

A NEW RECORD OF A GARDEN EEL, *HETEROCONGER TOMBERUA* (ACTINOPTERYGII: ANGUILLIFORMES: CONGRIDAE), FROM THE INDIAN OCEAN

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Abstract. A specimen of garden eel, *Heteroconger tomberua* Castle et Randall, 1999, was collected from the traveling water screen of sea water cooling system of the Madras Atomic Power Station (MAPS), Kalpakkam located along the east coast of India. Previously, *H. tomberua* was recorded in Fiji, Pacific Ocean. The presently reported record greatly extends the fish range to the Indian Ocean and constitutes a new addition to the ichthyofauna of India. The described specimen of *H. tomberua*, with its total length 55.9 cm, seems to be the largest ever found.

Keywords: garden eel, *Heteroconger tomberua*, first record, Kalpakkam, India, Indo-Pacific

The eastern Indian Ocean region is comparatively less intensively studied than other parts of Indo-Pacific region with regard to its benthic and/or deep-water fish fauna. This is particularly true in relation to the eels (order Anguilliformes), which have a pelagic leptocephalus larval stage. The species representing the subfamily Heterocongrinae (Anguilliformes: Congridae), commonly known as garden eels, are poorly known. They have apparently localized distributions and adult specimens are difficult to obtain. Moreover, the taxonomy of the group leptocephali is incomplete (Miller and Tsukamoto 2006). This paper deals with an interesting report of Pacific oceanic garden eel, *Heteroconger tomberua* Castle et Randall, 1999, from coastal waters of India.

Garden eels are characterized by very slender, long body with a short snout and a terminal oblique mouth (Castle 1997). The Heterocongrinae comprise 2 genera with 34 species distributed worldwide (Fricke and Eschmeyer 2011). These eels are common inhabitants of silty, sand-rubble or sea grass bed areas at depths between 2 and 55 m, although few species have been dredged beyond 200 m depth. The colonies of Heterocongrine eels are often observed as a “garden of eels” with their heads and upper bodies extending out the sand while they feed on

zooplankton during the daytime (Smith 1989). Other aspects of their behavior have not been studied sufficiently.

The Heterocongrine eels of the genus *Gorgasia* Meek et Hildebrand, 1923, recorded from various parts of the Indian Ocean are: *G. cotroneii* (D’Ancona, 1928); *G. klausewitzi* Quéro et Saldanha, 1995; *G. maculata* Klausewitz et Eibl-Eibesfeldt, 1959; *G. preclara* Böhlke et Randall, 1981; and *G. sillneri* (Klausewitz, 1962). The genus *Heteroconger* Bleeker, 1868 is represented in the Indian waters by *H. hassi* (Klausewitz et Eibl-Eibesfeldt, 1959) and *H. obscurus* (Klausewitz et Eibl-Eibesfeldt, 1959) and both are described from Andamans (Klausewitz and Eidl-Eibesfeldt 1959). Apart from these two species of the genus *Heteroconger*, two other species, i.e., *H. balteatus* Castle et Randall, 1999 and *H. congroides* (D’Ancona, 1928) are known from the Indian Ocean, especially from the Red Sea and nearby areas. Among other Indo-Pacific garden eels, *H. enigmaticus* Castle et Randall, 1999; *H. mercyae* Allen et Erdmann, 2009; *H. perissodon* Böhlke et Randall, 1981; *H. polyzona* Bleeker, 1868; *H. taylori* Castle et Randall, 1995; and *H. tricia* Castle et Randall, 1995 have been recorded from Indonesian region (Allen and Erdmann 2009). *Heteroconger tomberua* Castle et Randall, 1999, has previously been known only from coastal waters of Fiji

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(Castle and Randall 1999), New Caledonia (Fricke and Kulbicki 2007), and nearby areas. However, Castle and Randall (1999) believed that larvae collected from Sri Lanka and Nicobar Islands in 1997 by the DANA expedition, were *H. tomlerua*, but there was no adult specimen to confirm it. Similarly, Miller et al. (2011), studying larvae of garden eels from the north-west coast of Sumatra, were hesitant to confirm the presence of *H. tomlerua* because of non-availability of adult specimen.

During the study of the ichthyofaunal diversity of the coastal waters near and around Kalpakkam, the present authors discovered a single adult specimen of *H. tomlerua* hitherto not recorded from the Indian Ocean. The specimen was collected during July 2008, when the authors found the specimen amongst other fishes that were caught in the pump house water screen of the cooling water system of the Madras Atomic Power Station (MAPS) located at Kalpakkam (12°33'N, 80°11'E) (Fig. 1), on the east coast of India. The MAPS uses seawater as the condenser cooling fluid, which is drawn ($35 \text{ m}^3 \text{ s}^{-1}$) through a sub-sea bed tunnel located 53 m below the sea bed. The cooling water enters at the intake, located 420 m away from the shore, passes through the tunnel (468 m long and 3.8 m diameter) and reaches the forebay. At this forebay, seawater is pumped through traveling water screens (with mesh $1 \times 1 \text{ cm}$) into the condensers and other auxiliary cooling systems to get rid of macro organisms and particles. Impinged materials are carried vertically upward by the traveling screens. The present report is based on a single specimen collected from the traveling screens, out of a few observed specimens.

Freshly killed specimen was photographed using Sony Mavica MVC-CD500. It was initially fixed in 10% formaldehyde and later, after thorough washing, preserved in 70% ethanol for further study. The specimen is deposited at National Museum, Zoological Survey of India, Kolkata (Catalogue No. ZSI F-10575/2).

Measurements were carried out to the nearest 0.1 mm by a caliper, and meristic counts were made using a stereomicroscope. Vertebral count was taken from radiograph. The taxonomic key provided in Castle and Randall (1999) and Allen and Erdmann (2009) were followed to identify the specimen.

Heteroconger tomlerua Castle et Randall, 1999

Identifying characters: *H. tomlerua* can easily be distinguished from other *Heteroconger* species in having a high vertebral count, 186–208 in total. Body markings are evenly distributed with rounded, small, discrete dark spots on a light background. 2–3 irregular rows of small dark spots are present above and below lateral line, but with no other markings (Castle and Randall 1999).

Description of the Indian Ocean specimen: Colour pale yellow with presence of conspicuous small, round, dark brown spots evenly distributed throughout with no other markings. Body elongate and slender (Fig. 2), 55.9 cm long (Total length; TL); Body depth 1.16% of TL; Head length (HL) 4.3% of TL (Fig. 3) and 13.2% of snout-anus length. Mouth short, strongly oblique, angle of mouth reaching just below anterior rim of eye (Fig. 4); lower jaw projecting beyond upper. Mouth length constituting 18.75 % of HL. Upper lip confluent medially across anterior face of snout. Anterior nostrils and ethmoid sensory pores enclosed by upper lip. Teeth arranged in at least three rows on jaws and vomer. Pterygoid teeth absent. Snout–anus length constituting 32.55 % of TL. Dorsal fin originating small distance behind gill opening, above middle of pectoral fin. Dorsal and anal fin rays unsegmented. Pectoral fins present, but very small, constituting 10.4% of HL. Fifty-eight lateral line pores present before vent.

Radiographic analysis indicated a total of 191 vertebrae (6/58/191). The above morphological measurements are consistent with the morphological variations given by Castle and Randall (1999).

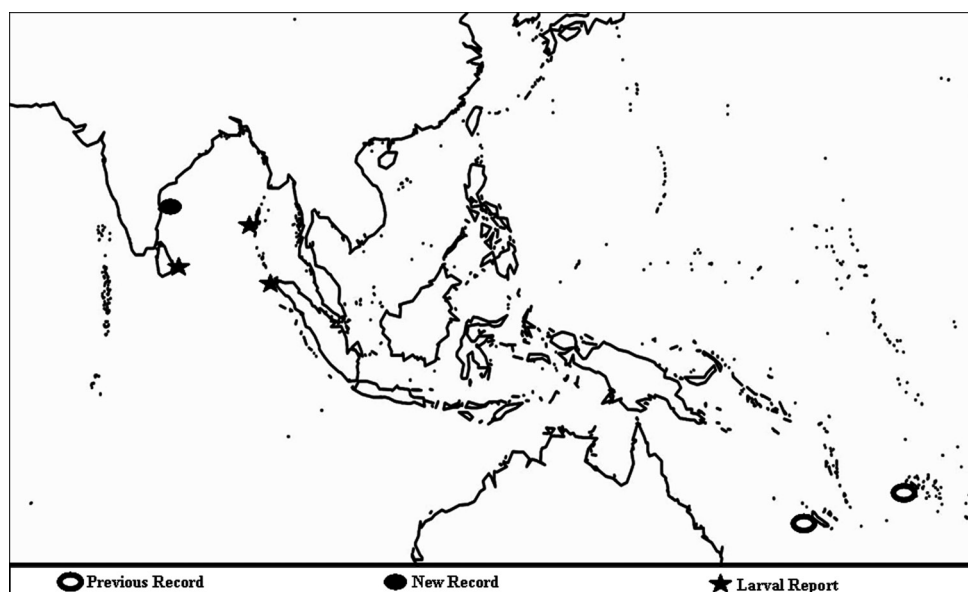


Fig. 1. Distribution of published records of *Heteroconger tomlerua*



Fig. 2. Specimen of *Heteroconger toberua* from Indian coast; general view

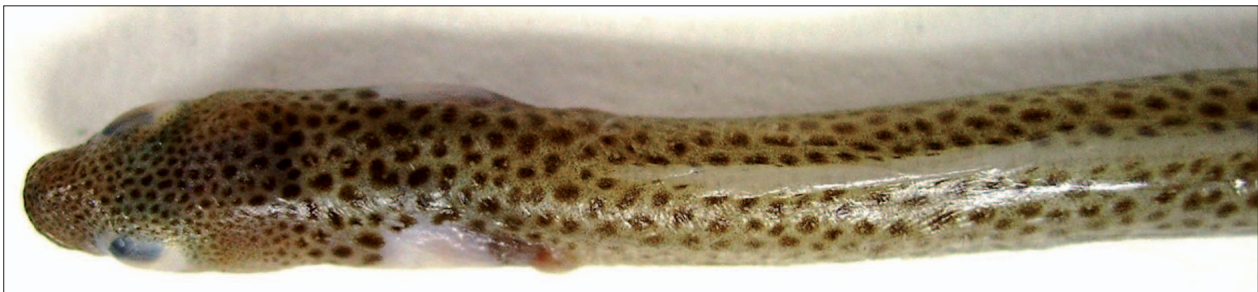


Fig. 3. Specimen of *Heteroconger toberua* from Indian coast; dorsal view of anterior part

Remarks. From the body markings and size of the eel it was first assumed to be *Gorgasia klausewitzi*. However, the presence of a short mouth with its angle reaching just below anterior rim of eye (Fig. 4), a band of teeth in jaws and vomer and confluent upper lip lead us to consider it to be a *Heteroconger* species. The majority of the known *Heteroconger* species of Indo-Pacific region have from 144 to 176 total vertebrae. Only four known species of *Heteroconger* in the world, i.e., *H. cobra* Böhlke et Randall, 1981; *H. mercyae*, *H. toberua*, and *H. tricia* do have more than 180 vertebrae. Three prominent dark and light u-shaped saddles in *H. cobra* and zebra-like black and white bars on head of *H. mercyae* distinguishes clearly from the present specimen. *H. tricia* closely resemble *H. toberua* but differs in having about 210 vertebrae and relatively large, evenly spaced, round dark spots. Hence, our specimen was identified as *H. toberua*, which was



Fig. 4. Specimen of *Heteroconger toberua* from Indian coast; lateral view of head

known only from Fiji. The specimen slightly differs from the body proportion taken from Fiji samples, where the maximum size encountered was 42.8 cm in TL (Castle and Randall 1999). Our specimen was substantially

Table 1

Morphometric measurements of *Heteroconger tomberua*,
found at the Madras Atomic Power Station, Kalpakkam, India

Character	Value			
	[mm]	[%TL]	[%SAL]	[%HL]
Total length (TL)	559.0	—	—	—
Body depth	6.5	1.16	3.57	27.08
Head Length (HL)	24.0	4.29	13.18	—
Head width	7.0	1.25	—	29.16
Head height	7.3	1.30	—	30.42
Max. eye diameter	4.4	0.78	—	18.33
Inter-orbital width	2.5	0.44	—	10.42
Snout length	3.6	0.64	—	15.00
Post-orbital head length	17.0	3.04	—	70.83
Mouth length	4.5	0.80	—	18.75
Gill opening length	2.5	0.44	—	10.42
Pre-dorsal length	25.8	4.61	14.17	—
Pre-anal length	185.0	33.09	—	—
Snout-anus length (SAL)	182.0	32.55	—	—
Pectoral fin length	2.5	0.44	—	10.42

longer. The only adult specimen obtained from Indian Ocean matches with the percentages of various measurements (Table 1) given in the original description of *H. tomberua*.

The recent, presently reported, finding of *Heteroconger tomberua* from east coast of India results in a range extension of this species from its type locality Fiji, and constitutes the first record from Indian Ocean. Many of the tropical oceanic fishes of Indian and Pacific Ocean share common distribution on either side of the Indonesian archipelago and the current discovery may be an example of such a range. Further surveys in the Indian Ocean, particularly the Bay of Bengal, may shed more light on the biogeography, distribution and abundance of *H. tomberua*.

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