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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 toil* 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[1], and both the coasts of India along with rivers to the Java Sea and South China Sea[2,3]. *Tenualosa toli* was also recorded from Mauritius[4], in the Cambodian Mekong near the border to Vietnam[5] and is also reported from the Oman Sea (Gulf of Oman)[6]

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[2,7]. Three species of hilsa namely, *T. ilisha*, *T. toli* and *H. kelee* harbours 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[8]. *Tenualosa toli* is also considered an important species along with other shads, like *T. ilisha* and *H. kelee*[9]. Toli shad share sympatric populations along with Indian shad in the Chiika Lake, on the east coast of India[8]. Drastically decline of Toli shad has been recorded from the Hooghly-Bhagirathi 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[10,11]. 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 taxonomic keys[2,12-14] 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 with dorsal fin rays 18, pectoral fin rays 14, ventral fin rays 8, anal-fin rays 19, ventral scutes 29, and lateral line scales 41. All the morphometric measurements were summarized in Table 1. The fish, *T. toli* is differing from other similar clupeids like *T. ilisha* in having a longer caudal fin, and fewer ventral sautés (30–33 in *T. ilisha*). *Tenualosa toli* differs from *H. kelee* in not

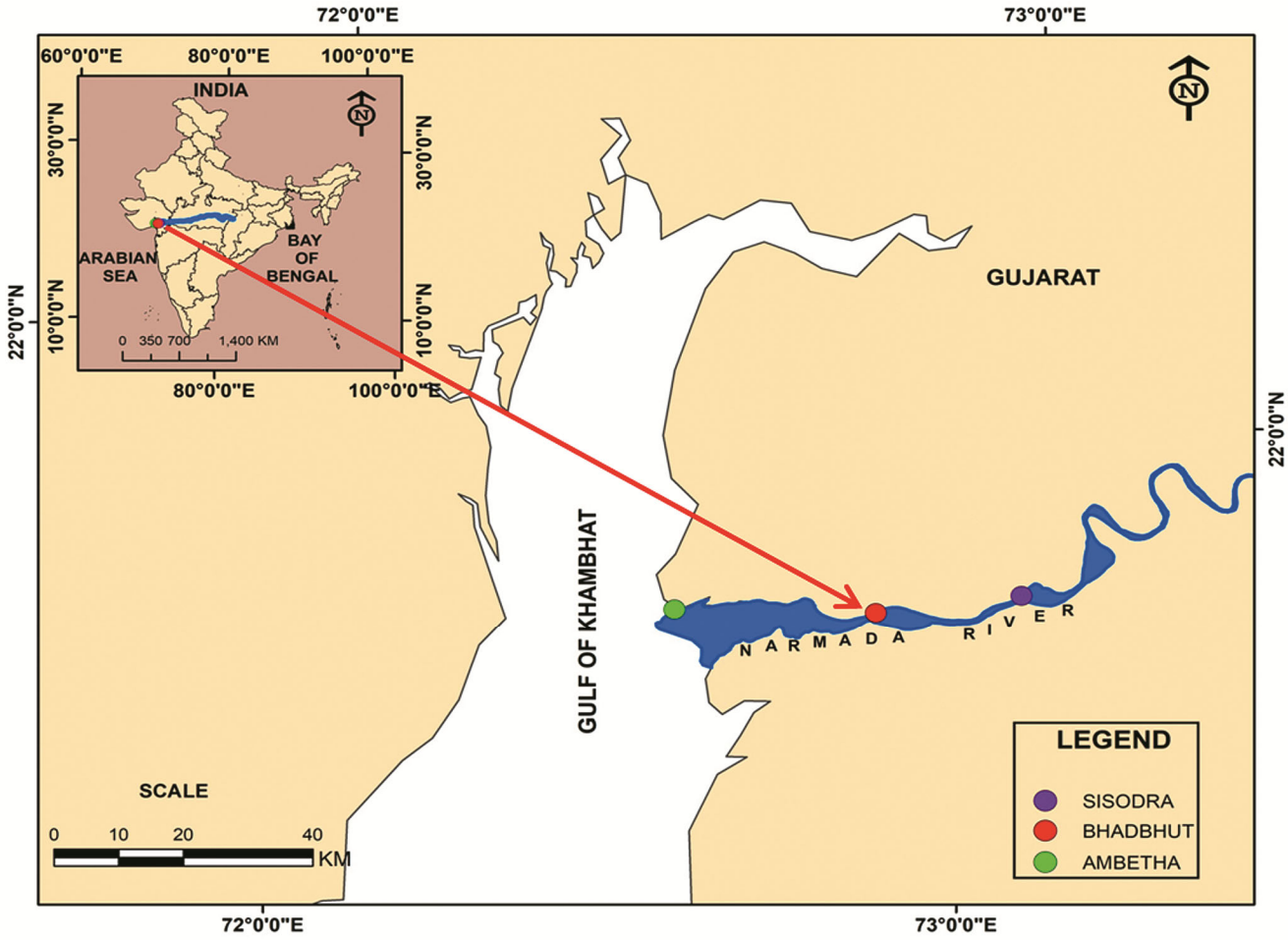

Fig. 1 — Map showing the collection site of *T. toli* from Narmada estuary, Gujarat, India

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[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

Present observations	Value			Jawad *et al.*[6]
Morphometric characters (mm)	N = 1			N = 2
Total weight	214 g			
Total length (TL)	298			
Standard length (SL)	224	SL/TL (%)	75.17	75.7-77.4
Head length (HL)	61	HL/SL (%)	27.23	27.1-27.6
Body depth (BD)	80	BD/SL (%)	35.71	39.7-40.3
Orbit diameter (OD)	12	OD/SL (%)	5.36	
Inter orbital width (IOW)	15	IOW/SL (%)	6.70	
Mouth opening (MO)	25	MO/SL (%)	11.16	
Caudal peduncle depth (CPD)	24	CPD/SL (%)	10.71	10.9-13.2
Caudal peduncle length (CPL)	16	CPL/SL (%)	7.14	6.3-7.2
Pre dorsal length (PDL)	97	PDL/SL (%)	43.30	43.1-43.7
Pre pectoral length (PPL)	63	PPL/SL (%)	28.13	
Pre ventral length (PVL))	112	PVL/SL (%)	50.00	
Pre anal length (PAL)	173	PAL/SL (%)	77.23	77.0-77.3
First dorsal fin length (1DFL)	34			
First Dorsal fin base (1DFB)	31			
Pectoral fin length (PFL)	43	PFL/SL (%)	19.20	
Ventral fin base (VFB)	13	PFB/SL (%)	5.80	
Ventral fin base (VFB)	8	VFB/SL (%)	3.57	
Ventral fin length (VFL)	25	VFL/SL (%)	11.16	
Anal fin length (AFL)	13	AFL/SL (%)	5.65	
Anal fin base (AFB)	40			
Caudal fin length (CFL)	72	CFL/SL (%)	32.14	

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

Meristic characters	Present study (n = 1)	Whitehead[13]	Shafi & Quddus[16]	Antony *et al.*[17]	Rahman[18,19]	Jawad *et al.*[6]	Dwivedi[20] (n=2)	Tint[19]
Dorsal fin rays	18	-	16-17	18-19	17-18	17	18	-
Pectoral fin rays	14	-	14	14	14-15	14	14	-
Ventral fin rays	8	8	9	9	8	8	8	-
Anal fin rays	19	-	19-20	18-20	19-21	19	19	-
Lateral-line scales	41	-	-	-	-	-	42-43	40-41
Ventral scutes	29	-	-	-	-	-	-	29-31

Table 3 — Morphological characters of three distinguished shads

Characters	*Tenualosa toli*	*Tenualosa ilisha*	*Hilsa kelee*
Body profile	Body fusiform, moderately deep and compressed, dorsal profile somewhat more concave than that of the abdomen	Body fusiform, moderately deep and compressed, dorsal and ventral profile equally convex	Body strongly compressed; ventral profile more arched than the dorsal profile
Head length	25 to 27 % of standard length	28 to 32 % of standard length	-
Head profile	Presence of numerous longitudinal striae on top of the head	Absence of fronto-parietal striae	Absence of fronto-parietal striae
Body depth	30 to 35 % of standard length	27 to 32 % of standard length	30 to 40 % of standard length
Dorsal fin origin	A little before the midpoint of the body	At the midpoint of the body	Slightly before the midpoint of the body
Caudal fin	Larger than the head length, around 31 to 34 % of standard length	Caudal fin moderate, almost the same length of head length, 25 to 31 % of standard length	Slightly shorter than head length
Body scales	Perforated	Not perforated	Not perforated
Belly scutes	Belly with a distinct keel and 28 to 30 scutes	Belly with distinct keel and 30 to 33 scutes	Belly with distinct keel and 27 to 31 scutes
Lateral line scale	37 to 40 in numbers	45 to 48 in numbers	-
Gill rakers	Fine and numerous with 60 to 100 on the lower part of the gill arch	Very fine and numerous with 120 to 200 on the lower part of the gill arch	Very fine and numerous with 100 to 175 on the lower part of the gill arch
Colour	Blue/ green on the back, silvery on flanks, a diffuse dark blotch behind gill opening	Black blue/ green, flanks silvery, a series of black blotches along flanks which may disappear in the larger adults.	Black blue/ green, flanks silvery, a black spot behind the operculum, followed by 3 to 7 similar spots along flanks.
Maximum length	60 cm (TL)[5]	60 cm (SL)[1]	35 cm (TL)[22]

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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.

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