Bagenal (1971) defined fecundity as the number of ripening eggs in the female prior to the next spawning period. Scot (1962) and Bagenal (1966) reported that shortage of food caused by overpopulation led to low fecundity. Wootton (1973) observed that high food levels increased the percentage of fish that matured, the number and frequency of spawning and the mean total weights of eggs produced per spawning. Clarias spp run up small streams to spawn in temporary flooded area in Lake Victoria (Lowe McConnell, 1978). In its natural environment Clarias bred generally during the rainy season (Bard et al 1976; Ayinla and Nwadulwe, 1990). This study aims to contribute to the knowledge of the productive potential of C. gariepinus due to ever increasing demand for it as food and fish for culture in Nigeria.

Study Area
Sampling for C. gariepinus was carried out in Opa Reservoir between 1989 and 1992. It has a catchment area of about 116 square kilometer extending over longitude 4°31' E to 4°39' E and latitude maximum capacity of 675 cubic metres. The substratum of the reservoir is mainly mud and sand. The vegetation at the shoreline is dense and aquatic macrophytes are present.

ABSTRACT
The sex-ratio of Clarias gariepinus in Opa Reservoir was 2:1 (male/female). The fecundity of C. gariepinus in Opa reservoir ranged between 1,567 and 650,625 egg. The fish species had extended spawning period which probably spreads the risk of predation on the eggs. The population of the fish species could be improved by stocking with the female breeders.

INTRODUCTION
Bagenal (1971) defined fecundity as the number of ripening eggs in the female prior to the next spawning period. Scot (1962) and Bagenal (1966) reported that shortage of food caused by overpopulation led to low fecundity. Wootton (1973) observed that high food levels increased the percentage of fish that matured, the number and frequency of spawning and the mean total weights of eggs produced per spawning. Clarias spp run up small streams to spawn in temporary flooded area in Lake Victoria (Lowe McConnell, 1978). In its natural environment Clarias bred generally during the rainy season (Bard et al 1976; Ayinla and Nwadulwe, 1990). This study aims to contribute to the knowledge of the productive potential of C. gariepinus due to ever increasing demand for it as food and fish for culture in Nigeria.

MATERIALS AND METHODS
Fish samples were caught using baited longlines, graded fleets of multifilament gillnets castnets and traps. These traps were set in all the ecological niches of the reservoir (Fig.2). Measurements of the total length and weights of the fish were recorded. The sexes of all fish and their states of maturity were noted. The matured specimens that produce free eggs or creamy white sperm fluid on the application of gentle pressure on the abdomen of both female and male specimens respectively were used for reproductive studies.

The fish were eviscerated and matured gonads were removed and weighed fresh. The ripe ovaries were preserved in Gilsons fluid. There was repeated shaking of the containers which assisted in the penetration of the preservations and separated the eggs completely from the ovarian tissues. The fecundity of each fish was determined using the gravimetric method. The diameter of the ripe preserved eggs from each sample were measured using binocular microscope fitted with an ocular micrometer eye piece.

RESULTS
Observation made on 1253 C. gariepinus caught showed that 835 were males and 418 were females giving a male/female sex ratio of 2:1.
The smallest mature male had a total length of 26.8 cm while the female was 25.6 cm. The length frequency of all *C. gariepinus* caught on spawning runs is shown in Fig. 3.

*C. gariepinus* were found carrying mature gonads throughout the year (Table 1) With the peak of breeding between June to August. The fecundity of 289 ripe females *C. gariepinus* ranged from 1,567 eggs to 650,625 eggs in the size range 39.5 cm - 82.5 cm. The mean number of eggs per gram wet weight of ovary varied from 196 to 2,957 with a mean of 713/g.

Table 1: Relative percentage of *C. gariepinus* carrying mature gonads in OPA Reservoir

<table>
<thead>
<tr>
<th>SEX</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
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<th>S</th>
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<th>N</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>9.8</td>
<td>9.4</td>
<td>8.1</td>
<td>7.5</td>
<td>5.6</td>
<td>10.6</td>
<td>12.4</td>
<td>7.5</td>
<td>6.1</td>
<td>6.5</td>
<td>9.4</td>
<td>7.5</td>
</tr>
<tr>
<td>FEMALE</td>
<td>5.1</td>
<td>6.1</td>
<td>7.0</td>
<td>9.7</td>
<td>1.0</td>
<td>17.2</td>
<td>18.1</td>
<td>14.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>6.0</td>
</tr>
</tbody>
</table>

The fecundity (F) was expressed in relation to the total length (TL) as shown in Fig. 4. The relationship was curve-linear and described by the equation:

\[ F = 6.98TL - 266.19 \]

The fecundity was also linearly related to the fish body weight (BW) as shown in Fig. 5 and ovary weight (GW) as shown in Fig. 6. The relationships were rectilinear and expressed by the equation:

\[ F = 1.14BW + 48.47 \ (p < 0.001) \]

and

\[ F = 1.85GW + 9.16 \]

Fig. 2: The length frequency of males and females of *Clarias gariepinus* caught on spawning runs in Opa reservoir.

The eggs of *C. gariepinus* have bimodal distribution with two modes. The small eggs had a range of 0.4 mm - 1.0 mm and the large eggs ranged from 1.0 mm - 1.6 mm.

**DISCUSSION**

There were more males than females of *C. gariepinus* and they can probably be attributed to the relatively few spawning female susceptible to catch. The low population of this fish species in the reservoir might be responsible for the production of larger sizes of the fish. There is however an assurance that every mature female will get a male to mate it.

Many tropical fishes are reported to breed at the beginning of the rainy season (Greenwood, 1958; and Van der Wal, 1978). *C. gariepinus* bred throughout the year. The reason for this pattern may be due to the large varieties of food items in the reservoir which is an advantage for gonadal material production to meet the all year round egg or milt production. The availability of suitable environment may also be responsible for extended breeding in the reservoir.

The fecundity of *C. gariepinus* in Opa reservoir is very high. Similar high fecundities ranging between 70,000 eggs to 100,000 eggs were recorded for *C. gariepinus* in Hardap dam, South West Africa by Gaigher (1977). The high fecundity will compensate for the likely high mortality of young ones in the fish due to lack of parental care.

Abimodal peak of ova distribution observed in *C. gariepinus* in Opa reservoir was similar to that reported by Clay (1979) for *C. gariepinus* in Lake Kariba where bimodal distribution had peaks in the ranges 0.3 mm - 1.00 mm and 1.0 mm - 1.7 mm. This observation is an indication of annual multiple
Fig. 1. Opa Reservoir and catchment area.

KEY

Reservoir
Scale: 1: 50,000

124
Fig. 2: Opa Reservoir showing fish sampling sites
Fig. 3. The length frequency of males and females of *Clarias gariepinus*
caught on spawing runs in Opa reservoir.
The fecundity plotted against total length of *C. gariepinus* in Opa reservoir.

\[ F = 6.98TL - 266.19 \]
\[ r = 0.59 \]
\[ N = 289 \]
The fecundity plotted against the weight of *C. gariepinus* in Opa reservoir.

\[
y = 1.14x + 48.37
\]

\[r = 0.68\]

\[N = 289\]
The fecundity plotted against the weight of the ovary of *C. gariepinus* in Opa reservoir.

\[ F = 1.85GW + 9.16 \]
spawning exhibited by *C. gariepinus* in Opa reservoir. This result agree with the observation of Burt *et al* (1988) that multiple spawning are characteristics of tropical or sub-tropical fishes.

The multiple spawning will increase the fecundity of the fish because if matured eggs are spawned at intervals more eggs probably immature ones can still be accommodated in the ovary over a longer period, and this resulted in the extended spawning. This pattern of spawning may spread the risk of predation of the eggs, larvae and the juveniles over longer period. The retained egg could be laid during unfavourable climatic conditions and thus resulting in high mortality and low population of the fish species in the reservoir.

**CONCLUSION**

The low population of this fish species in the reservoir could be improved by stocking it, with female breeders.

**REFERENCES**


