food items

Chironomid larvae, Chaoborus larvae, detritus, plant material, insect remains and ceratopogonid adults occurred regularly in the stomach of the fish throughout the period of study. However, the amount of food items was higher in the rainy months than the dry months. Quantitatively, in both the wet and dry seasons, *A. occidentalis* feed on all the food items listed in Table 2, except fish remains and dragon fly nymphs, which were not consumed during the dry season. Insect larvae, insect remains, detritus and plant materials contributed more during the wet season than in the dry season (Table 2), though there was no significant difference in the quantities of food items in both seasons. Variation of food with fish length is shown in Table 3. There was no distinct qualitative variation in food items consumed between size groups in this study. The medium – sized (19-24.9cm) and large sized groups (>25cm) fed more on insect larvae, particularly dragon fly nymphs and insect remains, while the 10-18.9cm group did not feed on dragon fly nymphs. In the 19cm-24.9 size group, detritus and plant material were predominant in their diet (Table 3).

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Table I. Summary of stomach contents of *A. occidentalis*

Food items	**Numerical method**		**Frequency of Occurrence method**	
Immature insects	**Number of Items**	**%**	**Number of stomachs**	**%**
Chironomid larvae	2,691	25.71	104	50.2
Chronomid pupae	291	2.78	26	12.6
Chaoborus larvae	356	3.40	27	13.0
Chaoborus pupae	54	0.52	8	3.86
Ceratopogonidae	242	2.31	35	16.9
Insect remains	2,042	19.51	137	66.2
Dragon fly nymph	47	0.45	5	2.42
Plant material				
Plant remains	1,301	12.43	84	40.6
Bottom organism				
Detritus	2,306	22.03	145	70.0
Zooplankton				
Bosmina sp	28	0.27	11	5.3
Daphnia sp	19	0.18	3	1.45
Cypris larvae	23	0.22	6	2.9
Closterium sp	12	0.11	2	0.97
Fish remains				
Fish scales	16	0.15	7	3.4
Fish bone	8	0.08	2	0.97
Unidentified mass	168	1.60	52	25.1
Mud	-	-	73	35.3
Unidentified worms	864	8.25	73	35.3

Table 2. Gross trophic spectrum and seasonal variation in the percentage occurrence (%O) and percentage number (%N) of the food items of *A. Occidentalis*

Food Items	Gross composition		Wet season		Dry season	
Immature insects	**%O**	**%N**	**%O**	**%N**	**%O**	**%N**
Chironomid larvae	50.2	25.71	50.8	32.9	50.5	20.3
Chronomid pupae	12.6	2.78	13.62	3.7	6.5	1.3
Chaoborus larvae	13.0	3.4	11.62	3.2	21.1	4.1
Chaoborus pupae	3.86	0.52	4.10	0.3	5.56	1.2
Ceratopogonidae	16.9	2.31	14.51	2.38	20.86	3.51
Insect remains	66.2	19.51	72.93	23.62	53.68	18.00
Dragon fly nymph	0.97	0.45				
Plant material						
Plant remains	40.6	12.43	42.82	16.73	43.68	11.97
Bottom organism						
Detritus	70.0	22.03	65.58	21.33	52.10	31..7
Zooplankton						
Bosmina sp.	5.3	0.27	4.00	2.02	7.28	0.38
Daphnia sp.	1.45	0.18	0.79	0.10	3.03	0.10
Cypris larvae	2.9	0.22	2.25	0.52	4.08	0.48
Closterium sp.	0.97	0.11	1.85	0.05	0.79	0.02
Fish remains						
Fish scales	3.4	0.15	1.17	0.18		
Fish bone	0.97	0.08	0.83	0.02		
Unidentified mass	25.1	1.60	41.09		39.29	
Mud	35.3		0.67	0.05		
Unidentified worms	35.3	8.25				
No. of fish examined	266		149		117	
No. of empty stomachs	59		18		41	
No. of food categories	15		15		12	

Table 3. Composition of the diets of *A. occidentalis* according to size group shown as percentage occurrence (%0) and percentage number (%N)

	Size group (cm)					
	10-18.9 n=139		19-24.9 n=99		25> n=28	
	O%	N%	O%	N%	O%	N%
Food items						
Immature insects						
Chironomid larvae	42.9	1.77	49	31.6	69.6	32.75
Chronomid pupae	10.5	1.7	9.8	3.7	30.4	3.41
Chaoborus larvae	11.4	4.26	12.6	2.17	17.4	4.79
Chaoborus pupae	7.6	1.21	-	-	-	-
Ceratopogonidae	14.3	0.99	14.9	3.19	30.4	3.70
Insect remains	56.2	17.01	70.1	21	73.9	23.1
Dragon fly nymph	-	-	-	-	8.7	0.94
Plant material						
Plant remains	41.0	12.7	41.1	14.04	21.7	6.61
Bottom organism						
Detritus	77.2	27	60.9	18.58	47.8	18.01
Zooplankton						
Bosmina sp.	6.70	0.4	3.4	0.15	4.3	0.22
Daphnia sp.	2.9	0.41	-	-	-	-
Cypris larvae	4.8	0.4	-	-	4.3	0.36
Closterium sp.	0.95	0.18	1.15	0.09	-	-
Fish remains						
Fish scales	4.8	1.25	1.15	0.07	4.3	0.15
Fish bone	1.9	0.18	-	-	-	-
Unidentified mass	26.7	1.89	23	1.39	17.4	1.45
Mud	38.1		34.5	-	17.4	-
Unidentified worms	26.7	13.8	18.4	4.06	26.1	4.50
No. of fish examined	102		82		23	
No. of empty stomachs	37		17		5	
No. of food categories	26.60		17.20		17.86	

n= the number of fish.

Discussion

A. occidentalis is a versatile food consumer; this is reflected in the high proportion of stomachs containing food (>75%). Food items of animal origin contributed significantly to the diet, which was dominated principally by bottom dwelling immature dipterans (mainly chironomid and *chaoborus*) and the remains of other insects. In addition, plant materials contributed significantly to the stomach content of the fish. It may therefore be justifiable to classify *A. occidentalis* as an

omnivore, thus supporting earlier reports on the species in Tiga Lake, Kano State and in Senegal (Maxwell, 1985; Risch, 1986). The preference for immature insects, plant material and detritus to other dietary items by the bagrids appears to be common to the genus irrespective of geographical location. For example, studies on the diet of *Chrysichthys auratus* in Tiga Lake, Kano (Sturm, 1984), in the River Benin, Niger Delta (Ikomi and Odum, 1998) indicated that they are also omnivores. However, Ajah *et al.* (2006) described *C. nigrodigitatus* as purely omnivorous at the juvenile stage and planktotrophic at the adult stage in Cross River. Variations in the feeding of the species in different habitats indicate flexibility and the accompanying ability to effectively utilize different available food (Ikom and Odum, 1998). This view gives the impetus to suggest that *A. occidentalis* may be a good aquaculture candidate.

The broad food spectrum of the *A. occidentalis* suggests that it feeds both in the surface water column and on or near the substratum. However, *A. occidentalis* appears to be basically a bottom feeder as evidenced by the significant contribution of the bottom-dwelling food items such as dipterans larvae and pupae, detritus and insect remains to its total diet. The sand grains, which contributed substantially to the stomach content, might have been accidentally ingested along with food, but their contribution to the nutrition of the species is not clear. However, bacteria and protozoa associated with sand grains may be of nutritional benefit in terms of aiding in the digestion of cellulose. Other food items such as *Bosmina* species *Daphnia* species, and cypris larvae were mainly supplementary.

The monthly survey of food items showed that chironomid larvae, *Chaoburus* larvae, detritus plant material, insect remains and ceratopogonids were ingested throughout the year by *A. occidentalis*. However, higher amounts were obtained in the months of July, August and September. The amount of food items selected by the fish at any time of the year seems to depend on their abundance and availability. Feeding intensity was generally low in March, April, November, and December, but from July to October the fish feeding intensity increased and peaked in August. The low feeding intensity observed in March and April (dry season) might be due to low or poor availability of food items. In November and December (beginning of the dry season) also corresponds to reduction in food supply. However, the high feeding intensity in the months of July to October with a peak in August coincides with the rain which brings in allochtonus materials through floods. The presence of plant materials in high percentages may signal an alternate food source, but given the shape of its mouth, the fish is a detritus or bottom feeder, and may have picked the plant remains while grazing at the bottom of the reservoir.

All size groups of *A. occidentalis* fed on insect larvae with other food items as supplement depending on the size of fish. The aquatic insects are of greater importance to all size groups of *A. occidentalis* in this study, although, fish as are generally known to change their food preference with age (Welcomme, 1979). Variation of food consumed, with size, in this study does not

appear to be very significant, though larger fish feed on dragon fly nymphs, which are bigger than insect larvae that dominate the food items. There was more of quantitative than qualitative variation in the food consumed. Furthermore, some of the stomachs examined (37) were empty, this may be due to either the fish regurgitating their food when entangled by the gill nets or continuous digestion after they were caught prior to analysis.

In conclusion, *A. occidentalis* of Zaria reservoir feeds on variety of food items, but largely, the fish maybe considered as an omnivore. Attempt at domesticating this fish must consider the food items it consumes in the wild.

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