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First distribution record of the Pamban sea slug, *Marionia pambanensis* O'Donoghue, 1932 (Gastropoda: Heterobranchia: Tritoniidae), from the Gujarat coast, India

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Short Communication

Abstract

Marionia pambanensis (O'Donoghue, 1932), commonly named Pamban sea slug, is a dendronotid nudibranch belonging to the family Tritoniidae, phylum Mollusca which was first described from the waters around Pamban Island, south-eastern coast of India. This species was previously reported only from the coasts of Tamil Nadu, Goa, and Maharashtra. The current study provides the first record from the Okha coast, Devbhoomi Dwarka district, between the Gulf of Kutch and the Arabian Sea in Gujarat. Distinguishing features from morphologically similar *M. olivacea* are mentioned.

Keywords: *New geographical range, Pamban sea slug, nudibranch, Gulf of Kutch, Arabian sea*

Introduction

Nudibranchs are a group of colourful, shell-less marine gastropod molluscs that inhabit oceans worldwide. They are often known as sea slugs due to their soft, slug-like bodies and are renowned for their incredible diversity of shapes, sizes, and vibrant colours. The order Nudibranchia is the largest order of Opisthobranchia (Ramakrishna *et al.*, 2010); over 6000 nudibranch species have been documented worldwide (Gosliner *et al.*, 2015), with 2000 species recorded from the Indo-Pacific (Gosliner *et al.*, 2008) and 194 species reported from India (Dhivya *et al.*, 2012; Bhawe and Apte, 2013). They occupy diverse marine habitats, including

coral reefs, rocky and sandy beaches, mangroves, seagrass beds, and mudflats (Apte and Desai, 2017). Nudibranchs are carnivores and are extremely specific in their diet. They predate upon sponges, bryozoans, ascidians, sea anemones, soft corals (Thompson, 1964), jellyfishes, hydroids, sea pens and other Opisthobranchs (Ramakrishna *et al.*, 2010; Gosliner *et al.*, 2015; Cheney and Wilson, 2018). They have a specialized radula, a tongue-like organ that allows them to rasp and scrape food from surfaces, and some species have evolved intricate sensory structures to detect and track prey. Due to the loss of the adult shell, nudibranchs have developed several anti-predator strategies, such as using nematocysts from eating cnidarian prey, chemical defence mechanisms, aposematic colouration, camouflage, and mimicry. Nudibranchs are hermaphrodites. They undergo a complex courtship ritual before exchanging sperm and fertilizing each other's eggs. The resulting egg masses are often laid in distinctive ribbon-like or spiral patterns. Despite their small size, nudibranchs are important in marine ecosystems as predators and prey. They are also highly valued by scuba divers and underwater photographers for their beauty and diversity. They have become an increasingly popular subject of study in evolutionary biology and biotechnology. The present study reports a new distribution record of one rare Nudibranch species, *Marionia pambanensis*, from the Gujarat coast.

Material and methods

The survey was conducted on the Okha reef (22° 28' 43.77"N and 69° 3' 59.34"E) (Fig. 1). The Okha coast is a rocky shore

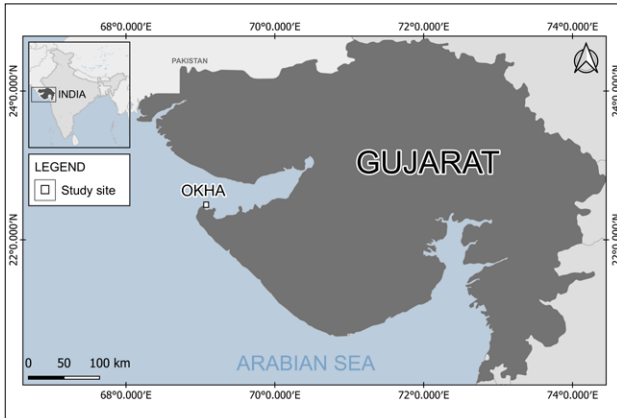


Fig. 1. Location of the study site

with patches of sand in between. It has a degraded coral reef, with most live corals found at the edges of the lower intertidal zone. However, associated flora and fauna are abundant. The coast is rich in soft and hard corals such as *Zoanthus* sp., *Palythoa* sp., *Gonopora* sp., *Favites* sp., *Favia* sp., etc., and other reef fauna such as Gastropods, crabs, shrimps, polychaetes, amphipods, isopods, etc., along with numerous species of macroalgae. However, The Okha coast is subjected to anthropogenic strain, with local inhabitants often using beaches to dispose of household and ceremonial wastes. An extensive survey of nudibranch diversity was carried out along the Okha Reef from November 2022 to January 2023. Daily surveys were conducted during low tides. Physiochemical parameters such as salinity, pH, and temperature of the tidepools were taken using Hanna portable meters, while dissolved oxygen of the tidepools was taken using Lutron portable Dissolved Oxygen meter. Images highlighting the key identifying characteristics were taken using the macro and super macro modes on an Olympus TG-6 camera. Identification was carried out with the help of a field guide titled 'Field Guide to the Sea Slugs of India' by Apte and Desai, 2017.

Results

Materials examined

A total of three specimens were observed during the study period. The first specimen was observed on 17th November 2022 (22° 28' 41.9844" N 69° 4' 24.8448" E); it measured 50 mm in length, 20 mm in width, and 10 mm in height. The second specimen was observed on 18th November 2022 (22° 28' 44.238" N 69° 4' 32.26 8" E); It measured 47 mm in length, 14 mm in width, and 8 mm in height, and the third specimen was observed on 8th December 2022 (22° 28' 43.6188" N 69° 4' 26.8068" E); it measured 40 mm in length; 15 mm in width and 8.0 mm in height.

Systematics

Phylum : Mollusca
 Class : Gastropoda
 Order : Nudibranchia
 Family : Tritoniidae
 Genus : *Marionia*
 Species : *pambanensis*

Distribution and habitat

Not much information is available regarding the global distribution of this species. Still, a quick global search on iNaturalist, 2023 yielded 14 observations from Maharashtra, Goa and Tamil Nadu in India. It is being reported for the first time from the Okha coast along Devbhoomi Dwarka district, Saurashtra coast at the mouth of the Gulf of Kutch in Gujarat. The Okha coast encompasses a variety of habitats, such as coral reefs, algal reefs, and sandy and rocky shores, providing an ideal niche for nudibranchs. All three specimens were found in shallow tidepools with sandy substrate located in the middle and lower intertidal zone of the Okha coast at dusk and night. One of the specimens was observed on top of a *Zoanthus sansibaricus* colony; the other two specimens were found crawling across the rocky sandy substrate.

The physiochemical parameters of tidepools provided important information about the water quality and environmental conditions of the habitat in which *M. pambanensis* was found. In this particular case, the salinity of the tidepools ranged from 37.3 to 37.5 ppt. The pH recorded was from 8.10 to 8.21. The dissolved oxygen levels were from 4.9 to 5.2, The temperature in the tidepools ranged from 22.2 to 23.7 °C. These physiochemical parameters suggest that the tidepools are a healthy and stable environment for diverse marine organisms to thrive.

Morphology

The live specimen measures 40-50 mm in length, 15-20 mm in width, and 8-10 mm in height. The specimens possess a limaciform configuration and are predominantly rectangular in transverse section, aside from the posterior extremity that gradually tapers into a slim, flattened appendage. The sides and notum are translucent cream in base colour with patterns of dark brown and orange (Apte and Desai, 2017) (Fig. 2a). The notum hangs slightly along the sides, which then gives rise to the rhinophore sheaths (measuring between 0.4 – 0.6 mm) (Fig. 2c) and brachial plumes (measuring between 1.8–2.5 mm) (Fig. 2b). The sides of the body are pustulose, with a network of orange-brown lines running between the brachial plumes. The mantle and oral veil are light

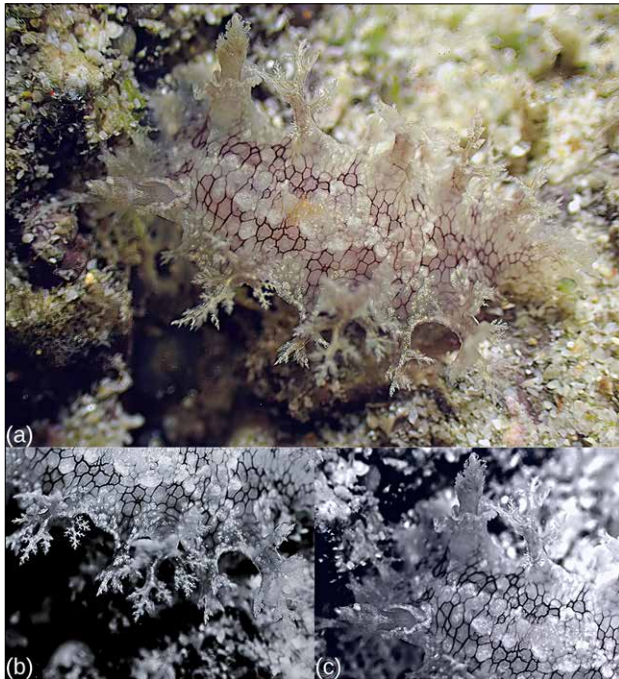


Fig. 2. *M. pambanensis* (a) Dorsal view, (b) Brachial plumes and (c) Rhinophores

brown, with a symmetrical pattern of dark brown patches along the edge of the mantle and at the base of the gills. The tiny pyramidal brachial plumes completely covered the dorsal and lateral surfaces; the branchial plumes were 12 in number. The oral veil is present at the anterior portion of the mouth in front of the rhinophores and bifurcated. Contractile slender rhinophores are fitted in erect cylindrical sheaths (Apte and Desai, 2017).

Discussion

Nudibranchs belonging to the family Tritoniidae (Nudibranchia, Cladobranchia, Dendronotidae) come in various sizes and colours, feeding exclusively on octocorals (McDonald and Nybakken, 1999). The genus *Marionia* has 28 accepted species, including most of the largest species in the family (*Marionia gemmi*). Odhner (1963) rediagnosed *Marionia* as having stomach plates, a digestive gland divided into two masses, jaws with three to six rows of fine denticles, a radula with tricuspid central teeth and differentiated first lateral teeth, branched and uniformly sized gills, and compound velar papillae. Since most of these characters require a thorough internal morphological study, identifications performed in situ are based only on external characters.

The description of the specimens in the present study was confirmed with the description provided by O'Donoghue, 1932; Apte and Desai, 2017. Apte and Desai, 2017 reported

that *M. pambanensis* from Maharashtra, India, was first identified as *Marionia olivacea* (Baba, 1937). Although there are many similarities between the two species, no phylogenetic analysis has been conducted to confirm this. Morphologically, these two species can be distinguished from each other by looking at their brachial plumes (Smith and Gosliner, 2007); *M. pambanensis* has 12 brachial plumes while *M. olivacea* have 9-15 brachial plumes, as well as by morphological differences in their velar papillae; *Marionia pambanensis* have six pairs of velar papillae while *M. olivacea* have seven pairs of velar papillae some of which are compound. Overall, *M. pambanensis* is a relatively poorly understood species, and further research is needed to understand its ecology, behaviour, and distribution fully.

Apte *et al.* (2010) reported 33 species in the Gulf of Kutch, Gujarat. Later Vadher *et al.* (2020) compiled an annotated checklist of 95 species of sea slugs belonging to 62 genera in 29 families from the Gujarat coastline. Eleven nudibranch species were observed during the study period, including *M. pambanensis*, a new record for this region, bringing the species count up to 96. First-hand observations from the intertidal region primarily recorded the species diversity of sea slugs. Snorkelling and SCUBA diving in this region and other regions of India would undoubtedly add to India's total Opisthobranch diversity.

The recent discovery of a new distribution record for *M. pambanensis* on the Okha coast highlights the importance of conserving and protecting this unique ecosystem from anthropogenic stress. This finding is a compelling reminder of the hidden biodiversity that may remain undiscovered in this location. By safeguarding this area, we preserve the newfound nudibranch population and create the opportunity to uncover more species that might be present in the region. Regular seasonal surveys become imperative to gather comprehensive data and identify additional species, further emphasizing the need for conservation efforts in this area.

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