

NEW RECORDS OF RARE MARINE FISHES FROM THE GULF OF MANNAR, INDIA

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Abstract. The Gulf of Mannar is a haven for rare species, which along with their pristine reef habitats are under constant threat from natural phenomena and anthropogenic activities. Therefore, the presently reported study aimed at documenting and inventorying rare benthic epi-faunal taxa from the region. We undertook 23 bottom trawl hauls at depths between 14 and 153 m in the Gulf of Mannar. Additionally, we collected rare fishes from the Tuticorin fisheries jetty. Our findings revealed that *Parapterois heterura* (Bleeker, 1856) is a new record for the Indian waters. Additionally, four species namely *Ebosia falcata* Eschmeyer et Rama-Rao, 1977, *Pseudanthias marcia* Randall et Hoover, 1993, *Apogon queketti* Gilchrist, 1903, and *Roa jayakari* (Norman, 1939) are new records for the east coast of India outside their known geographical range, whereas five other teleosts (*Ostichthys acanthorhinus* Randall, Shimizu et Yamakawa, 1982, *Apogon semiornatus* Peters, 1876, *Histiophorus typus* Temminck et Schlegel, 1844, *Macropharyngodon ornatus* Randall, 1978, and *Scolopsis xenochroa* Günther, 1872) are new records for the east coast of India. The present paper supplements the existing knowledge of benthic invertebrate taxa from this region, which is mandatory to understand the role of these species in ecosystem functioning.

Keywords: reef fishes, bottom trawl, taxonomy, morphometry, meristic counts

The Gulf of Mannar (10 500 km²) situated between India and Sri Lanka comprises 21 small islands surrounded by fringing coral reefs (Venkataraman et al. 2004). This region is known to be one of the richly endowed in terms of finfish diversity i.e., 538 species (Venkataraman and Wafar 2005). Recent developmental activities including large scale fishing and shipping activities as well as the proposed 83.2 km long Sethusamudram Shipping Canal Project (Kathal 2005) are potential threats to the pristine marine habitats in the region. However, published literature pertaining to rare marine fishes from the region is scanty (Dorairaj 1998, Venkataramani et al. 2005, Varghese et al. 2011) largely due to inadequate taxonomic expertise. In view of the above, documentation and inventorying of the demersal fauna of the region with particular emphasis on rare species was envisaged. The presently reported study reveals ten new records of teleosts collected from bottom trawl catches operated in the Gulf of Mannar.

The presently reported study area encompasses the trawling grounds in the southern Gulf of Mannar, located off south-eastern coast of India (Fig. 1) down to 150 m depth. During the reported study period (July 2012 to March 2013), 23 trawling operations with a total effort of 35 h were undertaken in the study area to assess the diversity and total community structure of demersal fish fauna. Rare specimens

encountered in the trawl hauls were picked out and temporarily stored in ice. At the laboratory, a detailed morphological study of the biological specimens was carried out using identification keys provided in FishBase (Froese and Pauly 2013) and other taxonomic literature (Allen 1999, Heemstra and Randall 1999, Poss 1999, Heemstra 2001, Pyle 2001, Russell 2001, Westneat 2001). Classification of higher taxa followed Nelson (2006), that of fish families followed van der Laan et al. (2013), and that of genera and species followed Eschmeyer (2013). Reference voucher samples are deposited at the Marine Biology Laboratory, Department of Marine Sciences, Goa University (GUMSMB).

Abbreviations used in the text are as follows. A = anal fin; D = dorsal fin; D₁ = first dorsal fin; D₂ = second dorsal fin; GR = gill rakers; HL = head length; LL = lateral line scale number; P = pectoral fin; SL = standard length; SnL = snout length; V = pelvic fin.

HOLOCENTRIDAE Bonaparte, 1833

Ostichthys Cuvier in Cuvier et Valenciennes, 1829

Ostichthys acanthorhinus Randall, Shimizu et Yamakawa, 1982

Material examined: 3 unsexed specimens, 94.5–95.8 mm SL, Gulf of Mannar, 103 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-6/01.

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Diagnosis: D XII, 13; A IV, 11; P 17; V I 7; GR 25–26; LL 28–29. Body covered with large ctenoid scales; body depth: 2.08–2.11 in SL; head large, 2.04–2.13 in SL, snout short, 6.19–6.44 in HL; prominent spine at anterior end of each nasal bone; orbit large, its diameter 7.44–7.85 in SL; preopercular edge serrate, with short, stout spine at corner; rear edge of opercle serrate, with prominent spine on dorso-posterior edge; 3½ scale rows between lateral line and middle of spinous dorsal fin; caudal peduncle slender, caudal fin forked. Body colouration bright red, with golden sheen on sides, fins translucent red (Fig. 2A).

Geographical distribution: Gulf of Oman, Kerala (west coast of India), and Indonesia (Randall et al. 1982).

Remarks: *Ostichthys acanthorhinus* unmistakably differs from its congeners in the presence of a prominent spine at anterior end of each nasal bone. This is a deep water species (down to 336 m depth) initially described from specimens off Oman and Kerala (Randall et al. 1982). The present observation reveals that this species is a new record for the east coast of India.

SCORPAENIDAE Risso, 1827

Parapterois Bleeker, 1876

Parapterois heterura (Bleeker, 1856)

Material examined: 2 unsexed specimens, 34.3–61.6 mm SL, Gulf of Mannar, 70 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-25/15.

Diagnosis: D XIII, 9; A III, 8; P 20; V I 5; GR 17. Body elongate, covered with large ctenoid scales (50 in longitudinal series), its depth 3.15–3.21 in SL; head long, 2.57–2.88 (34.69%–39.12%) in SL; snout 3.05–3.17 (11.37%–12.34%) in HL; upper margin of orbit distinctly below level of first dorsal spine base; interorbital space scaleless; top of bulge on snout at level of midline of pupil; tip of tentacle on lacrimal posterior spine extending beyond level of posterior margin of maxilla; dorsal fin with deeply incised membrane between spines, pectoral fin extending posterior to anal fin origin, caudal fin long, its median rays longest. Body coloration reddish with seven bands in head region and nine on body, ventral sur-

face of body whitish, dorsal, anal and caudal fins reddish with alternating light coloured bands, pectoral fins red with greenish blotches (Fig. 2B).

Geographical distribution: Western Indian Ocean and Western Pacific regions (Motomura 2004).

Remarks: *Parapterois heterura* is distinguished from its only congener *Parapterois macrura* (Alcock, 1896) in possessing shorter head and snout, level of upper orbital margin below the base of first dorsal spine, and top of bulge on the snout at level of middle of pupil (Motomura 2004). The percentages of HL and SnL in SL for the specimens examined in this study were concurrent with the prescribed morphometric ratios for *P. heterura* (see Motomura 2004). *Parapterois macrura* is known from the west coast of India (Motomura 2004), Oman and Somalia (Matsunuma et al. 2013). Motomura (2004) recently reviewed the taxonomic status of these two species and opined that *P. heterura* occurred along south-east coast of Africa, Indonesia, and western Pacific regions. Hence, the presently reported observation of this species is a new record for the Indian waters.

Ebosia Jordan et Starks, 1904

Ebosia falcata Eschmeyer et Rama-Rao, 1978

Material examined: 3 unsexed specimens, 89.2–99.8 mm SL, Gulf of Mannar, 106 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-25/14.

Diagnosis: D XIII, 10; A III, 8; P 16–17; V I 5; GR 14. Body elongate, covered with large ctenoid scales; dorsal profile prominently arched above operculum; parietal crest very long; dorsal fin with deeply incised membrane between spines, pectoral fin extending posterior to anal fin origin, caudal fin long, its median rays longest; preopercle with 3 spines; suborbital ridge with more than 10 spinous points. Body coloration reddish with nine black-edged bands including three on head (first two below eye, third posterior to preopercle) and six on body, ventral surface of body whitish, dorsal fin spines reddish with white tips, dorsal rays distally yellow, pectoral fins reddish basally, its lower rays prominently yellow, caudal and anal fins yellow (Fig. 2C).

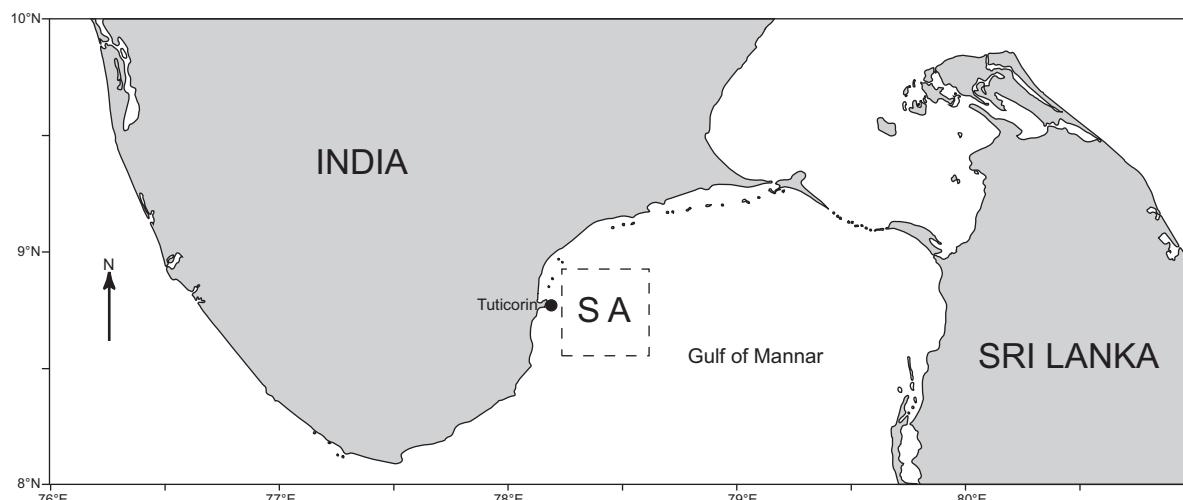


Fig. 1. Map of the study area in the Gulf of Mannar; SA = study area

Geographical distribution: Somalia and western coast of India (Eschmeyer and Rama-Rao 1977).

Remarks: *Ebosia falcata* is distinguished from its only congener—*Ebosia bleekeri* (Döderlein, 1884) in possessing higher number of spines in dorsal fin (VIII in the latter), and a longer parietal crest. Eschmeyer and Rama-Rao (1977) reported this species from the east coast of Africa and west coast of India. However, the present reporting of this species from this locality suggests its range extension to the east coast of India.

SERRANIDAE Swainson, 1839

Pseudanthias Bleeker, 1871

Pseudanthias marcia Randall et Hoover, 1993

Material examined: 1 female specimen (73.3 mm SL), 1 male specimen (76.0 mm SL), trawl by-catch at Tuticorin fisheries harbour, Cat. No. GUMSMB/TTN/TELO-23/04.

Diagnosis: D X 16; A III 7; P 20; V I 5; LL 47; total GR 37–38. Body slender, covered with ctenoid scales, its depth 2.84–3.03 in SL; head 3.33–3.35 in SL, snout short, 5.24–5.40 in HL. Male pinkish with light violet streak extending from below orbit to pectoral fin base, golden yellow patch below soft dorsal fin; two parallel lines extending from dorsal fin, terminating at base of caudal fin; uppermost caudal ray terminating in long filament (Fig. 2D). Female with protuberance on snout, bright red coloration on upper portion of body and posterior caudal fin margin, distinct violet streak extending from snout to pectoral fin base, lower and middle portion of body bright yellow, and lacking of filament on upper caudal fin lobe (Fig. 2E).

Geographical distribution: Oman (Randall and Hoover 1993) and Arabian Sea off south-west coast of India (Nair 2008).

Remarks: *Pseudanthias marcia* differs from its congeners in possessing filamentous caudal fin in males, deep concave caudal fin in females and its unique coloration pattern (Nair 2008, Heemstra and Akhilesh 2012). The pectoral fin ray counts in both the observed specimens were 20 as compared to 18 reported previously by Nair (2008), which could be a geographical variation. This species has been reported from Oman and off the southwest coast of India. Hence, the present observation suggests that this species is a new record for the east coast of India, outside its previously reported geographical range.

APOGONIDAE Günther, 1859

Apogon Lacepède, 1801

Apogon queketti Gilchrist, 1903

Material examined: 3 unsexed specimens, 59.3–64.8 mm SL, Gulf of Mannar, 70 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-6/13.

Diagnosis: D1 VII, D2 I 9; A II 8; P 15; V I 5; LS 26–27; total GR 14–15 (2+11 developed). Body small covered with ctenoid scales, its depth 2.80–2.91 in SL; head 2.38–2.44 in SL, snout short, 5.49–6.08 in HL. Preopercle edge smooth; palatine teeth present, caudal fin rounded; body silvery with four or five rows of scales with brownish spots, large dark ocellus on first dorsal fin, distal edges of anal and caudal fins black (Fig. 2F).

Geographical distribution: Red Sea and southern Africa to Persian Gulf and Arabian Sea off India (Gon and Randall 2003). This species is known to have migrated from the Red Sea to the Mediterranean Sea through the Suez Canal (Eryilmaz and Dalyan 2006).

Remarks: *Apogon queketti* along with *Apogon carinatus* Cuvier, 1828 and *Apogon poecilopterus* Cuvier, 1828 was grouped together within the *carinatus*-group of the subgenus *Jaydia* by Gon (1996) on the basis of shared characters such as smooth preopercular and post-temporal ridges, series of spots on the body and absence of dark spots on the peritoneum. *Apogon queketti* differs from the latter two species in having large dark ocellus on posterior part of first dorsal fin, conspicuous parallel rows of dark brown spots on scales forming longitudinal rows on the sides and anal and caudal fins with dark distal edges. On the other hand, *A. carinatus* has a dark ocellus on second dorsal fin and dark spots on sides are not arranged in rows, whereas *A. poecilopterus* lacks ocellus on dorsal fin and dark spots on sides (instead, it bears large indistinct black blotches on sides). The Zoological Museum Hamburg contains specimens of this species those were collected off Kerala (ZMH 5035) and Gulf of Kutch (ZMH 5036)*. This suggests that the species observed during the present study is a new record for the east coast of India.

Apogon semiornatus Peters, 1876

Material Examined: 1 unsexed specimen: 41.0 mm SL, Gulf of Mannar, 17 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-1/02. The photograph provided (Fig. 2G) is of formalin-preserved specimen.

Diagnosis: D1 VI, D2 I 9; A II 8; P 12; V I 5; LL 24; total GR 3+12 (1+6 developed). Body slender, covered with ctenoid scales, its depth 3.20 in SL; head large, 2.55 in SL, snout short, 4.35 in HL. Body coloration (in life) translucent red, sides marked with two black stripes, first one extending from posterior border of orbit to base of pectoral fin, second one inconspicuous, extending from below soft dorsal fin to posterior caudal fin margin.

Geographical distribution: Red Sea southern Africa to Japan and Australia (Gon and Randall 2003).

Remarks: *Apogon semiornatus* is similar in colour pattern only to *Apogon lativittatus* Randall, 2001. However, it differs from the latter in having only 12 pectoral fin rays as compared to 13 in the latter (Randall 2001). This species has been reported previously from Castle Bay, Nicobar Islands (Froese and Pauly 2013). Hence, the presently reported observation of this species is a new record for the east coast of India.

NEMIPTERIDAE Regan, 1913

Scolopsis Cuvier, 1814

Scolopsis xenochroa Günther, 1872

Material examined: 1 unsexed specimen: 110.8 mm SL, trawl by-catch at Tuticorin fisheries harbour, Cat. No. GUMSMB/TTN/TELO-21/02.

Diagnosis: D X 9; A III 7; P 17; V I 5; LL 44; total GR 9. Body moderately deep, covered with ctenoid scales, its

depth 3.21 in SL, head large, 2.92 in SL, with short snout, 3.58 in HL. Scales on top of head not reaching to level of posterior nostril; small antorse spine present below eye; maxillary smooth along its external edge. Details of body coloration conforming to those provided by Froese and Pauly (2013) as “Upper body greyish brown, silvery white below, pearly streak from behind eye along dorsal fin base, an oblique brown-edged pearly blue bar above pectoral base, an elongate white blotch below lateral line on posterior half of body with yellowish tinge above it, snout dusky and black blotch on opercle” (Fig. 2H).

Geographical distribution: Maldives, Sri Lanka to north-eastern Australia, New Guinea, and Solomon Islands (Russell 1990).

Remarks: *Scolopsis xenochroa* has easily distinguishable coloration. Among the 13 species of genus *Scolopsis* known from Indian waters (Barman and Mishra 2009, Mishra et al. 2013), *S. xenochroa* is the most similar to *Scolopsis ciliata* (Lacepède, 1802) in possessing a small antorse spine below eye. It differs from three congeners namely *Scolopsis bilineata* (Bloch, 1793), *Scolopsis igcaren-sis* Mishra, Biswas, Russell, Satpathy et Selvanayagam, 2013, and *Scolopsis vosmeri* (Bloch, 1792) in the lesser forward extent of the scaly area on top of head (up to the anterior nostril in the latter three species). Additionally it differs from the

remaining eight species—*Scolopsis aurata* Park, 1797, *Scolopsis bimaculata* Rüppell, 1828, *Scolopsis frenata* (Cuvier, 1830), *Scolopsis ghanam* (Forsskål, 1775), *Scolopsis lineata* Quoy et Gaimard, 1824, *Scolopsis margari-tifera* (Cuvier, 1830), *Scolopsis taeniata* (Cuvier, 1830), and *Scolopsis taenioptera* (Cuvier, 1830)—in having a small antorse spine below the eye. A specimen of *S. xenochroa* previously collected from the Andamans is placed in the CMFRI collection (Ref. No. CMFRI-F.105/316) (Murty 1969). It was reported from Sri Lankan coast of Gulf of Mannar (Öhman et al. 1997). Hence, the presently reported observation of this species is a new record from the east coast of India.

CHAETODONTIDAE Rafinesque, 1815

Roa Jordan, 1923

Roa jayakari (Norman, 1939)

Material examined: 1 unsexed specimen: 81.4 mm SL, Gulf of Mannar, 106 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-7/01.

Diagnosis: D XI 21; A III 18; P 14; V I 5; LL 46; total GR 13. Body very deep, covered with large ctenoid scales, its depth 1.43 in SL, head large, 2.11 in SL, snout short, 3.47 in HL. Body coloration comprising three light brown bars with golden tinge, first band slender and extending from anterior tip of dorsal fin, along orbit; second band broadest

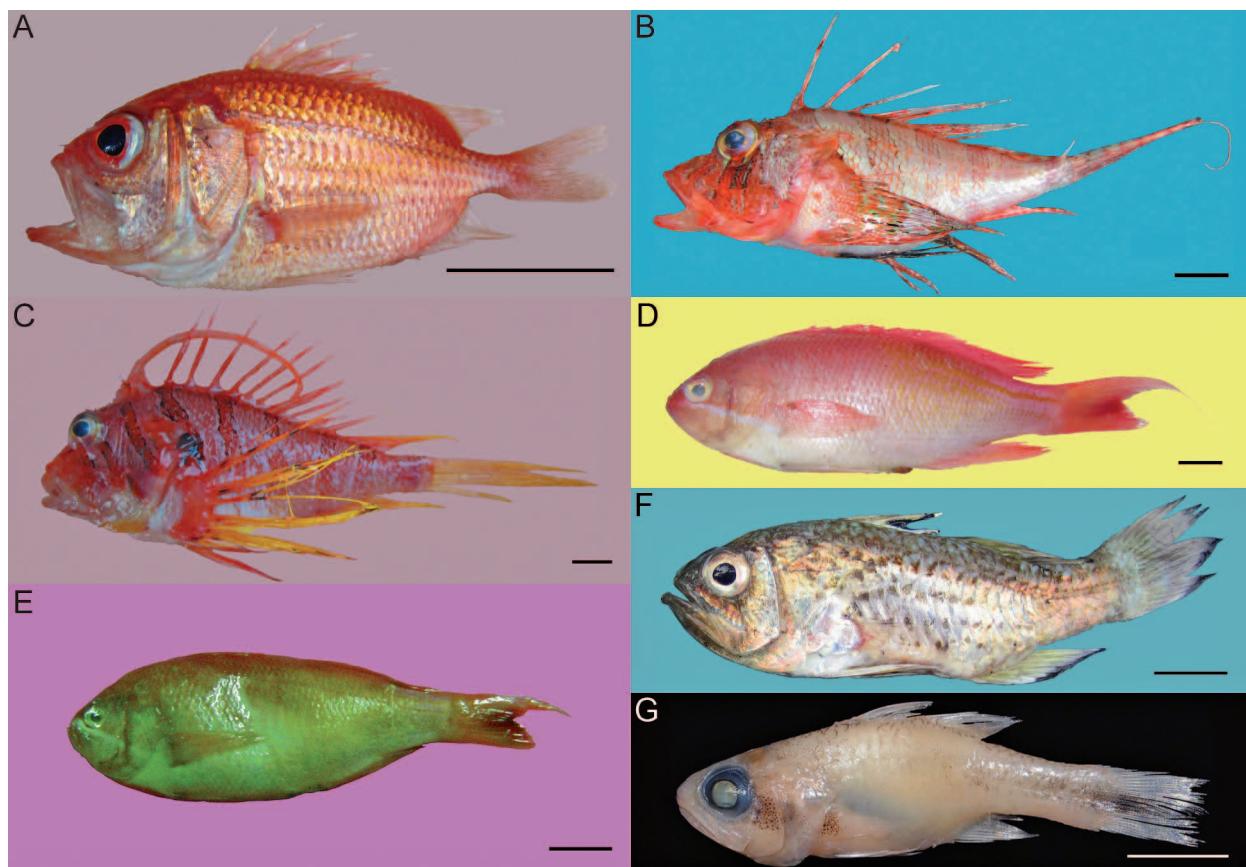


Fig. 2 A–G. Selected rare marine fishes from the Gulf of Mannar, India: *Ostichthys acanthorhinus* (A); *Parapterois heterura* (B); *Ebosia falcata* (C); *Pseudanthias marcia* male (D); *Pseudanthias marcia* female (E); *Apogon queketti* (F); *Apogon semiornatus* (G); Scale bars: 50 mm (A), 10 mm (B through G)

* Zoologisches Museum Hamburg – Collection Database. University of Hamburg – Biocenter Grindel and Zoological Museum – Section Ichthyology http://webapp5.rz.uni-hamburg.de/fishcollection/frm_suche.php.

and extending from 4th–5th dorsal fin spines down to belly; third band extending from 7th–11th dorsal fin spines and anterior dorsal rays down to soft anal fin; a conspicuous round black ocellus present on middle of soft dorsal fin; soft portion of pelvic fin black (Fig. 2I). **Geographical distribution:** Red Sea, Gulf of Aden, Gulf of Oman, southern Arabian coast, and west coast of India (Burgess 1978).

Remarks: *Roa jayakari* differs from its only two congeners—*Roa australis* Kuiter, 2004 and *Roa excelsa* (Jordan, 1921)—in the shape of the black ocellus on the dorsal fin (elongated in the latter two species) (Kuiter 2004). Additionally, *R. jayakari* shares the character “white-edged round black ocellus on the soft portion on the dorsal fin” with *Roa modesta* Temminck et Schlegel, 1844 and differs from it in having straight profile of the spinous portion of dorsal fin and the lack of black-edged bars (Kuiter 2004). However, FishBase (Froese and Pauly 2013) reassigned the latter species to the genus *Chaetodon* due to moderately long 3rd–5th dorsal fin spines. *Roa jayakari* has been reported previously off the south-west coast of India (George and Dayanandan 1966). In view of the above, this species is a new record for the east coast of India, suggesting its range extension.

PENTACEROTIDAE Bleeker, 1859

Histiopterus Temminck et Schlegel, 1844

Histiopterus typus Temminck et Schlegel, 1844

Material examined: 1 unsexed specimen: 78.8 mm SL, Gulf of Mannar, 106 m depth, demersal trawl, Cat. No. GUMSMB/TTN/TELO-7/04.

Diagnosis: D IV 25; A III 8; P 17; V I 5; LL 58; total GR 21. Body short very deep, covered with minute ctenoid scales, its depth 1.63 in SL, head large, 2.15 in SL, with large snout, 2.27 in HL. Vomer toothless; profile of dorsal fin slightly rounded, third dorsal spine longer than fourth one and more robust (this character could not be confirmed due to broken tip of third spine). Body coloration light greyish, with darker blotches on body and fins (Fig. 2J).

Geographical distribution: Red Sea and southern Africa to Australia and Japan (Froese and Pauly 2013).

Remarks: *Histiopterus typus* is the only representative species of the genus *Histiopterus*. It is similar only to *Eviotias acutirostris* (Temminck et Schlegel, 1844) in possessing fewest number (four each) of dorsal fin spines among all pentacerotids (Hardy 1983). However, it differs from the latter species in possessing a more robust third dorsal spine (Hardy 1983). This species was reported by Naomi et al. (2011) from trawl catches off Kerala. However, this is the first report of its occurrence along the east coast of India.

LABRIDAE Cuvier, 1816

Macropharyngodon Bleeker, 1862

Macropharyngodon ornatus Randall, 1978

Material examined: 1 female specimen: 98.2 mm SL,

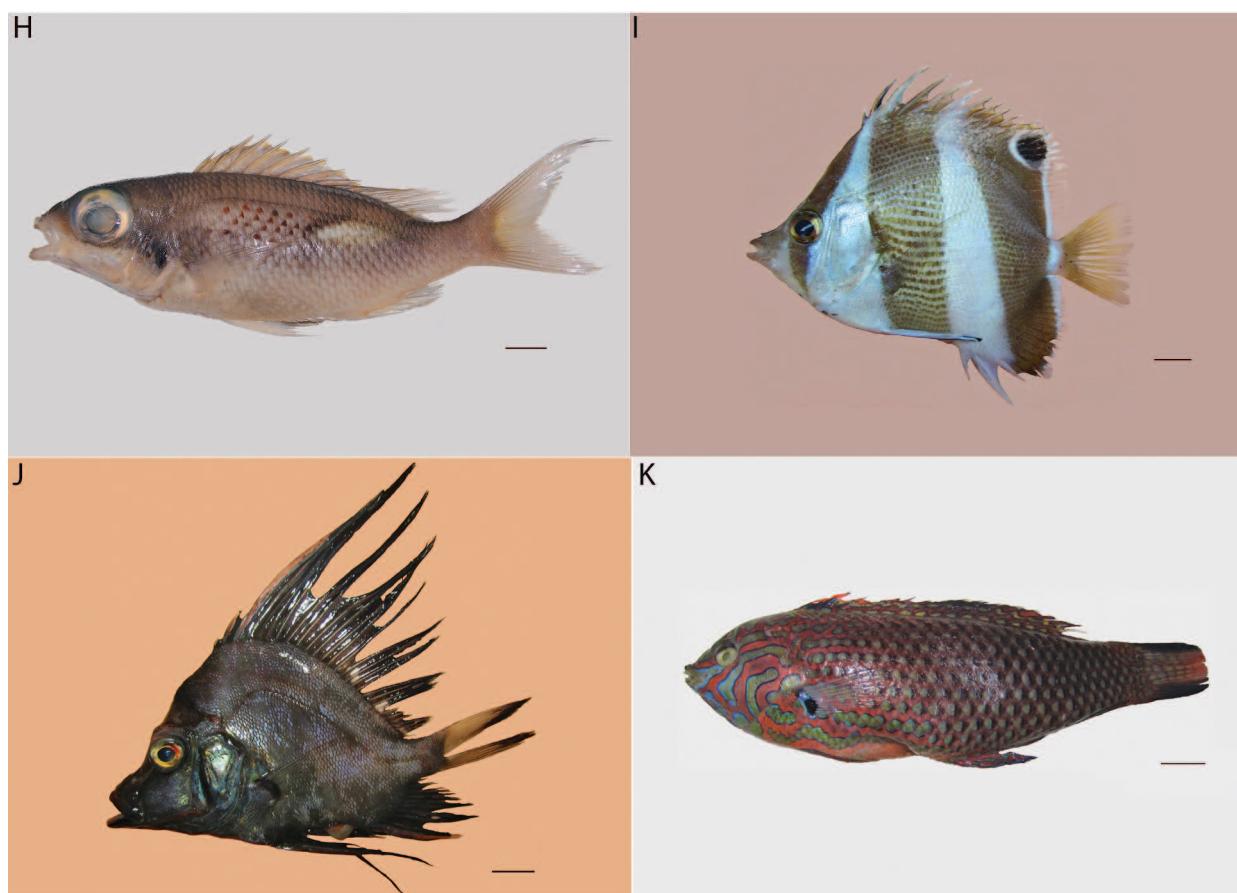


Fig. 2 H–K. Selected rare marine fishes from the Gulf of Mannar, India (continuation): *Scolopsis xenochroa* (**H**); *Roa jayakari* (**I**); *Histiopterus typus* (**J**); *Macropharyngodon ornatus* (**K**); Scale bar: 10 mm

trawl by-catch at Tuticorin fisheries harbour, Cat. No. GUMSMB/TTN/TELO-5/08.

Diagnosis: D IX 11; A III 10; P 12; V I 5; LL (interrupted) 27; total GR 18. Body moderately deep, covered with ctenoid scales, its depth 3.17 in SL, head large, 3.35 in SL, with short snout, 3.45 in HL. Present specimen is female with characteristic reddish coloration in anterior half of body, shading to blackish posteriorly; each scale greenish yellow and edged with light blue and black, bands on head of similar coloration (Fig. 2K).

Geographical distribution: Sri Lanka to Western Australia and New Guinea (Randall 1978).

Remarks: *Macropharyngodon ornatus* is distinguished from its congeners by virtue of its characteristic coloration (Randall 1978). The only other congener known from Indian waters is *Macropharyngodon meleagris* (Valenciennes, 1839) (see Venkataraman et al. 2012), in which the females are whitish to light greenish with irregular black spots. This species was reported previously from Trincomalee on the eastern coast of Sri Lanka (Randall 1978). Moreover, recent paper on reef fishes from the Sri Lankan coast of Gulf of Mannar (Öhman et al. 1997) did not report this species. Therefore, the presently reported observation of this species constitutes a new record for the east coast of India.

This study was undertaken as a part of the Ballast Water Management Programme India to document the epi-faunal fish and invertebrate diversity in the Gulf of Mannar. This exercise revealed 287 taxa of benthic epi-fauna including some of the rarest fishes and invertebrates. The presently reported observation of these species in the Gulf of Mannar underlines the significance of this region as a biodiversity “hotspot”. These findings enhance the current knowledge of fish assemblages in the reef ecosystems of India. Moreover, they suggest that increased mechanized fishing in the vicinity of complex reef habitats has enabled to unravel the occurrence of rare demersal fauna. Secondly, they also indicate towards lack of taxonomic expertise that hampered their identification in the past.

Existing published reports of occurrence of the aforementioned species indicate that, except *Apogon semiornatus* and *Histiopterus typus* (Indo-Western Pacific distribution), the majority of species are either distributed exclusively in the Western Indian Ocean or the Eastern Indian Ocean–Western Pacific bioregions. The occurrence of these species in the Gulf of Mannar associated with their known zoogeographical affinities suggests that the Gulf of Mannar and Palk Bay could be transitional geographical entities separating the two bioregions.

However, despite the importance of the Gulf of Mannar as a biodiversity “hotspot” and the declaration of a Biosphere Reserve, the coral habitats in this region have been extensively mined over the past five decades for construction material (Pillai 1996). Moreover, there is large scale exploitation of commercial fishes, even poaching of rare reef fishes, some of which are included in the IUCN’s list of threatened species (Salin et al. 2005). Moreover, physical and physiological stresses on these

reefs and their fish inhabitants were exacerbated by recent climatic perturbations. The El Niño Southern Oscillation event in 1998 caused up to 89% coral bleaching in this region (Arthur 2000). Subsequently, the tsunami in 2004 caused substantial reduction of live coral cover and sea grass vegetation (Kumarguru et al. 2005). Recent studies on the effects of increasing sea surface temperatures on coral assemblages from Gulf of Mannar have revealed extensive mortality among bleached coral recruits (Patterson Edward et al. 2008), along with predictions of phase shift from coral dominated ecosystem to an algal dominated one (Jeevamani et al. 2013). Further, release of untreated effluents and sedimentation of reefs due to altered land use patterns in the region also pose potential threats to the fragile coral reef and sea grass ecosystems in the region (Mathews and Edward 2006, Edward et al. 2012). In view of the above scenario, it is mandatory to continuously update the documentation of rare species to enable understanding of their role in ecosystem functioning, and advance conservation measures effectively.

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