

First Record of Shorthead Fang Blenny, *Petroscirtes breviceps* (Perciformes: Blenniidae) from the Kavvayi Estuarine Wetland System, South West Coast of India

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ABSTRACT

We report the presence of Shorthead fang blenny, *Petroscirtes breviceps* belongs to the family Blenniidae from the Kavvayi estuarine wetland system, based on one specimen of the species obtained during the survey. The species was identified by traditional taxonomical tools and further confirmed using mitochondrial Cytochrome c oxidase 1 (CO1) gene. This being the first report of this species from a tropical estuarine wetland connected to the Arabian Sea indicate the extended distribution of this species towards the Southwest coast of India.

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1. Introduction

Blenniidae, one of the diverse teleost families that includes 58 genera and 405 species, is considered a neglected group of reef vertebrates and has high invasive potential (Fuad et al., 2021; Cabezas et al., 2022). Although blennies are mostly of marine origin, some members of the family can also be found in freshwater environments, lakes, or estuaries along the tidal- influenced, shallow, inshore waters. The majority of blennies are benthic, living in grass beds, tide pools, or regions close to rocks, shells, and corals. Interesting characteristics of blennies include camouflage and changing colour during courtship. The majority of blennies feed on algae and tiny invertebrates; however, some of them attack the fins, scales, or skin of other fishes. The blenny genus, *Petroscirtes* Rüppell 1830, is characterized by the lower margin of the gill opening not reaching the upper margin of the pectoral fin base (Williams and Fricke, 2001). It is mainly distributed in the western Pacific and Indian Oceans (An et al., 2020). Currently, the genus comprises 11 valid species including *P. ancylodon* Ruppell, 1835; *P. breviceps* (Valenciennes, 1836), *P. fallax* Smith-Vaniz, 1976; *P. lupus* (De Vis, 1885); *P. Marginatus* Smith-Vaniz, 1976; *P. mitratus* Ruppel, 1830; *P. pylei* Smith-Vaniz, 2005; *P. springeri* Smith-Vaniz, 1976; *P. thepassii* Bleeker, 1853; *P. variabilis* Cantor, 1849 and *P. xestus* Jordan and Seale, 1906. We report for the first time, the presence of the shorthead fang blenny, *Petroscirtes breviceps* (Valenciennes, 1836), in the Kavvayi estuary, indicating the extended distribution of this species to the South-west coast of India. In the same way, *Colletteichthys flavipinnis* (Yellow Toadfish) has been reported for the first time in Kavvayi estuarine wetland, signifying a range extension and new occurrence (Gopi et al., 2023). The knowledge on the diversity and community structure of blennies is very limited in most of the tropical countries, including India. The Kavvayi estuarine ecosystem is widely recognized for its abundant biodiversity, harbouring rare species of fish, birds and hydrophytic plants. Regrettably, this ecosystem faces significant threats from human interventions, jeopardizing

its delicate balance (Harikumar, 2016). Understanding the diversity of fish species is essential for the development of management strategies and conservation plans, and also for identifying their geographic distribution, ecological function and status (Fuad et al., 2021). At the same time, the new records of fishes from the Kavvayi estuary may also help to strengthen the efforts to include Kavvayi as a Ramsar site.

2. Materials and Methods

2.1. Study area

Kavvayi is the third largest backwaters in Kerala, after Vembanad and Ashtamudi. It spreads between Kasargod and Kannur (12° 05' to 12° 15' N and 75° 05' to 75° 20' E) districts. Kavvayi wetland system consists of the Kavvayi backwater body and five west-flowing rivers, viz. Nileswar, Kariangode, Kavvayi, Perumba and Ramapuram. Kavvayi wetland system covers a geographical area of 1264.62 square kilometers, including the basin areas of the five rivers that feed the wetland (Harikumar, 2016). The mean annual rainfall of the wetland is about 3112.3 mm, and the south-west monsoon provides 86%, the north-east monsoon contributes 8.7%, and the remaining rainfall of 5.3% occurs during the non-monsoon period. The depth of the wetland ranges from 0.5m to 8.9m. The Kavvayi estuarine wetland ecosystem is vital for the livelihoods of the people living in its vicinity, directly and indirectly. The main sources of income for the coastal communities are fishing, mussel farming, and coir retting. Additionally, the emerging and thriving backwater tourism industry has become an important revenue stream related to the wetland (Shiji et al., 2015).

2.2. Sample collection, preservation, identification and Molecular analysis

The individual specimen discussed in the paper was caught in a stake net, a fixed bag net operated at Oriyara (12°11' 48" N, 75°07' 38" E), the northern part of Kavvayi wetland (Fig.1) and was passed on to the first author. Subsequently, the specimen was identified as *Petroscirtes* using standard

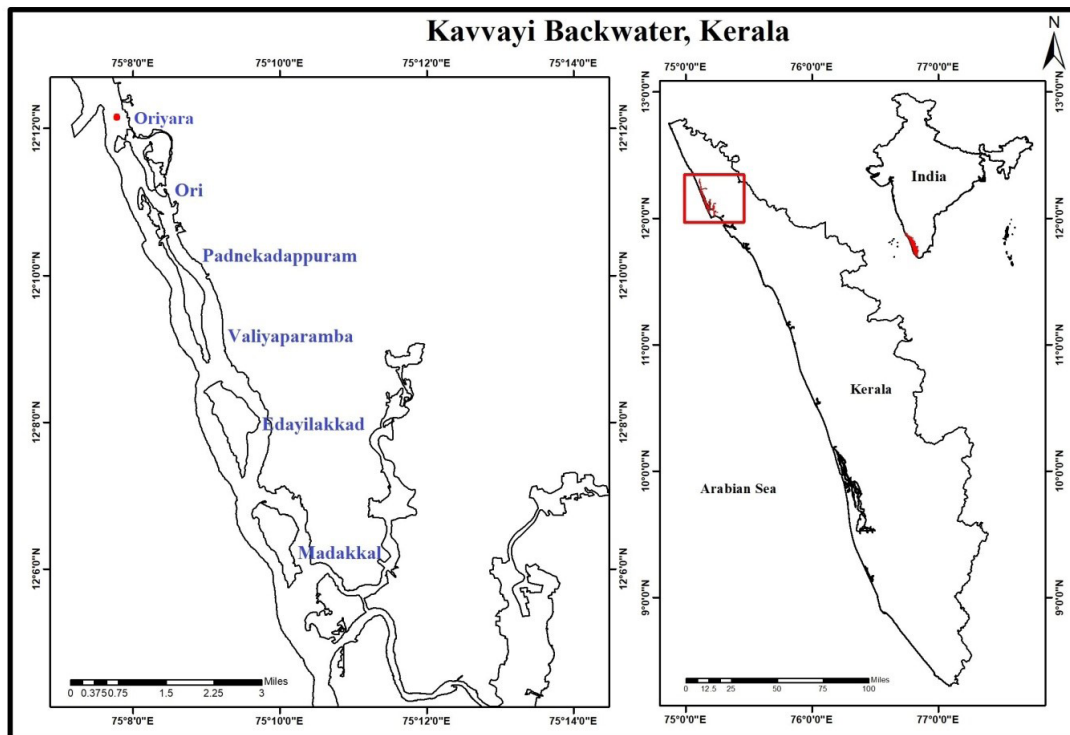


Fig. 1. Map showing the Kavvayi Estuarine Wetland, Kerala, India. Red point indicating the area of operation of stake nets where *Petroscirtes breviceps* collected.

references (FAO, 1983, FishBase, Mohanty et al., 2019). For the preservation of the specimen, 70% ethanol was used. Photographs and morphometric measurements were taken immediately. A digital calliper was used to take the measurements. Small pieces of muscle tissue were dissected out and preserved in 95 % ethanol for DNA barcoding. The specimen was deposited in the museum of KUFOS Regional Centre, Payyanur (Catalogue number KRC-PNR/PB/2023). Total DNA was extracted by using the DNeasy 96 Blood & Tissue Kit (Qiagen). Takara ready to use master mix was used for PCR amplification. The primer COI F 5' TCAACCAACCACAAAGACATTGGCAC 3' and COI R 5' TAGACTTCTGGGTGGCCAAGAATCA 3' was used for amplifying mtCOI gene sequences (Folmer et al., 1994; Ward et al., 2005). The 10 µl reaction mixture is composed of 5 µl master mix (Takara), 2 µl sterile water, 1 µl template DNA, 1 µl Forward primer, and 1 µl Reverse primer. The PCR condition included initial denaturation for 2 minutes at 94 °C, followed by denaturation of 30 seconds at 94°C, annealing at 55 °C for 45 seconds, extension at 72°C for 1 minute, and final extension at 72°C for 5 minutes for 35 cycles. Following amplification the PCR products were visualized on 2% agarose gel electrophoresis. The purified DNA samples were sequenced at OmicsGenLifeSciences Pvt Ltd, Kochi, Kerala, India. After conducting the Basic Local Alignment Search (BLAST) on the sequence, a Maximum Likelihood tree was constructed using MEGA X to assess the genetic distance and estimate the relatedness among the sequences (Kumar et al., 2018). Bootstrap analysis was performed using 1000 pseudo replications and aligned sequences were submitted to National Center for Biotechnology Information (NCBI).

3. Results

3.1. Taxonomic accounts

Class: Actinopterygii

Order: Blenniiformes

Family: Blenniidae

Genus: *Petroscirtes* Rüppell 1830

Species: *Petroscirtes breviceps* (Valenciennes, 1836)

3.2. Diagnosis: *Petroscirtes breviceps* (the striped poison-fang blenny mimic) is diagnosed with the presence of dark, broad stripe from snout through eye to caudal fin (Fig. 2).

3.3. Description

Dorsal XI- 18, Anal II, 18, Pectoral 14, Pelvic I, 3. Segmented caudal fin rays 6+5. Proportional measurements are expressed as the percentage of Standard length. Body width at pectoral fin origin 10; body depth at anal fin origin 18.75; snout length 7.8; orbit diameter 4.7; inter-orbital width 7.8; caudal peduncle depth 9.4; caudal peduncle length 1.6; snout to origin of dorsal fin 20.3; snout to origin of anal fin 53.1; snout to origin of pectoral fin 23.4; snout to origin of pelvic fin 20.3; first dorsal spine 7.8; second dorsal spine 9.3; third dorsal spine 10.1; fourth dorsal spine 10.9; first dorsal soft ray 14.1; first anal spine 3.1; second anal spine 4.6; first anal soft ray 6.25; pectoral fin length 14.1; pelvic fin length 15.6; caudal fin length 22.7.

Body elongated, scaleless, compressed laterally with a short caudal peduncle with a standard length of 64mm. Head short, blunted and no cirri on the head. But a pair of small simple cirrus on the lower jaw. Mouth terminal with comb-like close-set 32 and 40 incisors on the upper and lower jaw respectively. A pair of giant recurved canines



Fig. 2. Freshly collected sample of *Petrosirtes breviceps* from Kavvayyi estuarine wetland system

on the lower jaw, without any groove along the anterior surface (Fig. 3) under the skin both the lateral side of the upper jaw possesses a medium sized canine. Eyes are comparatively large, situated dorsally. Gill opening just above the pectoral fin base. In *P. breviceps*, a dark stripe running along the dorsal surface of the body from the tip of the snout to the base of the caudal fin. In closer view, the stripe looked like broken segments. The dorsal fin appeared as single and there is no notch between the spiny and softer rayed parts. The first dorsal spine is shorter than other spines on the dorsal fin. All the spines are flexible. Anal fin origin immediately after anus. Dorsal fin and anal fin rays segmented and these fins join to the caudal fin by a thin membrane. The posterior tip of the pectoral fin reached up to the eighth dorsal spine. The caudal fin of the rays is segmented, unbranched and elongated, with relatively bigger fins on the upper and lower ends.

3.4. Colour when fresh: Head and body light yellowish. A dark band runs along the lateral side of the body from the tip of the snout and through the eye and it ends up as a dark



Fig. 3. A view of the giant recurved canines on the lower jaw of the *Petrosirtes breviceps*

spot at the caudal base. Small black dots are distributed on the head and body; more on the snout. The dorsal fin more spotted or reticulated than the anal fin and both are almost uniformly dark.

3.5. Colour of the preserved specimen: The body light yellowish with the dark band is not distinct in preserved specimen. The pectoral, pelvic and caudal fins were pale yellow in colour.

3.6. Ecological note: It was collected at a depth of about 4 m and the salinity of the water body was 35 ppt during the collection. The substratum is muddy.

3.7. Molecular characterisation

The developed mtCOI sequences (base pair) of *P. breviceps* were submitted to the NCBI database with the following accession number, OR211589. Four other mtCOI sequences of *P. breviceps* and one out group from Family Blenniidae were obtained for constructing a phylogenetic tree. Maximum likelihood analysis demonstrates that the sequence used in this investigation is *P. breviceps* (Fig.4).

4. Discussion

From the Kavvayi wetland system so far a total of 160 fin fish and shellfish remain recorded, (manuscript under preparation). This is the first-ever description of *P. breviceps* from the South west coast of India. This species was first described from the Bay of Bengal as *Blennechis breviceps* (Valenciennes, 1836). Later, without giving any details of location and photo, Day (1876) included this species in his classic work. After that, Mukherjee (1995) and Rao et al. (2000) reported this species from the Malta River, West Bengal, and Andaman and Nicobar Island respectively. Mohanty et al. (2019) examined the unidentified specimens of the Chilika expedition of the years 1985–1987 and identified the shorthead fang blenny, *P. breviceps* from the earlier samples. This was the first record of the species from the coast of Odisha and the Chilika lagoon. Gopalakrishnan et al. (2012) and Joshi et

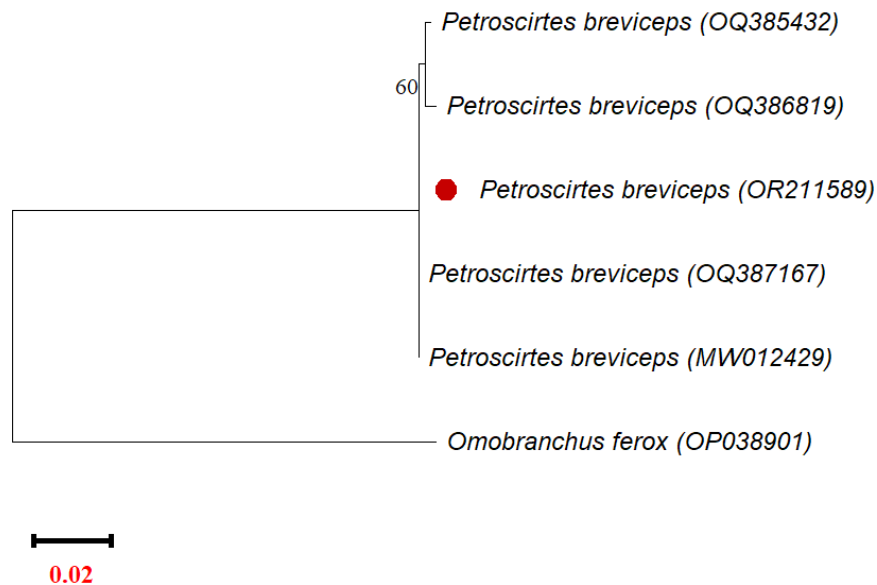


Fig. 4. Maximum Likelihood tree of Cytochrome oxidase I (COI) gene sequences of *Petroscirtes breviceps*

al. (2016) reported *P. variabilis* and *P. breviceps* from the Gulf of Mannar ecosystem, Tamil Nadu. BijuKumar and Raghavan (2015) reported *P. mitratus* from Kerala. Mitra et al. (2019) observed *P. variabilis* from the mangrove forest of Balasore, Odisha. Later, Chandra et al. (2020) reported *P. mitratus*, *P. variabilis*, *P. breviceps* and *P. xestus* from the Indian coast.

Majority of the *Petroscirtes* species were usually collected from shallow depths, less than 5m except for *P. marginatus* which was trawled 180-300m off Sumbawa, Indonesia (Smith-Vaniz, 2005). Application of closed circuit rebreathers (CCR) allowed the long duration dives at the twilight zone which resulted in the discovery of many new species of blennies (Pyle, 2005). The smallest species among the genus *Petroscirtes* is *P. pylei* reported from Fiji Islands (40.9 mm) and the second smallest is *P. marginatus* (49.1mm) which inhabited the deep-reef twilight zone (Smith-Vaniz, 2005). According to An et al. (2020) in Korean waters, *P. springeri* is similar to *P. breviceps* and *P. variabilis* in overall body appearance, only difference is the presence of two dark spots on the opercle and caudal fin base. From the genus *Petroscirtes*, only *P. pylei* and *P. springeri* typically have 12 dorsal-fin spines but they are not closely related. In the case of *P. marginatus*, the dorsal fin has a narrow dusky area proximally, a wider pale stripe above, and the distal half to two-thirds of the fin is very dark. Whereas in *P. breviceps* a dark stripe follows the dorsal contour of the body and extends well onto the base of the dorsal fin for its entire length; distally the dorsal

fin is heavily reticulated and uniformly dark (Smith-Vaniz, 2005).

Arai and Ida (1975) illustrated a single specimen of *P. breviceps* from Tanegashima Island, Japan and noted that except for its colour pattern which closely matched that of *Meiacanthus kamoharai*, the specimen agreed well with *P. breviceps*. The genera *Petroscirtes* (non-venomous genera of tribe Nemophini-fangblennies) contain species that mimic the aposematic colouration and behavior of *Meiacanthus* (the venomous genus). *P. breviceps*, the striped poison-fang blenny coevolving with *Meiacanthus* fang blennies with similar swimming behaviours, thus becoming Batesian mimics and benefiting from reduced predation pressures (Smith Vaniz et al., 2001). According to Springer and Smith-Vaniz (1972) *P. breviceps* was a Batesian mimic of *M. grammistes* in the Western Pacific Ocean, where these two species overlap its distributional range. Using morphological and DNA barcoding techniques we confirm that the specimen obtained is *P. breviceps* and this is the first report of the species from the South west coast of India.

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