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## New records of Indo-Pacific sponges from the Andaman and Nicobar Islands, India

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### Abstract

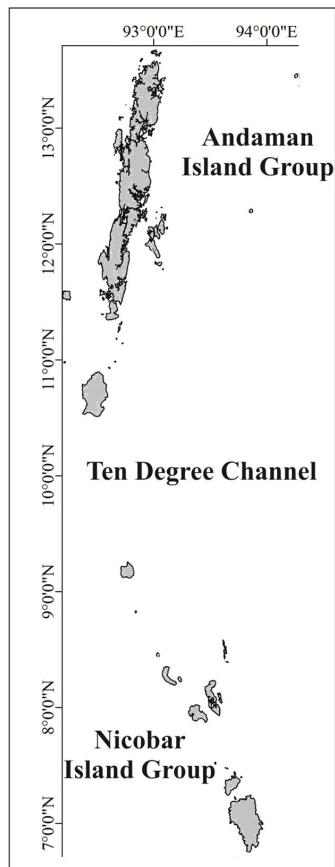
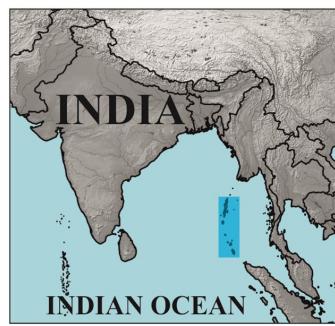
Six Indo-Pacific sponges are recorded for the first time from the Andaman and Nicobar Islands: *Agelas ceylonica* sensu Thomas, 1981, *Axinella donnani* (Bowerbank, 1873), *Dragmacidon australe* (Bergquist, 1970), *Siphonodictyon maldiviense* (Calcinai, Cerrano, Sarà & Bavestrello, 2000), *Clathrina clara* Klautau & Valentine, 2003 and *Plakortis bergquistae* Muricy, 2011. Among them, *D. australe*, *S. maldiviense* and *P. bergquistae* are indeed new records to India. These findings not only represent new additions to sponge fauna of India, but also highlight the importance of markedly overlooked sponge diversity of the Andaman and Nicobar Islands.

**Key words:** Agelasidae; Axinellidae; Calcarea; Clathrinidae; Demospongiae; Homoscleromorpha; Phloeodictyidae; Plakinidae; Porifera

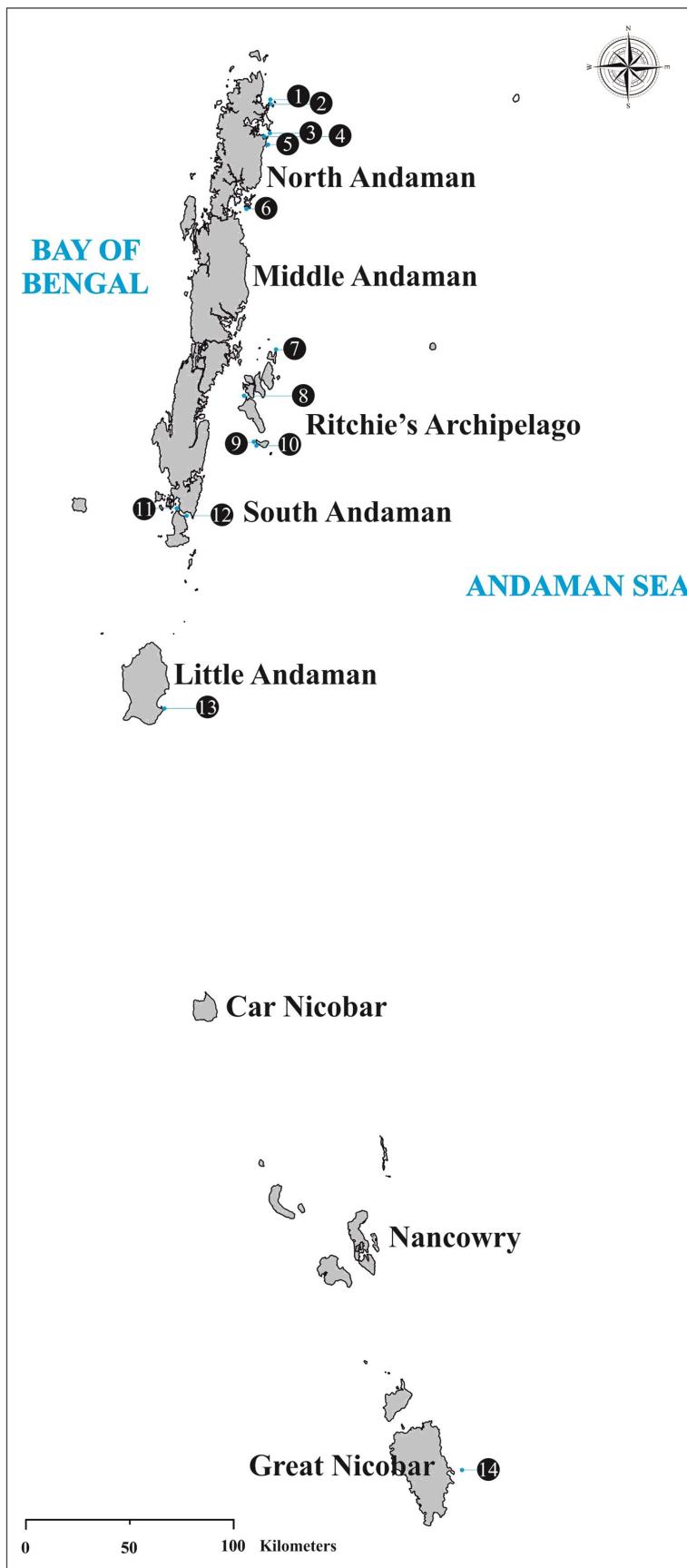
### Introduction

Sponges (Porifera Grant, 1836) of the Andaman and Nicobar Islands are probably one of the most diverse in India, yet have long been overlooked and poorly represented. Taxonomic studies on sponges of these Islands date back to the 19<sup>th</sup> century, when Schulze (1895) described *Hyalonema (Ijimaonema) heideri* Schulze, 1895 from the Andaman Islands in his account of hexactinellids of the Indian Ocean. Though several contributions have been made since then (Schulze 1902, 1904; Annandale 1915; Dendy & Burton 1926; Burton 1928; Burton & Rao 1932; Thomas 1977; Pattanayak 2006), they were very sporadic and knowledge on species composition is still sparse. It is not surprising that recent studies have revealed new records (Immanuel & Raghunathan 2011; Dam Roy *et al.* 2013; Immanuel *et al.* 2015a; Ubare & Mohan 2018; Das *et al.* 2019) and unknown species (Sautya *et al.* 2010; Vinod *et al.* 2012; Ubare & Mohan 2016) from this relatively understudied region.

This report is part of sponge taxonomy and diversity studies conducted at several localities in the Andaman and Nicobar Islands during 2015–2018. A total of six Indo-Pacific sponges are being reported for the first time from the Andaman and Nicobar Islands: *Agelas ceylonica* sensu Thomas, 1981, *Axinella donnani* (Bowerbank, 1873), *Dragmacidon australe* (Bergquist, 1970), *Siphonodictyon maldiviense* (Calcinai, Cerrano, Sarà & Bavestrello, 2000), *Clathrina clara* Klautau & Valentine, 2003 and *Plakortis bergquistae* Muricy, 2011. Among them, *D. australe*, *S. maldiviense* and *P. bergquistae* are new records to India. These newly recorded sponges are distributed among five families in three orders viz., Agelasidae Verril, 1907, Axinellidae Carter, 1875, Phloeodictyidae Carter, 1882 (Demospongiae Sollas, 1885), Clathrinidae Minchin, 1900 (Calcarea Bowerbank, 1862) and Plakinidae Schulze, 1880 (Homoscleromorpha Bergquist, 1978). Taxonomic descriptions for the studied species are provided and their distribution within the Andaman and Nicobar Islands *vis-à-vis* Indo-Pacific according to the marine ecoregions defined by Spalding *et al.* (2007) is discussed.



## ANDAMAN AND NICOBAR ISLANDS



**FIGURE 1.** Map of the Andaman and Nicobar Islands depicting survey localities (n=14) where sponge species occurrences were recorded. See **TABLE 1** for names and geographic coordinates. Map indicating the position of the Andaman and Nicobar Islands in the Indian Ocean on top left was prepared using SimpleMappr.

## Material and methods

### Study area

Andaman and Nicobar Islands ( $06^{\circ}45'$ – $13^{\circ}41'$ N;  $92^{\circ}12'$ – $93^{\circ}57'$ E) [Fig. 1; map indicating the position of the Andaman and Nicobar Islands in the Indian Ocean on top left was prepared using SimpleMappr (Shorthouse 2010)] are the emergent peaks of long ridge that extends from the Arakan-Yoma range of Myanmar to Sumatra of Indonesia in a sub-linear north-south direction (Bandopadhyay & Carter 2017). Flanked by the Bay of Bengal in the west and the Andaman Sea in the east, this archipelago is a chain of more than 500 scattered islands. The Andaman Island group and the Nicobar Island group are separated by the Ten Degree channel which is about 160 km wide (Tikader & Das 1985). Marine Protected Areas in these Islands comprise nine National Parks and 96 island sanctuaries (Laxmilatha *et al.* 2015).

Sponge species were recorded from 14 sub-tidal localities. The survey localities were accessed through a combination of road and motorized boats. The habitats were coral reef with various substrates, *viz.*, rocky, sandy and muddy bottoms. Depths of the surveyed localities ranged from 4–21 m (Table 1).

**TABLE 1.** Geographic coordinates of the survey localities where sponge species occurrences were recorded. The locations are arranged from north to south (see **FIGURE 1**).

No.	Survey localities	GPS coordinates		Depth (m)		
		Latitude (N)	Longitude (E)			
<b>Andaman Island Group</b>						
North Andaman						
1	Tree Islet	$13^{\circ}25.923'$	$93^{\circ}04.666'$	15		
2	Trilby Island	$13^{\circ}25.327'$	$93^{\circ}03.927'$	16		
3	Ross Island	$13^{\circ}17.907'$	$93^{\circ}04.190'$	11		
4	Durgapur	$13^{\circ}16.583'$	$93^{\circ}02.903'$	4		
	Durgapur (site II)	$13^{\circ}16.294'$	$93^{\circ}02.729'$	4		
5	Craggy Island	$13^{\circ}13.611'$	$93^{\circ}03.639'$	7		
Middle Andaman						
6	Sound Island	$12^{\circ}29.469'$	$92^{\circ}57.660'$	7		
Ritchie's Archipelago						
7	Outram Island	$12^{\circ}15.680'$	$93^{\circ}06.510'$	15		
8	Wall (a dive site)	$12^{\circ}03.296'$	$92^{\circ}58.038'$	21		
9	Bus Stop (a dive site)	$11^{\circ}50.195'$	$93^{\circ}00.479'$	20		
10	Natural Bridge	$11^{\circ}49.507'$	$93^{\circ}00.394'$	10		
South Andaman						
11	Pongibalu	$11^{\circ}30.958'$	$92^{\circ}39.201'$	18		
12	Rutland Island	$11^{\circ}30.119'$	$92^{\circ}37.112'$	11		
	Rutland Island (site II)	$11^{\circ}29.365'$	$92^{\circ}40.717'$	10		
Little Andaman						
13	Hut Bay	$10^{\circ}35.549'$	$92^{\circ}33.773'$	16		
<b>Nicobar Island Group</b>						
Great Nicobar						
14	B. Quarry	$07^{\circ}00.105'$	$93^{\circ}57.008'$	13		

### Sampling

Sponge assemblages were sampled from the survey localities by snorkeling/SCUBA diving. The collected specimens were fixed and preserved in 70% isopropyl alcohol and brought to the laboratory. Spicule suspension was

prepared by taking a small fragment of sponge in a test tube and adding few drops of concentrated nitric acid (for Demospongiae and Homoscleromorpha) and 4% sodium hypochlorite (for Calcarea). The test tube was allowed to stand till the tissue dissolved. Distilled water was added and the tube was allowed to stand until all the spicules settled at the bottom. The supernatant was discarded. This process was repeated several times until all the acid/bleach was removed. The spicules were then dehydrated in absolute ethanol. Measurements of the spicules were based on minimum–average–maximum ( $\mu\text{m}$ ) for 30 spicules of each spicule type. For preparation of histological sections, sponge fragments were serially dehydrated in 70% and 100% ethanol for 1–2 hours and then immersed in xylene for 24 hours. The fragments were later immersed in paraffin-xylene for 24 hours and then embedded in paraffin. Sections were made using a razor blade and immersed in xylene for dewaxing. Permanent slides were prepared by mounting the sections and spicules using DPX (Ackers *et al.* 2007; Slaoui & Fiette 2011). Sections were then examined and photographed using a stereo-zoom microscope (make: Leica; model: M205A) and a compound microscope (make: Omax; model: XM82ESC02). The specimens were identified using *Systema Porifera* (Hooper & Van Soest 2002) and World Porifera Database (Van Soest *et al.* 2020). The original descriptions were used for comparing and ascertaining the identity of the species. The specimens were registered and deposited at the National Zoological Collections of Zoological Survey of India, Andaman Nicobar Regional Centre (ZSI/ANRC), Port Blair.

## Results

The classification of the studied sponges follows Van Soest *et al.* (2020). Taxonomic descriptions for all the six species are provided based on the material examined from the Andaman and Nicobar Islands. Synonyms include original description and all the key references.

## Systematics

### Class Demospongiae Sollas, 1885

### Order Agelasida Hartman, 1980

### Family Agelasidae Verril, 1907

### Genus *Agelas* Duchassaing & Michelotti, 1864

#### *Agelas ceylonica* Dendy, 1905 *sensu* Thomas, 1981

(Figures 2A–F)

##### Synonymy:

*Agelas ceylonica* Dendy, 1905: 175, pl. XII, fig. 9; Lévi, 1961: 23, fig. 30, pl. 1. fig. 2; Thomas, 1980: 3, fig. 1e, f; Thomas, 1981: 20, pl. I, fig. 11, pl. II, fig. 6; Thomas, 1985: 205.

**Material examined:** 1 specimen, ZSI/ANRC–20437, June 15, 2018, Outram Island, Ritchie's Archipelago, Coll. Preeti Pereira.

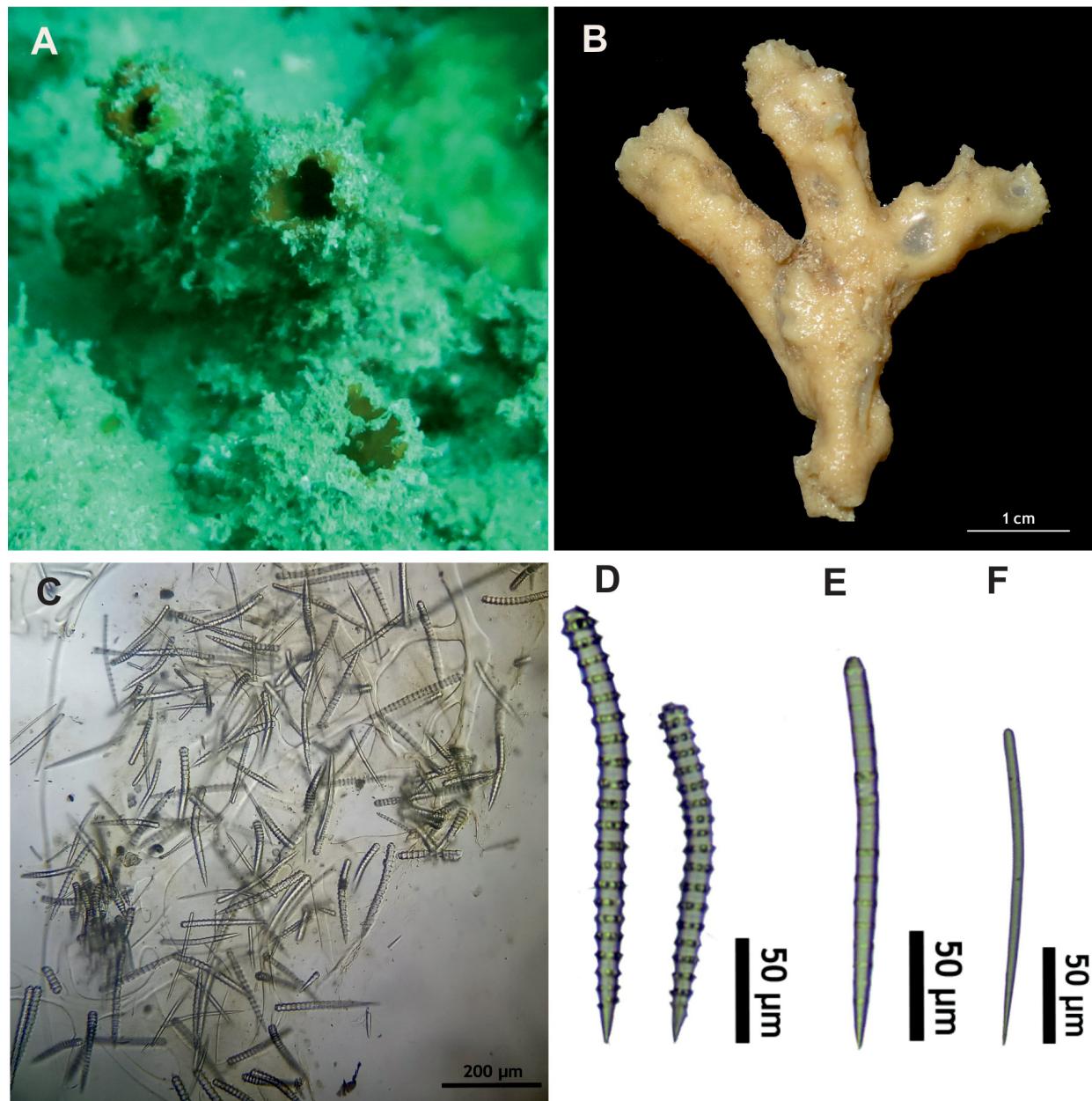
**Description:** Branching sponge with hollow tubes, growing upright from the substrate; the specimen was covered with debris so that only oscules were visible, on brushing off the sediment, bright orange, hispid surface and a thin dermal membrane was recognizable (Fig. 2A); the specimen turned light orange/beige after preservation (Fig. 2B); branches finely hispid, 7 mm in diameter; consistency soft, tough and resilient.

**Skeleton:** Skeleton made up of fine, pale spongin cored by acanthostyles, fibres cored; primary fibres 40–60  $\mu\text{m}$  thick, echinated, secondary fibres 20–30  $\mu\text{m}$  thick; meshes 100–270  $\mu\text{m}$  in diameter; acanthostyles, smooth styles and styles with plain whorls, scattered in the choanosome (Fig. 2C).

**Spicules:** Verticillate acanthostyles (Fig. 2D), styles with smooth whorls (Fig. 2E) and smooth styles (Fig. 2F); acanthostyles 120.0–205.5–276.0  $\times$  7.1–14.2–19.6  $\mu\text{m}$  with 14–21 spine whorls, styles with plain whorls 164.2–194.1–214.4  $\times$  7.5–16.2–12.9  $\mu\text{m}$  with 14–17 smooth whorls, smooth styles 136.3–172.3–211.3  $\times$  2.5–4.4–6.6  $\mu\text{m}$ .

**Distribution:** This is the first report of *Agelas ceylonica* *sensu* Thomas from the Andaman province. Its distribution was restricted to the Western Indo-Pacific realm. It has previously been reported from Sri Lanka (Dendy 1905), South India and Sri Lanka ecoregion in the West and South India shelf province; between the Great Pass and Canal Johny, Cargados Carajos (Lévi 1961), Mahe Island, Seychelles (Thomas 1981) in the Western Indian Ocean province; Minicoy Island (Thomas 1986), Maldives ecoregion in the Central Indian Ocean Islands province.

**Remarks:** The specimen examined from the Andaman and Nicobar Islands differs from the original description in the size of the tubes, colour and the presence of styles as an additional type of spicule. Manconi *et al.* (2016) summarized that the morphological characters of *Agelas ceylonica* are notably variable especially the growth form and colour. The specimen reported herein has a branching growth form with hollow tubes, which is similar to “slender, anastomosing, sub-cylindrical branches” (Dendy 1905) and “cavernous endosome” (Thomas 1981). The bright orange colour differs from the brown (Dendy 1905), pale gray (Thomas 1981), and is in agreement with the orange specimen described by Lévi (1961). The presence of smooth styles with plain whorls was not mentioned in the original description (Dendy 1905), but found by Thomas (1981) when analysing additional specimens. As we found styles with plain whorls, the specimen reported herein is assigned to *Agelas ceylonica* *sensu* Thomas, 1981.



**FIGURE 2.** *Agelas ceylonica* *sensu* Thomas, 1981 (ZSI/ANRC–20437): **A**, *in situ* photograph. **B**, preserved specimen. **C**, tangential view of the skeleton showing spongin and acanthostyles. **D**, acanthostyles. **E**, styles with plain whorls. **F**, smooth style.

## Order Axinellida Lévi, 1953

### Family Axinellidae Carter, 1875

#### Genus *Axinella* Schmidt, 1862

##### *Axinella donnani* (Bowerbank, 1873)

(Figures 3A–D)

###### Synonymy:

*Isodictya donnani* Bowerbank, 1873: 28, pl. VI, figs. 2–6.

*Axinella donnani* (Bowerbank, 1873): Dendy, 1887: 158, pl. XI, fig. 1; Dendy, 1889: 89; Thomas, 1970: 207, fig. 1, 4; Thomas, 1979: 28, pl. II, fig. 3; Thomas, 1981: 29, pl. II, fig. 15, pl. IV, fig. 33; Thomas, 1985: 289.

**Material examined:** 2 specimens, ZSI/ANRC–17049, February 22, 2017, Natural Bridge, Neil Island, Ritchie's Archipelago, Coll. Seepana Rajendra; 2 specimens, ZSI/ANRC–17058, May 12, 2016, Pongibalu, South Andaman, Coll. Preeti Pereira; 2 specimens, ZSI/ANRC–17061, November 17, 2015, Hut Bay Jetty, Little Andaman, Coll. Seepana Rajendra; 1 specimen, ZSI/ANRC–17497, May 28, 2017, Trilby Island, North Andaman; Coll. Seepana Rajendra, 1 specimen, ZSI/ANRC–17504, May 29, 2017, Durgapur (site II), North Andaman, Coll. Naveen Kumar Nigam; 1 specimen, ZSI/ANRC–18068, October 25, 2017, Tree Islet North Andaman, Coll. Preeti Pereira; 1 specimen, ZSI/ANRC–19281, March 19, 2018, Bus Stop (a dive site), Neil Island, Ritchie's Archipelago, Coll. Preeti Pereira.

**Description:** Massive, cup-shaped or funnel-shaped with undulating margins and thick walls, sometimes attached by a stalk to the substratum (Fig. 3A); Surface slightly hispid; colour bright orange when alive and lighter on preservation in iso-propyl alcohol (Fig. 3B); consistency compact and compressible. The sponge measured 7 cm across with a stalk length of 2 cm; ostia not visible, oscules measured 0.2 to 0.4 mm.

**Skeleton:** Ectosome not specialized; choanosomal skeleton made up of strong fasciculate primary fibres often branching into secondary fibres, giving it a confused appearance; spicules interspersed with clear spongin with their ends projecting beyond the ectosome, giving the sponge a lightly hispid appearance (Fig. 3C).

**Spicules:** Styles and oxeas (Fig. 3D).

Styles smooth, thick and slightly curved; Oxeas stout, slightly curved and sharply pointed at both ends. The spicule morphometrics varied greatly among the survey localities (Table 2).

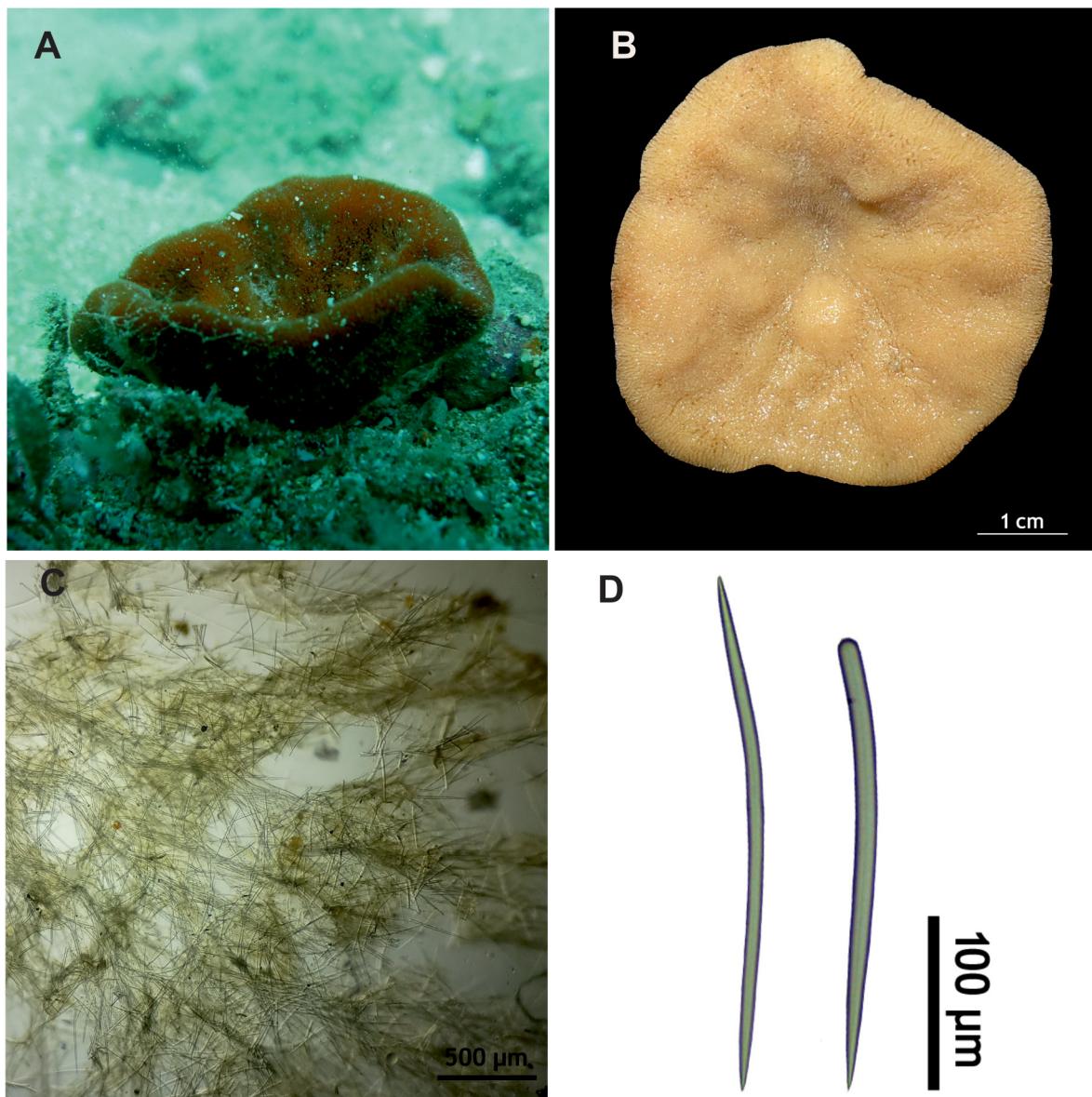
**TABLE 2.** Spicule morphometrics (styles and oxeas) of *Axinella donnani* (Bowerbank, 1873) from the Andaman and Nicobar Islands

Specimen	Locality	Spicule morphometrics ( $\mu\text{m}$ )			
		Styles	Oxeas		
ZSI/ANRC–17049	Natural Bridge, Neil Island, Ritchie's Archipelago	194.0–288.9–343.0 10.9–16.0	× 8.0– 16.0	224.2–278.0–349.9 × 8.0–10.0– 12.2	
ZSI/ANRC–17504	Durgapur, North Andaman	248.0–295.6–350.1 10.0–12.8	× 7.7–	205.0–272.2–334.6 × 7.5–9.6– 12.2	
ZSI/ANRC–19281	Bus Stop, Neil Island, Ritchie's Archipelago	226.5–302.7–362.4 10.0–13.6	× 7.5–	230.8–273.8–317.2 × 7.5–9.9– 12.5	

**Distribution:** *Axinella donnani* is reported herein for the first time from the Andaman province. The type locality of this species is Sri Lanka (Bowerbank 1873) and subsequent records have been made from the Gulf of Mannar (Dendy 1889; Thomas 1970; Thomas 1985) in the West and South Indian Shelf province; Tamil Nadu, Eastern India (Dendy 1887) in the Bay of Bengal province; Tulear, Madagascar (Vacelet & Vasseur 1977), Mahe Island Seychelles (Thomas 1981), Mozambique Channel, Delagao (Thomas 1979), Western and Northern Madagascar in the Western Indian Ocean province. The distribution of this species is restricted to the Western Indo-Pacific realm. Further records of this species in India include Poshetra, Gujarat (Dendy 1916), Gulf of Kutch (Subba Rao & Sastry 2005) and Karnataka (Pattanayak & Mitra 2013).

**Remarks:** The specimens examined in the present study are similar to those described by Bowerbank (1873)

and Thomas (1985). Widely distributed in the western Indo-Pacific, this species was commonly recorded from the shallow water sub-tidal localities of the Andaman group of Islands in depths ranging from 4–20 m.



**FIGURE 3.** *Axinella donnani* (Bowebank, 1873) (ZSI/ANRC–19281): **A**, *in situ* photograph. **B**, preserved specimen. **C**, tangential view of skeleton. **D**, oxea and style.

#### Genus *Dragmacidon* Hallmann, 1917

##### *Dragmacidon australe* (Bergquist, 1970)

(Figures 4A–D)

###### Synonymy:

*Pseudaxinella australis* Bergquist, 1970: 20: 20, Pl 4c, 12c.

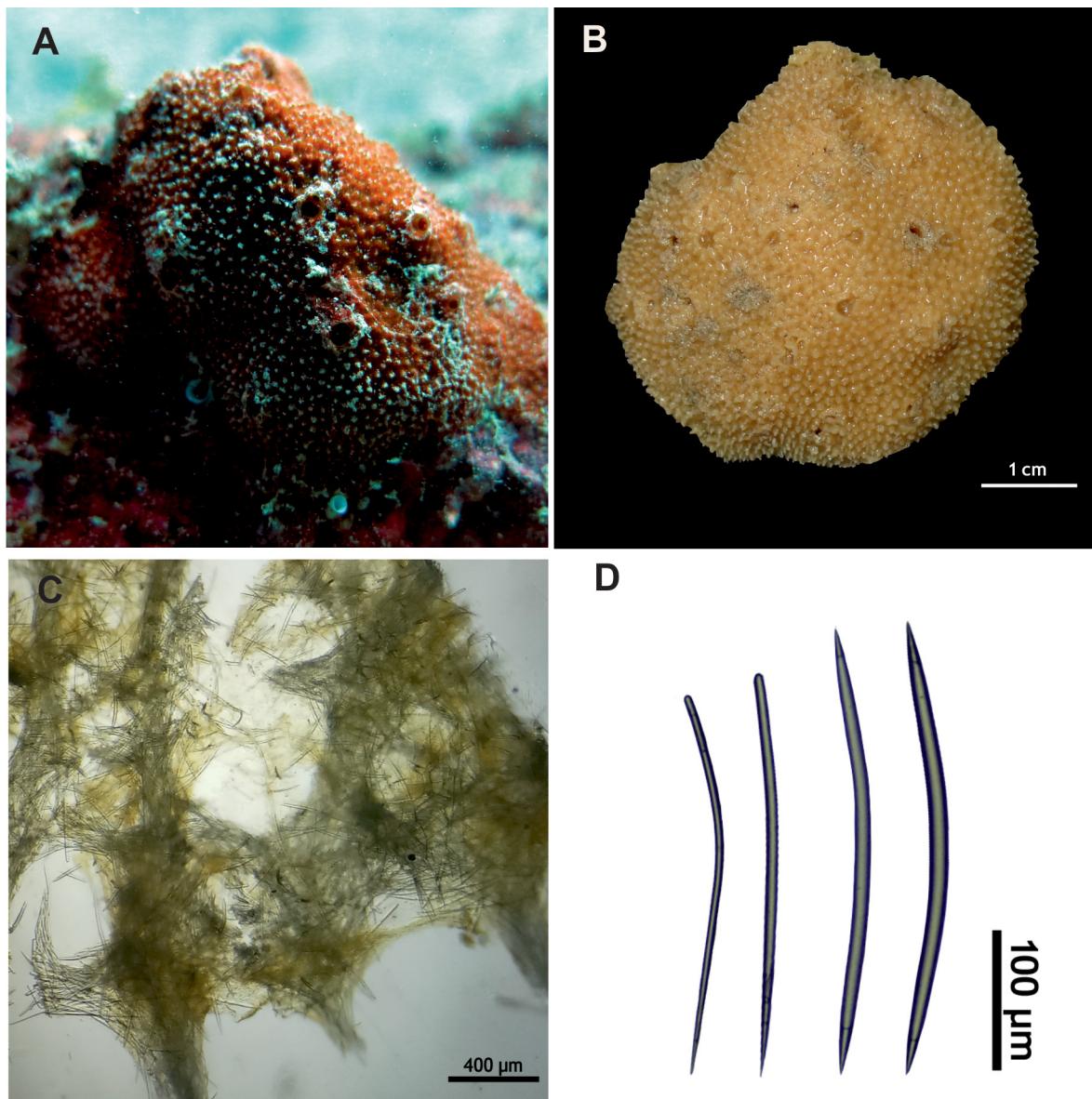
*Dragmacidon australe* (Bergquist, 1970): Alvarez & Hooper, 2009: 27, fig. 7 C–D, 9 A–B; Alvarez, Voogd, & Van Soest, 2016: 457–459, fig. 5.

**Material examined:** 1 specimen, ZSI/ANRC–19927, March 19, 2018, Bus Stop, Neil Island, Ritchie's Archipelago, Coll. Preeti Pereira.

**Description:** Thickly encrusting (Fig. 4A), 5 cm in diameter and 3 cm thick; deep red in colour when alive and

on preservation (Fig. 4B); consistency hard and incompressible; surface brush-like with slightly short and broad conules; oscules conspicuous; 2–4 mm in diameter.

**Skeleton:** The skeleton is made up of thick multi-spicular tracts and forms irregular oval or circular meshes, measuring 100–400 µm in diameter (Fig. 4C). Primary fibres thick, measuring 50–80 µm, densely interspersed with spicules; secondary fibres sparse.



**FIGURE 4.** *Dragmacidon australis* (Bergquist, 1970) (ZSI/ANRC-19927): **A**, *in situ* photograph. **B**, preserved specimen. **C**, tangential view of the skeleton. **D**, styles and oxeas.

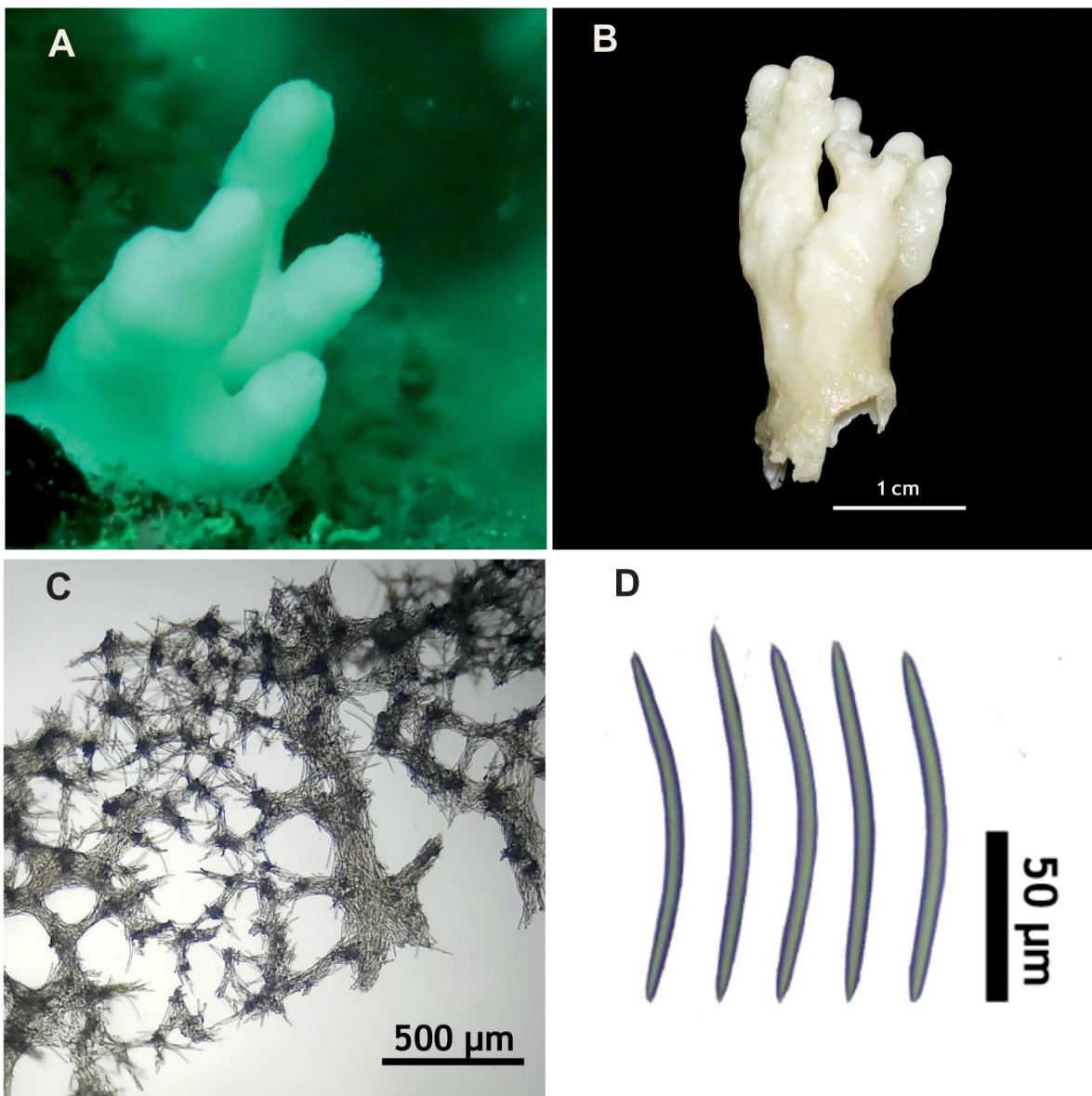
**Spicules:** Styles and oxeas (Fig. 4D).

Oxeas smooth and sharply pointed,  $128.9\text{--}322.7\text{--}373.7 \times 2.9\text{--}10.1\text{--}17.0$  µm.

Styles thin and slightly curved,  $267.6\text{--}305.2\text{--}351.3 \times 4.2\text{--}7.7\text{--}14.3$  µm.

**Distribution:** Originally described from New Zealand, Temperate Australasia realm by Bergquist (1970), *Dragmacidon australis* was subsequently recorded from Northern Great Barrier Reef, Northern Australia, Cartier Island, Sahul Shelf of the Northeast Australian Shelf and Sahul Shelf provinces in the Central Indo-Pacific realm (Hooper & Levi 1993). Alvarez & Hooper (2009) extended the distribution range of this species to the Northern Australia in their revision of Axinellids and stated that it is “probably at the edge of its range”. However, its distribution was further extended towards the Western Coral Triangle and possibly to Sunda Shelf in the Central Indo-Pacific realm (Alvarez *et al.* 2016). The current report confirms its extension into the Andaman province of the West Indo-Pacific realm.

**Remarks:** At present, *Dragmacidon australe* is known from a single specimen from Ritchie's Archipelago in the Andaman Islands. This specimen examined herein was found to be very similar to the species described from New Zealand by Bergquist (1970).



**FIGURE 5.** *Siphonodictyon maldiviense* (Calcinai, Cerrano, Sarà & Bavestrello, 2000) (ZSI/ANRC–20961): A, *in situ* photograph. B, preserved specimen. C, tangential section of ectosomal skeleton. D, oxeas.

#### Order Haplosclerida Topsent, 1928

#### Family Phloeodictyidae Carter, 1882

#### Genus *Siphonodictyon* Bergquist, 1965

***Siphonodictyon maldiviense* (Calcinai, Cerrano, Sarà & Bavestrello, 2000)**  
(Figures 5A–D)

##### Synonymy:

*Aka maldiviensis* Calcinai, Cerrano, Sarà, & Bavestrello 2000: 217, fig. 15; Calcinai, Cerrano, & Bavestrello, 2007: 1363, fig 4F–H & 6.

**Material examined:** 2 specimens, ZSI/ANRC–20961, June 19, 2018, Wall (a dive site), Havelock Island, Ritchie's Archipelago, Coll. Preeti Pereira; 1 specimen, ZSI/ANRC–20965, May 26, 2017, Craggy Island, North Andaman, Coll. Preeti Pereira; 1 specimen, ZSI/ANRC–20969, May 28, 2017, Trilby Island, North Andaman, Coll. Preeti Pereira; 1 specimen, ZSI/ANRC–20979, October 25, 2016, Durgapur (site I), North Andaman, Coll. M.P. Goutham-Bharathi; 1 specimen, ZSI/ANRC–20984, February 24, 2018, Ross Island, North Andaman, Coll. Smitanjali Choudhury; 1 specimen, ZSI/ANRC–20989, September 11, 2018, Sound Island, Middle Andaman ( $12^{\circ}29.469'N$ ,  $92^{\circ}57.660'E$ ), Coll. Naveen Kumar Nigam.

**Description:** The sponge was found boring corals and the description is based only on fistules; fistulae projecting from the surface of substratum (2–3 cm in height and 0.5–0.9 cm in breadth) and are poly-tomously branched and tapering (Fig. 5A); fistulae white when alive, retaining the colour after preservation (Fig. 5B); consistency firm, almost brittle; oscules and ostia not visible.

**Skeleton:** The ectosomal skeleton is arranged in triangular meshes, 50–80  $\mu\text{m}$  in diameter (Fig. 5C). The meshes are bounded by thick multi-spicular tracts comprising bundles of oxeas, with few oxeas projecting outside the fibres.

**Spicules:** Short, stout, hastate oxeas (Fig. 5D). See Table 3 for spicule morphometrics.

**TABLE 3.** Spicule morphometrics (oxeas) of *Siphonodictyon maldiviense* (Calcinai, Cerrano, Sarà & Bavestrello, 2000) from the Andaman and Nicobar Islands

Specimen	Locality	Spicule morphometrics ( $\mu\text{m}$ )
		Oxeas
ZSI/ANRC – 20961	Havelock Island, Ritchie's Archipelago	120.3–138.3–149.8 × 5.2–7.3–8.6
ZSI/ANRC – 20965	Craggy Island, North Andaman	124.1–135.0–145.1 × 4.6–6.7–8.5
ZSI/ANRC – 20989	Sound Island, Middle Andaman	117.4–130.4–146.6 × 6.6–8.0–9.6

**Distribution:** This is the first record of *Siphonodictyon maldiviense* for Indian waters from the Andaman Nicobar Islands. This species was originally described by Calcinai *et al.* (2000) from Maldives in the Central Indian Ocean Islands province, Western Indo-Pacific realm. Lim *et al.* (2008) extended its distribution to the Sunda shelf in the Central Indo-Pacific realm.

**Remarks:** *Siphonodictyon maldiviense* is the second species of the genus *Siphonodictyon* to be reported from the Andaman and Nicobar Islands. Despite recorded from several localities in the Andaman Island group (n=6), spicule morphology of this species did not vary greatly spatially.

## Class Calcarea Bowerbank, 1862

### Subclass Calcinea Bidder, 1898

#### Order Clathrinida Hartman, 1958

##### Family Clathrinidae Minchin, 1900

##### Genus *Clathrina* Gray, 1867

##### *Clathrina clara* Klautau & Valentine, 2003

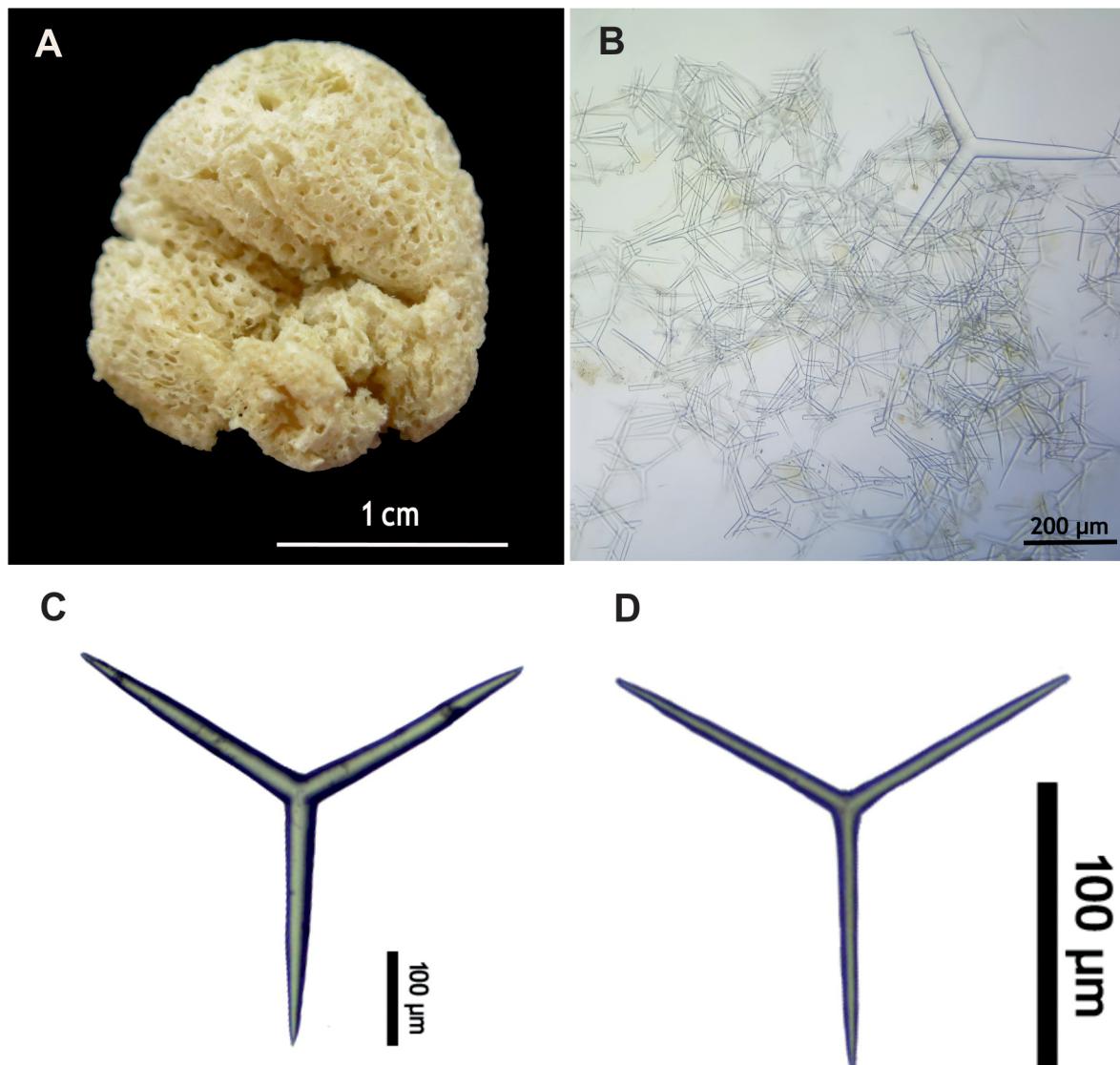
(Figures 6A–D)

Synonymy:

*Clathrina clara* Klautau & Valentine 2003: 46–47, fig. 39; Veena and Laxmilatha 2011: 2–3, fig. 1, 2

**Material examined:** 1 specimen, ZSI/ANRC–20973, September 15, 2017, Rutland Island (site I), South Andaman, Coll. Preeti Pereira.

**Description:** Encrusting on the undersurface of rocks shaded from sunlight; the specimen examined comprised a thin network of loosely anastomosed tubes. Water-collecting tubes are present, with raised oscula (0.5 cm high and 1cm wide); specimen colour white when alive and on preservation (Fig. 6A); consistency soft and fragile.

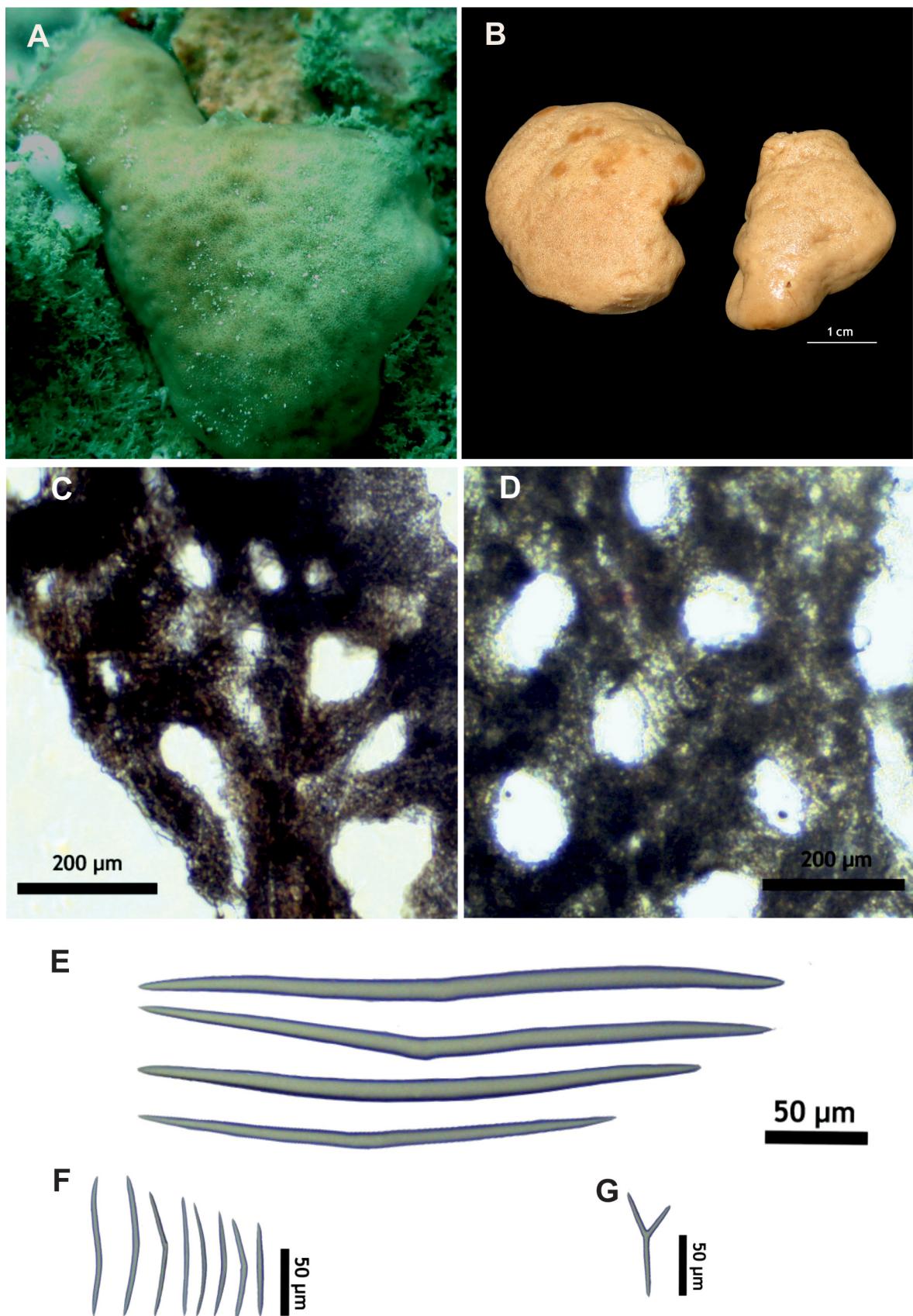


**FIGURE 6.** *Clathrina clara* Klautau & Valentine, 2003 (ZSI/ANRC-20973): **A**, preserved specimen, **B**, microscopic view of a fragment of cormus. **C**, giant triactine. **D**, smaller triactine.

**Spicules:** The spicules are equiangular and equiradiate triactines in two size categories (Fig. 6B); actines smooth, conical, with sharp ends. Larger triactines (Fig. 6C) measuring  $154.8\text{--}213.2\text{--}275.4 \times 21.5\text{--}24.9\text{--}31.2 \mu\text{m}$ , smaller triactines (Fig. 6D) measuring  $60.6\text{--}97.2\text{--}130.1 \times 3.3\text{--}6.6\text{--}9.2 \mu\text{m}$ .

**Distribution:** *Clathrina clara* is being reported for the first time from the Andaman and Nicobar Islands in the Andaman province. Originally described by Klautau & Valentine (2003) from Christmas Island, Java Transitional province, this species has been known from Vishakapatnam, Bay of Bengal province (Veena & Laxmilatha 2011). *Clathrina clara* is an Indo-Pacific species and its distribution range is restricted to the Central-west Indo-Pacific realm.

**Remarks:** At present, *Clathrina clara* is known only from a single specimen from South Andaman. The specimen reported herein has retained its colour on preservation in isopropyl alcohol as opposed to colour change from white to brown in holotype as noted by Klautau & Valentine (2003).



**FIGURE 7.** *Plakortis bergquistae* Muricy, 2011 (ZSI/ANRC-20445): A, *in situ* photograph, B, preserved specimen. C, tangential view of ectosome and choanosome. D, cross sectional view of choanosome. E, F, diods of different sizes. G, triod.

## Class Homoscleromorpha Bergquist, 1978

### Order Homosclerophorida Dendy, 1905

#### Family Plakinidae Schulze, 1880

##### Genus *Plakortis* Schulze, 1880

###### *Plakortis bergquistae* Muricy, 2011

(Figures 7A–G)

Synonymy:

*Plakortis bergquistae* Muricy, 2011: 311–313, fig. 7.

**Material examined:** 2 specimens, ZSI/ANRC–20445, February 20, 2016, B. Quarry, Great Nicobar Island, Coll. Sudhanshu Dixit; 1 specimen, ZSI/ANRC–20971, July 21, 2018, Rutland Island (site II), South Andaman, Coll. Preeti Pereira.

**Description:** Thickly encrusting sponge forming cushions, 4 cm in length and thickness up to 2 cm; colour of the specimen dark brown (Fig. 7A) when alive and light brown (Fig. 7B) in isopropyl alcohol; surface smooth and irregular; consistency soft and compressible; oscules raised when alive, become flush with the surface on preservation.

**Skeleton:** Ectosome not clearly differentiated from the choanosome; skeleton reticulate, forming irregular/circular meshes, 80–275 µm in diameter (Fig. 7C & 7D).

**Spicules:** Diods and triods; diods abundant, some straight or slightly curved, smooth, thickened at the centre and in two size categories (Fig. 7E & 7F). I: 61.0–104.1–169.7 × 2.1–4.2–6.5 µm; II: 182.5–240.1–315.1 × 5.8–8.1–10.7 µm; triods smooth, with all actines of equal length (Fig. 7G); 20.5–40.5–60.0 × 2.4–3.5–4.8 µm.

**Distribution:** This species is reported herein for the first time in Indian waters from the Andaman and Nicobar Islands. The type locality of this species is north Sulawesi in the West Coral Triangle province and has also been described from Western Australia, Northwest Australian Shelf province (Muricy 2011). The current report extends the distribution of this species to the Andaman province and also the West Indo-Pacific realm.

**Remarks:** *Plakortis bergquistae* is the third species of the genus *Plakortis* to be reported from the Andaman and Nicobar Islands. It differs from its congeners, *P. badabaluensis* Ubare & Mohan, 2016 (originally described from Badabalu of South Andaman) and *P. communis* Muricy, 2011 in spicule morphology as the former has a single size category of diods (vs. two size categories of diods based on thickness) while the latter has smaller diods and triods in a size range (vs. larger diods and triods).

## Discussion

The present report of six new records of sponges is significant as it adds to the diversity of the islands that are already known to harbour rich poriferan diversity (Immanuel *et al.* 2015b; Pereira & Raghunathan 2018). Distribution of the studied species within the Andaman and Nicobar Islands and their wider geographic distribution in the Indo-Pacific based on literature are depicted in Fig. 8. At present, the newly recorded sponges are restricted to 14 localities in the Andaman and Nicobar Islands (13 from the Andaman Island group and one from the Nicobar Island group). Three species *viz.*, *Agelas ceylonica sensu* Thomas, *Dragmacidon australe* and *Clathrina clara* were rare (known from single specimens) and recorded only from the Andaman Island group. Nevertheless, the scale of surveys is not adequate for authenticating the distribution precisely and the studied sponges might probably have a wider geographic distribution in the Islands.

Although a large number of studies have been carried out in Andaman and Nicobar Islands and India as a whole, most recent publications deal with checklists of species providing no scope for ascertaining the validity of the listed species. Understanding the species composition of any biogeographic region is imperative for devising conservation and monitoring programmes (Bell 2008), and unfortunately due to complexity in taxonomic identification, a large number of sponge species in the Islands are misidentified, undescribed or their locality uncertain.



**FIGURE 8.** Distribution of the newly recorded sponges. **A**, Andaman and Nicobar Islands. **B**, Indo-Pacific.

The knowledge of sponge species composition of the Andaman and Nicobar Islands continue to increase and the current study underscores the importance of markedly overlooked sponge diversity of the Islands. A greater effort dealing with taxonomy of sponges of this diverse locality and larger and unbiased sampling efforts notwithstanding the geographical isolation of the islands will reveal the exact species composition and authentic data for the distribution range of Indo-Pacific sponges.

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## Conflict of Interest

On behalf of the co-author, the corresponding author states that there is no conflict of interest.

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