

A new record of photosymbiotic ascidians from Andaman & Nicobar Islands, India

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Photosymbiotic ascidian fauna were surveyed in the intertidal and subtidal zone off Andaman and Nicobar Islands in India. A total of four species, *Didemnum molle*, *Diplosoma simile*, *Lissoclinum patella* and *Trididemnum cyclops*, were newly recorded in India. Clean waters in Andaman and Nicobar Islands probably provide a better environment for the growth of photosymbiotic ascidians and this area has a greater variety of these ascidians than the other areas in India and all of the observed species are potentially widely distributed in Coco-Channel, Andaman Sea, Great Channel and Bay of Bengal coral reefs.

[**Keywords:** Photosymbiotic, Intertidal, Sub tidal, Islands, Coral reefs]

Introduction

A number of tropical species have obligate symbioses with chlorophyll-containing cells. Supplementary tropical species at times have patches of non-obligate symbionts, habitually *Prochloron*, on the surface¹. This is an exclusive symbiotic system from the viewpoints of evolution and ecology. Hence researchers of biochemical and pharmaceutical science have also paid particular attention to photosynthetic ascidians as resources of bioactive compounds². Regarding 30 species in 4 didemnid genera (*Didemnum*, *Diplosoma*, *Lissoclinum*, and *Trididemnum*) have been recorded as host species worldwide³. Though, the ranges of distribution of individual species are less understood as few records of photosymbiotic ascidians exist^{3, 4}. To date, photosymbiotic ascidians have no report from India. From Andaman & Nicobar Islands, four species of Photosymbiotic ascidians are collected during an expedition. The specimens were collected by scuba diving. All the four Photosymbiotic ascidians are newly recorded species, *Didemnum molle* (Herdman, 1886),

Diplosoma simile (Sluiter, 1909), *Lissoclinum patella* (Gottscholdt, 1898) and *Trididemnum cyclops* (Michaelsen, 1921) are widespread in Indian waters. Andaman and Nicobar Islands have a coastline of 900n km with 572 islands surrounded by Coco-Channel, Andaman Sea, Great Channel and Bay of Bengal. The advantageous geographic position of this region provides a compassionate atmosphere for a great deal of marine organisms. Between 5 and 12 m, ascidians appear to be the dominant group, because there is a group of idle areas of rock apposite for them. Present study consist the morphologic as well as the taxonomic characters of four newly recorded species from Andaman & Nicobar Island.

Materials and Methods

Samples were collected by scuba diving and snorkeling in the Andaman & Nicobar Islands (6°-14° N and 91°-94° E) on August 2013 (Fig. 1). Ascidian colonies were photographed *in situ* before being collected. Colonies were subsequently anesthetized with menthol and 0.37

M $MgCl_2$ for approximately 2 hours and then fixed with 10% formalin-seawater. Ascidian taxa were mainly identified following Kott, Hirose and Su^{3,5}. The work by Shenkar was also consulted for synonyms⁶. The specimens were deposited in the Marine Biology Reference Museum (NBRM) and Ascidian Museum Database (AMD), Tamil Nadu, India.

Results

Morphological and taxonomical characters of the newly recorded species and distribution of photosymbiotic ascidians in Andaman and Nicobar Islands (Table 1) are described below.

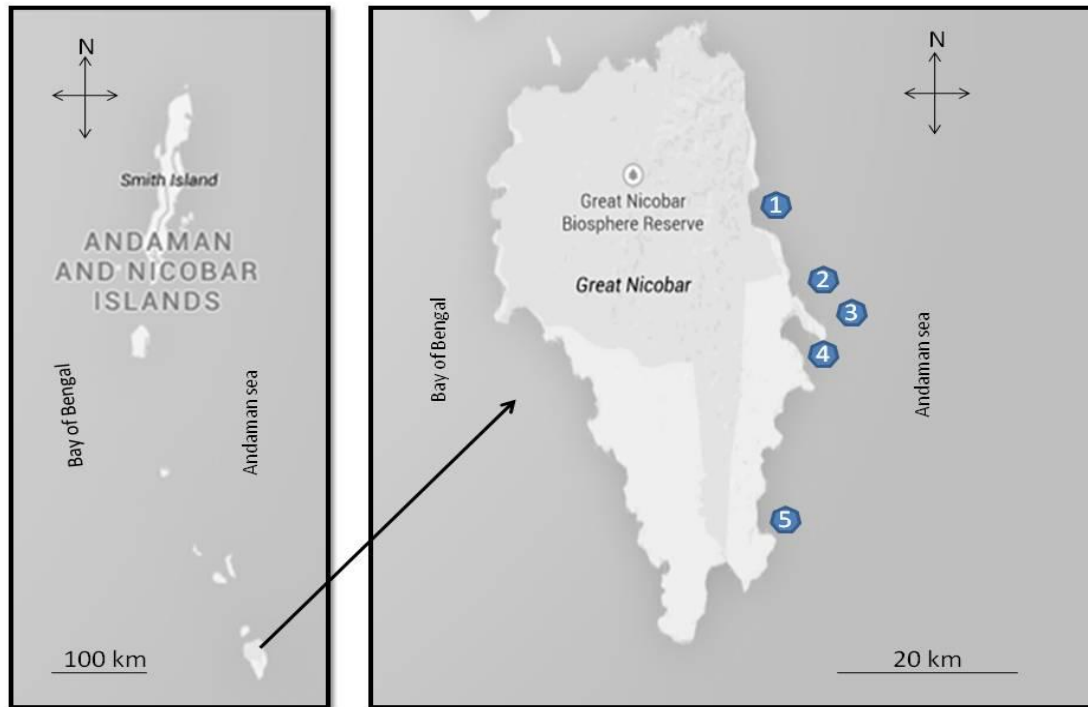


Figure 1. Distribution records of photosymbiotic ascidians in Andaman and Nicobar Islands.

Table 1. Distribution records of photosymbiotic ascidians in Andaman and Nicobar Islands.

Location	1. Afrabay	2. Laxman Beach	3. Bquary	4.Cambelbay	5. Gandhi Nagar
<i>Didemnum molle</i>	-	+	-	-	+
<i>Diplosoma simile</i>	-	+	-	+	-
<i>Lissoclinum patella</i>	+	-	-	+	-
<i>Trididemnum cyclops</i>	-	-	+	-	+

Didemnum molle Herdman, 1886 (Fig. 2A-D)

Systematic Position

Phylum: Chordate
Subphylum: Tunicata
Class: Ascidiacea
Order: Enterogona
Suborder: Aplousobranchia
Family: Didemnidae

Synonyms

Diplosomoides molle Herdman, 1886
Leptoclinum molle (Herdman, 1886)
Lissoclinum molle (Herdman, 1886)
Didemnum ternatanum (Van Name, 1918)
Didemnum sycon Michaelsen, 1920

Specimen: MBRM and AMD. Asc. 47

Collection site: Bquary (7° - 01° N & 93° - 95° E) and Afrabay (7° - 09° N & 93° - 89° E) subtidal coral reef at about 8 m in depth.

Remarks: The species is readily identified by its colonies are a dome form, small spicules (Fig. 2D), presence of *Prochloron* and the enormous amounts of mucus generated by living colonies every time disturbed. Zooids, the atrial aperture is

wide exposing most of the perforated pharynx directly to the cloacal cavity were found (Fig. 2B).

Distribution: Northern Territory, Western Australia, Queensland, Martha Ridgeway Reef, Western Pacific, Indonesia, Guam, Fiji, Vietnam and Maldives.

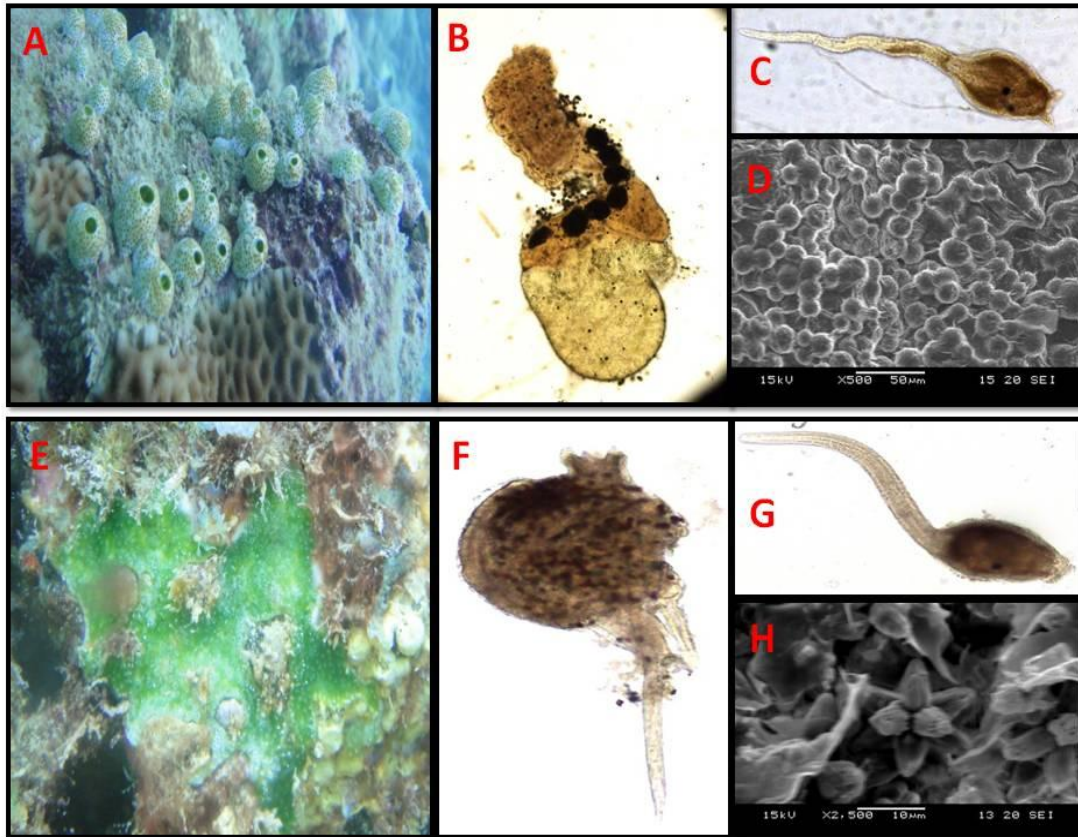


Figure 2. A: *Didemnum molle*, B: Zooid, C: Larva, D: Spicules and E: *Diplosoma simile*, F: Zooid, G: Larva, H: Spicules.

Diplosoma simile Sluiter, 1909 (Fig. 2E-H)

Systematic Position

Phylum: Chordate
Subphylum: Tunicata
Class: Ascidiacea
Order: Enterogona
Suborder: Aplousobranchia
Family: Didemnidae

Synonyms

Leptoclinum simile (Sluiter, 1909)
Diplosoma similis (Kott, 1980)
Diplosoma virens (Eldredge, 1967)
Leptoclinum midori (Tokioka, 1954)

Diplosoma midori (Kott, 1980)

Specimen: MBRM and AMD. Asc. 48

Collection site: Bquary (7° - 01° N & 93° - 95° E) and Gandhi Nagar (6° - 87° N & 93° - 90° E) intertidal death coral.

Remarks: Colonies form robust encrusting sheets, green colour affected by the presence of the *Prochloron* in the common cloacal cavity. Zooids are conspicuous sphincter muscle and six

triangular lobes. Four rows of six stigmata are in the branchial sac (Fig. 2F).

Distribution: Western Australia, Queensland, Western Pacific, Philippines, Central Pacific, Indonesia, Singapore and Japan.

***Lissoclinum patella* Gottschaldt, 1898 (Fig. 3A-D)**

Systematic Position

Phylum: Chordate

Subphylum: Tunicata

Class: Ascidiacea

Order: Enterogona

Suborder: Aplousobranchia

Family: Didemnidae

Synonyms

Didemnoides patella (Gottschaldt, 1898)

Didemnum patella (Michaelsen, 1920)

Leptoclinum patella (Kott, 1962)

Didemnoides ternatanum (Gottschaldt, 1998)

Specimen: MBRM and AMD. Asc. 49

Collection site: Campbell Bay (7° - 002° N & 93° - 91° E) and Gandhi Nagar (6° - 87° N & 93° - 90° E) subtidal coral reef at about 9 m in depth.

Remarks: Colonies form greenish-grey masses, large larvae (Fig. 3C) and zooids, long branchial siphon, false siphons (Fig. 3B) and the great rang in spicule diameter are distinctive (Fig. 3D). *Prochloron* cells were distributed within the common cloacal cavity.

Distribution: Western Australia, Queensland, Coral Sea, Indonesia, Philippines and French Polynesia.

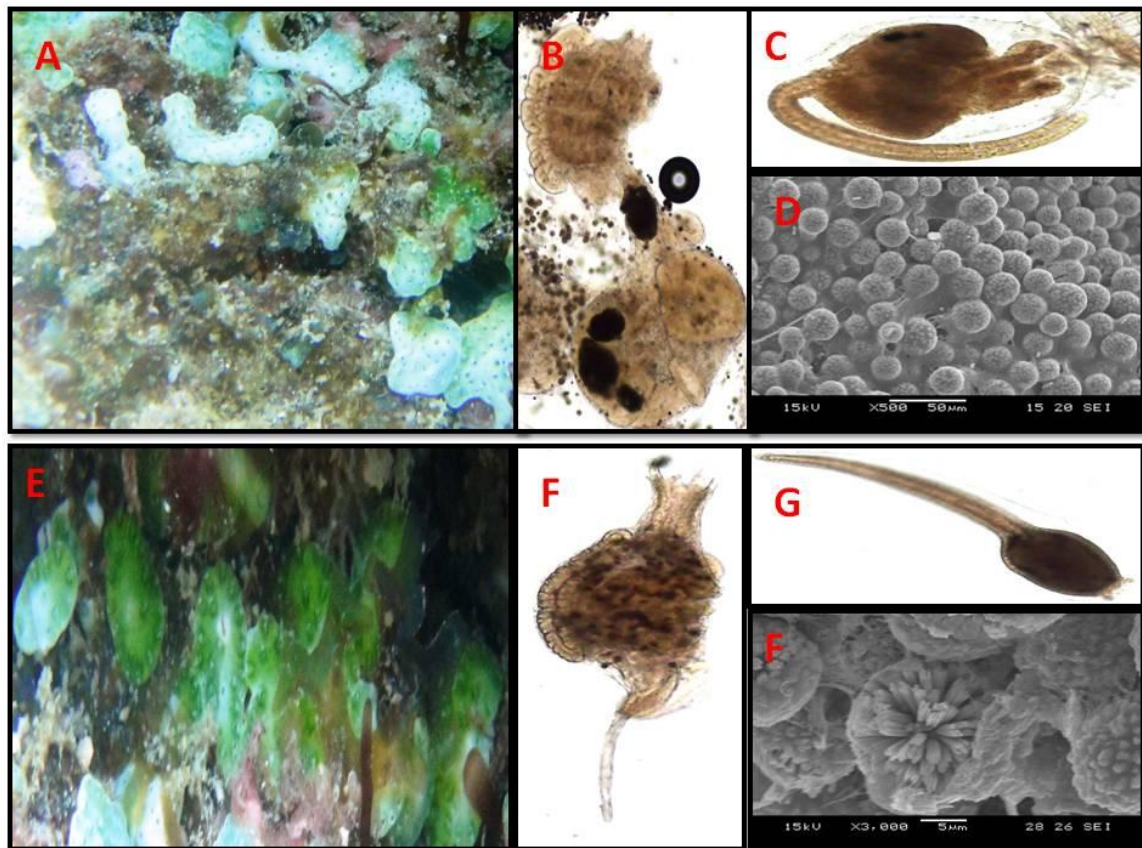


Figure 3. A: *Lissoclinum patella*, B: Zooid, C: Larva, D: Spicules and E: *Trididemnum cyclops*, F: Zooid, G: Larva, H: Spicules.

Trididemnum cyclops* Michaelsen, 1921 (Fig. 3E-H)Systematic Position*

Phylum: Chordate
Subphylum: Tunicata
Class: Ascidiacea
Order: Enterogona
Suborder: Aplousobranchia
Family: Didemnidae

Synonyms

Trididemnum symbioticum (Peres, 1962)

Specimen: MBRM and AMD. Asc. 50

Collection site: Laxman Beach (7° - 00° N & 93° - 95° E) Afrabay (7° - 09° N & 93° - 89° E) subtidal coral reef at about 8 m in depth.

Remarks: Colonies are small, oval flat-topped cushions usually less than 1cm long. Prochloron cells are in the thoracic cloacal cavity. Each zooid has a black dot, due to a pigment mass at the top of the endostyle (Fig. 3F). The biased distribution of the spicules (Fig. 3H) allows the symbionts to receive sunlight for photosynthesis.

Distribution: Western Australia, Queensland, Northern Territory, New Caledonia, Philippines, Singapore and French Polynesia.

Discussion

Four photosymbiotic ascidians were recorded in the present survey. Among the four species, *Didemnum molle*, *Diplosoma simile*, *Lissoclinum patella* and *Trididemnum cyclops* were originally described from the Andaman and Nicobar Islands and this report is the first to record these species of the India. Present records significantly expand our understanding of their range of distribution. The five species listed here may be distant from the entire coverage of the photosymbiotic ascidians fauna in India, because the present survey was conducted over a very short period of time and at only five sites. It is expected that more species motionless remain to be recorded. These species are to be expected distributed in the India Sea, considering that they are commonly found in coral reefs. The recognition and identification of species are frequently important in field studies dealing with biodiversity, and we expect that the present report will be helpful in expectations surveys and field

courses in this area. Further species, together with undescribed species, are potentially distributed around Andaman and Nicobar Islands, taking into account its location within a biodiversity hot spot. Therefore, additional extensive surveys are necessary to characterize the photosymbiotic ascidians fauna in this region.

Key to species of photosymbiotic ascidians recorded from India

1. Colony upright, vase-shaped, conspicuous quantity of mucus secreted when disturbed.....
..... *Didemnum molle*
2. Colonies large, sheet-like with numerous systems..... 1
3. *Prochloron* in common cloacal cavity..... 1, 4, 5, 7
4. Retractor muscle free from posterior end of thorax..... *Diplosoma simile*
5. Systems of zooids opening into deep pits thick, gelatinous surface test.....
..... *Lissoclinum patella*
6. Endostylar pigment cap present.....
.. 7
7. Vas deferens coils 6 times
.....
..... *Trididemnum cyclops*

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