THE DISTRIBUTION AND FEEDING HABITS OF A CICHLID FISH,*OREOCHROMIS NILOTICUS* (LINNAEUS) IN OPA RESERVOIR, ILE-IFE.

BY

KOMOLAFE, O.O.
Department of Biology,
Adeyemi College of Educations,
Ondo

AND

ARAWOMO, G.A.O.
Department of Zoology,
Obafemi Awolowo University,
Ile-Ife

ABSTRACT

The distribution of *Oreochromis niloticus* was studied in Opa reservoir using a graded set of gillnets while the food and feeding habits were studied using a castnet to collect the fish samples. About 90% of the fish specimens were caught near the reservoir bottom while about 69% of the specimens were caught within the inshore area of the reservoir. The fish species was an omnivore and it fed mainly on detritus, algae and higher plants. Feeding in *O. niloticus* started around 6.00a.m. and reached a peak by 3.00p.m. but this declined gradually until 6.00p.m. These results can be utilized for the proper management of the fish species in the reservoir.

INTRODUCTION

Oreochromis niloticus is widely distributed in association with other fish species in tropical water bodies (Welcomme, 1967). Field observations by Ita (1978) and Arawomo (1987) showed that *O. niloticus* lived in the shallow inshore and surface waters of the Kainji Lake and in the major rivers of the Federal Capital Territory of Nigeria. Welcomme (1970) also observed that *O. niloticus* inhabited shallow swamps of Lake Victoria.

Bagenal (1978) reported fish stomach content per-se may not reflect consumers food because some food items are digested rapidly. However, Bowman and Bowman (1980) observed that stomach fullness and the % of empty stomach are direct evidences for evaluating feeding periodicity. The food of fishes varied within species thereby indicating food selectivity (Pearcy and Jullies, 1974). *O. niloticus* inhabiting West African lakes fed on phytoplankton, diatoms, benthos and detritus (Fryer and Iles, 1972; Trewavas, 1983). The report on O. nilotucus in Opa reservoir will show how this economically important fish species can be sustained in the reservoir.

Study Area

Opa reservoir is located in Obafemi Awolowo University, Ile-Ife, Nigeria. The reservoir has a catchment area of about 116 square kilometres which extends from longitude $4^{\circ}31^{1}$E to $4^{\circ}39^{1}$E from latitude $7^{\circ}21^{1}$N to $7^{\circ}35^{1}$N (Figure, 1). The surface area of the reservoir is about 0.95 square kilometre while the maximum capacity is about 675 cubic metres (Figure, 2). The catchment area is characterised by annual dry and rainy seasons. The rainy seasons extends from April to September while the dry season extends from October to March.

The substratum of the reservoir is mainly mud and sand. Shoreline vegetation is dense with submerged aquatic macrophytes, some of which eventually decompose during the rainy season.

Materials and Methods

A graded set of gillnets measuring 160 metres long with five different mesh sizes of 32 metres each were used to study the distribution of *O. niloticus*. The mesh sizes were 2.5cm, 5.1cm, 7.6cm, 10.2cm and 12.7cm with a depth of 3.78m respectively. The gillnets were set between 6.00p.m. and 7.00p.m. in the evenings and left to fish. Fishes caught were removed between 6.00p.m. and 7.00a.m. the following morning. The reservoir was demacated into inshore and offshore areas as well as to three sections on the basis of the distance to the dam wall. These were done so as to carry out random sampling of the fish species and to facilitate the description of the actual area where fish specimens were concentrated in the reservoir.

O. niloticus specimens examined in this study were caught with castnets of 7.6cm and 2.5cm mesh sizes. The fishes were transferred to the laboratory where standard morphometric parameters were taken. The stomach of each fish was disseced and the contents were weighed to the nearest 0.1gm and the volume obtained by water displacement in a measuring cylinder. The analysis of the stomach contents of each fish specimen were done by the frequency of occurrence and numerical methods according to Hyslop (1980) and Costa *et al* (1992). Food identification was done to genus and species level where possible. Feeding rhythm of the species was studied on a three hourly basis for a period of twenty four hours at each period.

Results

1580 specimens of *O. niloticus* caught during this study constituted 33% of all fish specimens caught in the reservoir (Table 1). The size ranged from 11.0cm total length, 8.5cm standard length and a weight of 38.0gm. to 38.6cm, 31.4cm and 1038gm as total length, standard length and weight respectively. Fish specimens representing 30.5% of the total catch of *O. niloticus* was in the upper section of the reservoir, while 41.78% and 27.65% of the total fish specimens were caught in the central area and close to the dam wall respectively. *O. niloticus* was found to be available in all the water depths of Opa reservoir. Majority of fish specimens constituting 90.5% of the total catch were caught in the lower part of the gillnets. The non-concentration of the species away from the water surface was confirmed statistically (X^2 Cal. 557.9 X^2 tab. 76.15 df. 820). 68.7% of *O. niloticus* were caught in the inshore area while 31.3% were caught at the offshore area of the reservoir. This horizontal distribution when tested statistically gave (X^2 Cal. 217/6 X^2 tab. 76.15 df. 820), thus confirming the presence of the species at the reservoir inshore.

Feeding Rhythm

Out of 624 fish specimens caught for the feeding rhythm experiment, 35.3% of all fish specimens had full stomachs between 6.0a.m. and 3.00p.m. During the same period, 25.6% fish specimens had three-quarter and 21% with half stomach fullness respectively (Table, 2). 37.7% of the fish specimens had full stomachs between 9.00a.m. and 12.00 mid-day.

Table 1: Relative Abundance of Fish Species Caught in Opa Reservoir Between 1986 and 1989

{PRIVATE } Fish Species	Number of Fish Caught	%
Sarotherodon galilaeus Linnaeus	1848	38.60
Oreochromis niloticus Linnaeus	1580	33.00
Tilapia zillii Gervais	1310	27.36
Hepsetus odoe Bloch	26	0.54
mormyrus rume Cuvier and Valenciennes	4	0.09
Hemichromis ffasciatus Peters	3	0.06
Hemichromis bimaculatus Gill	1	0.02
Schilbe mystus Linnaeus	8	0.17
Heterobranchus bidorsalis Geoffrey Saint-Hilaire	2	0.04
Clarias garipeinus (Burchell)	5	0.11
Malapterurus electricus (Gmellin)	1	0.02
Total	4788	100

Table 2: Diurnal Feeding Rhythm of *O. niloticus* Caught in Opa Reservoir

{PRIVATE }Period of Feeding	Fish speciemns with full-stomachs	Fish specimens with 3/4 full-stomachs	Fish specimens with 1/2 stomach fullness	Fish specimens with 1/2 stomach fullness	Fish specimens with nearly empty stomach	Total number of fish	Fish percentage
(6.00-9.00)am	6	59	41	6	0	112	17.95
(9.00-12.00)pm	83	32	30	6	37	188	30.13
(12.00-3.00)pm	113	60	54	23	5	255	40.87
(3.00-6.00)pm	18	5	0	12	0	35	5.61
(6.00-9.00)pm	0	0	0	0	0.0	0	0.0
(9.00-12.00)am	0	4	0	0	0.0	4	0.64
(12.00-3.00)am	0	0	0	0	17	17	2.72
(3.00-6.00)am	0	0	6	0	7	13	2.08
Total	220	160	131	47	66	624	
Percentages(%)	35.26	25.64	20.99	7.53	10.58		100

The number of fish with full stomach increased to 51.4% between 12.00 mid-day and 3.00p.m. in the afternoon. The number of fish specimens with full stomachs decreased to 8.2% between 3.00p.m. and 6.00p.m. in the evening. 89.4% of all fish specimens caught in Opa reservoir fed between the hours of 6.00a.m. in the morning and 3.00p.m. in the afternoon. *O. niloticus* thus fed during the day and the peak feeding time was 3.00p.m. in the afternoon.

Food Composition

O. niloticus fed mostly on detritus and higher plants (Table 3). Other food items in the stomach were unicellular green algae, diatoms and insect remains. *O. niloticus* fed on similar food items during the dry and wet seasons except for the addition of *Synedra* sp and *Euglena* sp. during the rainy season. *O. niloticus* selectively fed on natural food materials available in Opa reservoir.

Table 3: Stomach Content Analyses of *O. niloticus* in Opa Reservoir

{PRIVATE }Food Items	*Occurrence*	%	Number	%
Sand grains	281	17.66	-	-
Detritus	408	25.64	-	-
Mud	203	12.76	-	-
Green Algae (Unicellular)*Closterium sp*	17	1.07	36	0.09
Euglena sp	4	0.25	20	0.05
Synedra sp Diatoms	49	3.08	233	0.59
Navicula sp	136	8.55	9452	24.12
Stauroneis sp	74	4.65	2268	5.79
Higher plant fragments	296	18.61	26935	68.73
Insect remains	123	7.73	246	0.63
Total	1591	100	39190	100

Discussion

During this period of study, *O. niloticus* constituted 33% of the total catch of 4788 fish specimens. In the inshore area of Opa reservoir, 68.7% of the total catch of *O. niloticus* specimens were caught and this is similar to the results obtained by Ita (1978) where 62.8% of the total catch of *O. niloticus* specimens were caught from inshore area of Kainji Lake. Gwahaba (1978) associated inshore concentration of the cichlid fishes to the presence of breeding adults. Akintunde (1976) and Ita (1978) attributed high percentage of *O. niloticus* and *S. galilaeus* in inshore of Kainji lake to the need for weed cover during spawning periods. The presence of higher plants in the diet of *O. niloticus* might also be reponsible for their concentration in inshore area of Opa reservoir.

Stomach contents of *O. niloticus* specimens comprised natural food materials such as higher plants, detritus, mud, sand grains and insect remains. Such natural food items were reported by Komolafe (1985) and Abayomi (1986) in the stomachs of *Tilapia zillii* and *Saroherodon gililaeus* of Opa reservoir respectively. Organic deposits fed upon by *O. niloticus* was also reported by Welcomme (1970) to be fed upon by *T. leucostica* in Lake Victoria. The organic deposits being fed upon by fishes have been reported by Hickling (1961) to be a rich source of crude protein. The sand grains consumed along with mud by *O. niloticus* of Opa reservoir as part of its diet were also recorded as part of food items for *Tilapia* species in the Lagos Lagoon (Fagade, 1971). According to him, sand grains had no nutritive value but might provide some nutritional benefits to the fishes through their dark coating of organic materials which disappeared during passage through the intenstine. Higher plants fed upon by *O. niloticus* in this study was reported by Trewavas (1983) as food of *O. niloticus* in West African water bodies. Filamentous green algae and diatoms prominent in the diet of *O. niloticus* were reported by Getachew (1989) as food of *O. niloticus* in Lake Awasa, Ethiopia.

O. niloticus started feeding in the early hours of the day between 6.00a.m. nd 9.00a.m. reaching the peak period around 3.00p.m. in the afternoon. This regular feeding rhythm was similar to the observations of Harbott (1975) and Lowe-McConnell (1975) on *O. niloticus* in Lake Rudolf where the species was reported to exhibit feeding rhythm commencing between 5.00 am and 8.00am in the morning and ceasing between 2.00pm and 8.00pm in the evening.

REFERENCES

Abayomi, O.S. (1986): The distribution, food and feeding habits of *Sarotherodon galilaeus* in Opa reservoir. M.Sc. dissertation of the University of Ife, Ile-Ife, Nigeria.

Akintunde, E.A. (1976): The biology of *Tilapia and Sarotherodon species of Lake Kainji, Nigerian with a special reference to* S. galilaeus. M.Phil. Thesis, University of Ife, Nigeria.

Arawomo, G.A.O. (1987): The fish fauna of the rivers in the New Federal Capital Territory, Abuja, Nigeria. *Ife Journal of Science* Vol. 2, Nos. 1 and 2 Pp. 37-43.

Bagenal, T.B. (1978): *Methods for Assessment of Fish Production in Freshwaters.* Blackwell Scientific Publications, Oxford. 365pp.

Bowman, R.E. and Bowman, E.W. (1980): Diurnal variation in the feeding intensity and catchability of silver Hake (*Merluccius billinearis). Can. J. Fish, Agust. Sc.*, 37: 1565-1572.

Coasta, J.L. Assis, C.A. Almeida, P.R., Moreira, F.M. and Coasta, M.J. (1992): On the food of the European eel *Anguilla anguilla* (1-) in the upper zone of the Tagus estuary, Portugal. *J. Fish. Biol;* 41: 841:-850.

Fagade, S.O. (1971): The food and feeding habits of *Tilapia* species in the Lagos Lagoon. *J. Fish. Biol.* 3: 151-156.

Fryer, G. and Iles, T.D. (1972): *The Cichlid fishes of the great lakes of Africa. Their Biology and Evolution.* Oliver and Boyd. Edinburgh.

Gwahaba, J.J. (1975): The distribution, population density and biomass of fish in an equatorial Lake, Lake George, Uganda, *Proc. R. Soc. Lond. B.* 190: 393-414.

Harbott, B.J. (1975): Preliminary observations on the feeding of *Tilapia nilotica Linn. in Lake Rudolf. Afr. J. Trop. Hydrobiology and Fisheries* 4(1): 27-37.

Hickling, C.F. (1961): *Tropical Inland Fisheries longmans* Green and Co. Ltd. London and Southampton 287pp.

Hyslop, E.J. (1980): Stomach content analyses - a review of methods and their application. *J. Fish. Biol* 17: 411-429.

Ita, E.O. (1978): An analysis of fish distribution in Kainji Lake, Nigeria. *Hydrobiologia* 58 930: 233-244.

Komolafe, O.O. (1985): The Biology of the cichlid Fish *Tilapia zillii* (Gervais) in Opa Reservoir. M.Sc. dissertation of the University of Ife, Ile-Ife, Nigeria.

Lowe-McConnell, R.H. (1975). *Fish communities in Tropical Freshwaters* Longman Group Ltd. Lond. 337pp.

Pearcy, W.G. and Jullie, W.A. (1974): Food Habits of deep sea macrourid fishes off Oregon *Coast. Deep Sea Res. Oceanogra. Abstr.*, 21(1): 745-759.

Trewavas, E. (1983): Tilapiine Fishes of the genera *Sarotherodon, Oreochromis and Danakilia.* The Dorset Press. Dorchester. British Museum (Natural History) 583pp.

Welcomme, R.L. (1967): The relationship between fecundity and fertility in the mouth brooding Cichlid fish. *Tilapia leucosticta J. Zool. Lond.*, 151: 453-468.

Welcomme, R.L. (1970): Studies of the effects of abnormally high water levels on the ecology of fish in certain shallow regions of Lake Victoria. *J. Zool. Lond.*, 160: 405-436.