



## Short Communication

### First record of Gossamer blenny, *Omobranchus ferox* (Herre, 1927) from the mussel farming sites of Kavvayi estuarine wetland system, Southwest coast of India

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The gossamer blenny, *Omobranchus ferox* (Herre, 1927), a member of the family Blenniidae (Order Blenniiformes), is documented for the first time in the Kavvayi estuarine wetland system. This record is established based on the examination of four specimens collected from the Kavvayi estuary, marking the initial occurrence of this species on the southwest coast of India.

[**Keywords:** Blenniidae, Kavvayi estuary, New record, *Omobranchus ferox*]

### Introduction

The family Blenniidae, consists of small fish inhabiting near shore marine environments across tropical and subtropical regions<sup>1</sup>. This family encompasses 26 genera and 405 species commonly known as combtooth blennies<sup>2</sup>. The genus *Omobranchus* Valenciennes (1836), consists of around 20 species found in nearshore and estuarine waters across the Indo-West Pacific and west of the Andesite Line, a key continental divide<sup>3,4</sup>. These species predominantly populate rocky and oyster reefs, often in proximity to mangrove swamp perimeters. Some species have been observed dwelling within crevices in mangrove roots and tree stumps<sup>5</sup>. The majority of specimens are typically found at depths shallower than half a meter. They deposit their eggs in rock crevices, discarded bivalve shells, marine weeds, and holes in mangrove stems<sup>6,7</sup>. From the genus *Omobranchus elongates* (Cloister blenny), *O. fasciolatus* (Arab blenny), *O. ferox*, *O. obliquus*, *O. punctatus* (Muzzled blenny), and *O. zebra* (Zebra blenny) were reported from the Indian waters<sup>8</sup>. During 1970, Visweswara Rao<sup>9</sup> described the breeding habits and early developmental

stages of two Blenniid, *O. japonicas* and *Cruantus smithi*, from the Godavari estuary. Later in 1973, Visweswara Rao<sup>10</sup> gave a taxonomic account of Blenniid fish from the Godavari estuary. Springer & Gomon<sup>4</sup> reported *O. ferox* from Visakhapatnam coast, which was earlier illustrated as *C. dealmeida* by Rama Rao<sup>11</sup> from the same coast. Gopi & Mishra<sup>12</sup> documented *O. zebra* from the Chilika lagoon of Odisha. Recently, Iyyappan *et al.*<sup>7</sup>, reported the new occurrence of *O. ferox* from the Vellar estuary on the southeast coast of India. While there is no report about the occurrence of *O. ferox* on the southwest coast of India. Knowledge of the diversity and community structure of blennies is very limited in most tropical countries, including India. The Kavvayi estuarine wetland plays a pivotal role in providing essential support to a diverse range of fish species. However, the existing information concerning the diversity and community structure of blennies within this estuary seems to be rather limited. The present study aims to determine whether the artificial habitat of mussel farming areas may increase opportunities for new species. Understanding this relationship is crucial for assessing the ecological impacts of farming practices and for the conservation and management of marine biodiversity in these regions.

### Materials and Methods

#### Study area

The Kavvayi wetland ecosystem, a prominent ecological system in north Kerala, is recognised as the third-largest backwater area within the state. Geographically situated between the coordinates of 75°06'48" E to 75°15'40" E longitudes and 11°59'52" N to 12°14'36" N latitudes spreading Kasaragod and Kannur districts in Kerala. Nileswar, Kariangode, Kavvayi, Perumba and Ramapuram are the major rivers directly discharged into the wetland system<sup>13</sup>. The Kavvayi estuarine system joins the Arabian Sea in proximity to Mavilakadappuram of Valiyaparamba panchayath. Its backwater, especially Valiyaparamba backwater is considered as the 'mussel culture zone' of Kerala. Mussel farming has played a pivotal role in driving the socio-economic progress of numerous coastal families residing in the estuarine expanse of Kavvayi<sup>14</sup>.

### Sample collection and analysis

A total of four specimens were collected from the mussel farming sites of Madakkal (1 no.) and Ayitti (3 nos.) regions of the Kavvayi wetland system on 12 May 2023 (Fig. 1). The dead fishes were collected from the harvested mussel ropes with trapped fishes. The specimens were placed in an icebox and transported to the laboratory. Subsequently, photographs were taken, and morphometric measurements were immediately conducted using a digital caliper. A small tissue sample was excised and preserved in 95 % ethanol to facilitate DNA barcoding studies, after which the specimen was preserved in 5 % formaldehyde. Standard references were utilised for species-level identification<sup>4</sup>. The specimen was subsequently archived in the museum of KUFOS Regional Centre, Payyanur, under the catalogue number KRC-PNR/OF1/2023, 48.87 mm; KRC-PNR/OF2/2023, 41.86 mm; KRC-PNR/OF3/2023, 44.81 mm and KRC-PNR/OF4/2023, 44.3 mm. Utilising the DNeasy 96 Blood & Tissue Kit from Qiagen, total DNA was extracted and mtCOI genes were amplified using the primers COI F 5' TCAACCAA CCACAAAGACATTGGCAC 3' and COI R 5'

TAGACTTCTGGGTGGCCAAGAATCA<sup>3'(refs. 15,16)</sup>. After amplification, the PCR products were subjected to visualisation through 1 % agarose gel electrophoresis. Subsequently, the PCR products were sent to OmicsGen LifeSciences Pvt Ltd in Kochi, Kerala, India, for sequencing. Upon obtaining the sequence data, a Basic Local Alignment Search (BLAST) analysis was conducted to determine sequence homology and similarity. This was followed by the construction of a Maximum Likelihood tree using MEGAX software, which enabled the assessment of genetic distances and the estimation of relationships among the sequences<sup>17</sup>. To validate the tree's robustness, a bootstrap analysis was performed using 1000 pseudo-replications. Finally, the resulting aligned sequences were submitted to the National Center for Biotechnology Information (NCBI) for archival and public availability.

### Results

#### Taxonomic accounts

Class: Teleostei

Order: Blenniiformes

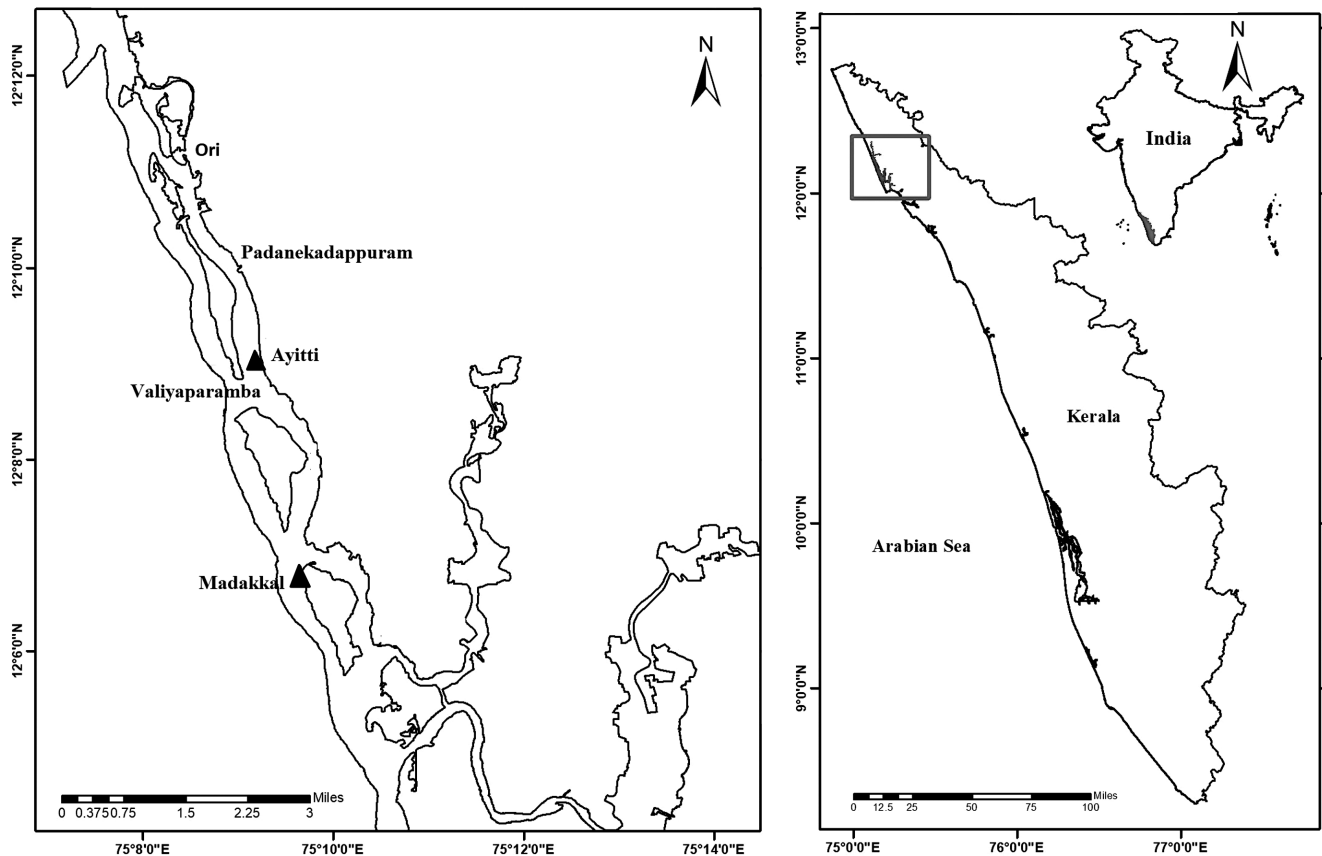


Fig. 1 — Map showing the Kavvayi estuarine wetland, Kerala, India. Triangular shapes indicating the collection sites of *Omobranchus ferox*

Family: Blenniidae

Genus: *Omobranchus* Valenciennes, 1836

*Omobranchus ferox* (Herre, 1927)

#### Material examined

All four specimens were examined for its counts, measurements and features. Except for specimen KRC-PNR/OF1/2023, all other specimens were collected from the green mussel farming area of Ayitti (12°14'79.21" N, 75°15'35.71" E).

#### Diagnostic features

Four samples were measured and their morphometric and meristic characteristics are given in Table 1. In KRC-PNR/OF1/2023 (48.87 mm) - dorsal fin XII, 21; 15<sup>th</sup> segmented dorsal-fin ray 20.3 % to standard length; anal fin II, 23; externally both the anal fin spines distinct; segmented caudal fin rays 15; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral line tubes 4; lower jaw teeth 18; upper jaw teeth 20; no fleshy crest on head. In KRC-PNR/OF2/2023 (41.86 mm) - dorsal fin XII, 20; anal fin II, 24; externally both the anal fin spines distinct; segmented caudal fin rays 14; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral line tubes 4; lower jaw teeth 18; upper jaw teeth 20; no fleshy crest on head; gill opening extending ventrally to opposite 6<sup>th</sup> pectoral-fin ray; males with dusky spot over last 1 – 4 segmented dorsal-fin rays; slender, dusky to black band adjacent

to postorbital margin. In KRC-PNR/OF3/2023 - dorsal fin XII, 21; 15<sup>th</sup> segmented dorsal-fin ray 14.03 % times the standard length; anal fin II, 23; segmented caudal fin rays 15; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral line tubes 4; lower jaw teeth 16; upper jaw teeth 18; no fleshy crest on the head. In KRC-PNR/OF3/2023 - dorsal fin XII, 21; anal fin II, 23; segmented caudal fin rays 15; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral line tubes 4; lower jaw teeth 16; upper jaw teeth 18; no fleshy crest on the head; gill opening extending ventrally to opposite 6<sup>th</sup> pectoral-fin ray; dusky spot absents on dorsal fin of females.

#### Species description

The wedge-shaped elongate body laterally compressed, and scaleless; the greatest depth is just back of the pectoral base (Fig. 2). Dorsal profile nearly horizontal; ventral profile strongly convex below the head and belly; eye protrudes slightly; a black stripe in the posterior part of eye; mouth very small; gill opening small slit-like. Males of *O. ferox* usually have a noticeable dusky spot (female lacks) on the posterior-most segmented dorsal-fin rays and a dark band adjacent to the postorbital margin. Close-set of slender, slightly depressible, golden-brown tipped incisiform teeth. Dorsal spines flexible, and smaller than rays. Tip of the dorsal spine yellowish-orange. The length of segmented dorsal fin

Table 1 — Comparison of the morphometric and meristic characteristics of *O. ferox* of the present study with the previous works. The values are arranged as range of measurements of four specimens

Morphometric characters	Present study (mm)	Springer & Gomon, 1975 (mm)	Meristic Characters	Present study	Springer & Gomon, 1975	Iyyappan <i>et al.</i> , 2023
Standard length	44.3 – 48.87	27.73 – 40.16	Dorsal fin rays	XII, 20 – 22	XI-XIII, 20 – 23	XII, 22
Head length	20.53 – 24.29	22.39 – 24.61	Pectoral fin rays	13	12-14	12
Pre-dorsal length	21.69 – 22.83	21.67 – 22.92	Pelvic fin rays	2	2	2
Pre-pectoral length	20.38 – 22.86	23.29 – 23.97	Anal fin rays	II, 23 – 24	II, 22 – 26	II, 24
Pre-anal length	46.07 – 46.94	45.04 – 46.01	Segmented caudal fin ray		13 – 15	12
Dorsal fin length	77.11 – 79.45	72.66 – 73.5	Interorbital pores	3	2 – 3	-
Caudal fin length	15.53 – 23	17.34 – 18.24	Circumorbital pores	8	8 – 9	-
Pelvic fin length	16.79 – 22.93	20.95 – 21.20	Lateral line tubes	4	4	4
Pectoral fin length	15.87 – 20.46	20.08 – 20.25				
Caudal peduncle length	4.64 – 5.95	2.92 – 3.01				
Caudal peduncle depth	7.97 – 9.44	8.11 – 8.31				
Length of 15 <sup>th</sup> dorsal fin ray	13.7 – 20.28	-				
<b>% of Head Length (HL)</b>						
Eye diameter	23.83 – 29.6	28.5 – 28.7				
Snout length	25 – 33.64	23.99 – 24.01				
Inter orbital width	8.3 – 10.37	-				

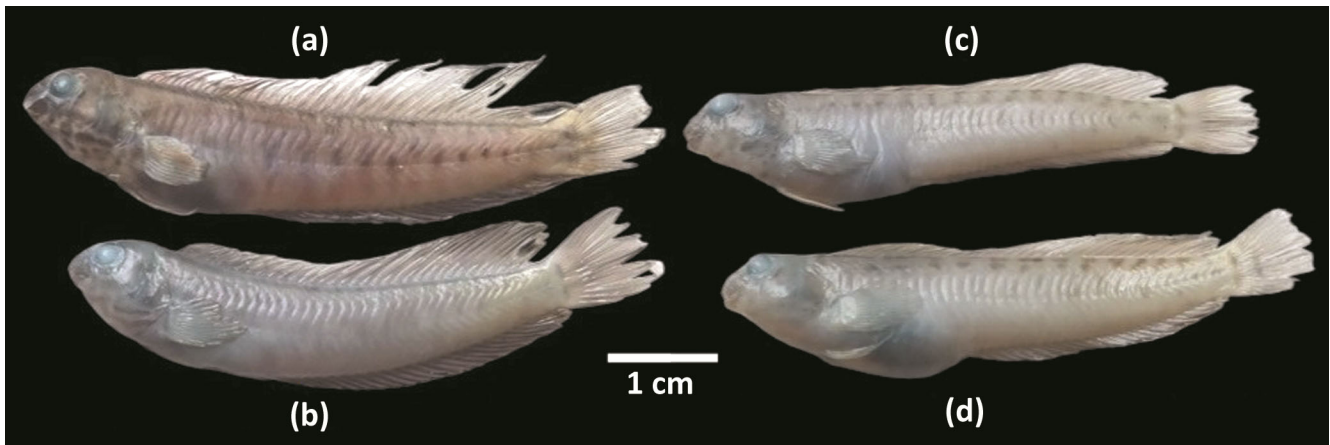


Fig. 2 — Freshly collected sample of *Omobranchus ferox*: a) 48.87 mm male; b) 41.86 mm male; c) 44.3 mm female; and d) 44.81 mm female; from Kavvayi estuarine wetland system

rays increases towards the caudal region starting from the 9<sup>th</sup> ray and maximum length at the 15<sup>th</sup> – 16<sup>th</sup> ray. Tip of the anal fin paddled.

#### Colour pattern when fresh

Male specimen light brownish in colour. Trunk exhibited 14 darker, narrow vertical bars; anterior bars slightly broader than the posterior ones. Some bands incomplete dorsally, or their dorsal ends separated from the rest of the band, giving the appearance of a row of dark blotches along the midline of the body. In comparison, the female specimen is lighter in colour, and the vertical bars were not distinct.

#### Molecular characterisation

The developed mtCOI sequences (base pair) of *O. ferox* were submitted to the NCBI database with the following accession number OR428093. Three other mtCOI sequences of *O. ferox* and one out group were obtained for constructing a phylogenetic tree. The phylogenetic tree revealed that the *O. ferox* of the present study (displayed with a taxon marker) has been clustered with the identical reference sequence of the species and confirmed as *O. ferox* (Fig. 3).

#### Distribution

The species is benthic<sup>18</sup>, commonly found in mangrove swamps and river estuaries, but more often in freshwater lakes<sup>19</sup>. Currently, six species of *Omobranchus* have been recorded in the waters around India<sup>8</sup>. In India, *O. ferox* has been specifically documented in collections made from the Vellar estuary and Visakhapatnam coast<sup>4,7</sup>. Chandra *et al.*<sup>20</sup>, reported *O. ferox*, *O. punctatus*, *O. zebra* from the mangrove ecosystem of Andhra coast. Similarly, Ray *et al.*<sup>21</sup>, observed *O. ferox* from the river and mangrove habitat

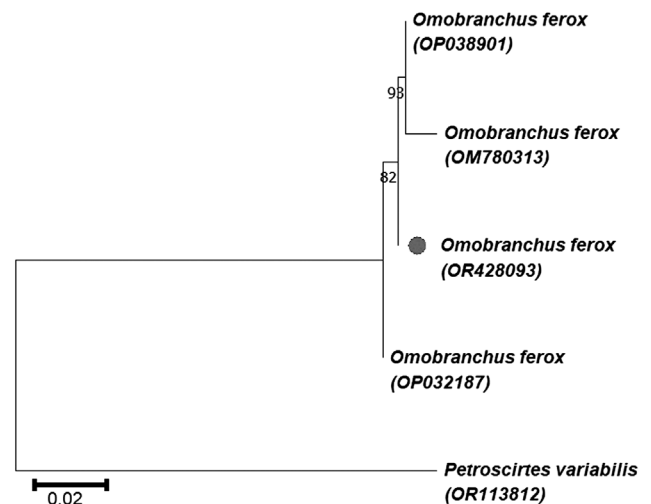


Fig. 3 — Maximum likelihood tree of mitochondrial Cytochrome oxidase 1 (CO1) gene sequences of *Omobranchus ferox* and related species (species information other than OR428093 was obtained from NCBI Database)

of Gowthami-Godavari estuary in Andhra Pradesh. It is native to the Indo-Pacific region from Lake Poelala and Maputo Bay in Mozambique<sup>22,23</sup>, but not from the northern Indian Ocean, Red Sea and Arabian Gulf. It is found in Australia, east coast of India, Indonesia, New Guinea, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam and is invasive in Hawaii and continental United States<sup>23</sup>.

#### IUCN status

According to the IUCN, *O. ferox* is classified under the Least Concern (LC) category<sup>24</sup>.

#### Discussion

Blenniidae fishes are appreciated for their lively behaviour and unique actions, such as cleaning the

substrate and consuming algae<sup>25</sup>. In the southern Brazilian waters, the mariculture of *Perna perna* (Bivalvia) provides an artificial substrate for *Hypleurochilus fissicornis* (Blenniidae), which is abundant in these structures. The empty shells at the mariculture sites are utilised as nesting places for males<sup>26</sup>. In the present study, *O. ferox* is obtained from the mussel-farming areas of Kavvayi estuarine wetland system. Chakraborty *et al.*<sup>27</sup>, reported a new occurrence record of two combtooth blennies, *O. zebra* and *O. smithi* (Blenniiformes: Blenniidae), from the brackish waters of the mangrove islands in the Indian Sundarbans, West Bengal. The Australian oyster blenny, *O. anolius* is widespread and abundant in the shells of the invasive oyster *Crassostrea gigas*, particularly when these oysters have formed densely packed clusters and also within oyster farms of Waitemata Harbour and Tamaki River region of New Zealand<sup>28</sup>. Blennies have a track record of successful invasions, a success often credited to their tendency to seek out small holes for refuge and nesting sites, potentially enabling them to exploit sea chests and crevices within vessels<sup>29</sup>. Large canine teeth and the size and form of the mouth indicate that *Omobranchus* is most likely a predator of small aquatic creatures<sup>20</sup>. The feeding groups of all *Omobranchus* species encompass omnivores, herbivores, and molluscivores, and the diet of *O. elegans* comprises plants or cyanobacteria, detritus, benthic crustaceans, and barnacles<sup>30</sup>. According to Gerhardinger *et al.*<sup>26</sup>, high mass mortality of the associated fauna on mussel ropes occurs periodically during handling procedures and mariculture harvesting. Although this mortality occurs periodically and adult blennioid males and their nests are removed from the area, ichthyoplanktonic samples from the area show that Blenniidae larvae occur year-round, likely maintaining the population. Within the Kavvayi estuarine system, *O. ferox* could potentially leverage the mussel farming sites as favourable habitats for its growth. At the same time, barnacle biofouling is prevalent on the shells of farmed mussels, which may be offering additional habitat for its survival. There is a possibility that a population of blennies has established itself within these mussel-farming areas of Kavvayi. However, there is a scarcity of information concerning the biology or ecology of *O. ferox* reported from the Indian waters.

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#### Conflict of Interest

The authors declare that they have no conflicts of interest.

#### Ethical Statement

This manuscript is the authors' own original work, which has not been previously published elsewhere. This manuscript is not currently being considered for publication elsewhere.

#### Author Contributions

CVA, TAK, AG & KJ: Collected the specimen, identified and made morphometric study; CVA contributed in genetic studies and wrote the original draft of the manuscript; KD & MPP: Supervised the study and also reviewed the manuscript.

#### References

- Hastings P A & Springer V G, Systematics of the Blenniidae (Combtooth Blennies), In: *The biology of blennies*, edited by Patzner R A, Gonçalves E J, Hastings P A & Kappor B G, (Science Publishers, Enfield, NH, USA), 2009, pp. 69–91.
- Eschmeyer W N & Fong J D, Species by family/subfamily. Available online at: <http://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp>; Accessed in 2023.
- Springer V G, Synopsis of the tribe *Omobranchini* with descriptions of three new genera and two new species (Pisces: Blenniidae), In: *Smithsonian Contributions to Zoology*, 130, (Smithsonian Institution Press, Washington), 1972, pp. 38. <https://doi.org/10.5479/si.00810282.130>
- Springer V G & Gomon M F, Revision of the blennioid fish genus *Omobranchus* with descriptions of three new species and notes on other species of the tribe Omobranchini, In: *Smithsonian Contributions to Zoology*, 177, (Smithsonian Institution Press, Washington), 1975, pp. 144. <https://doi.org/10.5479/si.00810282.177>
- Lim K K P, Iesa I, Kiat T S & Cragg S, Blennies in mangrove tree stumps exposed at low tide, *Singapore Biodivers Rec*, (2017) 158-159. ISSN 2345-7597
- Munro I S R, Eggs and larvae of the sabretoothed oyster blenny, *Dasson steadi* (Whitley) (Blenniidae), *Austral J Mar Freshw Res*, 6 (1) (1955) 30-34.
- Iyyappan S, Subramaniyan M, Ragul S & Thangaraj M, First occurrence of two Blenniidae fishes from Vellar Estuary, Southeast coast of India, *Int J Aquat Res Environ Stud*, 3 (2023) 17-26.
- Nair R J & Kumar D, An overview of the fish diversity of Indian waters, In: *DBT Training Manual on Molecular Biology*

- and *Biotechnology for Fisheries Professionals*, CMFRI Training Manual Series No. 15, (CMFRI, Kochi), 2018, pp. 35-66. ISBN 978-93-82263-24-1
- 9 Visweswara Rao V, Breeding habits and early development of two blennioid fishes *Omobranchus japonicus* (bleeker) and *Cruantus smithi* Visweswara Rao from Godavari estuary, *J Bombay Nat Hist Soc*, 12 (1) (1970) 175-182.
  - 10 Visweswara Rao V, Blennioid fishes from Godavari Estuary, *J Bombay Nat Hist Soc*, 70 (1973) 480-487.
  - 11 Rama Rao K V, On a Record of the Blennioid Fish *Crunatus Dealmeida* (Smith) from Indian Waters, *J Bombay Nat Hist Soc*, 64 (1967) 570-572.
  - 12 Gopi C & Mishra S S, Diversity of marine fish of India, In: *Marine faunal diversity in India*, edited by Venkataraman K & Sivaperuman C, (Academic Press, London), 2015, pp. 171-193. ISBN 9780128019481
  - 13 Harikumar P S, *Proc Lake: Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats* (Bangalore), 2016, pp. 251.
  - 14 Kripa V & Mohamed K S, Green mussel, *Perna viridis*, farming in Kerala, India – technology diffusion process and socioeconomic impacts, *J World Aquac Soc*, 39 (2008) 612-624.
  - 15 Folmer O, Black M, Hoeh W, Lutz R & Vrijenhoek R, DNA primers for amplification of mitochondrial cytochrome C oxidase subunit I from diverse metazoan invertebrates, *Mol Mar Biol Biotechnol*, 3 (1994) 294-299.
  - 16 Ward R D, Zemlak T S, Innes B H, Last P R & Hebert P D, DNA barcoding Australia's fish species, *Philos Trans R Soc Lond, B Biol Sci*, 360 (1462) (2005) 1847-57. <https://doi.org/10.1098/rstb.2005.1716>
  - 17 Kumar S, Stecher G, Li M, Knyaz C & Tamura K, MEGA X: Molecular Evolutionary Genetics Analysis across Computing Platforms, *Mol Biol Evol*, 35 (2018) 1547-1549. <https://doi.org/10.1093/molbev/msy096>
  - 18 Mundy B C, Checklist of the fishes of the Hawaiian Archipelago, *Bishop Mus Bull Zool*, 6 (2005) 1-704.
  - 19 Froese R & Pauly D (eds.), *Fishbase*, World Wide Web electronic publication. <http://www.fishbase.org>; version 2024.
  - 20 Mishra S S, Gopi K C, Kosygin L & Rajan P P, Ichthyofauna - Fishes, In: *Faunal diversity of mangrove ecosystem in India*, edited by Chandra K, Gopi K C, Mishra S S & Raghunathan C, (Zoological Survey of India), 2019, pp. 539-586. ISBN 978-81-8171-529-6
  - 21 Ray P G, Malla J A, Johnson & Sivakumar K, An overview of the fish diversity and their threats in the Gowthami-Godavari Estuary in Andhra Pradesh, India, *J Threat Taxa*, 14 (8) (2022) 21588-21604. <https://doi.org/10.11609/jot.7842.14.8.21588-21604>
  - 22 Springer V G, Blenniidae, In: *Smiths' sea fishes*, edited by Smith M M & Heemstra P C, (Springer -Verlag, Berlin), 1986, pp. 742-755.
  - 23 Heemstra P C, Heemstra E, Ebert D A, Holleman W & Randall J E, *Coastal fishes of the Western Indian Ocean*, (South African Institute for Aquatic Biodiversity, South Africa), 2022, pp. 650.
  - 24 IUCN, The IUCN Red List of Threatened Species, Version 2023-1. Accessed online at: <https://www.iucnredlist.org>; Accessed in 2024.
  - 25 Von Lindw J, Patterson J T, Ohs C L & DiMaggio M A, Aquaculture applications of the Family Blenniidae, *FA225, 06/2020. EDIS*, 2020 (4) (2020) 1-6. <https://doi.org/10.32473/edis-fa225-2020>
  - 26 Gerhardinger L C, Hostim Silva M & Barreiros J P, Empty mussel shells on mariculture ropes as potential nest places for the blenny (Perciformes: Blenniidae), *J Coast Res*, 39 (2006) 1202-1204.
  - 27 Chakraborty P, Yardi K & Sindha P, New record of two Combtooth blennies, *Omobranchus zebra* (Bleeker 1868) and *Omobranchus smithi* (Rao 1974) (Blenniiformes: Blenniidae) from West Bengal, India with a key to species of *Omobranchus* from India, *Fish Taxa*, 18 (2020) 22-29.
  - 28 Barker J J, *The introduced Australian oyster blenny, Omobranchus anolius*, Masters Degree Thesis, University of Auckland, New Zealand, 2009.
  - 29 Wonham M J, Carlton J T, Ruiz G M & Smith, Fish and Ships: relating dispersal frequency to success in biological invasions, *Mar Biol*, 136 (2000) 1111-1121. <https://doi.org/10.1007/s002270000303>
  - 30 Hundt P J, Nakamura Y & Yamaoka K, Diet of Combtooth blennies (Blenniidae) in Kochi and Okinawa, Japan, *Ichthyol Res*, 61 (2016) 76-82. <https://doi.org/10.1007/s10228-013-0366-7>