Chapter 4

Morphometric And Meristic Counts
MORPHOMETRIC AND MERISTIC COUNTS

Morphometric and Meristic counts of *Tor khudree*, *Hypselobarbus kurali*, *Cyprinus carpio* var. *communis* and *Oreochromis mossambica* were taken.

4.1 *Tor khudree*

4.1.1 Morphometry

The results obtained from morphometric measurements of *Tor khudree* are presented in Table 8 and summarised below.

**Total Length**

The mean value of total length expressed in percentage of standard length was 121.51. The size range of the fishes used for the study was also expressed as percentage of standard length which was 109.8 – 130.8.

**Predorsal length**

The mean value of predorsal length expressed as percentage of standard length was 50.09 with a range of 43.8 – 58.1.

**Head length**

The mean value of head length expressed as percentage of standard length was 24.628 with a range of 19.2 to 28.9.
Head depth

The mean value of head depth expressed as percentage of standard length was 22.226 with a range of 15.7 to 28.2.

Body depth

The mean value of body depth expressed as percentage of standard length was 31.578 with a range of 26.3 to 36.4.

Least height of caudal peduncle

The mean value of least height of caudal peduncle expressed as percentage of standard length was 12.732 with a range of 10.3 to 17.6.

Length of caudal peduncle

The mean value of length of caudal peduncle expressed as percentage of standard length was 20.374 with a range of 16.1 to 25.0.

Dorsal fin length

The mean value of dorsal fin length expressed as percentage of standard length was 14.074 with a range of 11.1 to 17.6.

Length of free margin of dorsal fin

The mean value of length of free margin of dorsal fin showed as percentage of standard length was 23.356 with a range of 18.0 to 27.8.
**Morphometric and Meristic counts**

**Dorsal fin height**

The mean value of dorsal fin height obtained as percentage of standard length was 20.33 with a range of 14.6 to 26.8.

**Pectoral fin height**

The mean value of pectoral fin height expressed as percentage of standard length was 19.044 with a range of 16.1 to 23.1.

**Ventral fin height**

The mean value of ventral fin height expressed as percentage of standard length was 16.574 with a range of 13.1 to 20.5.

**Anal fin height**

The mean value of anal fin height expressed as percentage of standard length was 18.468 with a range of 12.8 to 22.3.

**Length of anal fin base**

The mean value of length of anal fin base expressed as percentage of standard length was 8.282 with a range of 4.9 to 11.3.

**Girth**

The mean value of girth expressed as percentage of standard length was 70.062 with a range of 60.0 to 87.2.
Morphometric and Meristic counts

Snout length
The mean value of snout length expressed as percentage of head length was 34.07 with a range of 23.1 to 42.9.

Eye diameter
The mean value of eye diameter expressed as percentage of head length was 18.752 with range of 11.8 to 27.3.

Post orbital length
The mean value of post orbital length expressed as percentage of head length was 51.68 with a range of 36.4 to 64.7.

Inter-orbital width
The mean value of inter-orbital width expressed as percentage of head length was 46.422 with a range of 34.6 to 61.1.

Gape
The mean value of gape expressed as percentage of head length was 45.374 with a range of 35.3 to 58.3.

Rostral barbel length
The mean value of rostral barbal length expressed as percentage of head length was 27.678 with a range of 18.2 to 38.5.
Maxillary barbel length

The mean value of maxillary barbel length expressed as percentage of head length was 32.106 with a range of 25.0 to 45.5.

4.1.2 Meristic Counts

The details of the meristic counts for *Tor khudree* are presented in Table 10 and summarised below.

Number of dorsal fin rays

The number of dorsal fin rays was constant (10).

Number of pectoral fin rays

The mean value of number of pectoral fin rays was 14.84 with a range of 12 to 16.

Number of ventral fin rays

The mean value of number of ventral fin rays was 8.92 with a range of 8 to 10.

Number of anal fin rays

The mean value of number of anal fin rays was 5.98 with a range of 5 to 7.

Number of caudal fin rays

The mean value of number of caudal fin rays was 21.08 with a range of 19 to 25.
Morphometric and Meristic counts

Number of lateral line scales

The mean value of number of lateral line scales was 24.18 with a range of 23 to 25.

Number of lateral line transverse scales

The mean value of number of lateral line transverse scales was 4.28 to 3.28 with a range of 3.5 to 2.5/4.5 to 3.5.

4.2 Hypselobarbus kurali

4.2.1 Morphometry

The details of morphometric measurements of Hypselobarbus kurali are presented in Table 8 and summarised below.

Total length

The mean value of total length expressed as percentage of standard length was 124.992 with a range of 115.2 to 130.8.

Predorsal length

The mean value of predorsal length expressed as percentage of standard length was 48.302 with a range of 45.0 to 54.5.
Head length
The mean value of head length expressed as percentage of standard length was 25.872 with a range of 21.4 to 30.3.

Head depth
The mean value of head depth expressed as percentage of standard length was 19.984 with a range of 15.8 to 25.0.

Body depth
The mean value of body depth expressed as percentage of standard length was 25.97 with a range of 21.1 to 32.4.

Least height of caudal peduncle
The mean value of least height of caudal peduncle expressed as percentage of standard length was 10.062 with a range of 5.3 to 15.2.

Length of caudal peduncle
The mean value of length of caudal peduncle expressed as percentage of standard length was 18.13 with range of 14.3 to 22.2.

Dorsal fin length
The mean value of dorsal fin length expressed as percentage of standard length was 15.486 with a range of 12.1 to 18.9.
Morphometric and Meristic counts

Length of free margin of dorsal fin
The mean value of length of free margin of dorsal fin expressed as percentage of standard length was 25.048 with a range of 19.2 to 30.3.

Dorsal fin height
The mean value of dorsal fin height expressed as percentage of standard length was 22.842 with a range of 18.4 to 27.0.

Pectoral fin height
The mean value of pectoral fin height expressed as percentage of standard length was 20.382 with a range of 16.7 to 24.3.

Ventral fin height
The mean value of ventral fin height expressed as percentage of standard length was 17.048 with a range of 13.9 to 22.5.

Anal fin height
The mean value of anal fin height expressed as percentage of standard length was 21.004 with a range of 12.5 to 27.8.

Length of anal fin base
The mean value of length of anal fin base expressed as percentage of standard length was 9.234 with a range of 5.3 to 13.5.
Girth

The mean value of girth expressed as percentage of standard length was 62.09 with a range of 52.6 to 71.1.

Snout length

The mean value of snout length expressed as percentage of head length was 42.948 with a range of 31.1 to 55.6.

Eye diameter

The mean value of eye diameter expressed as percentage of head length was 23.186 with a range of 16.7 to 33.3.

Postorbital length

The mean value of postorbital length expressed as percentage of head length was 39.738 with a range of 28.6 to 55.6.

Inter-orbital width

The mean value of inter-orbital width expressed as percentage of head length was 43.356 with a range of 33.3 to 55.6.

Gape

The mean value of gape expressed as percentage head length was 45.682 with a range of 33.3 to 55.6.
Morphometric and Meristic counts

Rostral barbel length

The mean value of rostral barbel length expressed as percentage of head length was 13.604 with a range of 10.0 to 22.2.

Maxillary barbel length

The mean value of maxillary barbel length expressed as percentage of head length was found to be 24.924 with a range of 21.4 to 36.4.

4.2.2 Meristic Counts

The details of the meristic counts of *Hypselobarbus kurali* are presented in Table 10 and summarised below

Number of dorsal fin rays

The number of dorsal fin rays was constant (10).

Number of pectoral fin rays

The mean value of the number of pectoral fin rays was 14.84 with a range of 14 to 16.

Number of ventral fin rays

The mean value of the number of ventral fin rays was 9.38 with a range of 8 to 10.

Number of anal fin rays

The number of anal fin rays was constant (7).
Morphometric and Meristic counts

Number of caudal fin rays

The mean value of number of caudal fin rays was 20.08 with a range of 20 to 22.

Number of lateral line scales

The mean value of number of lateral line scales was 40.32 with a range of 38 to 42.

Number of lateral line transverse scales

The mean value of number of lateral line transverse scales was 7.51 to 4.96 with a range of 6.5 to 4.5/8 to 5.5.
Morphometric and Meristic counts

Table 8
Morphometric analysis of *Tor khudree* & *Hypselobarbus kurali*

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<thead>
<tr>
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<th><em>Tor khudree</em> % standard length</th>
<th><em>Hypselobarbus kurali</em> % standard length</th>
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<tr>
<td>Head depth</td>
<td>22.226</td>
<td>15.7-28.2</td>
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<td>Body depth</td>
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<tr>
<td>Length of free margin of dorsal fin</td>
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<td>18.0-27.8</td>
</tr>
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</tr>
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<table>
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FISHERY MANAGEMENT IN PERIYAR LAKE
Picture 5
*Tor khudree* - a good native sport fish

Picture 6
*Hypselobarbus kurali* - another native fish
4.3 *Cyprinus carpio* var. *communis*

4.3.1 Morphometry

The results obtained from morphometric measurements of *Cyprinus carpio* var. *communis* are presented in Table 9 and summarised below.

**Total length**

The mean value of total length expressed as percentage of standard length was 122.242 with a range of 117.1 to 128.6.

**Predorsal length**

The mean value of predorsal length expressed as percentage of standard length was 53.114 with a range of 47.1 to 60.0.

**Head length**

The mean value of head length expressed as percentage of standard length was 28.358 with a range of 25.0 to 32.5.

**Head depth**

The mean value of head depth expressed as percentage of standard length was 31.548 with a range of 22.8 to 38.9.

**Body depth**

The mean value of body depth expressed as percentage of standard length was 43.326 with a range of 38.0 to 47.2.
Morphometric and Meristic counts

Least height of caudal peduncle
The mean value of least height of caudal peduncle expressed as percentage of standard length was 16.652 with a range of 12.5 to 20.5.

Length of caudal peduncle
The mean value of length of caudal peduncle expressed as percentage of standard length was 18.618 with a range of 14.7 to 21.7.

Dorsal fin length
The mean value of dorsal fin length expressed as percentage of standard length was 36.32 with a range of 29.5 to 45.2.

Length of free margin of dorsal fin
The mean value of length of free margin of dorsal fin expressed as percentage of standard length was 45.658 with a range of 39.5 to 55.0.

Dorsal fin height
The mean value of dorsal fin height expressed as percentage of standard length was 14.024 with a range of 11.1 to 19.0.

Pectoral fin height
The mean value of pectoral fin height expressed as percentage of standard length was 19.846 with a range of 16.3 to 23.3.
Morphometric and Meristic counts

Ventral fin height
The mean value of ventral fin height expressed as percentage of standard length was 18.434 with a range of 14.3 to 23.0.

Anal fin height
The mean value of anal fin height expressed as percentage of standard length was 15.276 with a range of 12.0 to 19.4.

Length of anal fin base
The mean value of length of anal fin base expressed as percentage of standard length was 9.888 with a range of 7.4 to 12.9.

Girth
The mean value of girth expressed as percentage of standard length was 91.446 with a range of 82.1 to 106.8.

Snout length
The mean value of snout length expressed as percentage of head length was 37.202 with a range of 28.6 to 47.4.

Eye diameter
The mean value of eye diameter expressed as percentage of head length was 18.82 with a range of 13.0 to 27.8.
**Morphometric and Meristic counts**

**Postorbital length**

The mean value of postorbital length expressed as percentage of head length was 50.958 with a range of 42.1 to 66.7.

**Inter-orbital width**

The mean value of inter-orbital width expressed as percentage of head length was 51.528 with a range of 42.1 to 71.4.

**Gape**

The mean value of gape expressed as percentage of head length was 41.336 with a range of 31.6 to 50.0.

**Rostral barbel length**

The mean value of rostral barbel length showed as percentage of head length was 15.408 with a range of 10.0 to 20.8.

**Maxillary barbel length**

The mean value of maxillary barbel length showed as percentage of head length was 25.276 with a range of 20.0 to 29.5.

**4.3.2 Meristic counts**

The details of meristic counts of *Cyprinus carpio* var. *communis* are presented in Table 10 and summarised below.
Morphometric and Meristic counts

Number of dorsal fin rays
The mean value of number of dorsal fin rays was 1/18 with a range of 1/15 to 1/20.

Number of pectoral fin rays
The mean value of number of pectoral fin rays was 14 with a range of 14 to 15.

Number of ventral fin rays
The mean value of number of ventral fin rays was 8.76 with a range of 7 to 10.

Number of anal fin rays
The number of anal fin rays was constant (1/5).

Number of caudal fin rays
The mean value of number of caudal fin rays was 21 with a range of 18 to 24.

Number of lateral line scales
The mean value of number of lateral line scales was 32.1 with a range of 30 to 35.

Number of lateral line transverse scales
The mean value of number of lateral line transverse scales was 5.66 to 4.58 with a range of 5.5-3.5/6.5-5.5.
4.4 Oreochromis mossambica

4.4.1 Morphometry

The results obtained from morphometric measurements of Oreochromis mossambica are presented in Table 9 and summarised below.

Total length

The mean value of total length showed as percentage of standard length was 122.254 with a range of 112.8 to 129.4.

Predorsal length

The mean value of predorsal length expressed as percentage of standard length was 36.514 with a range of 32.4 to 41.9.

Head length

The mean value of head length expressed as percentage of standard length was 30.684 with a range of 26.3 to 35.4.

Head depth

The mean value of head depth expressed as percentage of standard length was 37.316 with a range of 30.8 to 45.2.

Body depth

The mean value of body depth expressed as percentage of standard length was 42.992 with a range of 35.1 to 51.6.
Morphometric and Meristic counts

Least height of caudal peduncle

The mean value of least height of caudal peduncle expressed as percentage of standard length was 14.718 with a range of 11.8 to 17.6.

Length of caudal peduncle

The mean value of length of caudal peduncle expressed as percentage of standard length was 15.112 with a range of 11.8 to 20.6.

Dorsal fin length

The mean value of dorsal fin length expressed as percentage of standard length was 56.914 with a range of 52.8 to 65.6.

Length of free margin of dorsal fin

The mean value of length of free margin of dorsal fin expressed as percentage of standard length was 73.298 with a range of 61.1 to 88.6.

Dorsal fin height

The mean value of dorsal fin height expressed as percentage of standard length was 27.32 with a range of 20.0 to 34.3.

Pectoral fin height

The mean value of pectoral fin height expressed as percentage of standard length was 33.7 with a range of 28.1 to 38.2.
Morphometric and Meristic counts

Ventral fin height

The mean value of ventral fin height expressed as percentage of standard length was 26.628 with a range of 21.9 to 31.4.

Anal fin height

The mean value of anal fin height expressed as percentage of standard length was 25.648 with a range of 18.9 to 33.3.

Length of anal fin base

The mean value of length of anal fin base expressed as percentage of standard length was 21.224 with a range of 18.8 to 27.3.

Girth

The mean value of girth expressed as percentage of standard length was 96.378 with a range of 84.2 to 109.7.

Snout length

The mean value of snout length expressed as percentage of head length was 40.458 with a range of 33.3 to 50.0.

Eye diameter

The mean value of eye diameter expressed as percentage of head length was 20.776 with a range of 16.7 to 27.3.
Post orbital length

The mean value of post orbital length expressed as percentage of head length was 48.006 with a range of 40.0 to 55.6.

Inter-orbital width

The mean value of inter-orbital width expressed as percentage of head length was 47.036 with a range of 55.6 to 36.4.

Gape

The mean value of gape expressed as percentage of head length was 46.62 with a range of 36.4 to 58.3.

Rostral and Maxillary barbels

The rostral and the maxillary barbels are absent in the *Oreochromis mossambica*.

4.4.2 Meristic counts

The details of the meristic counts of *Oreochromis mossambica* are presented in Table 10 and summarised below.

Number of dorsal fin rays

The number of dorsal fin rays was constant (16/12).
Morphometric and Meristic counts

Number of pectoral fin rays

The mean value of number of pectoral fin rays was 12.1 with a range of 11 to 14.

Number of ventral fin rays

The number of ventral fin rays was constant (1/5).

Number of anal fin rays

The mean value of number of anal fin rays was 3/11.02 with a range of 3/10 to 3/12.

Number of caudal fin rays

The mean value of number of caudal fin rays was 16.94 with a range of 15 to 20.

Number of lateral line scales

The mean value of number of lateral line scales was 33.74 with a range of 30 to 36.

Number of lateral line transverse scales

The number of lateral line transverse scales was constant (4.5 to 6.5).
### Table 9

**Morphometric analysis of Cyprinus carpio & Oreochromis mossambica**

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<td>% standard length</td>
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<td>Mean</td>
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<td>Girth</td>
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<td>Maxillary</td>
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Table 10

Meristic characters of *Tor khudree*, *Hypselobarbus kurali*, *Cyprinus carpio* and *Oreochromis mossambica*.

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<thead>
<tr>
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_FISHERY MANAGEMENT IN PERIYAR LAKE_
Picture 7
*Cyprinus carpio* var. *communis* (Common Carp) - an introduced fish

Picture 8
*Oreochromis mossambica* (Tilapia) - another introduced fish
4.5 BIOMETRIC INDEX

4.5.1 Biometric indices in Tor khudree

For each character a mean biometric index for each 50.0 mm length group has been calculated and presented in Table 11.

It is evident from the figure that all the characters show variations in their development. The head length in relation to total length shows some isometric features from IV to X size groups. Other groups show variations. The eye diameter in relation to head length, gape in relation to head length and girth in relation to total length show alternate rise and fall. The growth of inter-orbital width in relation to head length shows a great increase and decrease between the size groups I to VII. Variations are given in the Figures 14, 15, 16 & 17.

4.5.2 Biometric indices in Hypselobarbus kurali

For each character, a mean biometric index for each 50.0 mm length group has been calculated and presented in Table 12.

It is clear from the figure that the growth of eye diameter in relation to head length and the inter-orbital width in relation to head length show wide oscillations. The growth of head length and girth in relation to total length is similar, showing similar variations. The growth of gape in relation to head
length shows slight variations. The variations are represented in the Figures 18,19,20 & 21.

4.5.3 Biometric indices in *Cyprinus carpio communis*

For each character, a mean biometric index for each 50.0 mm length group has been calculated and presented in Table 13.

The figure shows that the growth of head length in relation to total length is isometric with slight variations. The growth of eye diameter, inter-orbital width and gape in relation to head length shows a great decrease between IV and V group. The growth of girth in relation to total length shows wide fluctuations. The variations are represented in the Figures 22,23,24 & 25.

4.5.4 Biometric indices in *Oreochromis mossambica*

For each character, a mean biometric index for each 10.0 mm length group has been calculated and presented in Table 14.

The figure reveals that the growth of head length in relation to total length is isometric with a rise in the last length group (191 to 200mm). The growth of inter-orbital width and gape in relation to head length and girth in relation to total length shows a great variations. The growth of eye diameter in relation to head length shows a gradual rise. The variations are given in Figures 26,27 & 28.

---

FISHERY MANAGEMENT IN PERIYAR LAKE
Table 11

Mean biometric indices in different length groups of *Tor khudree*

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<thead>
<tr>
<th></th>
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Abbreviations used:

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<th>HL</th>
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<td>Head Length</td>
<td>Eye Diameter</td>
<td>Snout Length</td>
<td>Inter-orbital Width</td>
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FISHERY MANAGEMENT IN PERIYAR LAKE

94
Morphometric and Meristic counts

Figure 14

Mean biometric indices in different length groups of *Tor khudree*

Abbreviations used:

- TL - Total Length
- HL - Head Length
- SnL - Snout Length
- POL - Post orbital Length
- ED - Eye Diameter
- IOW - Inter-orbital Width

FISHERY MANAGEMENT IN PERIYAR LAKE
95
Morphometric and Meristic counts

Mean biometric indices in different length groups of *Tor khudree*

**Abbreviations used:**

- **TL** -- Total Length
- **HL** -- Head Length
- **RBL** -- Rostral barbel Length
- **MBL** -- Maxillary barbel Length
- **HURBL**
- **HUMBL**

**Figures:**

- **Figure 16**
- **Figure 17**
### Table 12
Mean biometric indices in different length groups of *Hypselobarbus kurali*

<table>
<thead>
<tr>
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**Abbreviations used:**

- **TL**: Total Length
- **POL**: Post orbital Length
- **RBL**: Rostral barbel length
- **HL**: Head Length
- **ED**: Eye Diameter
- **SnL**: Snout Length
- **IOW**: Inter-orbital Width
- **MBL**: Maxillary barbel Length
Morphometric and Meristic counts

Figure 18

Figure 19

Mean biometric indices in different length groups of *Hypselobarbus kurali*

**Abbreviations used:**
- TL – Total Length
- HL – Head Length
- SnL – Snout Length
- POL – Post orbital Length
- ED – Eye Diameter
- IOW – Inter-orbital Width
Mean biometric indices in different length groups of *Hypselobarbus kurali*

Abbreviations used:

TL – Total Length, HL – Head Length, RBL – Rostral barbel Length
MBL – Maxillary barbel Length
Table 13

Mean biometric indices in different length groups of *Cyprinus carpio* var. *communis*

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Abbreviations used:

- **TL**: Total Length
- **POL**: Post orbital Length
- **RBL**: Rostral barbel length
- **HL**: Head Length
- **ED**: Eye Diameter
- **SnL**: Snout Length
- **IOW**: Inter-orbital Width
- **MBL**: Maxillary barbel Length
Figure 22

Figure 23

Mean biometric indices in different length groups of *Cyprinus carpio var. communis*

**Abbreviations used:**

TL – Total Length, HL – Head Length, SnL – Snout Length

POL – Post orbital Length, ED – Eye Diameter

IOW – Inter-orbital Width
Figure 24

Morphometric and Meristic counts

Figure 25

Mean biometric indices in different length groups of *Cyprinus carpio* var. *communis*

Abbreviations used:

TL – Total Length, HL – Head Length, RBL – Rostral barbel Length
MBL – Maxillary barbel Length
Morphometric and Meristic counts

Figure 26

Figure 27

Mean biometric indices in different length groups of *Oreochromis mossambica*

Abbreviations used:

TL - Total Length, HL - Head Length, SnL - Snout Length
POL - Post orbital Length, ED - Eye Diameter
IOW - Inter-orbital Width
Figure 28

Mean biometric indices in different length groups of *Oreochromis mossambica*

Abbreviations used ::

TL – Total Length