



Short Communication

First report of Indian frogfish, *Antennarius indicus* Schultz, 1964 from the Hooghly-Matlah estuary of India

D Bhakta*, R K Manna, A Ray, S M Nair, C Jana,
S Mandal, S Samanta & B K Das

ICAR-Central Inland Fisheries Research Institute,
Barrackpore, Kolkata, West Bengal – 700 120, India

*[E-mail: dibakar.bhakta@icar.gov.in]

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The primarily benthic, shallow-water, reef-associated Indian frogfish, *Antennarius indicus* Schultz 1964, belongs to the family Antennariidae (order Lophiiformes) and may be found in nearly all of the world's tropical and subtropical oceans and seas. Comprehensive morphological parameters of the Indian frogfish found in the Hooghly and Matlah estuary systems of India are provided by the current study. A single specimen with a length 97.87 mm and weight 33.48 g was collected from the winter migratory bagnet catch at Fraserganj fish landing site. Till now, there are no records of the occurrence of frogfishes in the Hooghly-Matlah estuarine system. The morphological features such as dorsal-fin spines - 3, dorsal-fin rays - 12, anal fin rays - 7, pectoral-fin rays - 10, and pelvic fin rays - 5, confirmed the first record of Indian frogfish *A. indicus* from the Hooghly-Matlah estuarine system. The estuary's current condition was revealed by the examination of the water quality at the collection site.

[**Keywords:** Antennariidae, *Antennarius indicus*, First record, Hooghly-Matlah estuary, India]

Introduction

Frogfishes fall under the order Lophiiformes of the family Antennariidae, which are distinguished from other related species with a transformed first anterior dorsal fin spine known as 'illicium', placed near the tip of the snout which acts as a luring device for attracting the prey¹. The sigmoid vertebral column, shorter body, and larger third dorsal-fin spine distinguish the species of the Antennariidae family from one another^{1,2}. Species of this group are predominantly benthic, sit-and-wait, and cryptic predators, which can blend almost effortlessly with nearly any combination of substrate and structure³.

Frogfish are widespread in almost all tropical and subtropical oceans and seas worldwide, even in moderate waters³. The genus *Antennarius* is the most speciose of the Antennariidae family, with 11 species

known to exist worldwide, including 6 from Indian waters. *Antennarius indicus* Schultz, 1964, a real tropical fish species linked to marine reefs, is native to the Indian Ocean and its adjacent waters. *Antennarius indicus* is found in the Western Indian Ocean, travelling via East Africa, the Gulf of Aden, and the Seychelles from Southeast India and Sri Lanka north to the Gulf of Oman⁵.

For the first time, Schultz⁶ reported the species from Vizagapatam (presently known as Visakhapatnam), India, and considered the species a holotype. In India, the species is also reported from the Gulf of Mannar ecosystem, Tamil Nadu⁷, Chilika Lagoon, east coast of India⁸, and Narmada estuary⁴. Other than India, the Indian frogfish was further reported in Seychelles², Sri Lanka⁹, Oman¹⁰⁻¹², Mozambique¹³, Iraq¹⁴, Pakistan¹⁵, Somalia¹⁶, and Chabahar Bay, Iran¹⁷.

Positioned on the Indian coast of the Bay of Bengal¹⁸⁻²¹, the Hooghly-Matlah estuary system is one of the largest and most productive estuaries in the nation. It spans approximately 295 km from the seafloor and is positioned between latitude 21°31' to 23°30' N and longitude 87°45' to 88°45' E. Over 90 % of fish harvested from the Hooghly-Matlah estuary system originate from the highly saline zone²². The estuary system supports a remarkable diversity of fish species in its various zones.

Winter migratory bagnet, locally known as 'been jal' is one of the very important artisanal fishing gears, mainly operating in the lower stretches of Hooghly-Matlah estuary during winter months (October to February)^{22,23}. The winter bagnet catch mainly consists of small-sized fishes, which are mainly sun-dried by the local fishers²⁴.

Mandal *et al.*²⁵ reviewed the ichthyofaunal diversity of mangrove-based Indian Sunderbans (including the lower stretch of Hooghly-Matlah estuarine systems) incorporating a list of 267 fish species; however, they have not recorded the Indian frogfish. Similarly, Mishra & Gopi²⁶ documented bony finfishes from the Indian Sunderbans (a total of 314 species) and Habib *et al.*²⁷ from Bangladesh Sunderbans (a total of 325 species) without mention of Indian frogfish. The present study confirms the presence of *A. indicus* in the Hooghly-Matlah estuarine system.

Materials and Methods

While sorting through the winter migratory bagnet catch, also known locally as "khutti," one dead specimen of the Indian frogfish was found in February 2021 at the Fraserganj fishing site (a lower stretch of the Hooghly-Matlah estuarine systems). The specimen was caught alongside other species at a depth of about 12 m. After being photographed, the specimen was transferred to the lab stored in an icebox for additional study. Using the common taxonomic keys, it was determined that the specimen was *Antennarius indicus*^{1,14-15}. Digital Vernier calipers were used to record all morphometric measurements to the nearest 0.01 mm, and the meristic counts were made with necked eyes in accordance with Hubbs & Lagler's methods²⁸. The specimen has been preserved and stored at the ICAR-CIFRI museum in Kolkata, India, as a voucher specimen with registration number (CIFRI/mus/04).

The water sample collected from the place where the bagnet was being operated was analysed for the selected water parameters following Standard Methods²⁹.

Results and Discussion

The family Antennariidae Jarocki, 1822; genus *Antennarius* Daudin, 1816; and species *Antennarius indicus* (Schultz, 1964) are the following in terms of the species' systematics (Fig. 1). The specimen that

was collected measured 97.89 mm in length and 33.48 g in weight. Table 1 presents the specimen's morphometric and meristic characteristics, along with a comparison with previously published data. The meristic counts of the specimen were three dorsal fin spines, 12 dorsal fin rays, 7 anal fin rays, 10 pectoral fin rays, and 5 pelvic fin rays, which were found almost alike to the work of Schultz⁶, Randall¹⁰, Jawad & Hussain¹⁴, and Oladi *et al.*¹⁷ (Table 1). Body depth 2.05 times TL and head 3.15 times of TL.

The following are the species^{6,17} taxonomic characteristics: body globose, short, and laterally compressed. Quite a broad, oblique to vertical mouth with many tiny villiform teeth present. The operculum is a tiny pore that opens behind and under the pectoral



Fig. 1 — Lateral view of *A. indicus* collected from the Hooghly-Matlah estuary, West Bengal

Table 1 — Meristic and morphometric features of *A. indicus* (n = 01) collected from the Hooghly-Matlah estuary and comparison with previously published data

	Present study	Schultz ⁶	Randall ¹⁰	Jawad & Hussain ¹⁴	Oladi <i>et al.</i> ¹⁷	Bhakta <i>et al.</i> ⁴
<i>Morphometric characters</i>						
Total length (mm)	97.89	NA	110	120-260	63.0	54.0
Standard length (mm)	76.08	44.5	NA	NA (88-89)	50.5	41.0
Head length (% in SL)	40.89	NA	NA	NA (31-32)	17.0	63.41
Eye diameter (% in HL)	11.54	NA	NA	NA (22.7-33)	34.0	11.53
Pre-orbital length (% in HL)	24.56	NA	NA	NA	NA	19.23
Post-orbital length (% in HL)	56.86	NA	NA	NA	NA	19.23
Pre-dorsal fin length (% in SL)	10.23	NA	NA	NA	NA	7.31
Pre-pectoral fin length (% in SL)	57.40	NA	NA	NA	NA	58.53
Pre-anus length (% in SL)	83.61	NA	NA	NA	NA	58.53
Pre-anal fin length (% in SL)	94.37	NA	NA	NA	NA	82.92
Post-anal fin length (% in SL)	34.29	NA	NA	NA	NA	48.78
Maximum body depth (% in SL)	62.84	NA	NA	NA (81-83)	30.9	60.97
Caudal peduncle depth (% in SL)	13.37	NA	NA	NA	NA	13.41
Pectoral fin height (% in SL)	18.68	NA	NA	NA	NA	34.14
<i>Meristic counts</i>						
Dorsal fin rays	12	12	12	12	12	12
Anal fin rays	7	7	7	7	7	7
Pectoral fin rays	10	13	12-13	12	11	10
Caudal fin rays	9	9	NA	NA	9	NA
Pelvic fin rays	5	5	5	NA	5	NA

fin's base. There are three dorsal spines: the first is free and adapted to serve as a lure, while the second and third are separated and covered in skin. The esca is a bare, stripped illicium with a cluster of feather-like appendages on top (Fig. 1). The second dorsal spine is equivalent to or larger than the 'illicium' or 'esca'. Skin featuring a few membrane flaps and spinulose. The pectoral fins lobe is an extended, leg-like structure (Fig. 1). *A. indicus* is distinguished from the other species of the genus *Antennarius* by the presence of a large esca made up of a cluster of leaf-like appendages, ten pectoral fin rays, and a circular black mark at the base of the second dorsal fin^{14,30}.

Colour: In live specimen, the body is yellowish-brown and fins with dark brown rows of spots. Esca has two or three dark ocelli and is yellow to yellowish-brown in color. There is a dark green border around the illicium^{6,10}.

The operational depth of the winter migratory bagnet at the lower stretch of the Hooghly-Matlah estuary fluctuates from 12 – 17 m. The Indian frogfish is reported to be a reef-associated species and is usually not found in water depths less than 25 m^(ref. 10). The species is also recorded in the Chilika Lagoon with less water depth (1.5 – 2.5 m). The presence of frogfish in the lower depths of estuarine system confirms the extension of its distributional ranges, which may be due to the habitat alteration, or other climatic and environmental factors. Previous records of frogfish from the Indian waters are provided in Figure 2. According to the local fishers, occurrence of frogfish in the bagnet is an accidental catch, as there is no significant interest of fishers in such non-commercial fish species. However, mass harvest of frogfishes in open seas through bottom trawl nets is reported to be utilized in the fishmeal industry along with other small fishes. This report is based on a single frogfish specimen from the estuarine system under study. It is necessary to do more research to see whether there is an established population in the surrounding areas. The current finding demonstrates that Indian frogfish are found in India's Hooghly-Matlah estuary system.

The location at which the current specimen of frogfish was collected is located near the Jahazkhali area (21°16'50" N, 88°14'30" E), about 43 km from the shoreline (Fraserganj). The bagnet operating site's water quality data analysis showed that an estuary condition with an average salinity of 26.8 ppt, a sp. conductivity of 41.9 mS/cm, and a total hardness of

4404 mg/l predominated at the collecting site (Table 2). Comparing this lower estuary area to others, the water was rather transparent (transparency 75.67 cm; turbidity 7.78 NTU). At the location, appropriate pH (8.15), total alkalinity (104 mg/l), and sufficient dissolved oxygen (7.3 mg/l) were measured.

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Fig. 2 — Map showing the occurrence records of frogfish from the Indian coastal waters (Current record in Green)

Table 2 — Water quality parameters recorded at the site of specimen collection

Water parameter	Average value
Temperature (°C)	20.6
Depth (m)	12
Transparency (cm)	75.67
Turbidity (NTU)	7.78
Sp. conductivity (mS/cm)	41.9
pH	8.15
Dissolved oxygen (mg/l)	7.3
Total alkalinity (mg/l)	104
Total hardness (mg/l)	4404
Salinity (ppt)	26.8

composition and provided us with the specimen in fresh condition.

Conflict of interest

The authors declare no conflicts of interest.

Ethical Statement

The study was conducted as per the guidelines of the ICAR-CIFRI ethical committee.

Author Contributions

DB: Specimen collections, identification, and manuscript writing; RKM: Sampling and analysis of the water parameters, and revision of the manuscript; AR: Sampling, taxonomic data collection and specimen photographing; SMN: Taxonomic analysis; CJ: Map preparation and manuscript writing; SS: Outlining of the manuscript; and BKD: Outlining of the manuscript, critical revision, etc.

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