



RESEARCH PAPER

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**First report of the Pleurobranchomorpha, *Berthellina citrina* (Rüppell & Leuckart, 1828) (Mollusca, Gastropoda) from South West Coast of India**

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**Abstract**

The Pleurobranchomorpha or side-gilled opisthobranch clade is distributed worldwide. *Berthellina citrina* (Rüppell and Leuckart, 1828) is a very conspicuous opisthobranch belonging to the family Pleurobranchidae. They are recorded for the first time from Vizhinjam, Kovalam, and Kollam, of Kerala, and Muttom of Tamil Nadu, south west coast of India. They are mostly found hidden under rocks and boulders and feed on encrusting sponges.

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## Introduction

Opisthobranchs are the most colourful component of coastal ecosystem and known to have worldwide distribution from Polar Regions to the tropical shores and even to the deepest seas with the representation of more than 6000 species. They are also evolved with unique chemical defensive strategies (Padmakumar and Lali, 1997; Cimino and Gavagnin, 2006). Species belonging to the order Pleurobranchomorpha are characterized by internal, rectangular shell; presence of pedal gland; median buccal gland; internal, tubular vas deferens and protrusible penis (Willan, 1987). They are carnivorous, shell-less or rudimentary shelled molluscs that live on soft bottoms at the middle and low latitudes. Their skin secretions are acidic, and successfully deter predators (Marbach and Tsumamal, 1973; Thompson, 1983). *Berthellina citrina* (Rüppell and Leuckart, 1828) is a very conspicuous opisthobranch belonging to the family Pleurobranchidae and considered as a close relative to the genus *Pleurobranchaea*. It is widely distributed in shallow waters of the Indo-West Pacific region and feeds on a variety of sponges and even corals (Bertsch and Johnson, 1981; Willan, 1984). Previously Kelaart (1858) described *Pleurobranchus citrinus* from Ceylon. It was later reported by Farran (1905) from the same coast. It has been recorded from Indian coast by Narayanan (1969). This species has recently been reported from Gulf of Kutch and Lakshadweep (Apte *et al.*, 2010).

The information on the diversity and distribution of opisthobranchs from the Kerala coast is scanty. Absolutely no information is available on Pleurobranchomorpha from this coast. Hence the aim of the present study was to record the distribution of Pleurobranchomorpha from the Kerala coast.

## Materials and methods

### Study area

Eight Specimens were collected from the intertidal regions of Vizhinjam (8° 22'N; 76° 57' E), Kovalam (8° 22'N; 76° 58' E) and Kollam (8° 56' N; 76° 34' E)

coast, Kerala, Muttom (08° 08' N; 77° 19' E), Tamil Nadu, south west coast of India during March – November, 2012.

### Sampling of organisms

The samples were collected from different stations by snorkelling and SCUBA diving. Most of the organisms were found under the rocks and boulders.

### Taxonomic analysis

Digital images of live organisms were made immediately after sampling. Specimens were relaxed in 7% MgCl<sub>2</sub> and preserved in 70-80% ethanol. The voucher specimen is deposited in the Museum of the Centre for Marine Biodiversity, University of Kerala (CMB-MOL6). The organism was identified using the description of Narayanan (1970).

## Results

### Taxonomy

Kingdom: Animalia

Phylum: Mollusca

Class: Gastropoda

Sub-Class: Heterobranchia

Infra-class: Opisthobranchia Milne-Edwards, 1848

Order: Pleurobranchomorpha Pelseneer, 1906

Family: Pleurobranchidae Gray, 1827

Genus : *Berthellina* Gardiner, 1936

*Berthellina citrina* (Rüppell & Leuckart, 1828)

Synonyms *Pleurobranchus citrinus* Rüppell & Leuckart, 1828;

*Pleurobranchus punctatus* Quoy & Gaimard, 1832.

Distribution: Very wide distribution in Indo-Pacific, Mozambique, East and south Coast of South Africa, North Atlantic Ocean, Red Sea, New Zealand, South Africa to Arabian Sea, Australia, Hawaii, Seychelles, Japan, French Polynesia, Maldives, Gulf of Kutch, Lakshadweep.

Food: The *B. citrina* was found in association with encrusting sponges and reported to feed on sponges, and other sessile invertebrates (Gosliner, 1987).

Habitat: They are most often found under rocks and boulders from the intertidal region to ~2 m depth.

Live colouration: Mantle is in bright orange colour with minute white spots observable in live condition.

Description: *Berthellina citrina* (Rüppell & Leuckart, 1828) is a very conspicuous Opisthobranch belonging to the Pleurobranchidae family. They have broadly ovate to sub rectangular body. They have soft body, up to 13 - 42 mm length. Anterior side has a pair of rolled rhinophoral head tentacles and a triangular oral veil (Fig. 1 and 2).

hidden in the space between the mantle and the foot and has 17-22 pectinate lamellae on either side of the rachis. Anus is situated on the right side dorsal to that of gill. Penial sac which is retractile is conspicuous on the anterior right end of the body. The organisms laying lengthy bright orange coloured egg ribbons in aquarium was observed (Fig. 4). The radula consists of 108 rows and each half has 160-170 teeth. Each tooth consists of 9-14 denticles.



**Fig. 1.** Dorsal view of the Pleurobranchomorpha, *Berthellina citrina*.

The oral tentacles are modified into velar flap. At the base of the each rhinophores, eyes are seen. There is a small, flat, triangular remnant shell, orange to pale yellow coloured, centrally located under the mantle and above the digestive gland (Fig. 3). The length of the shell varied between 3 and 4 mm. The foot is broad and oval with a smooth sole. Single gill is present on the right side of the body. They were found



**Fig. 2.** Ventral view of *Berthellina citrina*.



**Fig. 3.** Rudimentary shell of *Berthellina citrina*.



**Fig. 4.** Egg ribbons of *Berthellina citrina*.

### Discussion

The Pleurobranchomorpha or side-gilled opisthobranch clade is distributed worldwide (Schmekel, 1985). The Pleurobranchomorpha were earlier considered to be the sister group of the Order Umbraculida together with the clade Notaspidea (Burn, 1962; Willan, 1987). But Schmekel (1985) revealed the possible apomorphies to be plesiomorphic and subsequently rejecting the monophyly of this clade.

One of the recent classifications (Bouchet and Rocroi, 2005) denotes that the subclade Pleurobranchomorpha consists of a single superfamily, Pleurobranchoidea Gray, 1827 with two valid families: the Pleurobranchaeidae Pilsbry, 1896, and Pleurobranchidae Gray, 1827. The family Pleurobranchaeidae has four valid genera, i.e., *Euselenops* Pilsbry, 1896, *Pleurobranchaea* Leue, 1813, *Pleurobranchella* Thiele, 1925, and *Pleurobranchillus* Bergh, 1892. The family Pleurobranchidae consists of seven genera, i.e., *Bathyberthella* Willan, 1983, *Berthella* Blainville, 1824, *Berthellina* Gardiner, 1936,

*Boreoberthella* Martynov & Schrödl, 2009, *Pleurehdera* Ev. Marcus & Er. Marcus, 1970, *Pleurobranchus* Cuvier, 1804 and *Tomthompsonia* Wägele & Hain, 1991.

The genus *Berthellina* has eight valid species i.e., *Berthellina citrina* (Rüppell & Leuckart, 1828); *Berthellina edwardsi* (Vayssière, 1896); *Berthellina engeli* Gardiner, 1936; *Berthellina granulata* (Krauss, 1848); *Berthellina ilisima* Marcus & Marcus, 1967; *Berthellina oblonga* (Audouin, 1826); *Berthellina saidensis* (O'Donoghue, 1929).

There are inaccurate earlier reports on *Berthellina citrina* from the Indian coast. Narayanan (1969) first reported this species probably wrongly as *Berthellina minor* from Gulf of Kutch but indicated it to have some similarity with *Pleurobranchus* (*Berthella*) *citrinus* reported by Farran (1905) from Ceylon. Kelaart (1854) also described this species as *Pleurobranchus citrinus* from Ceylon. This species was also reported recently from Gulf of Kutch and Lakshadweep (Apte *et al.*, 2010). The specimens collected from Kerala and Tamil Nadu coasts are closely similar to *Berthellina citrina* described by Narayanan (1970) from Gulf of Kutch, except for minor variations in body length, number of lamellae in the gill and radula morphology which may be considered as local variations in the morphology of the organism commensurate with growth. The taxonomic position of this species is also revised in this new distribution record.

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