

A STUDY OF THE LENGTH AT MATURITY AND
HOOKS/GILL NET MESH SELECTION IN CLARIAS
LAZERA FROM LAKE CHAD

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ABSTRACT

The minimum length at first maturity of Clarias lazera was found to be 24cm (4.8%) for females and 20cm (1.8%) for males. Fifty percent maturity was attained at length of 28cm to 30cm for both sexes; there being little difference among the sexes at this level of maturity.

The modal retention lengths for gill nets were:-

- 13cm for 25.5mm mesh;
- 18cm for 32mm mesh;
- 28cm for 57mm mesh; and
- 38cm for 76mm mesh.

Modal lengths of Clarias lazera caught by various hooks sizes were No. 10 (28cm); No. 11 (33cm); Nos. 15 and 16 (28cm).

On the basis of these results, it is recommended that to protect the clarias fishery in Lake Chad, the use of gill nets of less than 57 mm mesh size and fishing hook No. 16 (and smaller sizes) which caught 43.94% of immature fishes should be discouraged.

INTRODUCTION

The changing ecological regime of Lake Chad caused by Sahelian drought of 1972 - 1974 has resulted in drastic reduction of some important fish species such as Lates niloticus, Distichodus spp., Labeo spp. and Citharinus spp. while other species like Clarias lazera, Gymnarchus niloticus, Heterotis niloticus and Tilapia spp. have increased in number.

Clarias lazera, which has accessory respiratory organs, is reputed to have a great ability to survive drought conditions, and to migrate across land (Nawar George, 1974), has become the most commercially important post drought species in Lake Chad since 1973. Catches of C. lazera have been increasing and it now accounts for about 85% of the total catch from the Lake.

It has been observed during 1981 and 1982 that the individual sizes of this fish species caught has changed and predominantly fingerlings are being caught. This change is believed to have been caused by the newly introduced fishing traps by the immigrant Malian fishermen which are now commonly used by most of the fishermen around Baga.

As a result of these changes, it was found necessary to carry out some investigations on the size at first maturity and the size at 50% maturity of C. lazera. Furthermore, it was decided to investigate the mesh selection of gill nets used and the size selectivity of fishing hooks. These investigations are essential for providing data needed to regulate the mesh size in order to prevent depletion of this important fish species in Lake Chad through indiscriminate use of small meshed fishing gears.

MATERIALS AND METHODS

Specimens of C. lazera examined during the present study were obtained from gill net catches from Mallamfatori on the shores of Kaniram and Duguri in northern Lake Chad using Lake Chad Research Institute's standard fleets of gill nets of

25.5mm, 32.0mm, 57.0mm and 76.0mm mesh, and hooks Nos. 10, 11, 15 and 16 which were set overnight. These provided 5746 fish specimens ranging from (13-44cm TL.) between January and December, 1977 and from December, 1978 to March, 1979. Total lengths in cm were measured but the data was grouped in 5 cm length classes. Each gill net was hung on 50% slack. Each fresh fish specimen was eviscerated and the gonad was examined to determine its sex and stage of development.

Gonad Maturity Stages

For the purpose of this study, a simplified 4-stage gonad maturity key modified from Kesteven (1960) and Nikolsky (1963) as reproduced in 3rd Edition of IBP Handbook No.3, T. Bagenal (Editor) (1978); was used. The stages described as follows were found more useful in the field:

- i) Immature: Young individuals which have never engaged in reproduction. Gonad generally of very small size and transparent and eggs not visible to naked eye. Difficult to distinguish the sexes from the gonads alone.
- ii) Mature: Gonads thick, opaque and developed; in females oocytes clearly visible to naked eye; in males milt may be exuded when cut.
- iii) Ripe and Ripe/Running: Ovaries swollen and full of mature eggs. Testes swollen, full of milt. When pressed eggs and milt, do not extrude freely in Ripe; but will extrude on light pressure of the abdomen, in Ripe/running stages. (It may be convenient to separate "Ripe" from "Ripe/Running" stage and in which case the latter becomes state IV).
- iv) Spent: Female gonads empty of large mature eggs but few residual smaller eggs may remain; in males, the testes are depleted of milt. In both sexes the gonad size is reduced from the larger size attained in stage III and may be flabby.

The spent gonad after recovering reverts to stage II.

RESULTS

Maturity

The sexes in C. lazera were distinguishable at a length of about 15cm. In C. lazera sexual dimorphism exists; the sign of sexual differences appearing by the presence of an elongated genital papilla which is clearly seen from about 15cm length in the males.

The data on the lengths at various stages of gonad maturity are shown in Tables 1 and 2.

It is shown that the smallest mature females were 24cm (4.8) in length, while corresponding length for males was 20 cm (1.8%). From Table 2 and Figure 1, the length at 50% maturity for females and male C. lazera lies between 28 cm and 30 cm. 47.7% maturity in females is attained at 28 cm (202 gm) compared with 42.9% maturity in males. For the ripe/running gonad stages, 56.9% maturity in females was reached at 28 cm length compared with 48% maturity in males. The mean weight of male and female C. lazera at the lengths of 20 cm, 24 cm, and 28 cm to 30 cm are shown in Table 3. The females are slightly heavier than males of the same length.

Gill Nets Mesh Selectivity

Table 2 shows the length distribution of C. lazera from gill nets of four mesh sizes. The 25.5 mm mesh caught fishes with modal length of 15 cm, the 32 mm mesh had a mode of 18 cm, while the 57 mm and 76 mm mesh nets had modes of 28 cm and 38 cm, respectively.

Table 4 shows the percentage length frequency distribution of C. lazera caught in gill nets of four mesh sizes, 25.5 mm, 32 mm, 57 mm and 76 mm. The modal retained lengths of the gill nets were 13 cm (25.5 mm mesh); 18 cm (32 mm mesh); 28 cm (57 mm mesh) and 38 cm (76 mm mesh).

Table 1 - Numbers of Clarias lazera from Lake Chad at various maturity stages in length classes (December 1978 to March, 1979)

| Length Class in 2 cm | Females (N = 149) | | | | Males (N = 119) | | |
|-------------------------|-------------------|----------|--------|------------------|-----------------|--------|------------------|
| | Immature | Maturing | Mature | Ripe and Running | Maturing | mature | Ripe and Running |
| 10 | - | - | - | - | - | - | - |
| 12 | 2 | - | - | - | - | - | - |
| 14 | 6 | 1 | - | - | - | - | - |
| 16 | - | - | - | - | 1 | - | - |
| 18 | - | 1 | - | - | - | - | - |
| 20 | - | 3 | - | - | 4 | 1 | - |
| 22 | - | 3 | - | - | 1 | - | 1 |
| 24 | - | 2 | 3 | - | 2 | 3 | - |
| 26 | - | 4 | 11 | 5 | 3 | 6 | 3 |
| 28 | - | - | 16 | 14 | 2 | 14 | 0 |
| 30 | - | 3 | 18 | 14 | - | 14 | 10 |
| 32 | - | 1 | 10 | 11 | - | 11 | 7 |
| 34 | - | - | 2 | 5 | - | 3 | 6 |
| 36 | - | - | - | 4 | - | 1 | 9 |
| 38 | - | - | 1 | 4 | - | 1 | 1 |
| 40 | - | - | 1 | 2 | - | - | 1 |
| 42 | - | - | 1 | - | - | 2 | 1 |
| 44 | - | - | - | - | - | - | 1 |

Table -- Percentage length frequency distribution of mature and ripe-running gonad stages of Clarias lazera from Lake Chad December, 1978 - March, 1979

| Length Classes | Percentage Mature | | Percentage Ogives Mature | | Percentage Ripe/Running | | Percentage Ogives Ripe/Running | |
|-----------------|-------------------|------|--------------------------|-------|-------------------------|------|--------------------------------|------|
| | Female | Male | Female | Male | Female | Male | Female | Male |
| 10 | - | - | - | - | - | - | - | - |
| 12 | - | - | - | - | - | - | - | - |
| 14 | - | - | - | - | - | - | - | - |
| 16 | - | - | - | - | - | - | - | - |
| 18 | - | - | - | - | - | - | - | - |
| 20 | - | 1.8 | - | 1.8 | 1.7 | - | 1.7 | - |
| 22 | - | - | - | 1.8 | - | 2 | 1.7 | 2 |
| 24 | 4.8 | 5.4 | 4.8 | 7.2 | - | - | 1.7 | 2 |
| 26 | 17.5 | 10.7 | 22.3 | 17.9 | 8.3 | 6 | 10.0 | 8 |
| 28 | 25.4 | 25.0 | 47.7 | 42.9 | 23.3 | 20 | 33.6 | 28 |
| 30 | 8.6 | 25.0 | 76.3 | 67.9 | 23.3 | 20 | 56.9 | 48 |
| 32 | 5.9 | 19.6 | 92.2 | 87.5 | 18.3 | 14 | 75.2 | 62 |
| 34 | 3.2 | 5.2 | 95.4 | 92.9 | 8.3 | 12 | 83.5 | 74 |
| 36 | - | 1.8 | 95.4 | 94.7 | 6.7 | 18 | 90.2 | 92 |
| 38 | 1.6 | 1.8 | 97.0 | 96.5 | 6.7 | 2 | 96.9 | 94 |
| 40 | 1.6 | - | 98.6 | 96.5 | 3.3 | 2 | 100.7 | 96 |
| 42 | 1.6 | 3.6 | 100.2 | 100.1 | - | 2 | - | 98 |
| 44 | - | - | - | - | - | 2 | - | 100 |
| Number Examined | 63 | 56 | 63 | 56 | 60 | 50 | 60 | 50 |

Table 3 - Mean weights (gm) of males and females Clarias lazera at lengths of attaining maturity

| TL | Females | | Males | |
|----|------------------|--------|------------------|--------|
| | Mean Wt. (gm) | STD | Mean Wt. (gm) | STD |
| 20 | 78.3 N = 3 | ± 19.7 | 62.8 N = 4 | ± 1.7 |
| 24 | 137.3 N = 8 | ± 19.3 | 92.2 N = 5 | ± 6.8 |
| 28 | 202.1 N = 17 | ± 22.8 | 204.1 N = 22 | ± 24.1 |
| 30 | 221.2 N = 18 | ± 32.8 | 219 N = 14 | ± 21.8 |

Table 4 - Percentage length - frequency distribution of Clarias lazera caught by gill nets of various mesh sizes in Lake Chad

| Length Classes (5cm) | Gill net mesh size | | | |
|----------------------------|--------------------|--------|--------|--------|
| | 25.5mm | 32.0mm | 57.0mm | 76.0mm |
| 13 | *33.33 | 25.16 | - | - |
| 18 | 22.46 | *34.70 | 0.86 | 0.33 |
| 23 | *31.52 | 29.28 | 11.76 | 2.98 |
| 28 | 9.42 | 7.22 | 64.15 | 6.62 |
| 33 | 2.17 | 1.14 | 22.37 | 42.38 |
| 38 | 1.09 | 1.32 | 0.76 | 46.03 |
| 43 | - | 0.16 | 0.11 | 1.66 |
| Number Examined | 276 | 608 | 1855 | 302 |

* Indicates modal frequency

Table 5 - Percentage length frequency distribution of Clarias lazera in hooks of different sizes used in Lake Chad

| Length Classes | Hook No. 10 | Hook No. 11 | Hook No. 15 | Hook No. 16 |
|----------------|-------------|-------------|-------------|-------------|
| 13 | 0.31 | - | 0.11 | 10.76 |
| 18 | 4.01 | 4.70 | 9.02 | 33.18 |
| 23 | 15.43 | 18.18 | 27.28 | *34.12 |
| 28 | *33.33 | 26.96 | *35.75 | *34.12 |
| 33 | 30.86 | *30.88 | 22.16 | 17.71 |
| 38 | 12.96 | 13.32 | 4.79 | 3.54 |
| 43 | 1.54 | 3.76 | 0.78 | 0.24 |
| 48 | 0.93 | 0.94 | 0.11 | 0.12 |
| 53 | 0.62 | 0.78 | - | - |
| 58 | - | 0.16 | - | - |
| 63 | - | 0.13 | - | - |

* Indicates modal frequency

The percentage numbers of immature fishes, under 28 cm length, caught by these meshsizes were as follows: - 25.5 mm (87.31%); 32.0 mm (89.14%); 57.0 mm (12.62%) and 76.0 mm (3.31%).

Selectivity of Fishing Hooks

Table 5 shows that the modal lengths of the Clarias lazera caught by hook No. 10 was 28 cm; hook No. 11 had 33 cm while hooks Nos. 15 and 16 each had lengths of 28 cm. However, the total percentage numbers of immature fishes of less than 28 cm length caught by various hooks were No. 10 (19.75%); No. 11 (22.88%); No. 15 (36.41%); and No 16 (43.99%).

DISCUSSION

The length at 50% maturity of males and females of C. lazera in Lake Chad during the period of the study was between 28 cm and 30 cm. The mean weights at length 28 cm and 30 cm were 202 gm and 221 gm respectively for females; and 204 gm and 219 gm for males respectively. The minimum size at first maturity was between 20 cm and 24 cm; but these fishes constituted only 2% to 5% of the mature population. There was no significant difference in the lengths at 50% maturity of females and males in this study. Kelleher and Vincke (1975) observed in Central African Republic that ripe female Clarias varied in size from 28 cm to 65 cm with weights from 175 g to 1,500 g.

To protect the Clarias fishery in Lake Chad it is recommended that Clarias lazera of less than 28 cm should not be caught to enable the fishes to reproduce themselves and attain a larger table size. Gill nets with meshes less than 57mm which catch C. lazera of less than 28 cm are injurious to the fishery and mesh regulation prohibiting the use of gears with such meshes will benefit the Clarias fishery in Lake Chad.

With respect to selectivity for hooks, it is recommended to use Hooks Numbers 10 and 11 which catch fewer fishes of less than 28 cm while the use of Hook Number 16 should be discouraged.

In recent times, the use of conical Malian origin traps for catching fingerlings of Clarias lazera in large numbers during certain periods of the year has been observed at Baga on Lake Chad. The traps have a nylon mesh cover of 25.4 mm mesh which will retain up to 87.31% of immature C. lazera.

It is recommended that these traps should only be used in the season when fingerlings of C. lazera occur for catching them as stocking materials of fish ponds and irrigation canals. The regular use of the traps of 25.5 mm mesh for fishing in the Lake should be banned or strictly controlled. The traps meshes should be increased to 57 mm.

The appropriate authority to enact fishery management regulation in the Nigerian sector of the Lake is the Borno State Government but the enforcement of this regulation will require international cooperation of the countries bordering Lake Chad.

It is, however, suggested that similar studies of mesh selection and size at maturity should be conducted for the other major economically important fishes of the Lake before a comprehensive management procedure of mesh regulation can be recommended. This is because the gill nets recommended for Clarias will catch other fishes as well as C. lazera. A compromise regulation may then be made to favour the most abundant economic species while not altogether depleting the others. In addition, a knowledge of habitat preferences of the various fishes will enable different meshes to be prescribed for different habitats in the Lake Chad.

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