J. Mar. Biol. Ass. India, 48 (1) : 95 - 99, January - June 2006

Two new styelid ascidians – *Polycarpa maniensis* sp. nov., *Polycarpa scatterata* sp. nov. and one new record *Polycarpa aurita* (Sluiter, 1890) from Indian waters

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Abstract

Three species of styelid ascidians are reported of which *Polycarpa maniensis* sp. nov. and *Polycarpa scatterata* sp. nov. are new to science. The other, *Polycarpa aurita* (Sluiter, 1890) is a new record to Indian waters.

Keywords: Styelid ascidians, *Polycarpa maniensis*, *P. scatterata*, *P. aurita*, new record

Introduction

The occurrence of four species of ascidians belonging to genus *Polycarpa* - *Polycarpa annandalei* Oka, 1915; *P. cryptocarpa* Sluiter, 1885; *P.glebosa* (Sluiter, 1904) and *P.palkensis* Herdman, 1906 has been reported by earlier workers Oka, 1915; Das, 1945 and Renganathan, 1986 from India. The present report adds three more species – *Polycarpa maniensis* sp. nov. and *P. scatterata* sp. nov., new to science and *P. aurita* (Sluiter, 1890) is a new record from Indian waters.

Systematics : Class: Ascidiacea; Order: Pleurogona; Suborder: Stolidobranchia; Family: Styelidae; Subfamily: Styelinae; Genus: *Polycarpa*

Polycarpa maniensis sp. nov. (Figs.1, 2)

Habit and habitat: Many specimens were collected from the undersurface of calcrete rocks of the littoral zone of Mandapam (9°16' N and 79°8' E).

External appearance : Largest specimen measures 1.5cm long, 0.7cm wide, oval, laterally flattened, sessile, attached to the substratum by the posterior ventral surface (Fig.1). Apertures sessile, 4 lobed, branchial aperture terminal, atrial one-third to one-half on the dorsal surface. Test tough, leathery with many wrinkles and irregular creases, devoid of epibionts and sand. Colour: living specimens are creamy yellow, pigmentation increases anteriorly, brownish around the siphons.

Internal structure : Body wall thick, creamy yellow and muscular. Long branchial tentacles 20-25 and with short rudimentary tentacles in between (Fig. 2). Dorsal tubercle a large cushion, fills the V-shaped peritubercular area. Opening of the neural gland U-shaped and directed to the left side. Dorsal lamina a simple low membrane. Low branchial folds 4 on each side crowded with internal longitudinal vessels. Arrangement of internal longitudinal vessels according to the formula E2 (8) 4(7) 2(6) 2(9) 3DL1(9) 2(7) 2(8) 3(9) 0E. 8-9 oval stigmata in a mesh. Gut forms a short loop in the posterior end of the body. Oesophagus short. Stomach elliptical with prominent internal folds and faint longitudinal grooves externally occupying half of the ascending limb of the gut loop. Rectum curves anteriorly towards the atrial opening, secondary gut loop wide. Short curved gastric caecum and a gastro-intestinal duct in the gut loop. Anal border slightly lobed. Anterior margin of the gut loop reaches only posterior one-third of the body. 3-4 rows of large upright flask shaped polycarps fixed along their length to the body wall, but on the left side they do not extend beyond the gut loop. Ducts of the polycarps directed towards the

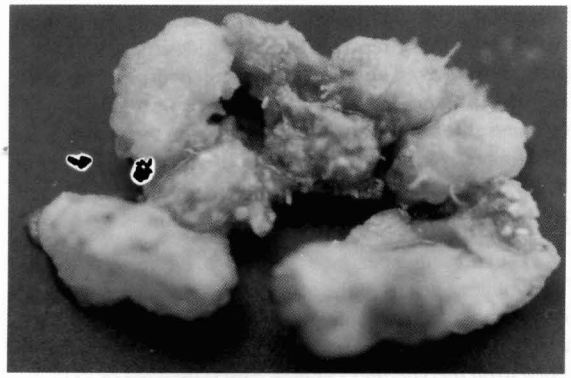

Fig. 1. *Polycarpa maniensis*

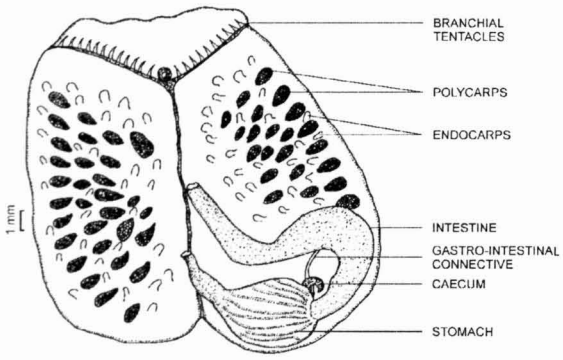

Fig. 2. *Polycarpa maniensis* n. sp. internal body wall, right and left side

atrial aperture. Numerous endocarps found at random on the body wall, except the gut loop.

Remarks: Polycarpa annandalei Oka, 1915 and *P. palkensis* Herdman, 1906 have elongate upright gonads compared to the flask shaped embedded gonads of the present species. The specimen studied differs from *P. glebosa* (Sluiter, 1904) in the presence of a gastric caecum and absence of root like process from the ventral side of the body. It cannot be confused with *P. cryptocarpa* Sluiter, 1885 which has a dark brown branchial sac and an interrupted opening of the neural gland.

The present specimen seems to be related to the Thelyphanes group in the absence of endocarps enclosed in the gut loop. In the present species polycarps are arranged in 3 or 4 rows on the body wall whereas in *Polycarpa thelyphanes* (Sluiter, 1904) they are in a single, irregular row on each side of the endostyle. Moreover, as far as endocarps are concerned they are rare on the body wall of *P. thelyphanes*, but the present species has numerous endocarps scattered on the body wall. Hence it cannot be considered as *P. thelyphanes*. The present species resembles *P. lucilla* Kott, 1985 in the arrangement of gonads in 2 or 3 rows but no endocarps are seen on the body wall of this species.

P.palkensis Herdman, 1906 and *P. willisi* Herdman, 1906 from Ceylon have gonads (in 2 or 3 rows) similar to *P. lucilla* Kott, 1985 but a redescription of both the Ceylon species by Michaelsen, 1923 reports the presence of a tight gut loop enclosing a single endocarp, which is absent in the present species.

In the nature of the test and in the presence of endocarps scattered on the body wall, the present species resembles *P. papyra* Kott, 1985, but differs in having a greater number of branchial tentacles, V-shaped opening of the neural gland directed to the left, more stigmata in each mesh, posterior position of the gut loop, short elliptical stomach, anterior margin of the gut loop reaching only posterior one-third of the body, a curved gastric caecum, a gastro-intestinal duct in the gut loop and the presence of well developed polycarps in 3 or 4 rows even in the specimen which is only 1.5cm long. Gonads were not reported in the specimen studied by Kott, 1985 which is 2cm long.

Polycarpa scatterata sp. nov.

Habit and habitat: Many specimens attached to the shell of barnacles were collected at a depth of 4 metres from Tuticorin Harbour (8° 48' N and 78° 11' E).

External appearance: Individuals 1cm long and 1cm broad, laterally flattened, upright, more or less round to squarish, sessile, fixed by their posterior end. Living specimens light grey, in preservative the colour fades to dirty yellow. Test thin, soft, flexible invested with fine sand, silt, hydroids, worm tubes, etc. as epibionts. Both the apertures on the anterior end situated a little apart, directed anteriorly. Siphons indistinct.

Internal structure: Body wall yellowish brown, thin, transparent adhering to the test. Internal siphons short (Fig. 3). Circular muscles present around siphons and on both sides of the body. Longitudinal muscles from the siphons extend on to the right and left sides of the body and form a mesh with the circular muscles. More than 60 branchial tentacles crowded around the base of the branchial siphon. Dorsal tubercle fills the V-shaped peritubercular area. Opening of the neural gland U-shaped with both the horns turned in. Branchial sac has narrow flat folds which do not overlap. 4 internal longitudinal vessels between folds and 18-20 on the folds. 4-5 stigmata per mesh. Dorsal lamina a low short membrane. Gut forms a narrow deeply curved loop at the posterior end of the body. Oesophagus short. Stomach barrel shaped with 12 well marked oblique external folds occu-

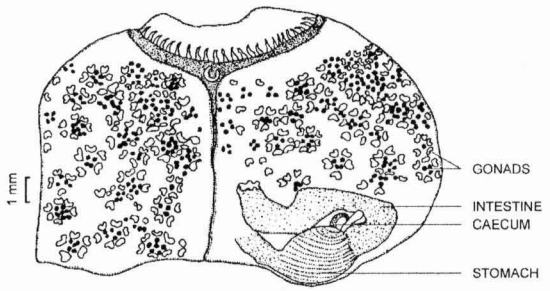

Fig. 3. *Polycarpa scatterata n.* sp. internal body wall with gut and scattered gonads.

pying only one-third of the ascending limb of the gut loop, broader towards the pyloric end leading to a wide intestine. A curved gastric caecum at the junction of the stomach and intestine. Intestine same diameter throughout. Rectum directed anteriorly, opens at the base of the atrial siphon just anterior to the oesophagus, anus with small rounded lobes. Gonads scattered on both sides and deeply embedded in the body wall. Each gonad consists of 4-8 rounded ova surrounded by pear shaped to bilobed testis follicles. From each testis follicle arises a small duct which joins together to open along with the oviduct. Male and female component of each gonad spread out and the adjacent gonads become confluent. The primary circular arrangement of the gonad lost with maturity. Endocarps completely absent from the body wall except for a tall one enclosed in the gut loop.

Remarks: Kott (1985) divided the species of *Polycarpa* occurring in Australian waters into five natural groups based on the nature of the gut loop, gonads and the position of the endocarps. The present species resembles the Pedunculata group in the nature of the gut loop, gonads being deeply embedded in the body wall, with one or two flat-topped endocarps contained in the gut loop, but none outside it on the body wall. In this group, those species which have scattered gonads alone have been considered for comparison. They include *Polycarpa pedunculata* Heller, 1878; *P. stripes* Kott, 1985; *P. pigmentata* (Herdman, 1906); *P. obscura* Heller, 1878 and *P.nigricans* Heller, 1878.

All the species except *P. pedunculata* enclose two flat topped endocarps in the gut loop with complex openings of the neural gland in older specimens. But in *P. pedunculata* a single endocarp is present in the gut loop and has a V or S-shaped slit on the dorsal tubercle. The present species resembles *P. pedunculata* in these two characters. But *P. pedunculata* differs from the present species in having 8-10 stigmata in a mesh and in the presence of elongate gonads with a long ovarian sac and numerous lobed pyriform male follicles scattered along each side and crowded beneath the ovary. The specimen studied resembles the description of the specimen from Philippines studied by Millar, 1975 and assigned to *Polycarpa cryptocarpa* in the presence of the gonads with a short central ovary, male follicles in a fan-like arrangement around it and in the presence of a single endocarp in the gut loop. But the V-shaped opening of the neural gland, a barrel shaped stomach with 12 well marked folds, curved gastric caecum in the gut loop, lesser number (4-8) of large ova and the male follicles arranged in a circle around the central ovary are characters which distinguish the present species from *Polycarpa cryptocarpa* described by Milllar 1975.

Polycarpa aurita (Sluiter, 1890) (Figs. 4,5)

Synonymy: Refer Kott, 1985, p. 152.

Polycarpa aurita: Monniot, 1987, p.294.

Habit and habitat: Many specimens were collected from the chank beds off Tuticorin coast at a depth of 10 meters and also from the pearl oyster cages at a depth of 4-5 metres.

Distribution: Australia, Indonesia, New Caledonia, Philippines, Atlantic Ocean (Gulf of Mexico, Caribbean, Venezuela), India.

External appearance: (Fig. 4) Individuals 1.5cm to 3cm long and 1cm broad. Body slightly laterally compressed. Branchial aperture terminal, atrial aperture one-third the distance from the anterior end on the dorsal surface. In highly contracted specimens the siphons become obscured and appear to be sessile. Small rounded projections on the surface of the test, crowded, smaller near the siphons and gradually fading towards the posterior end. Fixed by oblique posterior end with a high ventral and low dorsal end. Body elongate and club shaped without a stalk. Individuals found in groups, sometimes joined by their posterior ends to form a common basal mass. Test yellowish brown, tough, thick, rigid, cartilaginous, opaque, without hairs or epibionts. Brownish black pigments present around siphons.

Internal structure: Body wall thick, opaque, pinkish brown with heavier pigmentation in the siphons (Fig. 5). Circular and longitudinal muscles well developed in the anterior half of the body. Rim of the apertures turned in due to contraction. Siphon lining has regular rows of arched swellings each with a minute tentacular process. Branchial tentacles 30-35 arranged in 3 orders: long,

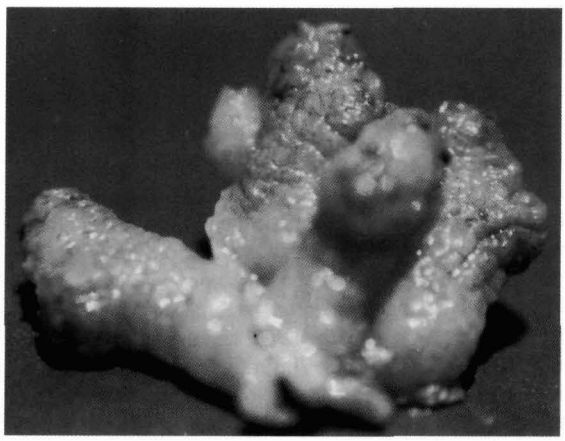

Fig. 4. *Polycarpa aurita*

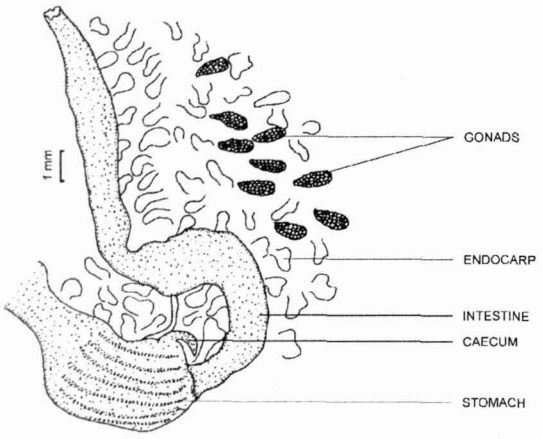

Fig. 5. *Polycarpa aurlta* gut, gonads and endocarps

medium and very short. Prebranchial area narrow. Dorsal tubercle occupies the V-shaped peritubercular area. Opening of the neural gland horizontal slit. Dorsal lamina simple, long. Branchial sac has 4 folds. 25-40 internal longitudinal vessels in the folds, 6-9 in the interspaces. 2-3 stigmata in a mesh. Parastigmatic vessels present. Branchial sac connected to the body wall. Gut forms a narrow loop across the ventro-lateral corner of the body. Oesophagus short, stomach large, occupies half to three-fourth of the ascending limb. Stomach with a typlosolar fold and faint longitudinal grooves. Curved caecum with a gastro-intestinal duct at the pyloric end of the stomach. Intestine curves towards the dorsal middle line. Rectum long, terminal part bent towards the atrial aperture. 14-24 small anal lobes. 6-7 tall endocarps enclosed in the pole of the gut loop. Secondary gut loop not deep. Gonads consists of numerous elongate polycarps scattered over the body wall radiating towards the atrial aperture. In older mature specimens some of the polycarps overlap. About 10-12 pairs of rounded to oval male follicles beneath the ovarian tube. Endocarps numerous, thin, vascular, spread on the body wall between the gonads and enclosed in the gut loop.

Remarks: The specimen studied resembles *Polycarpa aurita* (Sluiter, 1890) and Kott, 1985 in many features. The distinguishing characters of the species are the large number of internal longitudinal vessels on the folds, the branchial connectives, the part of the pharynx without gill slits behind the dorsal tubercle, the large stomach with the caecum, the gastro-intestinal duct and the dark pigmentation around the siphons. The minute tentacular projections on swellings in the siphon lining and the long polycarps are also characteristic. This species is being reported for the first time from Indian waters.

Key to the species of *Polycarpa* recorded from India

1. Scattered embedded gonads 2

   Elongate upright gonads 6

2. Gastric caecum absent 3

   Gastric caecum present 4

3. Opening of the neural gland interrupted ..... *P. cryptocarpa*

   Opening of the neural gland U-shaped slit ..... *P. glebosa*

4. Gastro-intestinal duct present, gonads arranged in two or three rows 5

   Gastro-intestinal duct absent, gonads scattered ..... *P. scatterata* n.sp.

5. Endocarp enclosed by gut loop and on the body wall ..... *P. aurita*

   Endocarp present only on the body wall ..... *P. maniensis* n.sp.

6. Stigmata less than 4 ..... *P. annandalei*

   Stigmata more than 4 ..... *P. palkensis*

Holotype of *Polycarpa maniensis* sp. nov. (VOCM AS67) and *Polycarpa scatterata* sp. nov. (VOCM AS68); and the new record specimen *Polycarpa aurita* (Sluiter, 1890) (AS52) have been deposited in the ascidian collections of the Museum of the Research Department of Zoology, V.O. Chidambaram College, Tuticorin, Tamilnadu, India.

Paratype of *Polycarpa maniensis* (APCM AS67A) and *Polycarpa scatterata* sp. nov. (APCM AS68A) have been deposited in the ascidian collections of the Museum of the Ascidian Research Laboratory, A.P.C. Mahalaxmi College for Women, Tuticorin, Tamilnadu, India.

Acknowledgements

The authors gratefully acknowledge the kind help rendered by Dr. T.K. Renganathan, retired Professor of Zoology, V.O. Chidambaram College, Tuticorin in confirming the identification, the Scientists of CMFRI (T) for collection of the ascidian samples and to the Ministry of Environment and Forests, New Delhi for financial assistance.

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Accepted: 10 February 2006