

# THE REPRODUCTION OF *Oreochromis niloticus* (Linnaeus) IN OPA RESERVOIR, ILE-IFE, NIGERIA.

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## ABSTRACT

*Oreochromis niloticus* is one of the commercial fish species in Opa reservoir. It bred throughout the period of study in the reservoir. The fish species is a maternal mouth brooder with the female specimens carrying eggs and alevins in their mouths.

The sex ratio of *O. niloticus* was 1:1 and the maximum fecundity recorded was 1810 eggs. The fecundity increased as the fish length increased. The relatively high fecundity of the fish species in the reservoir is an indication of the suitability of the small reservoir in contributing to fish production.

## 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°31'E to 4°39'E and from latitude 7°21'N to 7°35'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 season 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

*O. niloticus* specimens examined during the period of study were caught between October 1986 and February 1989. The fish which were caught either by gill-netting or cast-netting were transferred to the laboratory where standard morphometric parameters were taken. Each specimen was then opened ventrally from the anus to the pectoral fin and the sex and stage of gonadal maturation

determined visually (Kesteven, 1960; Roberts, 1989).

All mature gonads were removed, weighed and gonadal stages noted according to Leavastu (1965) and Hynes *et al* (1992). Mature ovaries collected from each specimen were preserved in modified Gilson's fluid (Simpson, 1951; Barbieri, 1989). The preserved ovaries were periodically shaken to ensure the separation of eggs from the ovarian tissues. The preserved ovaries were then used for fecundity studies and measurement of the egg size.

## RESULT

1430 specimens of *O. niloticus* were examined during the period of study. The breakdown of the total catch revealed that 55.3% were males while 44.7% were female specimens (Table 1). Gill-netting accounted for 57.4% of the total catch while cast-netting accounted for 42.6% of the total catch. Irrespective of the sex of fish, a significantly higher number of fish specimens were caught inshore than in the offshore stations. Whether at inshore or at the offshore stations, the number of male specimens caught were slightly higher than those of the female specimens although the sex-ratio was approximately 1:1. Male and female *O. niloticus* specimens caught by cast-netting during the breeding periods had characteristic reddish-

**Table 1: stages of gonadal development recorded in the *O. niloticus* specimens caught during the period of study**

Gonadal stages	Male		Female	
	No of fish	%	No of fish	%
I	77	12.05	86	10.86
II	126	19.71	182	23.01
III	139	21.75	225	28.45
IV	275	43.05	281	35.53
V	15	2.34	11	1.39
VI	17	1.10	6	0.76

#### **Gonado-somatic index and Fecundity**

brown breeding dress on the ventral surfaces especially around the pharyngeal regions.

#### **Breeding season**

*O. niloticus* specimens caught in Opa reservoir during the study had no definite breeding period (Fig.3a). In the female specimens caught during the study period peak breeding periods were observed during the months of December (1986); March, June and November (1987); April and November in 1988. The result also showed the percentage of *O. niloticus* male specimens which reached gonadal Stage IV development during the months of November (1986); January, May and December (1987); February, June and October (1988) and in February 1989.

The gonadosomatic index varied between 0.12 and 4.06 with a mean of  $1.05 \pm 0.01$  in female fish specimens. The mean gonadosomatic index recorded for mature testes was  $0.39 \pm 0.02$  with individual values ranging between 0.03 and 1.67. The gonadosomatic index increased with the development of the gonads in both male and female fish specimens until the gonads reached maximum size at the fourth stage of gonadal development. However, the result showed that the gonadosomatic index decreased in spawning and spent fish specimen (Fig. 4).

Out of 639 female fish specimens examined during the period of study, 54.5% had one batch of eggs in their ovaries while 45.5% had two batches. Matured eggs of *O. niloticus* which were yellowish and pear shaped had diameters which varied between 2.12mm and 2.69mm with a mean of  $2.47 \pm 0.02$ . Eggs in the third and fourth stages of gonadal development constituted 64.8% of the total number of eggs counted (Table 1). The result also showed that more than two thirds of the male specimens examined were in the third and fourth stages of gonadal development. The total fecundity in the ovaries ranged from 73 eggs to 1810 eggs with a mean fecundity of 815 eggs. In the reservoir the mean relative fecundity of *O. niloticus* specimens was  $3.34 \pm 0.11$  eggs per gram body weight of fish. A very low correlation was recorded between fecundity and standard length ( $r = 0.370$ ,  $P 0.001$ ); between fecundity and fish weight ( $r = 0.367$ ,  $P 0.001$ ) and between fecundity and gonadal weight ( $r = 0.299$ ,  $P 0.001$ ).

#### **DISCUSSION**

The high inshore concentration of *O. niloticus* during the period of study was similar to what was obtained in some other tropical lakes (Bishai, 1961; Ita, 1978). Gwahaba (1975) associated inshore concentration of cichlid fishes to the presence of

breeding adults and the need for weed cover during spawning periods (Akintunde, 1976; Ita, 1978). The ability of *O. niloticus* specimens in Opa reservoir to breed all year round is an indication of the ability of the fish to sustain itself adequately in the water body. As observed in Opa reservoir, *O. niloticus* specimens were also reported to have bred all the year round in Lake Mariut (El-Zarka *et al.*, 1970), Lake Nasser (Latif and Rashid, 1972), Lake Naivasha (Siddiqui, 1977) and Lake Kainji (Madu and Ita, 1986). This observation tallies with the findings of Low-McConnell (1958) who reported that *O. niloticus* specimens bred all the year round in waterbodies located away from the equator. The presence of more than one batch of egg in the female specimens during the period of study was an indication of all year breeding activity in the species.

The frequency of spawning in Opa reservoir was probably influenced by abundance of natural food all year round in the reservoir. (Komolafe, 1985) and other conducive environmental factors (Abayomi, 1986). McEvoy (1991) also reported that multiple spawning was only possible where there was long period of adequate food supply. The high gonadosomatic index obtained for the specimens of *O. niloticus* in this study confirmed the observation of Babiker and Ibrahim (1979) that it was possible to obtain high gonadosomatic index in fish species with ripe ovaries due to large deposit of yolk in the eggs. The fecundity of *O. niloticus* in the reservoir which varied between 73 eggs and 1810 eggs was lower than what was recorded for *Tilapia zillii* in the same habitat which had fecundity varying from 2820 eggs to 6473 eggs (Komolafe, 1985). The low fecundity in the species was attributed to the month brooding habit (Segun, 1989) and limited space available for incubation and rearing of fry in the bucal cavity (Babiker and Ibrahim, 1979) while *T. zillii* with a higher fecundity was a substratum spawner.

A relatively fast growth of *O. niloticus* was observed in Opa reservoir and this was attributed to the high quality of natural food materials in the reservoir (Komolafe, 1995). Such rich environments are typical of small reservoirs which are suitable for fish culture due to the shallow depth and associated high dissolved oxygen and low carbon dioxide.

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