Short Communication

Morphological and meristic features of Vulnerable *Tenualosa toli* (Valenciennes, 1847) from Narmada estuary, Gujarat, India


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A clupeid group (Hilsa) in the Indian sub-continent is represented by three species viz., *Tenualosa toli*, *T. ilisha* and *Hilsa kelee*, which has great economic significance for the fishers. *Tenualosa toli* is observed to have narrow distribution in the Indian sub-continent, along with vulnerability status. The present study describes the morphological and meristic features of *T. toli* collected from the Narmada estuary, Gujarat, India. A single specimen was collected from the bag net catches (10 mm cod-end mesh size) - from Bhadbhut fishing site in December 2019. The size of specimen with a total length of 298 mm, standard length of 224 mm, and weight of 214 g. The morphometric and meristic characters were assessed and compared with other published literature. The present investigation of *T. toli* suggested that immediate measures should be adopted to rejuvenate the species in the aquatic habitats.

**Keywords**: Gujarat, India, Meristic counts, Morphometric characters, Narmada estuary, *Tenualosa toli*

Introduction

The fish, *Tenualosa toli* (Valenciennes, 1847) is commonly known as ‘Toli shad’ and locally called “Palwa” along with *T. ilisha* in the state of Gujarat under the family Clupeidae and subfamily Alosinae (the shads). It is distributed in the Bay of Bengal, coastal India, in the Indo-Australian Archipelago and Hongkong, and both the coasts of India along with rivers to the Java Sea and South China Sea. *Tenualosa toli* was also recorded from Mauritius, in the Cambodian Mekong near the border to Vietnam and is also reported from the Oman Sea (Gulf of Oman).

It is a marine inhabited species, anadromous in migration, pelagic and schooling in coastal waters, euryhaline, enters estuaries and tidal rivers, and found in Sundarbans. Three species of hilsa namely, *T. ilisha*, *T. toli* and *H. kelee* harboirs in the estuaries and coastal waters of India, but only *T. ilisha* forms a commercially important fishery, and the rest two are scarcely available in the Indian waters. *Tenualosa toli* is also considered an important species along with other shads, like *T. ilisha* and *H. kelee*. Toli shad share sympatric populations along with Indian shad in the Chiika Lake, on the east coast of India. Drastically decline of Toli shad has been recorded from the Hooghly-Bhabirath River systems flowing to the Bay of Bengal, and all the three shads are only reported to be found together at Tapti estuary in 2011 (ref. 8). Very scattered information is available on the occurrences of Toli shad at Narmada estuary, that also without any proper features. Despite some overlapping characteristics of the three shads, in the present study, the distinguishing morphological characteristics of Toli shad are provided and compared some features with the other shads.

Materials and Methods

The specimen was collected from the bag net (10 mm cod-end mesh size) catch composition from Bhadbhut (21°40’52" N, 72°50’42" E) fishing site of Narmada estuary in December 2019 (Fig. 1). A single specimen was found (Fig. 2). The bag net is locally known as ‘Golava’ fishery usually commenced in the winter season (October to May) at the lower stretch of the Narmada estuary. The collected specimen was identified with the standard taxonomic keys and is kept in the fish museum of ICAR-CIFRI, Vadodara as a voucher specimen. All the morphometric measurements were done by using a digital caliper to the nearest 1.0 mm.

Results and Discussion

The size of specimen with a total length of 298 mm, standard length of 224 mm, and weight of 214 g. The species was identified with the standard taxonomic keys and is kept in the fish museum of ICAR-CIFRI, Vadodara as a voucher specimen. All the morphometric measurements were done by using a digital caliper to the nearest 1.0 mm.

**Keywords**: Gujarat, India, Meristic counts, Morphometric characters, Narmada estuary, *Tenualosa toli*
Fig. 1 — Map showing the collection site of *T. toli* from Narmada estuary, Gujarat, India

Fig. 2 — Toli shad, *Tenualosa toli* collected from Bhadbhut - Narmada estuary, Gujarat
having numerous fronto-parietal striae on the top of the head. A comparative meristic character of *T. toli* done by other researchers is provided in Table 2, and morphological characters of three distinguished shads are depicted in Table 3.

*Toli* shad is a protandrous hermaphrodite that inhabits fast-flowing, turbid estuaries, and adjacent coastal waters and shows schooling behaviours. This is a pelagic-neritic, anadromous species inhabited in marine, freshwater as well as brackish water. It is a semelparous species and is reported to die after single spawning only and the spawning season lasts from May to November. It has also been reported to feed mainly on zooplankton. As per IUCN Red List Status, the species are kept under the Vulnerable (VU) category\(^\text{15}\). The species is observed to have narrow distribution in the Indian sub-continent, along with vulnerability status. Immediate measures should be adopted to rejuvenate the species in the studied environment along with other similar aquatic habitats.

### Table 1 — Morphometric measures of a single specimen of *T. toli* collected from Bahdbhut region of Narmada estuary, Gujarat and compared to other studies

<table>
<thead>
<tr>
<th>Morphometric characters (mm)</th>
<th>Present observations</th>
<th>Value</th>
<th>Jawad <em>et al.</em>(^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weight</td>
<td></td>
<td>214 g</td>
<td>N = 2</td>
</tr>
<tr>
<td>Total length (TL)</td>
<td></td>
<td>298</td>
<td></td>
</tr>
<tr>
<td>Standard length (SL)</td>
<td></td>
<td>224</td>
<td>SL/TL (%) 75.17</td>
</tr>
<tr>
<td>Head length (HL)</td>
<td></td>
<td>61</td>
<td>HL/SL (%) 27.23</td>
</tr>
<tr>
<td>Body depth (BD)</td>
<td></td>
<td>80</td>
<td>BD/SL (%) 35.71</td>
</tr>
<tr>
<td>Orbit diameter (OD)</td>
<td></td>
<td>12</td>
<td>OD/SL (%) 5.36</td>
</tr>
<tr>
<td>Inter orbital width (IOW)</td>
<td></td>
<td>15</td>
<td>IOW/SL (%) 6.70</td>
</tr>
<tr>
<td>Mouth opening (MO)</td>
<td></td>
<td>25</td>
<td>MO/SL (%) 11.16</td>
</tr>
<tr>
<td>Caudal peduncle depth (CPD)</td>
<td></td>
<td>24</td>
<td>CPD/SL (%) 10.71</td>
</tr>
<tr>
<td>Caudal peduncle length (CPL)</td>
<td></td>
<td>16</td>
<td>CPL/SL (%) 7.14</td>
</tr>
<tr>
<td>Pre dorsal length (PDL)</td>
<td></td>
<td>97</td>
<td>PDL/SL (%) 43.30</td>
</tr>
<tr>
<td>Pre pectoral length (PPL)</td>
<td></td>
<td>63</td>
<td>PPL/SL (%) 28.13</td>
</tr>
<tr>
<td>Pre ventral length (PVL)</td>
<td></td>
<td>112</td>
<td>PVL/SL (%) 50.00</td>
</tr>
<tr>
<td>Pre anal length (PAL)</td>
<td></td>
<td>173</td>
<td>PAL/SL (%) 77.23</td>
</tr>
<tr>
<td>First dorsal fin length (1DFL)</td>
<td></td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>First Dorsal fin base (1DFB)</td>
<td></td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Pectoral fin length (PFL)</td>
<td></td>
<td>43</td>
<td>PFL/SL (%) 19.20</td>
</tr>
<tr>
<td>Ventral fin base (VFB)</td>
<td></td>
<td>13</td>
<td>VFB/SL (%) 5.80</td>
</tr>
<tr>
<td>Ventral fin base (VFB)</td>
<td></td>
<td>8</td>
<td>VFB/SL (%) 3.57</td>
</tr>
<tr>
<td>Ventral fin length (VFL)</td>
<td></td>
<td>25</td>
<td>VFL/SL (%) 11.16</td>
</tr>
<tr>
<td>Anal fin length (AFL)</td>
<td></td>
<td>13</td>
<td>AFL/SL (%) 5.65</td>
</tr>
<tr>
<td>Anal fin base (AFB)</td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Caudal fin length (CFL)</td>
<td></td>
<td>72</td>
<td>CFL/SL (%) 32.14</td>
</tr>
</tbody>
</table>

### Table 2 — Comparative meristic characters of *T. toli* by different researchers

<table>
<thead>
<tr>
<th>Meristic characters</th>
<th>Present study ((n = 1))</th>
<th>Whitehead(^13)</th>
<th>Shafi &amp; Quddus(^16)</th>
<th>Antony <em>et al.</em>(^17)</th>
<th>Rahman(^18,19)</th>
<th>Jawad <em>et al.</em>(^6)</th>
<th>Dwivedi(^20) ((n = 2))</th>
<th>Tint(^19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal fin rays</td>
<td>18</td>
<td>-</td>
<td>16-17</td>
<td>18-19</td>
<td>17-18</td>
<td>17</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>Pectoral fin rays</td>
<td>14</td>
<td>-</td>
<td>14</td>
<td>14</td>
<td>14-15</td>
<td>14</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Ventral fin rays</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Anal fin rays</td>
<td>19</td>
<td>-</td>
<td>19-20</td>
<td>18-20</td>
<td>19-21</td>
<td>19</td>
<td>19</td>
<td>-</td>
</tr>
<tr>
<td>Lateral-line scales</td>
<td>41</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>42-43</td>
<td>40-41</td>
</tr>
<tr>
<td>Ventral scutes</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29-31</td>
<td></td>
</tr>
</tbody>
</table>
Acknowledgments
The authors are thankful to the Director, ICAR-Central Inland Fisheries Research Institute, Barrackpore for the encouragement during the study period. The authors are also thankful to the supporting staff of ICAR-CIFRI, Vadodara for their timely technical support.

Conflict of Interest
The authors declare no conflicts of interest.

Ethical Statement
The Institute Research Committee of ICAR-Central Inland Fisheries Research Institute, Barrackpore, considering the animal care and ethical issues approved the research program and sampling methodology. The authors consent to participate in the study.

Author Contributions
DB - specimen collection, identification, manuscript writing; SPK & RKS - data entry; JKS - specimen collection & data entry; LK, AKS, AP & SS - review & editing and BKD – conceptualization and editing.

References
1 Shafi M & Quddus M M A, Bangaposagorer Matsho Shampad (Fisheries of the Bay of Bengal) (in Bengali), (Kabir publication, Dhaka, Bangladesh), 2003, pp. 122.

Table 3 — Morphological characters of three distinguished shads

<table>
<thead>
<tr>
<th>Characters</th>
<th>Tenualosa toli</th>
<th>Tenualosa ilisha</th>
<th>Hilsa kelee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body profile</td>
<td>Body fusiform, moderately deep and compressed, dorsal profile somewhat more concave than that of the abdomen</td>
<td>Body fusiform, moderately deep and compressed, dorsal and ventral profile equally convex</td>
<td>Body strongly compressed; ventral profile more arched than the dorsal profile</td>
</tr>
<tr>
<td>Head length</td>
<td>25 to 27 % of standard length</td>
<td>28 to 32 % of standard length</td>
<td>-</td>
</tr>
<tr>
<td>Head profile</td>
<td>Presence of numerous longitudinal striae on top of the head</td>
<td>Absence of fronto-parietal striae</td>
<td>Absence of fronto-parietal striae</td>
</tr>
<tr>
<td>Body depth</td>
<td>30 to 35 % of standard length</td>
<td>27 to 32 % of standard length</td>
<td>30 to 40 % of standard length</td>
</tr>
<tr>
<td>Dorsal fin origin</td>
<td>A little before the midpoint of the body</td>
<td>At the midpoint of the body</td>
<td>Slightly before the midpoint of the body</td>
</tr>
<tr>
<td>Caudal fin</td>
<td>Larger than the head length, around 31 to 34 % of standard length</td>
<td>Caudal fin moderate, almost the same length of head length, 25 to 31 % of standard length</td>
<td>Slightly shorter than head length</td>
</tr>
<tr>
<td>Body scales</td>
<td>Perforated</td>
<td>Not perforated</td>
<td>Not perforated</td>
</tr>
<tr>
<td>Belly scutes</td>
<td>Belly with a distinct keel and 28 to 30 scutes</td>
<td>Belly with distinct keel and 30 to 33 scutes</td>
<td>Belly with distinct keel and 27 to 31 scutes</td>
</tr>
<tr>
<td>Lateral line scale</td>
<td>37 to 40 in numbers</td>
<td>45 to 48 in numbers</td>
<td>-</td>
</tr>
<tr>
<td>Gill rakers</td>
<td>Fine and numerous with 60 to 100 on the lower part of the gill arch</td>
<td>Very fine and numerous with 120 to 200 on the lower part of the gill arch</td>
<td>Very fine and numerous with 100 to 175 on the lower part of the gill arch</td>
</tr>
<tr>
<td>Colour</td>
<td>Blue/ green on the back, silvery on flanks, a diffuse dark blotch behind gill opening</td>
<td>Black blue/ green, flanks silvery, a series of black blotches along flanks which may disappear in the larger adults.</td>
<td>Black blue/ green, flanks silvery, a black spot behind the operculum, followed by 3 to 7 similar spots along flanks.</td>
</tr>
<tr>
<td>Maximum length</td>
<td>60 cm (TL)</td>
<td>60 cm (SL)</td>
<td>35 cm (TL)</td>
</tr>
</tbody>
</table>