

## NEW RECORDS OF FOUR REEF-ASSOCIATED FISHES FROM EAST COAST OF INDIA

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**Abstract.** First records of: viper moray, *Enchelynassa canina* (Quoy et Gaimard, 1824); vermiculated blenny, *Entomacrodus vermiculatus* (Valenciennes, 1836); cardinalfish, *Apogon fleurieu* (Lacepède, 1802); and orange-lined cardinalfish, *Archamia fucata* (Cantor, 1849) in the waters along the east coast of India are herewith documented. This record increases the knowledge on the richness of the Indian marine reef-associated fauna and may suggest a range extension of the geographical distribution of the mentioned species from the western Indian waters to east coast of India.

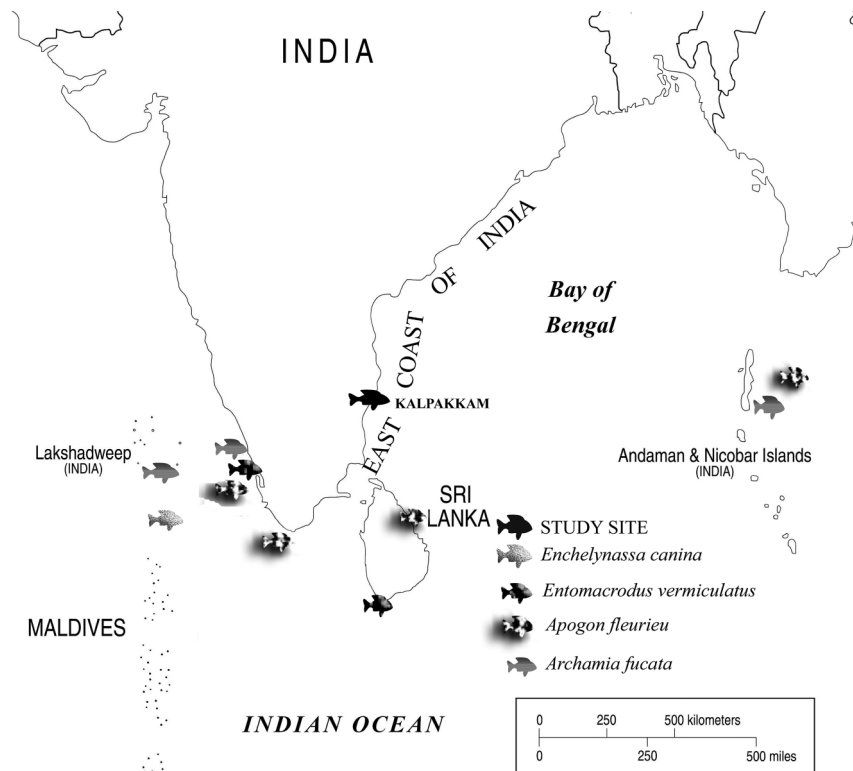
**Keywords:** east coast of India, Kalpakkam, reef-dwelling, viper moray, vermiculated blenny, cardinalfish, orangelined cardinalfish

The east coast of India is a vast low lying stretch of land ranging from deltas of Gangetic plain in north to Kanyakumari in the south. The coastline shares the waters of Bay of Bengal in the north and Gulf of Mannar at its southern quarter. It is nearly 3200 km long comprising of the maritime states of West Bengal, Orissa, Andhra Pradesh, and Tamil Nadu. The coast receives many large rivers including the Ganges-Brahmaputra, Mahanadi, Godavari, Krishna, and Cauveri, all forming fertile, heavily populated deltas. While fluvial, alluvial, and lacustrine deposits forming large deltas are common in the northern part of the east coast, the coral reefs dominate the southern part. The fauna of the east coast of India generally does not differ from that of the Bay of Bengal. On the other hand, comparatively smaller southern part which occupies the coast of the Gulf of Mannar shares a different kind of biodiversity, rich with coral reefs and reef-associated fishes. The Gulf of Mannar in the southeast coast of India features a chain of 21 islands fringed with coral reefs, housing a variety of reef-dwelling fishes. This coral-reef rich environment also extends a little towards north with predominance of the ichthyofauna typical for the Bay of Bengal. Though few works have been done on reef-associated fishes along the East coast of India, some of the general works on fish diversity (Talwar et al. 1992, Kapoor

et al. 2002, Barman et al. 2004, Barman et al. 2007, Barman et al. 2011) reported nearly 1114 species from the east coast.

Kalpakkam is one of the important and sensitive areas along the east coast of India, and it houses a nuclear power plant (Madras Atomic Power Station, MAPS) very close to the coastal belt. The Environment and Safety Division, Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, Tamil Nadu has been monitoring the fish diversity along this coast within a stretch of 30 km (Fig. 1) since 2007. During the above-mentioned study, we have discovered more than 316 species from this region with many new findings, including four species described in this paper and constituting new records and range extensions for the east coast of India. The specimens of these four species were collected from travelling water screen of MAPS pump-house (12°33'N, 80°11'E) within July 2008. The fishes collected were brought to the laboratory and washed. Morphometric and meristic characters were noted for identification. The fish individuals were photographed and finally preserved in 10% formalin. Specimens are deposited at the Environmental and Safety Division Collection House, IGCAR, Kalpakkam, Tamil Nadu, India with appropriate catalogue number which will be available for further studies on request.

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**Fig. 1.** Map showing east coast of India, collection localities, and previous records of the four fish species (*Enchelynassa canina*, *Entomacrodus vermiculatus*, *Apogon fleurieu*, *Archamia fucata*) around the Indian subcontinent

Literature on Indian marine fishes, such as Day (1875–78), Munro (1982), and Talwar and Kacker (1984), was used for identifying the fishes. A short account of the four new records is presented below.

Family: MURAENIDAE

*Enchelynassa canina* (Quoy et Gaimard, 1824) (Fig. 2)

Common name: viper moray

*Muraena canina* Quoy et Gaimard, 1824 (Waigiou, Rawak Island, Bismarck Archipelago).

*Enchelynassa canina* Jones et Kumaran, 1968 (see Jones and Kumaran 1968, p. 321; Minicoy; Central Marine Fisheries Research Institute catalogue No. CMFRI-LA-F38/511).

Material examined: 1 specimen, 750 mm TL, Kalpakkam, East Coast of India, Catalogue No. IGCAR/EnSD/2008/015.

**Diagnosis:** Body elongate, robust; tail shorter than head and trunk combined; mouth wide with arched jaws, teeth exposed when mouth closed; posterior nostrils large, oval, surrounded by fleshy rim, placed in front of eyes; each anterior nostril in form of tube, bearing bilobed fleshy flap; teeth sharp, fang-like, in two series on jaws, vomer with two small conical teeth on roof of mouth; dorsal fin originating before gill openings. Body colour nearly uniform darkish brown, dorsal and anal fins lighter posteriorly.

**Distribution:** Found in areas with strong surge such as outer reef flats and reef fronts of tropical waters of Indo-Pacific, from Reunion and Mauritius, stretching as

far east as Panama west coasts, as far north as Hawaiian Islands, and as far south as Tonga and Mangareva islands (Froese and Pauly 2012).

**Remarks:** Records of the species in the Indian Ocean were mostly from the coral islands of the western and central part. In the Indian region, the only report of the species was from Minicoy Island in Laccadive archipelago (Jones and Kumaran 1968). The present report is the first record of the species from the Bay of Bengal, as well as from the coast of Indian subcontinent.

Family: BLENNIIDAE

*Entomacrodus vermiculatus* (Valenciennes, 1836) (Fig. 3)

Common name: vermiculated blenny

*Salarias vermiculatus* Valenciennes, 1836 (Seychelles; Museum National D'Histoire Naturelle, Paris: lectotype: catalogue No. MNHN A-1809).

*Entomacrodus vermiculatus* Springer, 1967 (see Springer 1967, p. 321; Malacca Straits, Pulo Jarak; United States National Museum catalogue No. USNM 199425).

Material examined: 7 specimens, 100–107 mm TL, Kalpakkam, East Coast of India, Catalogue No. IGCAR/EnSD/2008/186-192.

**Diagnosis:** Body robust and elongate; crest on head in form of low ridge; supra-orbital cirrus approximating size of eye diameter, pointed and with 4 to 12 filaments on either side; nasal cirrus with 4 to 10 simple filaments; single, pointed nuchal cirrus present on either side; upper lip strongly crenulate for entire length; few conical teeth

present on vomer; depth of body 5.0 to 5.3 times in standard length. Dorsal fin with 13 spines and 15 or 16 rays; anal fin with 2 spine and 18 rays; pelvic fin with one spine and 4 rays; middle 9 rays of caudal fin branched; head covered with small white spots; body covered with white vermiculations; fins also mottled.

**Distribution:** Mostly found between rock pools in intertidal zones of tropical Indian Ocean ranging from Christmas Island in the east to Seychelles and Maldives in the west (Froese and Pauly 2012).

**Remarks:** *Entomacrodus vermiculatus* has been recorded from Sri Lanka (Anonymous 2011) and Laccadive Islands (Jones and Kumaran 1980). Two specimens of this species from Kovalam, Kerala were deposited by Randall and Smith Vaniz in the National Museum of Natural History, Paris (MNHN 1981–1184). Moreover, *Salarias reticulatus*, recorded from the Chalakudy River, Kerala, by Kurup et al. (2005), is considered to be a junior synonym of *E. vermiculatus* (see Eschmeyer 2011). The present authors, after careful analysing of the original report also believe that *E. vermiculatus* is present along the western coast of India. The present report from

Kalpakkam coast of Bay of Bengal constitutes the first record of the species from the East coast of India.

Family: APOGONIDAE

*Apogon fleurieu* (Lacepède, 1802) (Fig. 4)

Common name: cardinal fish

*Ostorhinchus fleurieu* Lacepède, 1802 (Pacific; Bernice P. Bishop Museum, Honolulu: neotype: catalogue No. BPBM 15921 was designated by Gon 1987).

*Apogon fleurieu* Gon et Randall, 2003 (see Gon and Randall 2003a, p. 14; Red Sea; J.L.B. Smith Institute of Ichthyology, Grahamstown: catalogue No. RUSI 3170).

Material examined: 2 specimens, 68–72 mm TL, Kalpakkam, East Coast of India, Catalogue No. IGCAR/EnSD/2008/081-082.

**Diagnosis:** Body elongate, compressed; depth 2.4 to 2.8 in standard length; preopercular ridge smooth, posterior and ventral margin mostly serrate. First dorsal fin with 7 spines; second dorsal fin with one spine and 9 rays; anal fin with 2 spines and 8 rays; pectoral fin contains 13 to 15 rays. Lateral line comprising 24 pored scales; median predorsal scales 5. Gill rakers on first arch: 19–22.



Fig. 2. Viper moray, *Enchelynassa canina*, from the east coast of India



Fig. 3. Vermiculated blenny, *Entomacrodus vermiculatus*, from the east coast of India



Caudal fin forked. Body coppery with iridescence in life, with large black mid-lateral spot on posterior caudal peduncle expanding to broad blackish bar in adults that does not distinctly broaden dorsally and ventrally; broad blackish band from snout tip to eye, bordered (in live specimens) by blue line above and below; narrow brown streak present on maxilla; each lateral line scale with small blackish spot fainting posteriorly; anal fin base with line of dark brown dashes.

**Distribution:** Common in shallow coastal reefs with moderate currents, also in tidal channels of estuaries of Indo-West Pacific region from Persian Gulf and Red Sea to Gulf of Oman and scattered localities in East Africa, Seychelles, India, Sri Lanka, the Indo-Malayan region, and Hong Kong (Froese and Pauly 2012).

**Remarks:** *Apogon fleurieu* is recorded predominantly from eastern and western parts of the Indian Ocean. Very few reports are from central part of Indian Ocean. From this region, *Apogon fleurieu* has been recorded from Wadge Bank, south-west of Kanyakumari; Kovalam, Kerala, Trincomalee, east coast of Sri Lanka and Andaman Sea (Randall et al. 1990). Gon (1987) reinstated the validity of this species which had been regarded as nomen dubium for a long time, but incorrectly placed

*A. aureus* (Lacepède, 1802) in its synonymy. Randall et al. (1990) showed that *A. aureus* is a valid species, very similar to *A. fleurieu*. It differs from *A. fleurieu* in having a total of 22–27 gill-rakers, and the dorsal- and ventral ends of the dark caudal peduncle bar are wider than the middle one, thus giving it the shape of an hourglass (Gon and Randall 2003a). It may be possible that due to similarity, the report of *A. aureus* from Madras by Day (1875–78) is referable to this species (Randall et al. 1990). Pending further study on this aspect, the current report serves as the first report of this species from the East coast of India.

Family: APOGONIDAE

*Archamia fucata* (Cantor, 1849) (Fig. 5)

Common Name: Orangelined cardinalfish

*Apogon fucatus* Cantor, 1849 (Sea of Pinang, Malaysia; Natural History Museum, London: holotype: catalogue No. BMNH 1860.3.19.353).

*Archamia fucata* Gon et Randall, 2003 (see Gon and Randall 2003a, p. 28; Egypt, Gulf of Aqaba, Nuweiba; Tel-Aviv University, Ramat-Aviv catalogue No. TAU P.8690).

Material examined: 5 specimens, 83–86 mm TL, Kalpakkam, East Coast of India, catalogue No. IGCAR/EnSD/2008/088-092.



Fig. 4. Cardinalfish, *Apogon fleurieu*, from the east coast of India



Fig. 5. Orangelined cardinalfish, *Archamia fucata*, from the east coast of India

**Diagnosis:** A small fish with 4–8 gill rakers on upper arm and 14–18 on lower arm, total 19–25; presence of 2 dorsal fins; first dorsal fin with 6 spines and second dorsal fin with 1 spine and 9 rays; anal fin with 2 spine and 15 to 18 rays; pectoral fin containing 13 to 15 rays. Lateral line comprising of 25 scales. Body depth 2.3 to 2.9 in SL; posterior preopercular edge variable, usually with few or no serrate above angle; ventral preopercular edge serrate on posterior two-thirds. Colour in life specimens silvery, sometimes with yellow to orange hue with 20–23 narrow curved orange lines; yellow stripe running from tip of snout to posterior end of eye, bordered in narrow iridescent blue reaching onto eye above and below pupil; dark dots in cheek, sometimes forming broad dark cheek mark; large dark caudal spot often present. Fins pale, but leading edge of first dorsal- and sometimes second dorsal fin pale orange; anal fin sometimes with faint orange basal stripe, tip of first 1–2 rays sometimes white.

**Distribution:** Often found in continental and insular shelves; on coral and rocky reefs with muddy, sandy, and silty bottoms or coral rubble in Indo-Pacific region from Red Sea and east coast of Africa to the Marshall Islands, Samoa, and Tonga in the east; Ryukyu Islands in the north to northern Australia in the south (Froese and Pauly 2012).

**Remarks:** In Indian waters, *Archamia fucata* was recorded from Kerala coast in the Arabian Sea (Sheeja et al. 2011) and from the islands of Laccadive Archipelago (Jones and Kumaran 1980). Moreover, Gon and Randall (2003b) has recorded the same species from Sri Lankan coast and Rao et al. (2000) from the Andaman and Nicobar Islands, presumably from the Andaman Sea. Hence, the present report can be validated as the first of its kind from East coast of India.

During the ongoing fish diversity study along Kalpakkam coast, we recorded more than 150 reef-associated fishes (including the above-mentioned four species) from this small stretch. The above-mentioned project also includes three new records from Indian coast viz., *Brachysomophis cirrocheilos* (Bleeker, 1857) (see Biswas et al. 2011a), *Torquigener brevipinnis* (Regan, 1903) (see Biswas et al. 2011b), and *Heteroconger tomberua* Castle et Randall, 1999 (see Biswas et al. 2012). As there is no report of any exposed coral reef area near to Kalpakkam coast, very little has been done about the reef-associated fishes of this region. In this scenario the discovery of these reef-inhabiting fishes always needs an explanation. Reef fishes of India are mostly restricted to Andaman and Nicobar Islands, Laccadive Islands (Minicoy), Gulf of Mannar and some patches of coral reefs in the West Coast of Indian mainland. In eastern coast, due to the presence of large alluvial deltas, the reef activities are not so prominent. The current study area, though, situated in the southern part of the east coast is mere 400 km north to Gulf of Mannar. Tupper et al. (2011) reports the presence of a long stretch of coral reefs along the Pondicherry coast (~ 80 km south to Kalpakkam coast). Moreover, ~ 7 km north to the collection site, many rocky patches are pres-

ent along the Mahabalipuram coast which provides a conducive environment for these fishes. In addition, interaction with the local fishermen reveals the presence of small sporadic submerged coral patches along the Kalpakkam coast. The above finding, to some extent, explains the occurrence of these reef fishes in this region. Further intensive studies on the coastal shelf along east coast of India, more precisely corals and their associated fauna, can shed light on this aspect.

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