New records of three styelid ascidians (Order: Stolidobranchia) to Indian waters from Andaman and Nicobar Islands

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The present paper deals with three species of styelid ascidians such as *Polycarpa papyra* Kott, 1985 in which no endocarp found in the gut loop whereas, numerous small endocarps are present in the body wall, *Polycarpa argentata* (Sluiter, 1890) in which gonads arrangement is confined in the ventral half of the body with large flat topped endocarp enclosed in the gut loop and *Symplegma rubra* Monniot, 1972 characterized by a red ring encircled both the siphons, which are reported for the first time to Indian waters from Andaman and Nicobar Islands.

Keywords: Styelidae; New record; Andaman and Nicobar Islands

Introduction

The ascidians under the Family Styelidae belong to the Class Asciidiacea and Order Stolidobranchia represent both solitary and colonial species. Colonial members of this family are diverged as they represent zooids embedded in common test and form encrusting sheet like structure while on the other hand zooids can be connected by only stolons. Some members of this group are aggregated such a way that they can be thought as colonial species but they do not have any connections among them. Literatures on ascidian fauna are scanty although the highly diversified reef ecosystem, mangrove ecosystem and sea-grass ecosystem provide a favorable condition to grow ascidians in Andaman and Nicobar Islands. Ascidians are well known animals from the era of Aristotle. A total of about 2900 species of ascidians were recorded across the world’s ocean while 429 species were recorded from Indian waters till now of which 37 species are styelid. Andaman and Nicobar Islands represented 8 species of styelid ascidians. Oka reported two ascidians from Andaman and Nicobar Islands from the collections of R.I.M.S. Investigator. Styelid ascidians are easily noticeable undersea while some of the colonial species are observed under the rocks. Among the styelids, no non-indigenous species are reported from Andaman and Nicobar Islands till now. The present study reported three species of styelid ascidians, among them *Polycarpa papyra* Kott, 1985 and *Polycarpa argentata* (Sluiter, 1890) are solitary and *Symplegma rubra* Monniot, 1972 is colonial in nature and all are new record to Indian waters. The morphological and anatomical features along with the distribution of these three newly recorded styelid ascidians are given in detail.

Materials and Methods

Andaman and Nicobar Islands comprised of 572 islands, islets and rocky out crops of the low mountain chain. This region has enriched biodiversity with the various marine and terrestrial ecosystems. Ascidians were collected during undersea faunal surveys in Andaman and Nicobar Islands (Fig. 1) from August, 2014 to December, 2015 by Self Contained Underwater Breathing Apparatus (SCUBA) diving. Craggy Island is a patchy reef area with sandy bottom (Fig. 2a & b), Hut Bay Jetty, Little Andaman Island is a sandy bottom area with a very few settlement of hard corals and the pillar of the jetty is fouled with diverged marine fauna (Fig. 2c & d) while Trinket Island also represents the similar type of topographical pattern like Craggy Island (Fig. 2e & f). Collected specimens were defecated and narcotized with magnesium sulphate and menthol crystals respectively followed by washing in fresh seawater. The narcotized specimens were preserved in 4% formaldehyde prepared with seawater. Dissections of the specimens were done under Labomed CZM4 stereo zoom microscope and digitized under Leica M205A DFC 500 stereo zoom microscope.
Identification was made by following literature of Kott and Monniot using key identification characters.

**Results & Discussion**

Subphylum TUNICATA Lamarck, 1816  
Class ASCIDIACEA Blainville, 1824  
Order STOLIDOBRANCHIA Lahille, 1886  
Family STYELIDAE Sluiter, 1895  
Genus Polycarpa Heller, 1877  
1. Polycarpa papyra Kott, 1985 (Fig. 3)  
Material examined: Five individuals were sampled from Craggy Island of North Andaman (13°13.531 N; 93°03.394 E), 22.viii.2014, depth 5 m; Collector: Tamal Mondal (Reg. No.: ZSI/ANRC – 13613).

Morphological features:  
**External appearance:** Almost cylindrical body with thin naked tunic posteriorly and sessile apertures. Specimens are about 4.5 cm in length. Apertures are situated distantly from each other (Fig. 3a & b). Some epibionts found near the apertures. Test is leathery and brown in colour in *in-situ* condition (Fig. 3a). Individuals found in aggregates but no connection is present between individuals (Fig. 3a).  
**Anatomical characters:** Branchial and atrial apertures are four lobed. Very delicate body wall is with inconspicuous muscles (Fig. 3c). Siphons are without armature. About 10 tentacles are found surrounding the branchial aperture. Dorsal tubercle is with slit like opening (Fig. 3d). Dorsal lamina is smooth. There are four branchial folds present per side of the body.  

Branchial formulae: E 2 (8) 5 (11) 7 (7) 5 DL left  
Four to six stigmata are found per mesh. Gut loop is narrow and situated in postero-ventral corner of the body in the observed specimen. The long pleated stomach consists of two third of the ascending limb of the gut loop (Fig. 3e). Terminal part of the rectum curves anteriorly toward the opening of atrial aperture. The anal border has 18 narrow and long lobes (Fig. 3f). Endocarps are not enclosed in the gut loop region and they crowded towards the ventral border. On left it is restricted at the anterior part of the gut loop. Gonads are restricted towards the ventral border arranged in almost in row like manner (Fig. 3g & h). Inner part of the body has no gonads only endocarps are present. Body wall has several dots like structures of pigments those are not papillae.

**Distribution:** India: Andaman and Nicobar Islands; Elsewhere: Australia.

Remarks: Polycarpa biforis (Sluiter, 1904) and Polycarpa contecta (Sluiter, 1904) which has long stomach and more number of longitudinal vessels in between the branchial folds, are with one endocarp enclosed in the gut loop and no endocarps are found on the body wall of both species which distinguish the *Polycarpa papyra* from these two species. Also both the species have the S-shaped or inverted S-shaped neural gland opening. Both the *P. biforis* and *P. contecta* not reported from the Indian waters till date. The newly reported *Polycarpa papyra* has previously been reported only from the Australia. Further report of this species has not been found till the present record.

2. Polycarpa argentata (Sluiter, 1890) (Fig. 4)  
Material examined: Two individuals were sampled and examined from Hut Bay Jetty, Little Andaman Island (10°35.549 N; 92°33.773 E), 17.xi.2015, depth 6 m; Collector: Jhimli Mondal (Reg. No.: ZSI/ANRC – 13614).

Morphological features:  
**External appearance:** Body is pear shaped with 4 cm in length. Branchial aperture is terminal. Atrial aperture is situated at the distance of one third of the body length
from branchial aperture. Test tough, flexible, slightly leathery with wrinkles and epibionts. Colour of preserved specimen is greyish black (Fig. 4a).

**Anatomical characters**: Both the apertures have four lobes. Body wall is soft and thin. About 16 tentacles are found surrounding the branchial aperture. Dorsal tubercle is simple U shaped (Fig. 4b). There are four branchial folds on each side of the body (Fig. 4c). Dorsal lamina is smooth edged.

Branchial formula: E 2 (8) 3 (10) 4 (10) 4 (10) 4 DL left

There are about 11-13 stigmata per mesh. Gut loop is short and simple (Fig. 4d). The short stomach has internal folds but it is not visible from outside. The rectum is short and wide. It forms an obtuse angle with the primary loop after extending forward. Anal border has 20 rounded lobes. There are two endocarps enclosed in the gut loop and are absent from the body wall (Fig. 4d). Gonads are numerous small almost spherical polycarps completely, but not deeply embedded in the body wall. They become crowded towards ventral midline. Pear shaped male follicles are present surrounded the globular ovary (Fig. 4e).

**Distribution**: **India**: Andaman and Nicobar Islands; **Elsewhere**: Australia, Indonesia\(^1\), Palau Island\(^2\), Gilbert Island, Marshal Island\(^3\).

**Remarks**: *Polycarpa stirpes* Kott, 1985 is with similar gonads but in *P. stirpes* the gonads are scattered in the body wall not limited to the ventral side\(^1\). *P. stirpes* is not reported from Indian waters. The species *P. argentata* may be the native species as its previous distribution indicates an almost pan...
Fig. 3 — *Polycarpa papyra* Kott, 1985: a: Species *in-situ*; b: preserved specimen; c: specimen without test; d: dorsal tubercle; e: gut loop; f: anal border; g: gonad arrangements; h: gonads.

tropical distribution.
Genus: *Symplegma* Herdman, 1886

3. *Symplegma rubra* Monniot, 1972 (Fig. 5)

Material examined: Part of a colony was sampled and examined from Trinket Island of Nancowry group of islands (07°59.842 N; 93°30.569 E), 22.xii.2015, depth 8 m; Collector: Tamal Mondal (Reg. No.: ZSI/ANRC – 13716).

Morphological features:

*External appearance:* A red ring encircles the both siphons (Fig. 5a). Zooids are embedding in the oblique manner in the common tunic. Zooids are attached to the test by only posterior region of their ventral side. Colour of the living zooids are not persists in the preservatives (Fig. 5b).
Anatomical characters: There are 6 long tentacles and minute tentacles in two orders surrounding the branchial siphon. Dorsal tubercle has oval opening. Dorsal lamina made up of two smooth membranes. Branchial sac has no folds only four longitudinal vessels are present on each side of the body (Fig. 5c & d). There are 12 rows of stigmata.

Gut forms a loop on the right side of the body (Fig. 5c). Stomach has 12 plications. There is a long and curved pyloric caecum present (Fig. 5e). Gonads
present on both side of the body (Fig. 5c). Testes are three lobed (Fig. 5f). Two testis present per body side with a common opening. No ovary has been found in any of the zooids of the colony.


Remarks: Symplyema viride stolonica Berril, 1932 is with opaque tunic which forms the continuous passage on the other hand the zooids of S. rubra is separated from each other by small spaces which are found through its transparent tunic. Symplyema rubra also has a pan tropical distribution and its presence only in Nicobar group of islands indicates it might have brought by the Indian Ocean Currents.

Conclusions
The studies on reef associated ascidians of Andaman and Nicobar Islands are very limited while other works on the Indian ascidians (mainland India) were made mostly on the artificial structures and inter-tidal habitat. Present study refers the inclusion of three species of reef associated ascidians from island ecosystem of Andaman and Nicobar Islands as new distributional record to Indian waters.

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References