MORTALITY ESTIMATES OF THE FOUR MAJOR CICHLID FISHES OF UMUOSERICHE LAKE, IMO STATE, NIGERIA.

By

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ABSTRACT

The mortality of the four major cichlid fishes of Umuoseriche Lake is the subject of this paper. Mortality as estimated by five techniques, vary amongst the cichlid fishes, viz, *Tilapia carbrae, Tilapia mariae, Tilapia zilli and Chromoditilapia guntheri.* The highest mortality rate was recorded for *T. mariae* where the total mortality (Z) was 2.06; and natural mortality (M) was 1.8949. This species was also the most highly exploited species of fish with an exploitation ratio of 0.566 (56.6%) and exploitation rate of 0.494. The least exploited cichlid fish is *C. guntheri* where an exploitation ratio of 0.43209%) and exploitation rate of 0.2225 was recorded. In *C. guntheri*, total mortality was 0.726 and natural mortality was 0.4131. In *T. zilli,* total mortality was 1.0547 wile exploitation ratio was 0.3674 (36.74%) and an exploitation rate was 0.2394. In *T cabrae*, total mortality was 1.8662; exploitation ratio was 0.4786 with an exploitation rate of 0.4045.

INTRODUCTION

The Umuoseriche man-made lake is located in the freshwater swamps of the Niger delta floodplain and is fed during the drains by the Udrashi River and other smaller drivers. Of the seventeen species of fish that inhabit the lake, cichlids are the dominant species, constituting about 92.25% by number and 78.15 by weight (Anene, 1998). These stocks o fish are usually exploited by the local people using dragnets, long set lines of various mesh sizes, hook and line, and basket traps, without recourse to the exploitation ratio.

The exploitation ratio is an index, which measures whether a fishery is over fished, or not. It is based on the theory that the optimal value of exploitation is equal to 05. This value of exploitation ratio is one the theory that sustainable yield is opined when the fishing mortality co-efficient is equal to the natural mortality (Pauly, 1983). Information on the mortality of cichlid fishes is limited to Landau, 1979 that worked on lake Kinneret in Israel and Tweddle and Turner, 1979 and as such, little is known on the exploitation levels of fishes in this lake as well as similar ecosystems in the Niger delta.

This study is part of a more comprehensive program on the ecology of cichlid fishes in Umuoseriche man-made lake (Anene, 1996, 1998). This particular study is based on the mortality of four major cichlid fishes in the system with emphasis on the various ratios of exploitation.

MATERIALS AND METHODS

The procedure used in this study was the one-man active seining methodology provided by Wingate and Schupp (1985), and similar to the experimental trawl fishing technique of

Schroeder (1984). In the one-man active seining technique, one end of the net is fixed to the pole with the lead line as close to the bottom as possible and the float line on the surface of the water. The loose end of the net is then stretched with the net in the same position to a distance equal to its length. It was then volume of water and all the fish therein. Where the loose end touches the fixed end, the net is slowly pulled. The float line is pulled faster than the lead line so that it rolls over to form a crib. The operation is completed if all the net converges at the fixed end and all the fish entrapped are removed. The operation lasts for 40 to 50 minutes.

Sampling was routinely done on the first Saturday of every month between April 1996 and March 1997. Sampling time was between 0900 hrs and 1600hrs. A gill net measuring 12m by 2 and a stretched mesh size of 40mm was used for sampling. During each sampling trip, four or five random operations were made on the shallow margins characterized by submerged and emergent vegetation while the same number of operations were also carried out in the open deeper waters bringing the total to 8 10 operations per trip. After few months of sampling, basket traps to target dermesal fishes, which appeared to be rate in the samples. Dishes caught in the basket were no different from those caught in the seine net.

Fish samples caught were immediately opened up and immersed in 10% formal in and transported to the laboratory where the were identified to species level using keys provided by Boulenger, (1909, 1916), Pellegrin, (1912); Daget, (1954), Gras, (1`961), Blache, (1964), Daget and Iltis, (1965), Stauch, (1966), Thys (1966), Reed *et.al.* (1967), Loiselle (1979), Leveque *et.al.* (1990). Representative samples of cichlids were also sent to the Laboratorium voor Ichthyologie in Tervuren, Belgium for confirmation of identified samples. Samples were given a registration number, weighed to the nearest 0.1 mg on a Metler balance. Their total and standard lengths were also measured to the nearest 1mm on a measuring board.

$$Z = \frac{NK}{\dfrac{N+1\ (\ln L - L^{1}}{L - L'}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where n is the number of fish from which the mean length (L') was calculated, L is the length of the longest fish in the sample, L^1 is the length of the smallest fish in the sample and K is growth parameter calculated from Von Bertalanfy's growth formula (VBGF).

Natural mortality (M was calculated from Taylor's formula (Ehrhardt *et. al.*, 1983).

$$M = \frac{2.9957}{T_o \quad (2.9957)/k} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where T_o and K are parameters of VBGF as estimated in (Anene, 1996)

The fishing mortality co-efficient F was estimated from Pauly (1983).

$$F = \quad Z \ M \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where Z and M are as stated in equations 1 and 2 above.
The exploitation ration (E) was estimated from the equation (Pauly, 1983).

$$E = \frac{F}{F+M} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The equation can be transformed into

$$E = F/Z$$

The rate of exploitation (u) was estimated from the equation (Landau, 1979, Gulland, 1985).

$$U = F/Z(I\ e^{z})$$

Where Z and M are as defined in equations (1) and (2) above.

RESULTS:

In the course of sampling, the most exploited stock in terms of numbers was *T. mariae,* which contributed 36.73% and *T. zilli*, which contributed 25.15% of the exploited fish stock. However, in terms of weights, *T. Zilli*, with a percentage of 36.0% was more exploited than *T. mariae* where the percentage was 34.9% (Table 1). In terms of total number of fish caught, C. guntheri (15.25%) and *T. cabrae* (18.52%) were not as exploited as *T. mariae* and *T. zilli*. The pattern of exploitation was same in terms of weight.

Table 1: Percentage contribution of the major cichlid fishes to total fish catch in Umuoseriche man-made Lake.

Species	Number (x 100N)	% Number	Weight (x102)g	% weight
C. guntheri	99	15.25	4994.16	9.48
T. cabrae	120	18.25	5747.79	10.92
T. mariae	238	36.73	18382.01	34.9
T. zilli	163	25.15	18947.5	36.0

Table 2 shows that the rate of exploitation is highest for *T. mariae* (0.566 or 56.66% per year) and lowest for *T. zilli* (0.3674 or 36.74% per year). This is irrespective of the fact that the total weight of T. zilli harvested was higher tan for any of the other three cichlid species. The exploitation ratio for *T. cabrae* and *C. guntheri* are 0.4786 (or 47.86%) and 0.4309 (43.09%) per year respectively. The rate of exploitation (u) is also highest for *T. Mariae* (0.4940 or 49.40% per annum) and lowest for *C. guntheri* (0.2225 or 22.25% per year). The rate of exploitation for *T. cabrae* was 0.4045 or 40.45% per annum while for *T. zilli*, it was 0.2394 (or 23.94%) per annum. Those published for *T. guineensis*, *C. guntheri* and *T. Mariae*.

Table 2: Lengths of various fish species and estimated growth parameters (K and T)

Species	**L"(mm)**	**L (mm)**	**K**	**T_o (Years)**
C. guntheri	88	160	0.4202	0.123
T. cabrae	63	178	1.1366	0.443
T. mariae	106.0	191.0	0.7404	0.162
T. zilli	90.0	234.0	0.6888	0.141

Table 3: Estimates mortality rates in the major cichlid fishes of Umuoseriche manmade lake

Species	Z	M	F	μ	E
C. guntheri	0.726	0.4131	0.3129	0.2225	0.4309
T. cabrae	1.8662	0.9731	0.8931	0.4045	0.4786
T. mariae	2.062	1.8949	0.1671	0.4940	0.5660
T. zilli	1.0547	0.6672	0.3875	0.2394	0.3674

(Z = Total mortality, M = Natural mortality, F = Fishing mortality, E = Exploitation ratio and μ = exploitation rate).

Total mortality co-efficient (Z) was 0.726, 1.866, 2.062 and 1.054 for *C. gunther*, *T. cabrae*, *T. mariae* and *T. zilli* respectively while the mortality co-efficient for these cichlid fishes was the most highly exploited stock with an exploitation ratio (E) of 0.566. The least exploited stock is *T. zilli* with a ratio (E) of 0.367. *C. guntheri* and *T. cabrae* have an exploitation ratio (E) of 0.431 and 0.479, respectively.

DISCUSSION

Even though more *T. zilli* were caught on weight-weight basis. *T. mariae* remains the most exploited stock of cichlid fisheries resources. The rate of exploitation is in excess of 0.5 and thus at the rate of 238 x 102 or 18382 x 102 kg per annum, this species of fish stands the risk of being over-exploited. At a rate of exploitation recorded for *C. guntheri*, *T. cabrae*, and *T. Zilli*, these species of fish can be exploited without fear of over-fising.

Total mortality of *mariae* and *T. cabrae*, were relatively higher than for the other cichlid fishes because they preyed on by C. guntheri which itself suffers the lowest level of mortality. Their relatively smaller size makes tem more susceptible to predation than *T. zilli*. Other predators in the system include *Hepsetus odoe*, *Clarias* species (Anene, 1998).

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