

Some Colonial Ascidians from Indian Waters

T K RENGANATHAN

Department of Zoology, V O Chidambaram College, Tuticorin 628 008

and

S KRISHNASWAMY

School of Biological Sciences, Madurai Kamaraj University, Madurai 625 021

Received 29 February 1984; revised received 20 September 1984

Three colonial ascidians are reported of which two are new and one is the 1st record from Indian waters. *Ecteinascidia krishnani* of the family Perophoridae and *Polyandrocarpa chendurensis* of the family Pyuridae are new species and *Botrylloides magnicoecum* (Hartmeyer, 1912) is a new record.

So far, only 20 genera and 28 species of ascidians from India are reported¹⁻¹⁰ and of these, 5 genera and 10 species are from the southeastern coast¹¹⁻²⁴. The present paper deals with occurrence, ecology and taxonomy of 3 species of colonial ascidians of which two are newly described and one is a new record. The specimens are deposited with the Zoological Survey of India, Calcutta.

Ecteinascidia krishnani sp. nov.

Occurrence and ecology—*E. krishnani* was collected from the rocky area in the littoral zone near Tuticorin harbour (lat. 8°47' 10" N and long. 78°9' 60" E). The colonies were attached to the underside of the calcrete stones and are usually found encrusted with another colonial ascidian, *Perophora formosana*. Being intertidal they are exposed during low tides. They are not found in large numbers. Since they are transparent and small careful observation is needed to locate the specimens. This species is available throughout the year and variations in surface water temperature and salinity in the collection area are much less, 26-31°C and $28-34 \times 10^{-3}$ respectively.

Taxonomy—Class, Ascidiacea; Order, Enterogona; Suborder, Phlebobranchiata; Family, Perophoridae; Genus, *Ecteinascidia* Species *krishnani*.

Description—Colony: Each individual of the colony is attached by a short thin peduncle to a basal stolon network.

Zooid (Fig. 1A): Body is ovoid in outline, <4 mm in length. It is usually erect but sometimes lying obliquely. It is attached to substratum by postero-lateral part of body. Branchial and atrial siphons are 8-lobed. Just below and around the oral and atrial openings 8 orange coloured dots are seen. The atrial aperture is situated on the level of 3rd transverse vessel. The test is quite transparent, thin, delicate and colourless. Body-wall is thin and translucent.

Prominently 2 muscle bands are seen, one above the atrial siphon and the other below it. Lower muscle band is wider. Connecting these 2 muscle bands, there are minute muscular fibres. The muscle bands do not reach the endostyle. There are 40 tentacles, including large and small ones. Each tentacle is long and slender. There are 12 rows of stigmata. Each row consists of 35-40 stigmata. Fourteen inner longitudinal vessels on each side are present of which 4 to 5 dorsal and 3 to 4 ventral ones are incomplete and represented only by papillae (Fig. 1D). Rest of the vessels in the middle are somewhat continuous. There are 2 or 3 stigmata in a

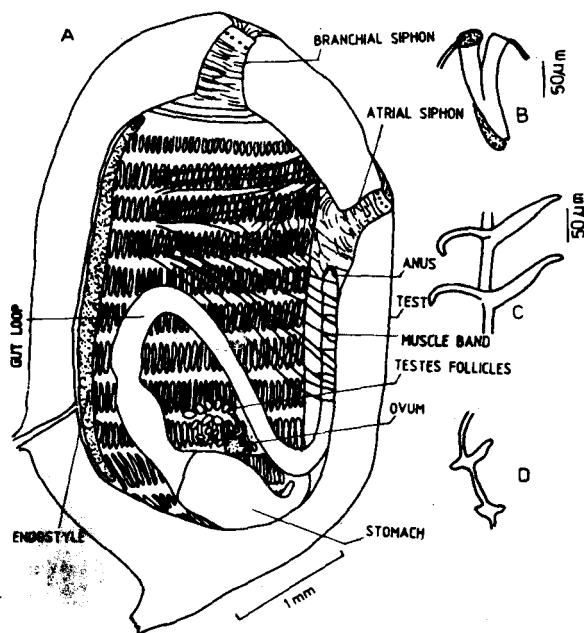


Fig. 1—*E. krishnani* (A) Individual zooid from left side; (B) dorsal tubercle, (C) part of dorsal lamina showing languets; and (D) two of papillae supporting inner longitudinal vessel

mesh. Dorsal tubercle (Fig. 1B) is an oval orifice. Dorsal lamina (Fig. 1C) is a low membrane and there is no minute intermediate languet between ordinary languets. Stomach is somewhat oval and is without any crest or plication on the surface. Anterior margin of the intestinal loop reaches the 5th stigmatal row. Distinct constriction is present between rectum and midintestine. Anus with blunt end is situated at the level of the 4th transverse vessel. About 24 testicular follicles are arranged in the 1st intestinal loop and they are pear shaped. A single large yellowish ovum just below the testes follicles is seen.

Species of *Ecteinascidia* are distinguished by gut loop, gonad, nature of papillae and nature of musculature on the body wall. The present form closely resembles *Ecteinascidia tokaraensis*²⁵ Tokioka, 1954. Though differences in the above mentioned characters can be noted between *E. tokaraensis* and the present form, the most important difference is that the anus is located at the same level as the intestinal loop in the present form. The species is named *krishnani* in honour of the beloved father T.S. Krishnan of one of the authors (TKR).

Key to Indo-Ceylon and related species of *Ecteinascidia*

- | | |
|---|--------------------|
| 1 Branchial aperture 7 lobed and atrial aperture 6 lobed—testes follicles branched | <i>thurstoni</i> |
| 2 Constricted stolon, peculiar short forked muscle bundles—well marked siphons | <i>sluiteri</i> |
| 3 A large number of transverse anastomosing muscle fibres—stomach with longitudinal folds | <i>bombayensis</i> |
| 4 Two rows of transverse muscles never reaching the endostyle—anterior gut loop not at the level of anus—'C' shaped testicular follicles surrounding the ovary containing 20-30 small ova | <i>tokaraensis</i> |
| 5 Anterior gut loop at the level of anus, pear shaped testes follicles with a single large ovum below them | <i>krishnani</i> |

Polyandrocarpa chendurensis sp. nov.

Occurrence—Genus *Polyandrocarpa* was recorded in India only recently. So the present species is the first species of this genus from India. The present specimen was obtained from the chank beds of Tiruchendur (lat. 8° 30' N and long. 78° 11' E) at 30 m depth. It was collected during chank fishing conducted by the Fisheries Department of Tamil Nadu in Feb. and March 1983. The colony was seen attached to the chank, *Xancus pyrem*.

Taxonomy—Class, Ascidiacea; Order, Pleurogona; Suborder, Stolidobranchiata; Family, Styelidae; Genus, *Polyandrocarpa*; and Species, *chendurensis*.

Description—Colony (Fig. 2A): Colony consists of a transparent but tough stolon (Fig. 2B) which has slight thickenings at intervals where it gives off numerous net

work like branches. Stolons are not visible externally as they are covered by sand and shell fragments. Whole colony is encrusted on the shell in the form of numerous irregularly arranged blunt elevations which are closely packed and completely covered by numerous broken shell pieces and a little amount of sand. Colony is buff coloured and measures 4.5 cm × 3 cm and 8 mm thick. Attached surface is smooth when removed from the shell of the chank.

Zooid (Fig. 2C, D): Zooids are present where the stolon is much flattened and branched and are usually smaller. On the same stolon zooids measuring from 2- < 10 mm in width are found. Oral and atrial apertures are not visible externally, since they are covered by shell pieces. Zooids are somewhat oval in shape. Though they are close together, they are not embedded in a common matrix. When removed from the test, zooid is seen to have a horizontal ovoid body. Both the siphons have 4 lobes. The test is exceptionally thick and tough and it gives off numerous transparent colourless test processes by which zooids are attached to the stolon. The interior of the test is smooth and shining. The bodywall is light brown in colour. There is a thick musculature. Muscle bands are not seen clearly. However, closely set thin circular muscles and widely placed thicker longitudinal muscles are discernible to some extent.

There are 20 to 24 oral tentacles which are recurved at their tips. Small tentacles (1, 2 or 3) alternate with a long and large tentacle (Fig. 2E). Largest tentacle measures 800 μm in size. The dorsal tubercle (Fig. 2F) is a small longitudinal pad with a small longitudinal

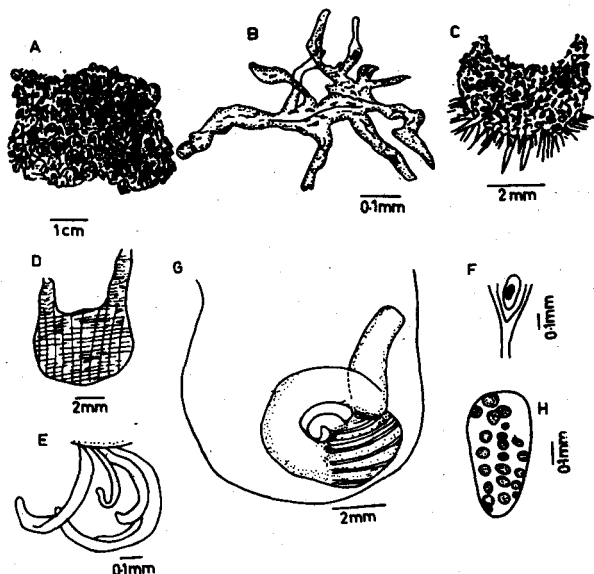


Fig. 2—*P. chendurensis* (A) Entire colony; (B) part of stolon; (C) zooid with test covered; (D) zooid with test removed showing musculature; (E) few tentacles; (F) dorsal tubercle; (G) zooid cut open to show gut; and (H) gonad

slit. Dorsal lamina is a plain moderately wide membrane. There are 4 branchial folds on each side, with the following arrangement of internal longitudinal bars on the right side of one zooid examined: dorsal lamina 0 (7) 1 (11) 0 (10) 1 (12) 0 endostyle. The stigmata are regular and narrow.

Curved oesophagus is hidden from view due to the extension of intestine below. Stomach is somewhat (Fig. 2G) globular with about 15 plications. Caecum is very large and curved and it occupies almost the whole space between stomach and intestine. Intestine forms a small closed loop. Posteriorly the intestine makes an inward twist to be followed by the straight rectum which opens into an expanded anus near the atrial siphon. Anal border is plain. There is only a single gonad (Fig. 2H) on either side situated a little behind the middle of the body. Gonads are near the intestinal loop. Shape of the gonads varies from spherical to longitudinally oval. Each gonad contains numerous bodies, probably testes follicles and 10 to 12 endocarps are seen on each side.

It is unique to find species of *Polyandrocarpa* with only a single gonad. Only Millar²⁶ has reported a species, *P. oligocarpa* Millar 1970 with a single gonad. Kott²⁷ has reported a species, *triggiensis* which also shows a single gonad but only sometimes. The present species shows only a single gonad in which it resembles *oligocarpa*. But it differs from *oligocarpa* in the following characters:

	<i>oligocarpa</i>	<i>chendurensis</i> n.sp
1 Stolon	Stout, flexible tubular	Flat, flexible irregularly much branched
2 Oral tentacles	At least 60 and are of alternating sizes	Only 20-24 and 2 to 3 small tentacles alternate with a large tentacle.
3 Dorsal tubercle	A transverse oval pad with a C-shaped slit having the open internal posterior	A small longitudinal pad with a small longitudinal slit
4 Oesophagus	Curved into a semi-circle and clearly seen	Curvature is not visible due to extension of intestine.
5 Stomach	Spindle shaped with 10-12 longitudinal plications	Somewhat globular with about 15 longitudinal plications
6 Caecum	Small and almost straight	Very large and curved and it occupies the whole space between the stomach and intestine.

7 Intestine	It forms a small closed loop	It forms a small closed loop, touching the anterior part of the stomach and the posterior part of intestine makes an inward twist.
8 Anal border	Slightly indented	Plain
9 Gonad	Gonoducts visible	Not visible

P. triggiensis shows a single gonad only sometimes and the shape of it is different. Moreover its test is thin and brittle. In these characters the present species differs from *triggiensis*. So the present form is considered as a new species and it is named *chendurensis* since it is available from Tiruchendur.

Key to species of *Polyandrocarpa* having a single gonad

- 1 Test thick and tough -----2
Test thin and brittle *triggiensis*
- 2 Tubular stolon, 60 tentacles of alternating sizes, dorsal tubercle like a transverse oval pad with C-shaped slit *oligocarpa*
Irregularly much branched stolon, 24 tentacles with 2 or 3 small tentacles alternating with a large tentacle, dorsal tubercle like a small longitudinal pad *chendurensis*

Botrylloides magnicoecum (Hartmeyer, 1912)

Occurrence and ecology—Colonies of *B. magnicoecum* are recorded from lower intertidal zone near Tuticorin harbour and are usually attached to the underside of calcrete stones. They are found in association with other ascidians like *Botrylloides chevalense*, *Eudistoma viride*, *Didemnum psammathodes*, *Lissoclinum fragile*, *Perophora formosana* and *Microcosmus curvus*. They are found only in the rocky area. This species is available throughout the year and in this area variation in temperature is from 26° to 31°C and salinity from 28 to 34 × 10⁻³. This species is reported earlier from New Zealand, Australia, Japan, S. Africa, Bermudas and Guadeloupe.

Synonymy²⁸⁻³⁵

- Botrylloides nigrum* var. *magnicoecum* Hartmeyer, 1912, 7, 271-272, pl. 41, fig. 11.
Botryllus magnicoecus Hastings, 1931, 4(3), 69-109, pl. 3, fig. 5.
Botryllus magnicoecus, Brewin, 1951, 79(1), 104-113.
Botrylloides magnicoecus Kott, 1952, 3(3), 205-334, fig. 75, 76.
Botryllus magnicoecus Millar, 1955, 125(1), 195, fig. 22.
Botryllus magnicoecus Tokioka, 1967, 252, 1-247, fig. 60a-e.
Botrylloides magnicoecum Monniot, C. 1972, 43, 618, fig. 1A-C.
Botrylloides magnicoecum Monniot, C. 1983, 5, 424-426, fig. 1D-E.

Taxonomy—Class, Ascidiacea; Order, Pleurogona; Suborder, Stolidobranchiata; Family, Styelidae; Subfamily, Botryllinae; Genus, *Botrylloides*; and Species, *magnicoecum*.

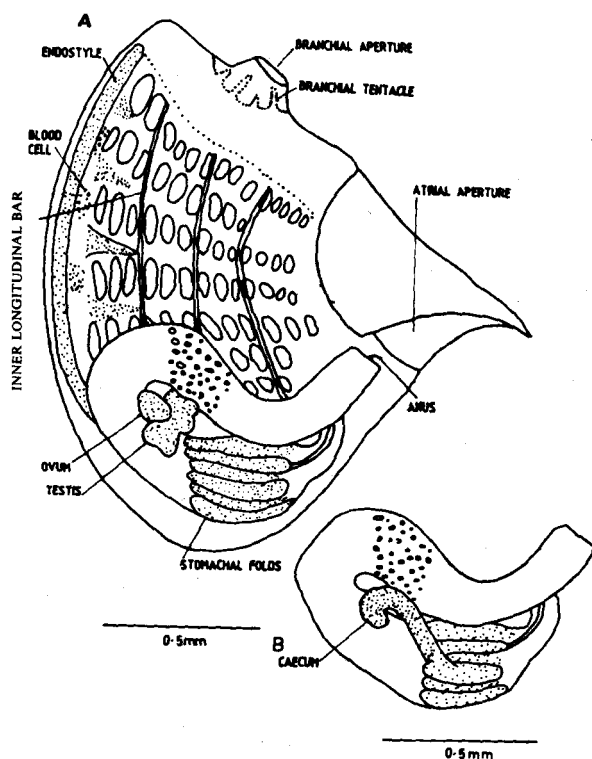


Fig. 3—*B. magnicoecum* (A) Entire zooid adult and (B) external view of digestive tract showing caecum

Description—Colony: Colonies are usually encrusting and of various shades. Surface of colony is flat. Test is soft, gelatinous and almost transparent. At the periphery of the colony sausage shaped vascular ampullae are present. They are about 500 μ m long and 70 μ m wide.

Zooid (Fig. 3A): Zooids arranged in ladder systems are <2 mm in length. Branchial tentacles consist of 4 larger and 4 smaller ones, regularly alternating. There are 7 rows of stigmata on the left side and 8 rows on the right side. Second row does not reach the dorsomedian line. Around the middle of the branchial sac, stigmata are arranged between the 3 inner longitudinal bars as follows: dorsal lamina 4.3.3.3 endostyle. Many blood cells are deposited along each side of the endostyle in the range from 2nd to 4th stigmatal row. Anterior end of the intestinal loop reaches 5th stigmatal row and anus opens at the level of 6th row. Stomach has 9 longitudinal plications and a very large caecum (Fig. 3B) is a noteworthy character. Testes with a few lobes lie in the intestinal loop. There is a single large ovum by the side of the testes.

The present species is the 2nd species of the genus *Botrylloides* reported from India, the first being *B.*

*chevalense*²². Presence of gonads in the intestinal loop is characteristic of this Indian specimen. Presence of blood cells near endostyle and the character of 2nd stigmatal row never reaching the dorsomedian line have not been mentioned by many authors. Though these characters do not seem to have taxonomic importance now, detailed studies may be needed in the future to erect a new species.

Acknowledgement

The authors are grateful to Dr F Monniot of Paris for help in confirming the identification of specimens, to Mr Y Jeyabaskaran, Deputy Director of Fisheries, Tuticorin for allowing the collection of specimens from chanks. One of the authors (TKR) is thankful to UGC New Delhi for financial assistance.

References

- 1 Sebastian V O, *Curr Sci*, **21** (1952) 316.
- 2 Sebastian V O, *Washington Acad Sci*, **44** (1954) 18.
- 3 Sebastian V O, *Zool Anz*, **154** (1955) 266.
- 4 Sebastian V O, *J Timb Dry Preserv Ass India*, **11** (1956) 2.
- 5 Sebastian V O, *J Timb Dry Preserv Ass India*, **5** (1959) 19.
- 6 Oka A, *Mem Indian Mus*, **6** (1915) 1.
- 7 Das S M, *Indian Zool Mem*, **5** (1936) 1.
- 8 Das S M, *Proc Indian Acad Sci*, **8** (1938) 295.
- 9 Das S M, *Proc Indian Acad Sci*, **11** (1940) 50.
- 10 Das S M, *J Roy Asiatic Soc Bengal Science*, **11** (1945) 6.
- 11 Renganathan T K, *Curr Sci*, **50** (1981) 922.
- 12 Renganathan T K, *Curr Sci*, **50** (1981) 1008.
- 13 Renganathan T K, *Curr Sci*, **51** (1982) 149.
- 14 Renganathan T K, *Curr Sci*, **51** (1982) 253.
- 15 Renganathan T K & Daniel J A, *Curr Sci*, **51** (1982) 535.
- 16 Renganathan T K, *Curr Sci*, **52** (1983) 929.
- 17 Renganathan T K, *Geobios New Reports*, **2** (1983) 57.
- 18 Renganathan T K, *Geobios New Reports*, **2** (1983) 128.
- 19 Renganathan T K, *Geobios New Reports*, **3** (1984) 49.
- 20 Renganathan T K, *Geobios New Reports*, **3** (1984) 54.
- 21 Renganathan T K, *Geobios New Reports*, **3** (1984) 155.
- 22 Renganathan T K, *Geobios New Reports*, **3** (1984) 158.
- 23 Renganathan T K & Jones Nelson D, *Geobios New Reports*, (1984) (Communicated).
- 24 Renganathan T K & Monniot F, *Bull Mus Natn Hist Nat Paris*, (1984) (in Press).
- 25 Tokioka T, *Publs Seto Mar Biol Lab*, **3** (1954) 239.
- 26 Millar R H, *Zool J Linn Soc*, **49** (1970) 121.
- 27 Kott P, *Aust J Mar Freshw Res*, **3** (1952) 205.
- 28 Hartmeyer R, *Deutschen Tiefsee Expedition*, **7** (1912) 271.
- 29 Hastings A B, *Sci Rep*, **4** (1931) 69.
- 30 Brewin B I, *Trans Roy Soc N Z*, **79** (1951) 104.
- 31 Kott P, *Aust J Mar Freshw Res*, **3** (1952) 205.
- 32 Millar R H, *Proc Zool Soc Lond*, **125** (1955) 169.
- 33 Tokioka T, *Bull US Natn Mus*, **251** (1967) 1.
- 34 Monniot C, *Bull Mus Natn Hist Nat Paris*, **43** (1972) 617.
- 35 Monniot C, *Bull Mus Natn Hist Nat Paris*, **5** (1983) 424.