

## Morphometric and Meristic Characteristics of Dominant Fishes in Blue Nile River, Ethiopia

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**Abstract:** The present study provides morphometric and meristic characteristics of dominant fish species in Blue Nile River which can be used for the management and conservation of this fish species in the Blue Nile River. By using different fishing gears a total of 500 samples were collected. *Labeobarbus intermedius*, *L. forskalii* and *M. kannume* were the most dominant species had total length ranged from 17 to 52.3 cm, 13.8 to 46.5 cm and 25.2 to 40.8 cm with the mean and standard error of total length was  $32.5 \pm 0.50$ ,  $34.3 \pm 0.39$  and  $32.2 \pm 0.44$  respectively. The morphometric characters of *Labeobarbus intermedius*, DFL and AFL were 20.61- 27.38% and 15.48-22.57% of SL, respectively. The meristic characteristics of *L. forskalii* and *M. kannume* dorsal and caudal fin rays were 11 to 12, 18 to 21 and 51--59, 22-23 respectively.

**Key words:** Conservation • *Mormyrus kannume* • Morphometry • Standard Length

### INTRODUCTION

Ethiopia is water tower of East Africa and has a number of lakes and rivers in which the majority of the rivers and lakes are situated in Rift Valley of Africa [1]. There are about 7, 000 km length of flowing (Rivers and streams) and 7,700 km<sup>2</sup> standing waters [2]. In addition, minor water bodies such as crater lakes and reservoirs make up about 400 km<sup>2</sup> area [3].

Ethiopia has a rich diversity of ichthyofauna in its lakes, rivers and reservoirs, although they are poorly known [4]. Even though, Ethiopian has high production potential and notable fishery investigation has been carried out only in a few of numerous freshwater bodies. The territory of Ethiopia encompasses parts of the catchment areas of two oceans, separated by the north portion of the Great African Rift. Two major biogeographic units, the Nilo-Sudan and the east coast ichthyofauna provinces are in contact to this region [5]. Some fish families identified within the Nile basin and its tributary rivers are Mormyridae, Characidae, Cyprinidae, Bagridae, Schilbiidae, Moxostomidae, Clariidae and Cichlidae Awoke *et al.* [6] and MoWR [7].

Morphological variability of fish is considered to be an important adaptive strategy for populations experiencing inconsistent environment [8]. Variability of environment could be explained by a biotic component such as Physico chemical parameter of water, habitat and substrate types and biotic components like competition and predation, which serves as selective pressures [9]. More over fragmentation caused by construction of dams might disrupt the connectivity of hydro-ecosystem and the gene flow between local fish population [10-12]. Information on the morphometric measurement of fishes and the study of statistical relationship among them are essential for taxonomic works [13]. Since no data of morphometric and meristic characters is available in the study area, so this study was initiated to provide a base line data of these fish from Blue Nile River, Ethiopia.

### MATERIALS AND METHODS

A total of 500 samples were collected from Blue Nile River, both dry season (April, 2013) and wet season (November, 2014). Fish was sampled by overnight setting of monofilament gillnets had mesh sizes 6, 8, 10, 12 and

14cm stretched bar mesh and a length of 25m and a depth of 1.5m and also used specially designed castanets to capture large sized fishes, to avoid capture of fry and fingerlings. Specimen was preserved in 10% formaldehyde solution and was transport to Bahir Dar Fish and other aquatic Life Research Center comparison with previously identified specimens available. Total 12 morphometric measurements and 3 meristic counts were taken. Morphometric measurements were taken by digital slide caliper up to the nearest 0.1mm and the length of fish were taken by digital measuring board up to the nearest of 0.1cm. Meristic characters were counted by using stereomicroscope. Excel 2007 and SPSS 16.0 were used to analyze all the data.

## RESULTS AND DISCUSSION

**Length Frequency Distribution:** The length frequency distribution of the most dominant species of *L. intermedius*, *L. forskalii* and *M. kannume* are showed in (Figs. 1-3). *Labeobarbus intermedius* the most dominant species had total length ranged from 17 to 52.3 cm, with the mean and standard error of total length was  $32.5 \pm 0.50$  (Fig. 2). *Labeo forskalii* is the second most abundant species with total length range from 13.8 to 46.5 cm with mean and standard error of  $34.3 \pm 0.39$  (Fig. 3). *Mormyrus kannume* is the third abundant species had total length range from 25.2 to 40.8 cm with mean and standard error of  $32.2 \pm 0.44$  (Fig. 3).

**Species Description:** The morphometric data have been converted into percentages with respect to standard length and head length. Standard univariate statistics methods (Mean, standard deviation, maximum and minimum) have been used to summarize the morphometric and meristic data.

### **Labeobarbus Intermedius (Ruppell, 1835):**

*Labeobarbus intermedius* is an East Africa ray-finned fish species in the family Cyprinidae. It has variable body shape and head, has characteristics of most *Labeobarbus* species. *L. intermedius* has a variable in dorsal profile. Mouth is terminal and protractile. Its HL 17.515.43% in SL. Depth of the body is little greater than head length; its depth 25.68-27.43% SL. It has medium eye 24.87-26.55% in HL (Table 1). Its DFL and AFL were 20.61- 27.38% and 15.48-22.57% of SL, respectively (Table 1). Lip development is variable. Lower lip is interrupted and sometime continuous. Have two barbells on each side of the head. Its caudal peduncle length is greater than depth. This freshwater fish is found in Kenya, Tanzania, Uganda and widely distributed in Ethiopian.

**Labeo Forskalii (Rüppell, 1835):** This species is distinguished by labial folds well-developed sucker around the mouth, rostral flap large and horny tubercles on the snout. Body shape has more or less compressed its depth 19.02- 20.99% in SL (Table 2). Snout is swollen with distinct curved transverse groove above. Snout length is greater than head length (41.12 – 54.55% in HL) (Table 2). It has 11 to 12 dorsal fin rays and 18 to 21 caudal fin rays. The color of the species has dark olive above and on the sides, whet beneath. *Labeo forskalii* fish is under the genus *Labeo* from Northeast and East Africa. The species have also distributed in Dubus, Angereb, Sanja, Tekeze, Baro, Omo, Gendewuha, Guang, Ayima and Gibe, Beles and Gelgel Beles Rivers of Ethiopia.

**Mormyrus Kannume (Forsskal, 1775):** Depth of the body is less than length of head (Its depth 20.71-23.41% in SL) (Table 3). Upper profile of head is descending in straight line. It has small eye (14.46 -19.67% in HL). Paired and vertical fins all present; narrow caudal peduncle

Table 1: Morphometric measurements maximum (cm), minimum (cm), mean and standard deviation (SD) examined of *L. intermedius*

| Morphometric characteristics            | Max(cm) | Min(cm) | Mean  | SD   |
|---|---------|---------|-------|------|
| Percent with respect to Standard length |         |         |       |      |
| Head length: HL                         | 17.52   | 15.43   | 16.85 | 0.96 |
| Body depth: BD                          | 27.43   | 25.68   | 26.23 | 0.80 |
| Pectoral fin length: Pc. FL             | 27.43   | 25.68   | 26.23 | 0.80 |
| Pelvic fin length: Pv. FL               | 17.62   | 15.48   | 16.98 | 1.00 |
| Dorsal fin length: DFL                  | 18.22   | 10.56   | 14.83 | 3.55 |
| Anal fin length: AFL                    | 27.38   | 20.61   | 23.83 | 3.19 |
| Caudal Peduncle length: CPL             | 39.90   | 30.56   | 34.95 | 4.90 |
| Caudal Peduncle depth: CPD              | 9.11    | 8.02    | 8.75  | 0.49 |
| Percent with respect to Head length     |         |         |       |      |
| Snout length: SnL                       | 27.96   | 25.87   | 26.69 | 0.89 |
| Head depth: HD                          | 75.39   | 66.12   | 71.96 | 4.26 |
| Eye diameter: ED                        | 26.55   | 24.87   | 25.71 | 0.84 |
| Inter –orbital width: IOW               | 27.14   | 24.67   | 26.38 | 1.15 |

Table 2: Morphometric measurements maximum (cm), minimum (cm), mean and standard deviation (SD) examined of *L. forskalii*

| Morphometric characteristics            | Max   | Min   | Mean  | SD   |
|---|-------|-------|-------|------|
| Percent with respect to standard length |       |       |       |      |
| Head length: HL                         | 25.69 | 22.81 | 23.81 | 1.09 |
| Body depth: BD                          | 23.41 | 20.72 | 21.96 | 1.12 |
| Pectoral fin length: Pc.FL              | 17.96 | 13.06 | 16.42 | 1.76 |
| Pelvic fin length: Pv.FL                | 11.83 | 11.15 | 11.46 | 0.27 |
| Dorsal fin length: DFL                  | 51.70 | 45.36 | 48.27 | 2.46 |
| Anal fin length: AFL                    | 19.46 | 13.66 | 16.68 | 2.09 |
| Caudal Peduncle length: CPL             | 6.81  | 5.71  | 6.36  | 0.42 |
| Caudal Peduncle depth: CPD              | 11.45 | 8.67  | 10.35 | 0.99 |
| Percent with respect to Head length     |       |       |       |      |
| Snout length: SnL                       | 33.93 | 22.89 | 27.27 | 3.80 |
| Head depth: HD                          | 55.36 | 40.96 | 46.88 | 5.34 |
| Eye diameter: ED                        | 19.67 | 14.46 | 16.98 | 1.82 |
| Inter –orbital width: IOW               | 28.57 | 24.09 | 27.24 | 1.6  |

Table 3: Morphometric measurements maximum (cm), minimum (cm), mean and standard deviation (SD) examined of *M. kannume*

| Morphometric characteristics            | Max   | Min   | Mean  | SD   |
|---|-------|-------|-------|------|
| Percent with respect to standard length |       |       |       |      |
| Head length: HL                         | 25.69 | 22.81 | 23.81 | 1.09 |
| Body depth: BD                          | 23.41 | 20.72 | 21.96 | 1.12 |
| Pectoral fin length: Pc.FL              | 17.96 | 13.06 | 16.42 | 1.76 |
| Pelvic fin length: Pv.FL                | 11.83 | 11.15 | 11.46 | 0.27 |
| Dorsal fin length: DFL                  | 51.70 | 45.36 | 48.27 | 2.46 |
| Anal fin length: AFL                    | 19.46 | 13.66 | 16.68 | 2.09 |
| Caudal Peduncle length: CPL             | 6.81  | 5.71  | 6.36  | 0.42 |
| Caudal Peduncle depth: CPD              | 11.45 | 8.67  | 10.35 | 0.99 |
| Percent with respect to Head length     |       |       |       |      |
| Snout length: SnL                       | 33.93 | 22.89 | 27.27 | 3.80 |
| Head depth: HD                          | 55.36 | 40.96 | 46.88 | 5.34 |
| Eye diameter: ED                        | 19.67 | 14.46 | 16.98 | 1.82 |
| Inter –orbital width: IOW               | 28.57 | 24.09 | 27.24 | 1.66 |

Table 4: Meristic characteristics of *L. intermedius*, *L. forskalii* and *M. kannume* captured from Blue Nile River

| Fish species          | Meristic characteristics | Max | Min | Mean  | SD   |
|-----------------------|--------------------------|-----|-----|-------|------|
| <i>L. intermedius</i> | Dorsal fin rays: DFR     | 10  | 9   | 9.75  | 0.5  |
|                       | Caudal fin rays: CFR     | 21  | 20  | 20.75 | 0.5  |
|                       | Lateral line scales: LLS | 34  | 30  | 32.25 | 1.71 |
| <i>L. forskalii</i>   | Dorsal fin rays: DFR     | 12  | 11  | 11.5  | 0.58 |
|                       | Caudal fin rays: CFR     | 21  | 18  | 20    | 1.41 |
|                       | Lateral line scales: LLS | 42  | 41  | 41.25 | 0.5  |
| <i>M. kannume</i>     | Dorsal fin rays: DFR     | 59  | 51  | 54    | 2.68 |
|                       | Caudal fin rays: CFR     | 23  | 22  | 22.5  | 0.55 |
|                       | Lateral line scales: LLS | -   | -   | -     | -    |

depth (6.82-9.39% SL) and deeply forked caudal fin. Dorsal fin rays 51-59, Anal fin rays 22-23 (Table 4). Dorsal and anal fins are opposite each other on the posterior part of body. The color of the fish has brownish or olive above and white in beneath. This species distribution extends from Egypt along the entire length of the Nile and into Tanzania. The species also distributed in Ethiopian

freshwaters like Gendewuha, Guang, Omo, Angereb, Ayima and Gibe Rivers. This study has provided baseline data about the morphometric and meristic characters of the important fish, which will be helpful for the management and conservation of *L. intermedius*, *L. forskalii* and *M. kannume* in Blue Nile River and other water bodies in Ethiopia.

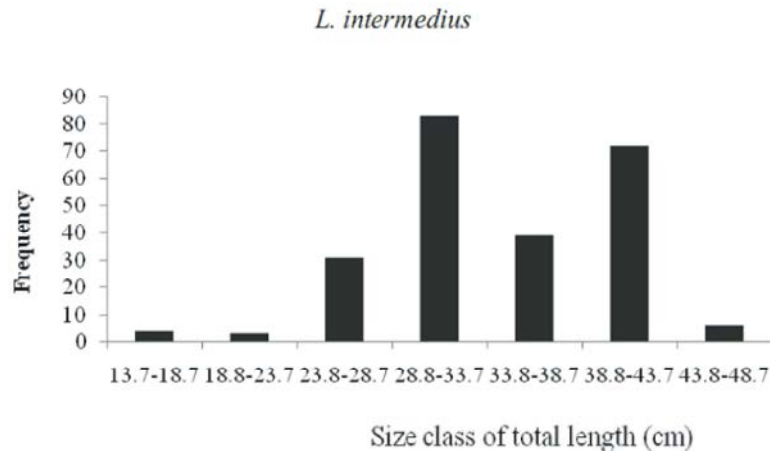


Fig. 1: Length frequency distribution of *L. intermedius*

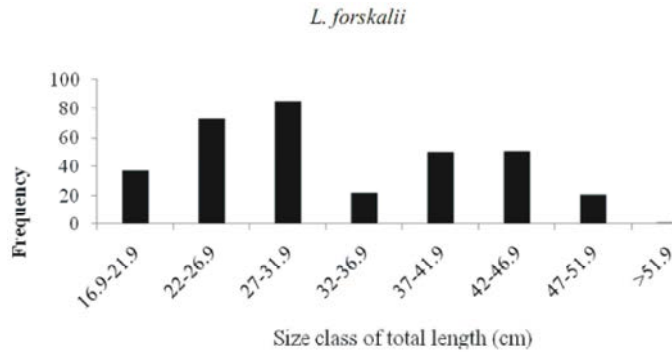


Fig. 2: Length frequency distribution of *L. forskalii*

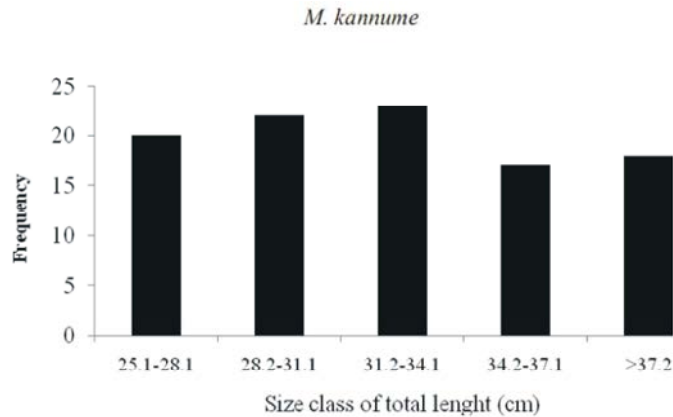


Fig. 3: Length frequency distribution of *M. kannume*

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