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Food and Feeding Habits of *Oreochromis niloticus* (L.) and *Sarotherodon galilaeus* (L.) in a Tropical Reservoir

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Abstract: This paper provides information on the diets of *Oreochromis niloticus* and *Sarotherodon galilaeus* in Ero reservoir. Fish species were procured from fishermen every fortnight using gill nets, cast nets, traps, hooks and lines. Specimens were chilled with iced blocks at the point of collection and transported to the laboratory. 494 fish specimens were examined and their stomach contents analyzed. Frequency of occurrence and numerical methods were employed in this study. The result of the analysis showed that *O. niloticus* and *S. galilaeus* fed on similar food items. These were mainly macrophytes, *Chlamydomonas* species and Spirogyra. Other food items include detritus, sand grains and insect parts. Thus both species are omnivorous and occupy the same ecological niche.

Key words: Food and feeding · *O. niloticus* · *S. galilaeus* · Ero reservoir

INTRODUCTION

The study of the food and feeding habits of freshwater fish species is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management programme on fish capture and culture (Oronsaye and Nakpodia, 2005). According to Arawomo and Fawole (1997), cichlids are among the commercially exploited fishes for human consumption especially in Africa lakes.

Various works have been done on the diets of Cichlids and other fish species from various lakes in Nigeria and few other lakes and reservoirs from southwestern Nigeria except those from Ero reservoir (Durr and Gonzalez, 2002) worked extensively on the food and feeding habits of *Beryx splendens* and *B. decadactylus* (Berycidae) off Canary Islands while (Ikomi, 1996) examined the food and feeding raltionships of *Ethmalosa fimbriata* (Bowdich) and *Mugil cephalus* (L.) from Kulama creek (Niger Delta); Komolafe and Arawomo (1998) also worked on the distribution and feeding habits of *O. niloticus* (L.) in Opa reservoir, Ile-Ife while (Arawomo and Fawole, 1997) assessed the food and feeding habits of *Sarotherodon galilaeus* (Artedi) in Opa reservoir of Obafemi Awolowo University, Ile-Ife.

The fish fauna of Ero reservoir was reported on by Ose and Fagbuaro (Oso and Fagbuaro, 2004). This study therefore aims at providing further information on the nourishment and abundance of natural foods needed by the fish in Ero reservoir.

MATERIALS AND METHODS

Study area: Ero reservoir is located at Ikun Ekiti in Moba Local Government Area of Ekiti State. The reservoir is an earth filled embankment with a length of 662 m, an impounded reservoir area of 4.5 km^2 and normal water level of 504.5 m.

The reservoir is bordered by a number of villages and settlements; Ewu, Ikun, Igogo, Iye, Ikosu and Isaoye (Kester, 2001). The Federal Government through Nigerian Water Resources Development Authority constructed Ero Reservoir developed out of the embankment type of dam in 1979. It was impounded in March 1985 and commissioned in July 1985.

Sampling procedure: The reservoir was demarcated into three zones based on the inputs from its tributaries. Fish specimens were collected every fortnight between March 2004 and April 2005 with the aid of the fishermen operating on the reservoir. Gears employed included gill nets, cast nets, traps, hooks and lines. Samples were chilled in iced blocks at the point of collection before being transported to the laboratory in the Department of Zoology University of Ado-Ekiti for analysis.

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Identification of fish species was done using fish identification guide by Olaosebikan and Raji (1998) and FAO (1992). The weight of each specimen was taken using a top loading metler balance (model PNI200) to the nearest 0.1 g after draining excess water with a pile of filter paper while standard length was measured in centimeter using a measuring board. Specimens were dissected and the gut taken out to remove the stomach. The contents were emptied into a petri dish for analysis.

Analysis was done using frequency of occurrence and numerical methods as described by Hyslop (1980) and Costal *et al.* (1992). In the frequency of occurrence method, the occurrence of food items was expressed as the percentage of the total number of stomach containing food. In the numerical method the number of each food item was expressed as the percentage of the total number of food items found in the stomachs.

RESULTS

A total of 299 specimens of *Oreochromis niloticus* and 195 specimens of *Sarotherodon galilaeus* were obtained. The total length and standard length ranged from 8.4 to 20.5 cm and 6.3 to 15.2 cm, respectively in *O. niloticus* while the weight ranged between 9.4 and 132 g. In *S. galilaeus*, the standard length ranged between 8.7 and 14.3 cm, total length ranged from 11.3 to 18.5 cm and weight ranged from 30.4 to 103.7 g.

Table 1 shows the summary of the food items in *O. niloticus.* Higher plant remains macrophytes accounted for 49.29% of the content under frequency of occurrence method followed by *Chlamydomonas* with 47.29%. Detritus/mud and spirogyra had 44.82 and 42.36%, respectively. In the numerical analysis, filamentous species particularly spirogyra (36.75%) constituted the most important diet of *O. niloticus* followed by *Chlamydomonas* sp. (26.12%) while Volvox sp. and insects appeared to be complementary. Table 2 shows analysis of empty stomachs of *O. niloticus*. Out of 299 specimens examined 96 (32.11%) had empty stomach.

Table 3 shows the summary of stomach contents of *S. galilaeus* from Ero reservoir. Higher plant remains formed the most important diet (60.32%) followed by detritus/mud (49.21%) while Volvox species was least observed in frequency of occurrence method. In the numerical method, Spirogyra was the most important food item observed (33.49%) while insect larvae were the least (6.13%). As shown in Table 4, 69 (35.38%) out of 195 specimens examined had empty stomachs.

Table 1: Summary of the stomach contents of *O. niloticus* in Ero reservoir

	Frequency of occurrence		Numerical method	
Food items	No	%	No	%
Detritus/Mud	91	44.82	-	-
Macrophytes	100	49.29	-	-
Green algae:				
Chlamydomonas	96	46.00	47.29	22.66
Closterium sp.	417	342.00	26.12	20.60
Filamentous algae:				
Spirogyra sp.	86	42.36	610.00	36.75
Colonial green algae:				
Volvox sp.	45	22.17	187.00	11.27
Sand grains	78	38.42	-	-
Insect parts	39	19.21	104.00	6.27

Table 2: Analysis of empty stomach in *O. niloticus*

Months	No. of stomach examined	No. of empty stomach	% of empty stomach
Nov	38	10	26.32
Dec	30	8	26.67
Jan	20	9	45.00
Feb	53	17	32.08
Mar	39	14	35.90
Apr	51	16	31.37
May	35	12	34.29
Jun	33	10	30.30

Table 3: Summary of stomach contents of *S. galilaeus* from Ero reservoir

	Frequency of occurrence		Numerical method	
Food items	No.	%	No.	%
Detritus/Mud	62	49.21	-	-
Sand grains	49	38.10	-	-
Insect parts	18	14.29	97	15.25
Insect larvae	17	13.49	39	6.13
Macrophytes	76	60.32	-	-
Chlamydomonas sp.	31	24.60	132	20.75
Closterium sp.	24	19.05	84	13.21
Spirogyra sp.	61	48.41	213	33.49
Volvox sp.	15	11.90	71	11.16

Table 4: Analysis of empty stomach of *S. galilaeus*

Month	No. of stomach examined	No. of empty stomach	% of empty stomach
Nov	30	11	36.67
Dec	18	6	33.33
Jan	17	8	47.06
Feb	36	15	41.67
Mar	24	7	29.17
Apr	28	8	28.57
May	25	9	36.00
Jun	18	6	33.33

DISCUSSION

The major food items of *Oreochromis niloticus* and *Sarotherodon galilaeus* in Ero reservoir were similar, mainly macrophytes, green algae, detritus, sand grains, insect parts etc. The feeding habits were similar to those reported by Fagade and Olaniyan (1972) in the Lagos Lagoon; and Fagade (1979) on *Tilapia guineensis* from Lekki Lagoon.

Apart from the major food items, they also picked a variety of other food items. Liem (1984) stated that teleost including cichlids were able to exploit more than one source. This ability to exploit different varieties of food makes *O. niloticus* and *S. galilaeus* to be omnivorous. Several other workers have also reported on the high degree of overlap in diet of fishes from the same community (Akinwumi, 2003; Olufeagba, *et al*. 2002).

Examination of the diet of these two species showed that there was high percentage of mud and detritus in their stomach. This is an indication that the species are bottom grazers and inter-specific competition can be said to occur in the reservoir between the two species. The similarity in ecological niche was however already accompanied by some discrete differences in the selection of complementary food items. *O. niloticus* which were numerically more abundant in the reservoir during the period of study utilized a fewer variety of supplementary food items than *S. galilaeus* which on the other hand were less in numerical abundance in the samples and showed more choice of supplementary food items consisting of insect larvae. The difference noted in the diversity of supplementary food items of the two-tilapia species may be an active and immediate response to interspecific competition or other habitat factors.

O. niloticus and *S galilaeus* were observed to be herbivores having highest percentage frequency of occurrence of higher plant remains as 49.2 and 60.3%, respectively. The food and feeding habits of *O. niloticus* and *S. galilaeus* in Ero reservoir as reported in the present study is in agreement with earlier reports for these fish species found in some other water bodies. For instance, Kuton and Kusemiju (2000) noted that inter-specific competition occurred among the four cichlid species in Lekki Lagoon. Also, Brown (1985) further reported that this fish species fed mainly on detritus, insects and plant materials in Ikpoba River. Ikomi and Sikoki (2001) observed that the presence of tiny unicuspid teeth in the mouth of the fish suggests that fish species feed on plants, leaves, buds and seeds of water lilies and are thus herbivorous feeders.

CONCLUSIONS

The result obtained in this study showed that about 32.11% of the *O. niloticus* examined had empty stomach while in *S. galilaeus* about 35.38% had empty stomach. The reason for this may be due to the fact that the food items in their stomach may have been regurgitated or digested as the fish struggled for escape in the traps and gill nets. It was observed that specimens caught with cast net had lesser amount of empty stomach. Thus, cast netting may be recommended for study of food and feeding.

The result revealed a high level of similarity in the diet of the two species thus suggesting some degree of food competition. Both species also showed high level of trophic flexibility. This competition makes them to occupy the same ecological niche within the same river. The percentages of occurrence of empty stomach were relatively low for both species and showed no significant difference. This observation indicates that food is available for these fish species but poor in variety. It could be said that the reservoir was not rich in natural foods. This may account for the small sized fish that dominated the catch. Ero reservoir, though primarily constructed to provide potable water for some neighbouring towns and villages, can support a very good fish production with proper management approach put in place.

RECOMMENDATIONS

Fertilization: This is necessary to enhance the growth of natural food in the reservoir. Poultry droppings have been used to fertilize reservoirs with appreciable results. Poultry can also be established over some parts of the reservoir to achieve continuous fertilization from faecal droppings.

Water quality monitoring: Proper monitoring of the physico-chemical parameters of the water is important to ensure successful fishery management plans.

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