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FOOD AND FEEDING HABITS OF *Synodontis guttatus* AT IDAH AREA OF RIVER NIGER, KOGI STATE, NIGERIA.

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ABSTRACT

The food and feeding habits of Synodontis guttatus at Idah area of River Niger, Kogi State Nigeria were studied. Fish samples were collected from July to December 2009; the stomach contents were analyzed using frequency of occurrence method. The fish is an omnivore, feeding mainly on phytoplankton, diatoms, plant leaves and seed, fish scales, crustacean, insect larvae, pupae, worms, fish parts and detritus. The juveniles showed more inclination towards phytoplankton, diatoms and plant parts while the adults exhibited more diverse and complex feeding habits.

Key words: Omnivore, stomach content, feeding adaptations, River Niger.

INTRODUCTION

The fish family Mochokidae is presented mainly by genus *Synodontis* commonly known as catfish. Reed *et al*, (1967) described twenty *Synodontis* species found in Northern Nigeria, while Holden and Reed (1972) indicated that at least twenty one species have been identified in the Niger River. The different *Synodontis* species vary in commercial status in different locations, many are important food fishes and some have attractive hues and exhibit behavioral characteristics that make them potential ornamental candidates.

Synodontis accounts for important parts of the commercial catches in Northern Nigeria and, according to Reed *et al* (1967), they are available throughout the year. In the River Niger, *Synodontis* accounted for 18.00% by number and 18.68% by weight of the total fish caught (Mortwani and Kanwai 1970). Reed *et al*, (1967) reported some natural food substance of some common *Synodontis* species. The food and feeding habits of ten species captured in River Niger have been investigated (Imevbore and Bakare, 1970). Olatunde (1989) conducted similar studies on *Synodontis schall* in Zaria, Nigeria.

Synodontis guttatus are found throughout Africa, except in the Southernmost parts of Magreb, although most species occur in Central and West Africa, the species occur throughout most of the freshwaters of the Sub-Saharan Africa and the Nile River (Friel and Vigliotta, 2006). The state of knowledge on the various *Synodontis* species in Nigeria is largely on their gross anatomy and some behavioural characteristics. The available scientific investigations on their biology are still inadequate for their propagation and management. This study examines the food and feeding habits of *S. guttatus* at Idah area of River Niger, Nigeria.

MATERIALS AND METHODS

Study Area

The study area is Idah area of River Niger in Idah Local Government Area of Kogi State, Nigeria. The river extends from Lokoja via Ajaokuta, Itobe to Idah. The river is located on latitude 7°-07N and longitude 6°44E. The water temperature ranges between 22°C and 31°C, Idah has a tropical savannah climate with two clearly marked season of wet (between April and October), and dry (between November and March). The cold harmattan wind is experienced between (November and February) when the hot season start and last until the rain begins. The highest water levels are between August and September and the lowest are between March – April. River Niger serves as a boundary between Kogi State and Edo State. Idah town is a commercial nerve centre between the two States where fisheries and aquaculture is practiced.

Collection of Samples

Samples of *S. guttatus* were obtained from Egah market, Idah area of River Niger, Kogi State. The samples were purchase weekly from the fishermen from July to December 2007, and examined fresh, and transported to biological sciences laboratory of Kogi State University, Anyigba while those that could not be treated were preserved in a freezer until the next day. A total of sixty specimens (60) were examined. The total length (TL, cm) of each sample was measured.

The gut of the fish was removed by making a longitudinal incision along the mid ventral line form the mouth to the anus to expose the visceral organs. The gut was removed carefully by detaching it from other internal organs and fatty tissues. The gut length (GL) was then measured to the nearest cm on a graduated measuring board. The stomach was cut off from the gut and weighed on an electric top-loading balance (Sortius) to obtain the stomach weight (SW). The stomachs were scored 0, 25, 50, 75 and 100% according to its fullness.

Identification of Stomach Contents

Each stomach was split open and the contents emptied into a Petri-dish. The contents were then observed under a monocular microscope. The food materials were identified with the aid of keys provided by Needham and Needham (1962) and Mellanby (1975).

Analysis of Stomach Contents

The stomach contents were analyzed by frequency of occurrence method as described by Hynes, (1950). Each food item was identified and number of stomachs in which each food occurred was counted and expressed as a percentage of stomach containing food. The method showed the proportion of individuals eating a particular food item in a species. The occurrence of each food item was expressed as a percentage of all stomach with food. That is, $P = (b/a) \times 100$

Where, a = Total number of fish examined with food in the stomach; b = Number of fish containing a particular food item; P = Percentage of occurrence of each food item.

Statistical Analysis

The relationship between the fish TL and GL was computed using a linear regression model

$$GL = a + b\,TL$$

Where GL is Gut length (cm); TL is Fish total length (cm); a is Constant; b is Exponent.

RESULTS

Food Contents

Analysis of the fullness of the stomach shows that 89.6% (juvenile 50.2%, adult male and female 49.8%) had food content while 10.3% had empty stomach (Table 1). The percentage of the stomach with food items was highest in August and September and lowest in November and December. These period falls within the rainy and dry season in the study area respectively.

Scientia Africana, Vol. 10 (No. 2), December, 2011. Pp 70 - 75
 ISSN 1118 - 1931

Table 1: The mean of the stomach fullness condition of *Synodontis guttatus* at Idah area of River Niger in Kogi State.

Sex	*0/4 (n=14)*	*4/4 (n=9)*	*¾ (n=16)*	*½ (n=14)*	*¼ (n=7)*	*Subtotal*	*Percentage (%) total*
AF	0.36	0.22	0.19	0.14	0.43	1.34	26.91
AM	0.21	0.33	0.25	0.21	0.14	1.14	22.89
Grand total	**0.99**	**0.99**	**1.00**	**1.00**	**1.00**	**4.98**	**100%**

AF = Adult female, AM = Adult male, 0/4 = Empty stomach, 4/4 = Full stomach, ¾ = Three quarter full stomach, ½ = Half full stomach, ¼ = One-quarter full stomach.

Table 2 contains the frequency of occurrence of the food items with respect to size and whole sample. The percentage total from the result shows that plants part accounted for 41.7%, algae 18.2%, insect 0.32%, insect appendages 1.63%, insect larvae 0.16%, crustacean parts 0.16%, fish scales 0.16%, sand grains 29.16%, mud 1.63%, unidentified items 6.84%. In all plants component was the highest food item followed by sand grains, insect larvae, crustacean parts and fish scales.

Table 2: The mean of the food items of *Synodontis guttatus* at Idah area of River Niger in Kogi State.

S/No	*FOOD ITEMS*	*AM*	*AF*	*JV*	*SUBTOTAL*	*TOTAL %*
1.0	**PLANTS**					
1.1	Plant components	0.1677	0.0505	0.1987	0.4169	41.70
1.2	Algae	0.0222	0.0228	0.2384	0.1824	18.24
2.0	**INSECTS**					
2.1	Insects	0.0016	0.0016	0.0000	0.0032	0.32
2.2	Insect appendages	0.0049	0.0065	0.0049	0.0163	1.63
2.3	Insect larvae	0.000	0.0016	0.0000	0.0016	0.16
3.0	**DECAPODS**					
3.1	Crustaceans parts	0.0016	0.0000	0.0000	0.0016	0.16
4.0	FISH					
4.1	Fish scales	0.0000	0.0000	0.0016	0.0016	0.16
5.0	**BOTTOM ITEMS**					
5.1	Sand grains	0.0798	0.0879	0.1238	0.2915	29.16
5.2	Mud	0.0065	0.0033	0.0065	0.0163	1.63
6.0	**UNIDENTIFIED ITEMS**	0.0228	0.0342	0.0114	0.0684	6.84
	Grand total	**0.3061**	**0.2084**	**0.4853**	**0.9998**	**100%**

Length and weight frequency distribution of *Synodontis guttatus* is shown in Table 3. The standard length (cm) and the weight (cm) for adult male, adult female, combined sex and juveniles is 10.2 to 10.3cm/25 - 75g, 12.0 - 14.3cm/50 – 80g, 20.2 – 14.3cm/25 – 80g and 6.7 – 13.1cm/14.5 – 11.5g respectively.

Table 3: Length and weight frequency distribution in *Synodontis guttatus* at Idah area of River Niger.

Sex	*Standard length (cm)*				*Total weight (g)*		
	n	Min	Max	Mean ± S.D	Min	Max	Mean ± S.D
Males	12	10.2	13.3	12.0±1.21	25.0	75.0	56.7 ± 15.86
Females	13	12.0	14.3	12.7 ± 0.73	50.0	80.0	68.1 ± 12.67
Combined sexes	25	10.2	14.3	12.4 ± 1.04	25.0	80.0	62.6 ± 15.1
Juveniles	26	6.7	13.1	8.3 ± 0.95	4.15	11.45	11.8 ± 2.15

n = Number, Min = Minimum, Max = Maximum, S.D = Standard deviation.

The relative condition factor (K) of *Synodontis guttatus* is shown in Table 4. The minimum condition factor (K) is 0.78 while maximum is 1.99.

Table 4: The mean relative condition factor (K) of *Synodontis guttatus* at Idah area of River Niger.

Sex	*Relative condition value (KN ± S.D)*	*n*	*Condition factor*		*a*	*b*	*r*
			Min	Max			
Male	3.27 ± 0.73	12	2.34	4.90	2.3486	0.1607	0.7558
Female	3.29 ± 0.59	13	2.56	4.03	1.9353	0.4865	0.5276
Combined sexes	3.28 ± 0.65	25	2.34	4.90	2.3906	0.1489	0.7361
Juveniles	1.35 ± 0.26	26	0.78	1.99	2.2261	0.0651	0.8310

K = Condition factor, a = intercept of the regression, b = Slope of the regression, r = correlation coefficient, S.D. = Standard Deviation, Min =Minimum, Max = Maximum.

DISCUSSION

The proportion (10.3%) of *S. guttatus* found with empty stomach may not be unexpected, and it is attributable mainly to post harvest digestion. Large percentages of empty stomach have been found in similar studies with some carnivorous fish such as *Pellornula afzeliusi* and *Lates niloticus* (Balogun, 1988), but lower proportions were obtained in *Tilapia guineensis* and *Hyperopisus bebe occidentalis* which are omnivores (Ipinjolu and Osanaye 1996) and in a carnivore (Ipinjolu *et al*, 1988).

The percentage of occurrence of food substances varied with month, season and size class. The result of this study shows occurrence of plant materials were more in the stomach of

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juvenile than adults in the month of September and October. This indicate more intense feeding at one group than the other and it could be as a result of partitioning of food resources in a bid to avoid intra-specific competition and may be attributed to the fact that this period fall within the rainy season characterized by abundance of plant materials.

Plant had the highest frequency in juvenile similar to the result obtained by Owolabi (2005) in Jebba Lake, Nigeria. It also agrees with Laleye *et al* (2006) in Queme River, Benin, this indicate that *Synodontis* is a omnivorous fish during rainy season even at its offset, followed by sand grain and this aid them in digestion of hard food like plants. This also shows the species under study is a benthic fish.

The variety of food substances found in the stomachs shows that *S. guttatus* is an omnivore, feeding on plant food substance such as phytoplankton, diatoms, desmid, plant parts (leaves and seeds), and animal food sources comprising of insects larvae, pupae and adults, crustacean, annelid worms, fish remains, nematodes; and detritus.

Imevbore and Bakare (1970) reported that two individuals of *S. resupinatus* captured in River Niger were found feeding mainly on insect larvae and bivalve molluscs, but variety of plant and animal food materials were found in some other *Synodontis* species. The results of the present study indicate that *S. guttatus* exhibit more versatile and complex omnivorous feeding habit in Idah area of River Niger which is similar to the finding on the food and feeding habits of *S. schall* Zaria area (Olatunde, 1989). However, *S. schall* fed more on animal materials than plants.

The juveniles showed more indignation towards soft plant materials particularly phytoplankton, diatoms, leaves and insect larvae while the adults exhibited more versatile feeding nature. These indicate that the food preference of *S. guttatus* change with age as found with *Clarias gariepinus* (Ayinla and Faturoti, 1990) and *Brienomyrus longianalis* (Ikomi, 1996).

The distribution of food taxa indicates that *S. guttatus* could explore wide range of food substances which are influenced by season and water hydrology.

The length-weight frequency distribution shows that adult female had the highest standard length 14.3cm than the adult male 13.3cm and juvenile 13.1cm. The total weight in adult female 80g and 4.5g for the juveniles. This shows that the rate of increase in body length is not proportional to the increase in body weight.

The values of relative condition factor (2.3 – 4.90) were obtained from this study were slightly higher than the range mean values of the condition factor (2.65 – 3.32) indicated by Baijot and Bouda (1997) especially for some slow-growing important fishes in Africa, the adult (male and female) *S. resupinatus* has the tendency to increase in size and mass (Laleye *et al;* 2006).

CONCLUSION

S. guttatus is an omnivore, feeding on diverse on plant and animal food substances. However, the juveniles show more indignation towards phytoplankton, diatoms, leaves and insect larvae, while the adults exhibit more versatile and complex feeding habit. This fish explore food items of aquatic and terrestrial origin depending on availability as influenced by season and water hydrology.

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