FOOD AND FEEDING HABITS OF *Synodontis resupinatus* (BOULENGER, 1904) AT IDAH AREA OF RIVER NIGER, KOGI STATE, NIGERIA

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ABSTRACT

The food and feeding adaptations of Synodontis resupinatus at Idah area of River Niger, Kogi State Nigeria were studied. Fish samples were collected from July to December 2007; the stomach contents were analyzed using frequency of occurrence method. The fish is a 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 indignation towards phytoplankton, diatoms and plant parts while the adults exhibited more diverse and complex feeding habits.

Keywords: *Synodontis resupinatus*, Stomach content, Feeding adaptations, River Niger

INTRODUCTION

The fish family Mochokidae is presented mainly by the 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. 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 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 resupinatus Boulenger 1904, are found through out 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. resupinatus* 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^{o-}07N and longitude 6^{o}44E. The water temperature range between 22^{o}C and 31^{o}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.

Sampling: Samples of *S. resupinatus* were obtained from Egah market Idah area of River Niger, Kogi State. The samples were obtained weekly between July and December 2007 from fishermen and transported iced to the Biological Sciences Laboratory, Kogi State University, Anyigba, for fresh examination, while those that could not be studied 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 as described by Olatunde (1978).

Stomach Content Analyses: 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).

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 total length (TL) and gut length (GL) was computed using a linear regression model: $GL = a + b\ TL$, where both TL and GL were measured in centimeters, a is constant and b is an exponent.

RESULTS

Stomach Contents: Analysis of the fullness of the stomach shows that 89.6 % (juvenile 50.2 %, adult male and female 49.8 %) had food content in their stomach, 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.

The percentage frequency of occurrence of the food items with respect to size and whole sample indicated 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 % and 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 percentage of occurrence of food substances varied with month, season and size class. The result of this study showed the occurrence of plant materials were more in the stomach of juvenile than adults in the months of September and October. This indicated 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 felled within the rainy season characterized by abundance of plant materials. This result was inline with the findings of Lowe-McConnell (1975) who reported availability of plant, invertebrates and fish in tropical waters during the rainy season.

Table 1: Stomach fullness conditions of *Synodontis resupinatus* 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, JV = Juveniles, 0/4 = Empty stomach, ½ = Full stomach, ¾ = Three quarter full stomach, ½ = Half full stomach, ¼ = One-quarter full stomach.

Table 2: Percentage frequency of occurrence of the food items in *Synodontis resupinatus* at Idah area of River Niger in Kogi State

Food Items	AM	AF	JV	Subtotal	Total %
Plants					
Plant components	0.1677	0.0505	0.1987	0.4169	41.70
Algae	0.0222	0.0228	0.2384	0.1824	18.24
Insects					
Insects	0.0016	0.0016	0.0000	0.0032	0.32
Insect appendages	0.0049	0.0065	0.0049	0.0163	1.63
Insect larvae	0.000	0.0016	0.0000	0.0016	0.16
Decapods					
Crustaceans parts	0.0016	0.0000	0.0000	0.0016	0.16
Fish					
Fish scales	0.0000	0.0000	0.0016	0.0016	0.16
Bottom Items					
Sand grains	0.0798	0.0879	0.1238	0.2915	29.16
Mud	0.0065	0.0033	0.0065	0.0163	1.63
Unidentified Items	0.0228	0.0342	0.0114	0.0684	6.84
Grand total	**0.3061**	**0.2084**	**0.4853**	**0.9998**	**100%**

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

Sex	n	Standard length (cm)			Total weight (g)		
		Min	Max	Mean	Min	Max	Mean
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

Plant had the highest frequency in juvenile *Synodontis* was also reported by Owolabi (2005) in Jebba Lake, Nigeria, and also agreed with Laleye *et al.* (2006) in Queme River, Benin. These findings indicated that *Synodontis* was a omnivorous fish during rainy season even at its offset. The sand grains encountered aided in digestion of hard food items like plants as well as indicated that the species under study is a benthic fish.

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).

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

Sex	n	Condition factor		Mean condition factor	a	b	r
		Min	Max				
Male	12	2.34	4.90	3.27 ± 0.73	2.3486	0.1607	0.7558
Female	13	2.56	4.03	3.29 ± 0.59	1.9353	0.4865	0.5276
Combined sexes	25	2.34	4.90	3.28 ± 0.65	2.3906	0.1489	0.7361
Juveniles	26	0.78	1.99	1.35 ± 0.26	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.

The males length-weight relationship is as expressed by the regression equation: Log TW = -2.3486 + 0.1607 Log TL (r = 0.7558) (Figure 1), while the females' length-weight relationship is as expressed by the regression equation: Log TW = -1.9353 + 0.4865 Log TL (r = 0.5276) (Figure 2) and the combined sexes' length-weight relationship is as expressed by the regression equation: Log TW = -2.3906 + 0.1489 Log TL (r = 0.7361) (Figure 3). Finally, the juveniles' length-weight relationship is as expressed by the regression equation: Log TW = -2.2261 + 0.0651 Log TL (r = 0.8310) (Figure 4).

The relative condition factor (K) of *Synodontis resupinatus* indicated that the minimum condition factor (K) was 0.78, while maximum was 1.99 (Table 4).

DISCUSSION

The proportion (10.3%) of *S. resupinatus* 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 1987; 2000), but lower proportions were obtained in two omnivores, *Tilapia guineensis* and *Hyperopisus bebe occidentalis* (Fagade, 1978; Ipinjolu *et al.,* 1996) and in a carnivore (Ipinjolu *et al.,* 1988).

The variety of food substances found in the stomachs showed that *S. resupinatus* is an omnivore, feeding on aquatic plant food items 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 fed 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 indicated that *S. resupinatus* exhibited 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* from Zaria area (Olatunde, 1989). However, *S. schall* fed more on animal materials than on plant items.

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 indicated that the food preference of *S. resupinatus* change with age, a condition earlier reported for *Clarias gariepinus* (Ayinla and Faturoti, 1990) and *Brienomyrus longianalis* (Ikomi, 1996).

The composition of the food taxa indicated that *S. resupinatus* could explore wide range of food substances which are influenced by season and water hydrology.

The length-weight frequency distribution showed that adult female had the highest standard length 14.3 cm than the adult male 13.3 cm and juvenile 13.1 cm. Similarly, the total weight was higher in adult females (80 g) than in the juveniles (4.5 g). The result indicated that the rate of increase in body length was 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) reported 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. resupinatus* 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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