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Short Communication: First report of *Thalamoporella rozieri* (Bryozoa: Thalamoporellidae) from Andaman waters with reference to its epibiotic colonization on marine sponges

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Abstract. *Naufal M, Jayaraj KA. 2018. Short Communication: First report of Thalamoporella* rozieri *(Bryozoa: Thalamoporellidae) from Andaman waters with reference to its epibiotic colonization on marine sponges. Biodiversitas 19: 1521-1526.* Bryozoans are aquatic, sessile, colonial, fouling invertebrates, which are found in most marine habitats. Considering the ecological and economic consequence due to the biofouling behavior of bryozoans, a far-reaching study has been carried out on it throughout the world. However, Andaman waters are lacking the bryozoan research for last nine decades. A study on the bryozoan distribution in the littoral region in the eastern coasts of the Andaman Islands was carried out during August 2016. This is the first study on the intertidal bryozoans of Andaman Islands and identified a new report of bryozoan *Thalamoporella rozieri* from Andaman and Nicobar Waters. Tuberosities in the present *T. rozieri* colonies are large. The minute calcareous spicules are also examined. Our study has also come across an interesting association in which the epibiont bryozoan *T. rozieri* adhere to the basibiont sponge *Placospongia* sp on a big rock. The colony of epizoic *T. rozieri* on the sponge was lengthier and continuous than on other inert host substrata. This may be because of active substrate selection by settling larvae. As both are filter feeders, no deleterious effect was noticed either in the basibiont side of *Placospongia* or in the epibiont side of *T. rozieri*.

Keywords: Andaman and Nicobar Islands, bryozoan, Cheilostomata, epibiont, *Thalamoporella rozieri*

INTRODUCTION

Bryozoans are known to be an important component of suspension feeding, colonial animals with many species, apparently circumtropical in distribution. They are plenteously present in fresh waters, tropical reefs, Polar regions, and even in the deep sea territory. Their colonies are formed by repetitive budding of genetically identical, physically associated and intercommunicating member zooids (McKinney and Jackson 1989). The influence of the outside environment at the time of growth is preserved by skeletal growth modifications of both single units (zooids) and colonies (zoaria). Nowadays, the settling of fouling bryozoans on ship hulls are rapidly altering the species composition of bryozoans on a worldwide scale, occasionally with annoying impacts (Scholz et al. 2003). Our knowledge of the taxonomy, diversity, and distribution of many bryozoan species is still insufficient, although a huge work has been made during last decades. SEM technology has allowed to revise the taxonomy of more bryozoans and their distribution as well as to recognize new species (Denisenko 2015). *Thalamoporella rozieri* is a commonly occurring cheilostomatid ascophoran bryozoa in tropical and warm temperate waters like Indian Ocean, Mergui Archipelago (Burma), Makassar Strait (Indonesia), Sulu Archipelago (Philippines), Banda Sea (Indonesia), and Cape Verde Island (Hincks 1887; Waters 1909; Harmer 1926; Thornely 1907; Robertson 1921; Menon 1967). It forms an important biofouler among the rich and diversified bryozoans fauna of India EEZ. Five different colonies belonging to this genus have been recognized from the coastal water of India (Shrinivaasu et al. 2015). In this study, we present the descriptions of the first report of the cheilostome bryozoan *T. rozieri,* which was found during the shallow intertidal benthic investigation in the Andaman Islands.

Sponges are the most common marine invertebrates found in various environments which range from silty harbors to continental shelf seamounts, from intertidal rock pools to subtidal rocky reefs, from volcanic ridges and hydrothermal vents to the deep abyssal plains, rises, and polar regions (Michelle Kelly 2015). Deliberating the wide ecological distribution and abundance of bryozoan and sponges in the marine world, both of the organisms are common neighbors to each other. Fascinatingly, the associated fauna and its species composition have been listed in various sponges with specific attention on the dealings between hosts and endobionts (Forester 1979). The distinct structural organization of sponges with a highly developed aquiferous system, sessile condition, and continuous water flow favor the presence of many endobionts and epibionts with both commensal and parasitic habits (Sara and Vacelet 1973).

Encountering the ecological and economic significance of bryozoans, an extensive study has been carried out on it throughout the world. Circumscribed bryozoans include 3 classes, four orders, 187 families, 808 genera and over 5000 species (Bock and Gordon 2018; Wright 2014; Bock and Gordon 2013). Partial studies on bryozoans of Indian waters have been done, through expedition collections. A total of 257 marine species have been identified from Indian EEZ so far. However, until recently, no comprehensive attempt has to work out taxonomical aspects in detail. Andaman and Nicobar cover 30% of Indian EEZ with rich repositories of biodiversity and endemicity. However, the bryozoan reports from Andaman and Nicobar is below 18%, due to its remoteness and lack of research (Shrinivaasu et al. 2015). The available literature on Andaman bryozoans are limited (Thornely 1905; Thornely 1907; Robertson 1921). Until now no comprehensive attempt has been made to work out taxonomical and ecological aspects of intertidal bryozoans from this typical tropical marine habitat of Indian EEZ. This paucity of information on bryozoans from the coastal water of this island territory has also created a serious gap in connection with economically important problems, for instance, fouling. The present study targets to fill this scantiness of information on bryozoans from the coastal water of Andaman Islands with a description of new record of bryozoan *T. rozieri* along with an unusual sponge-bryozoan association in which *Placospongia* sp as host to the encrusting *T. rozieri.*

MATERIALS AND METHODS

Burmanallah (11°33'569 N and 92°43'781 E), which is a rocky intertidal zone on the eastern coasts of the Andaman Island was investigated during August 2016 (Figure 1).

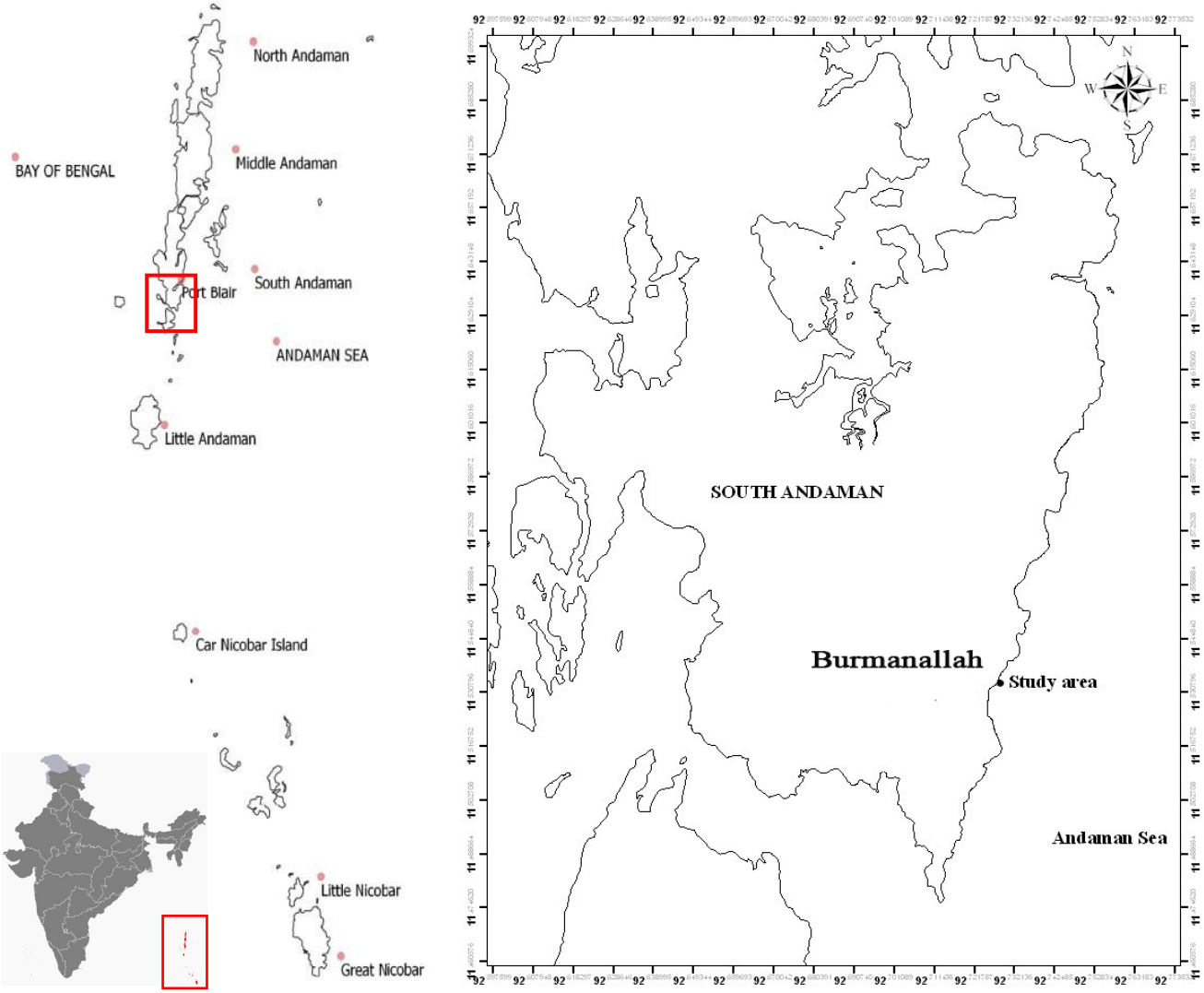

Figure 1. Map showing the study site Burmanallah (11°33’569 N and 92°43’781 E), Andaman and Nicobar Islands, India

Beginning up to an hour before low tide and continuing for up to an hour after low tide, the sample collection was done through the intertidal zone and covered up to 250 m parallel to the sea by snorkeling. Bryozoan colony and the sponge specimens thus obtained were air-dried and wrapped with paper for transport. In the laboratory, Bryozoan colonies on stones and rock fragments were removed and treated with Sodium hypochlorite solution (NaOCl) to remove the soft tissues and algal attachments. The bryozoan specimens were examined by SMZ 1500 stereoscopic microscope. Morphometrics were done with Nikon Eclipse - Ni microscope and SEM (JEOL Model JSM - 6390LV) photographs were used for the detailed study of morphology and systematic aspects. Species identification was done using standard identification keys (Soule and Soule 1970; Menon and Menon 2006). The occupation of sponges by epibiont bryozoan was enumerated by digital photography. The sponge specimen was taken for *in situ* documentation of spicule features and generic identification was done with standard identification key (Michelle Kelly 2015).

RESULTS AND DISCUSSION

Taxonomic account

Class Gymnolaemata (Allman 1856)
Order Cheilostomata (Busk 1852)
Suborder Anasca (Levinsen 1909)
Division Coelostega (Levinsen 1909)
Family *Thalamoporellidae* (Levinsen 1909)
Genus *Thalamoporella* (Hincks 1887)
Species *Thalamoporella rozieri* (Audouin, 1826; Waters 1909: 123; Robertson 1921: 52; Harmer 1926: 292; Menon, 1967: 92)

Material examined. The holotype ITBR 3181, ITBR3182, ITBR 3183, collected from intertidal region of Kodiyaghat, Andaman Islands, India are examined and deposited in the collection of Marine Biology museum at Department of Ocean Studies and Marine Biology (DOSMB), Pondicherry University, Andaman Islands, India. Enclosures

Description: Zoarium is encrusting (Figure 3). Zooecia is rectangular, elongated, alternately arranged and separated by raised, thick calcareous margins (Figure 2.A). Opesia is broad, terminal, with large proximal sinus. Opesiules are placed distally and somewhat asymmetrical (Figure 2.B). Operculum with rounded distal margin, the proximal region with a complete bar. Cryptocyst is distally sloped and granulated. The proximal portions comprise small pores (Figure 2.C). The median process of the cryptocyst forms the polypide tube, the lateral walls of which form those of the two opesiules. Zooid dimensions are mentioned (Table 1). It also consists of large adoral tubercles (Figure 2.D). Ovicells bilobate and large with a median septum. The proximal half is occupied by elongated opening of the ovicell.

Remarks: During Siboga expedition, Harmer (1926) had noticed the presence of avicularia as an important character in the collected species *Thalamoporella*. But our specimen does not possess vicarious avicularia. Though three forms of this species was distinguished by Hincks (1880) based on the presence or absence of avicularia, tuberosities, and ovicells. *T. rozieri* are those forms with the tuberosities and the ovicells. The present specimen possesses ooecia and tuberosities without any avicularia. It also consists of typical bilobate ovicells. The observation that adoral tuberosites can get modified into ovicells (Harmer 1926) agrees in this case, because here zooecia with ovicells and adoral tuberosities are absent and all the zooecia which lack the ovicells have tuberosities with an outer wall and an inner wall with space in between.

Bryozoan-sponge association

An interesting bryozoan-sponge association existed on a big submerged rock (Figure 3). The epibiont bryozoa *T. rozieri* was found to be attached over sponge *Placospongia* sp. which was growing in the downside of the big rock. The mat growth of bryozoan was very thin and transparent, and thus hardly visible on the edge of the colony. Further development of the zooids over the *Placospongia* sp. makes it more easily identifiable *in situ*. However, one end of the colony has extended from sponge surface towards the rock surface. The colony of epizoic *T. rozieri* on the sponge was lengthier and continuous than the colonies on other inert host substrata. At a relatively early stage of colonization of a *T. rozieri* at the edges, the zooidal coating was very thin and transparent, and thus hardly visible on the Porifera surface. Further development of the zooids makes it more easily recognizable *in situ*, especially by the development of a wider whitish skeleton along the middle of the colony.

Discussion

The earliest description of Tropical mid-Pacific *Thalamoporella* was revealed by Soule and Soule (1970). A comprehensive discussion on the systematic, evolution and biogeography of the family *Thalamoporellidae* was made by Soule et al. (1987). A review of worldwide known species after some subsequent reports on species without avicularia, species with rounded avicularium mandibles, and species with acute or sub-acute avicularium mandibles (Soule et al. 1992; Soule et al. 1999) linked the gap in understanding of this interesting genus. In our study from the Andaman Islands, *T. rozieri* was collected from almost all substrata including rocks and shells. Until date, there is no report of the genus *Thalamoporella* from the waters of Andaman Islands. This species was reported earlier from west coast and east coast of India (Menon 1967), in addition to the report of a few another species of *Thalamoporella* like *Thalamoporella hamata*, *Thalamoporella gothica* from those regions. Similarly *T. rozieri* was reported from a few regions of Mediterranean and Red Sea (Jean-Georges 2014). In India, *Thalamoporella* species were also studied in various aspects of Palaeoceanography. Guha and Gopikrishna (2004) and described fifteen new fossil species of *Thalamoporella* from the Tertiary (Lutetian-Burdigalian) sequences of western Kachchh, Gujarat, India.

Figure 2. Encrustation of *Thalamoporella rozieri* on *Placospongia* sp.

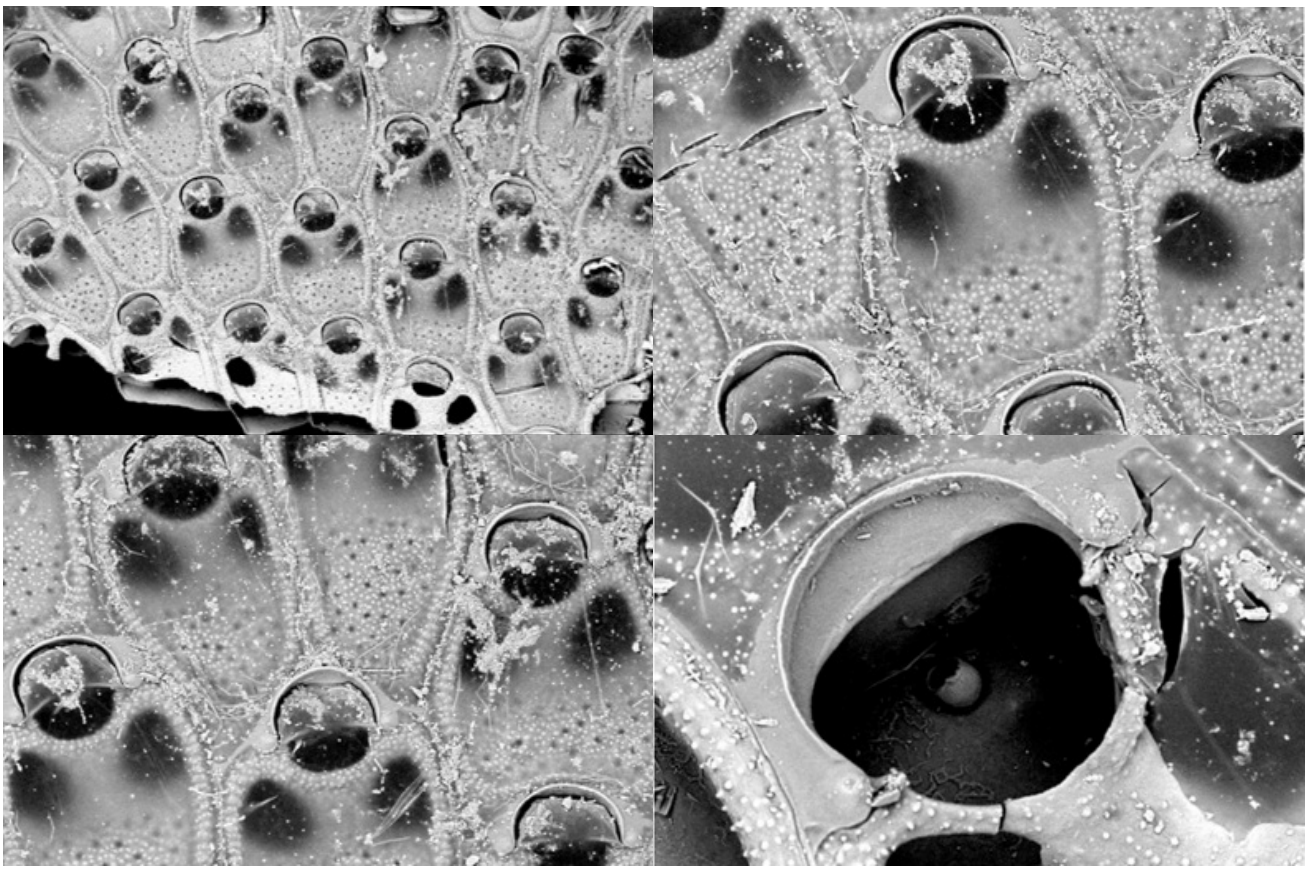

Figure 3. A, Elongated and rectangular zooecia of *Thalamoporella rozieri*; B, Terminal and asymmetrical Opesia; C, Small pores in the proximal region; D, Large adoral tubercles

Table 1. Dimensions of *Thalamoporella rozieri* zooid (in mm).

	Zooid width	Zooid length	Orifice width	Orifice length	Opesiules width	Opesiules length
Number	15	15	15	15	15	15
Min	233.46	132.68	66.91	59.24	56.65	39.10
Max	293.71	194.08	81.99	65.68	81.49	60.34
Mean	259.23	159.20	74.18	62.68	70.41	48.72
SD	18.5	18.63	05.08	02.08	06.80	06.35

Thalamoporella species represent high degree of polymorphism and Fifty- eight species of *Thalamoporella* are narrated by Soule et al. (1992). Using scanning electron microscopy he examined the minute unique to Family *Thalamoporellidae* and be smooth, dense, and uniform in size and configuration. *Thalamoporella* spicules, first described by Levinsen (1909), are minute calcareous structures with the shapes of compasses or calipers. The specimens of *Thalamoporella* collected during Siboga expedition was examined by Harmer (1926) and pointed out the presence of avicularia as an important character. Even though the species observed in the current study does not possess vicarious avicularia, Hincks (1880) has distinguished three forms of this species based on the presence or absence of avicularia, tuberosities, and ovicells. Those forms with avicularia and tuberosities as *Thalamoporella gothica*, a group, with avicularia and ovicells as *Thalamoporella indica* and the third forms with the tuberosities and the ovicells are grouped as *T. rozieri*. Their zooecial size may vary according to the amount of space and competition and the irregularity of the substrate. Jean-Georges (2014) has made an excellent comparative analysis with three *T. rozieri* specimens which are collected from three different zones such as Red Sea, Indian Ocean, and Eastern Mediterranean Sea. His findings state that the species from the Indian Ocean and Mediterranean Sea have got straight to concave and shouldered poster orifice, whereas the poster orifice of *T. rozieri* from the Red Sea was deeply arcuate. Generally, bryozoans do not put up with silt, and colonies were situated on the sides or underneath of shells, coral colonies, rocks, pipes and constructions, where they will not be exposed. The ovicells of *Thalamoporellid* were unique and show only a small amount of variation among the species for which they were known. It's quite noteworthy that, there were a number of species of *Thalamoporella from* our collection in which no ovicells have ever been found, and this may be due to the smallness of fragments of colonies collected.

Bryozoans were common, and often the most abundant, faunal component of epibiota on variety of host substrate, (Key et al. 2013) and most recently Wahl (2009) reported that there were more epizoic bryozoan species than any other group of metazoans. In the present study, the underneath of most of the big rocks was attached by the sponge *Placospongia* sp. and the bryozoan *T. rozieri.* The initial stages of colonization of *T. rozieri* on the *Placospongia* sp. were not observed. But as a substratum, the sponges are much safer zone of accommodation for *T. rozieri*. The sponges settle randomly on the accessible substratum and are not replaced by other organisms. Further settlement of other benthic organisms might have prevented owing to the successful competition by sponges (Keough 1984). The settlement of organisms on the surfaces of living organisms (i.e., epibiosis) can be both gainful and harmful to the host. Production of antifouling substances by symbiotic epibiota (Piel 2004) and supplying the host with sufficient nutrients could be the beneficial part (Faulkner et al. 2000). The disadvantages due to this association include the possible inhibition of growth, necrosis, or death of host organisms (Wahl and Mark 1999). However, both the organisms were appeared to be undisturbed in our study. Sponges were also known to be rich sources of unique and diverse bioactive metabolites that provide potent antibacterial, antifungal, antifeeding, and antifouling protection (Blunt et al. 2003).

The bryozoa-sponge interaction can be also viewed as a mutualistic commensalism. A similar overgrowth pattern of bryozoan on sponges has been narrated by Corriero (2007). Studies are stating that filter-feeding epibionts possibly obtain profit from the nutrient currents created by certain hosts (Ryland 1974). In the present findings, the bryozoa were always exposed over the *Placospongia sp*. Hence one of the greatest hazards in the life of an epibiont will be the danger of falling victim to predators of the substrate organism (Oswald et al. 1984). Occasionally, epibionts seem to be protected by the defensive shield of certain basibionts (Young 1986). As epibionts may fall victim to predators of their substratum, so many basibionts suffer from damage due to grazers preying on epibionts. Bryozoa are among crustose epibiotic forms, thus it reduces the elasticity of its substratum and hinders both motion and flexibility. At the same time, increased brittleness enhances breakage in high turbulent environments. Mechanical anchoring of larger epibionts on the basibionts, as we can see in the present study between epibiont *T. rozieri* and basibiont *Placospongia sp,* occasionally damages soft basibiont surfaces (Dixon et al. 1981). At the same time, there is only limited evidence on the functionality of these compounds in the natural environment against naturally occurring antagonists, such as micro- and macrofoulers.

Our results demonstrate that the Andaman Islands and surrounding regions deserve essential baseline surveys which are still lacking for even some of the better-studied taxa in the world, such as bryozoans. To explore the diversity and ecological activities of bryozoans in this tropical archipelago a detailed study is most vital.

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