

NEW RECORDS OF TWO SPECIES OF THE GENUS *LEPTOCLINIDES* BJERKAN, 1905 FROM INDIAN WATERS

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ABSTRACT

Ascidians or sea squirts are marine sessile filter feeding animals. Collections of ascidians were carried out from intertidal rocky areas and trawl discards from the Gulf of Mannar waters of India and identified up to the species level using taxonomic keys. The survey reports the presence of two species of the genus *Leptoclinides* - *Leptoclinides madara*, *Leptoclinides rufus* of the family didemnidae as

new records to Indian waters. Key to the species of the genus *Leptoclinides* recorded is given with detailed descriptions of new records.

KEYWORDS: *Leptoclinides*, *L. madara*, *L. rufus*.

INTRODUCTION

From India, five genera - *Didemnum* Savigny, 1816, *Diplosoma* Macdonald, 1859, *Lissoclinum* Verrill, 1871, *Polysyncrator* Nott, 1892 and *Trididemnum* Della Valle, 1881 of the family didemnidae Giard, 1872 has been so far reported.^[1-6] The genus *Didemnum* is represented by two species - *Didemnum candidum* Savigny, 1816, *Didemnum psammathodes* Sluiter, 1895 and only one species of each of the genus *Diplosoma* - *Diplosoma swamiensis* Renganathan, 1986; *Lissoclinum* - *Lissoclinum fragile* Van Name, 1902; *Polysyncrator* - *Polysyncrator millepore* Vasseur, 1969; and *Trididemnum* - *Trididemnum cerebriforme*, Hartmeyer, 1913.^[1,7-16]

MATERIALS AND METHODS

The standard procedure put forward by Kott, 1985 was adopted for collection, narcotisation and preservation.^[17] Identification of the collected ascidians to the species level was carried out based on external and internal features. The following taxonomic characters were studied. Colour, nature of the colony (extensive sheets, encrustations, lobed, surface elevations); nature of test (tough, thick, brittle, firm, rigid, translucent, fleshy); test inclusions (pigment, bladder cells, spicules); spicule shape, size, number of rays in optical section, length, shape of tip of rays, distribution; position and nature of common cloacal cavity (interruptions); size of zooids, length of siphons, nature of rim of apertures, orientation of atrial aperture, mantle musculature, presence or absence of retractor muscle, number of rows and number per row of stigmata, lateral organs; length of gut loop, shape of stomach; number of testis follicles, coils of vas deferens (loose or tight); size of larva, number of lateral ampullae, incubation of larva in basal test. Key to identification of Indian ascidians given by Meenakshi, 2003 was used.^[18] The entire colony, zooids were observed with dissecting, stereo, binocular microscopes and accurately identified. Diagrams were drawn with the help of Camera Lucida for interpretation of results. Voucher specimen of each species has been deposited in the Museum of the Department of Zoology, A.P.C. Mahalaxmi College for Women, Thoothukudi.

RESULTS AND DISCUSSION

The present survey revealed the occurrence of two species of the genus *Leptoclinides* Bjerkan, 1905 - *Leptoclinides madara* Tokioka, 1953, *Leptoclinides rufus* (Sluiter, 1909) of the family didemnidae as new records to Indian waters.^[19-21] The colony of the genus *Leptoclinides* are large, robust with common cloacal cavity interrupted by connectives. Compared to the other genera of the family didemnidae, the zooids are large, atrial siphon relatively long but less than the length of the thorax and atrial apertures oriented posteriorly. Retractor muscle is absent. Spicules are usually stellate with conical rays having pointed or flattened tip. There are 4 rows of stigmata and large lateral organs. A loosely coiled vas deferens is around the numerous testis follicles. The larvae are large with the usual adhesive organ and ampullae. The genus *Leptoclinides* was first recorded from Indian waters by Meenakshi *et al.*, 2003.^[18]

Leptoclinides madara Tokioka, 1953^[20]

[Figure - 1 (A and B), Plate - 1]

Leptoclinides madara Tokioka, 1953, p. 200.^[20]

Leptoclinides madara: Rho, 1975, p. 127.^[22]

Leptoclinides madara: Nishikawa, 1980, p. 79.^[23]

Leptoclinides madara: Kott and Goodbody, 1980, p. 522.^[24]

Leptoclinides madara: Nishikawa, 1990, p. 116.^[25]

Leptoclinides madara: Monniot and Monniot, 2001, p. 287.^[26]

Occurrence: This species was collected from trawl discards of Narippaiyoor South, Ramanathapuram District (AS 1395).

Distribution: Japan, Australia, Philippines, New Ireland, India.

External appearance: Colonies are thin, irregular and small 1.5 cm long found attached to the surface of barnacles and sea weeds. They are fleshy and smooth. The outer layer is shiny with rounded margins. Living colonies are yellowish brown in colour with patches of orange whereas in preservative the colour fades to white. The superficial thin bladder cell layer is uniformly scattered with bladder cells but free of spicules. Beneath this, spicules are concentrated and distributed uniformly except where the cloacal cavities are present. Extensive common cloacal cavities are present below the common cloacal opening. Spicules are mostly globular with 11-16 long pointed rays. Test is soft and contains pigment cells and faecal pellets. Zooids are embedded in test and are easily removed.



Plate - 1: *Leptoclinides madara*

Internal appearance: Zooids are about 0.8 mm long with thorax and abdomen almost equal in length. The large cylindrical branchial siphon has circular muscles and strong sphincter muscles at the base. The rim of the siphon is slightly lobed. The atrial siphon is short and small with 6 rounded lobes facing posteriorly situated at the level of 2nd and 3rd row of

stigmata. Sphincter muscles are present at the base of the atrial siphon also. There are up to 8 longitudinal muscles running from the base of the branchial siphon. The base of the branchial siphon has 25 short tentacles. Branchial sac is wide and short. Prebranchial area is narrow. The lateral thoracic organ is large present at the level of 3rd row of stigmata. Branchial sac contains 4 rows of stigmata. There are 16 elongate, oval stigmata per row. Anterior row of stigmata are larger in size than the other rows. A short oesophagus connects the cylindrical stomach. A short duodenum, a small posterior stomach and a wide elongate rectum ends at the level of 4th row of stigmata. Anus is smooth and rounded. 6 testis follicles are arranged like the petals of a flower at the distal part of the gut loop with 6 coils of vas deferens. There are two female follicles above the testis. Embryos at different stages of development and tailed larvae were found in the basal test. An oval larva with a trunk 0.3 mm long and a tail wound halfway around it was noted. 4 broad lateral epidermal ampullae are on each side of the three anteromedian adhesive organ.

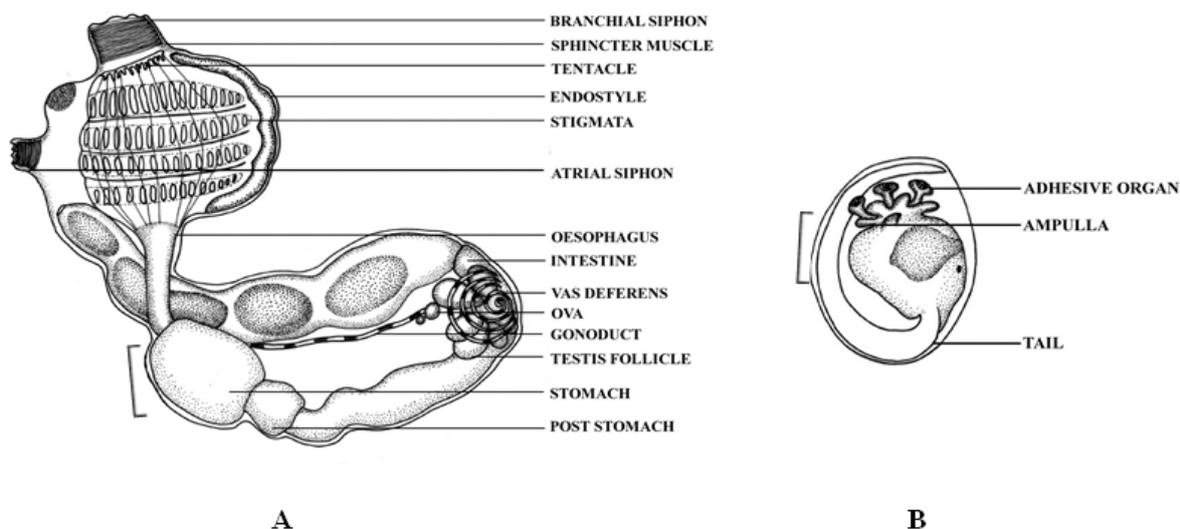


Figure 1: A and B. *Leptoclinides madara*, A. zooid, B. larva. Scale: A and B - 0.05 mm

Remarks: The genus *Leptoclinides* is being described for the first time from Indian waters. The colony from Indian water resembles *Leptoclinides madara* Tokioka, 1953 and *L. madara*: Monniot and Monniot, 2001 in all respects except for differences like fleshy, smooth, yellowish brown colonies, absence of spicules in the thin bladder cell layer, short siphon and oesophagus compared to colonies which are hard crusts, thick with zooids having long branchial siphon and oesophagus.^[20,26] *Leptoclinides rufus* (Sluiter, 1909) can be easily differentiated from the present species by the thick, cushion shaped, large, white to different shades of brown colour colonies.^[21]

Leptoclinides rufus (Sluiter, 1909) ^[21]

[Figure - 2 (A and B)]

Polysyncraton rufum Sluiter, 1909, p. 77, 1913, p. 77. ^[21]

Leptoclinides rufus: Tokioka, 1952, p. 52. ^[27]

Leptoclinides rufus: Kott, 1962, p. 286 (part). ^[28]

Leptoclinides rufus: Kott, 1998, p. 87. ^[29]

Didemnum reticulatum Sluiter, 1909, p. 60 (part, ZMA TU475.1, TU475.2 and TU475.7 part). ^[21]

Leptoclinides reticulatus: Hastings, 1931, p. 92. ^[30]

Leptoclinides reticulatus: Kott, 1962, p. 285. ^[28]

Leptoclinides reticulatus: Tokioka, 1967, p. 89 (part, specimens with single layer of spicules, USNM 11449). ^[31]

Leptoclinides marmoratus: Millar, 1975, p. 235. ^[32]

Leptoclinides oscitans Monniot & Monniot, 1996, p. 177. ^[33]

Leptoclinides rufus: Kott, 2001, p. 79. ^[34]

Occurrence: This species was collected from the intertidal rocky area of Manapad, Tuticorin District and trawl discards of Kooduthalai, Tirunelveli District (AS 291, AS 835).

Distribution: Australia, Palau Islands, Indonesia, India.

External appearance: Colonies are large, thick, cushions measuring 6 cm X 4 cm. The surface of the test is smooth with a thick superficial spicule free bladder cell layer. In life and in preservative the colony is white to different shades of brown. Numerous round common cloacal openings are distributed along the flat test. Test is gelatinous. Spicules are uniformly distributed throughout the test but absent in the basal layer. They are stellate with 10 short pointed rays in optical section. Algal cells, brown orange pigment cells and faecal pellets were noticed in the test.

Internal appearance: Zooids are transparent, large, measuring 3 mm (thorax 2 mm, abdomen 1 mm). Branchial siphon is longer than the atrial siphon. Atrial siphon shorter than the length of the thorax and directed posteriorly, situated at a level between the 3rd and 4th row of stigmata. The branchial sac has 8 pairs of longitudinal muscle bands extending from the base of the branchial siphon. Circular sphincter muscle bands are present at the base of branchial and atrial siphon. Branchial sac is long and narrow. The base of the branchial

siphon has a circlet of tentacles. Prebranchial area is wide. There is no retractor muscle. Rim of both the apertures have some minute papillae. The lateral organ is small, rounded situated on each side of the thorax. Branchial sac contains 4 rows of stigmata with 11-13 stigmata per row. They are long and rod shaped. Thick transverse muscle bands are present between the rows of stigmata. The abdomen contains a long tube like oesophagus, oval stomach, short duodenum, short post stomach and long wide rectum. Anus opens at the level of 4th row of stigmata with a bifid languet. Abdomen bends and lies horizontal to the thorax. Gut loop contains 6 male follicles. Vas deferens coils five and a half times around the testis. In the single colony studied, no larvae were observed.

Remarks: The colonies of *L. rufus* studied at present are large, thick cushions with white to different shades of brown. The specimen described by Kott, 2001 has colonies which are fleshy with a smooth shiny outer surface often with ridges, depressions and black, orange or red irregular, fusiform, branched or spherical pigment cells.^[34] The Indian colony differs in the nature of colonies, size of the zooid, number of stigmata, male follicles and coil of vas deferens. *L. madara* can be distinguished by the nature and colour of colonies.

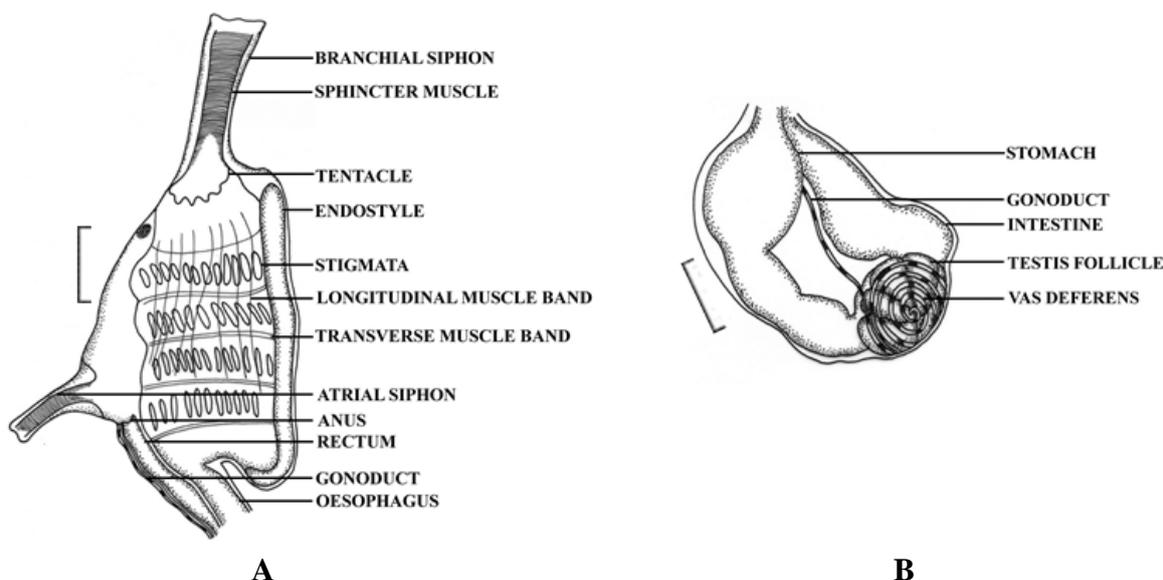


Figure 2: A and B. *Leptoclinides rufus*, A. thorax, B. abdomen. Scale: A & B - 0.12 mm.

KEY TO THE SPECIES OF *LEPTOCLINIDES* REPORTED FROM INDIA

1. Thin, irregular, fleshy, small yellowish brown colonies *L. madara*
2. Thick, cushion shaped, large, white to different shades of brown colonies *L. rufus*

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REFERENCES

1. Savigny, JC, Rescherches anatomiques sur les ascidies composees at les ascidies simple. Systeme de la classe des Ascidies, in *Memoirs sur les-animaux sans vertebres*, 1816; Part.2, pp. 1-239.
2. Macdonald JD, On the anatomical characters of a remarkable form of compound Tunicata. *Transaction of the Linnean Society of London (Zoology)*, 1859; 22: 373-375.
3. Verrill AE, Descriptions of some imperfectly known and new ascidians from New England. *American Journal of Science*, 1871; 3(1): 54-446.
4. Nott JT, On the composite ascidians of the North Shore Reef. *Transactions New Zealand Institute*, 1892; 24: 305-344.
5. Della Valle A, Nouvi contribuzioni alla storia naturale delle ascidie composte del Golfa di Napoli. *Atti della Accademia Nazionale Lincei Series*, 1881; 10(3): 431-498.
6. Giard A, Recherches sur les ascidies composees ou synascidies. *Archives de Zoology Experimentale et Generale*, 1872; 1: 507-704.
7. Sluiter CP, Tunicaten. In Semon, R. Zoologische Forschungsreisen in Australien und den Malagischem Archipel. *Jenaische Denkschriften*, 1895; 8: 163-186.
8. Renganathan TK, Studies on the ascidians of South India. Ph. D., Thesis. Madurai Kamaraj University, Madurai, 1986.
9. Van Name WG, The Ascidians of the Bermuda Islands. *Trans. Connecticut Acad. Arts Sci*, 1902; 11: 325-412.
10. Vasseur P, Deuxieme contribution a l'etudedes ascides de Madagascar region de Tulear. *Bulletin du Museum National d'Histoire Naturelle ser*, 1969; 240(5): 912-933.
11. Hartmeyer R, Tunicata. In: L.Schultze, Zool. U. anthrop. Ergebnisse Forschungsreise in Sudafrika Bd 5, Lfg 2. *Denskschr. med. naturw. Ges. Jena*, 1913; 17: 125-144.
12. Meenakshi VK, Biology of a few chosen ascidians. Ph. D., thesis, Manonmaniam Sundaranar University, Tirunelveli, 1997.
13. Renganathan TK, On the occurrence of a colonial ascidian, *Didemnum psammathodes* (Sluiter, 1895) from India. *Current Science*, 1981; 50(20): 922.

14. Renganathan TK, On the occurrence of a colonial ascidian, *Lissoclinum fragile* (Van Name, 1902) from India. *Current Science*, 1982; 51(3): 149.
15. Meenakshi VK, Senthamarai S, Gomathy S, *Polysyncraton* Nott, 1892 an unrecorded genus of the family Didemnidae from India, *Journal of Chemical, Biological and Physical Sciences*, 2014; 4(4): 3243-3246.
16. Meenakshi VK, *Trididemnum* Della Valle, 1881, an unrecorded genus of colonial ascidian from India. *Journal of the Bombay Natural History Society*, 2000; 97(2): 302-304.
17. Kott P, The Australian Ascidiacea. Part I, Phlebobranchia and Stolidobranchia. *Memoirs of Queensland Museum*, 1985; 23: 1-440.
18. Meenakshi VK, Marine Biodiversity – Taxonomy of Indian ascidians. Final Technical Report submitted to the Ministry of Environment and Forests, New Delhi, 2003.
19. Bjerkan P, Ascidiens von dem norwegischen Fischereidampfer 'Michael Sars' in den Jahren 1900-1904 gesammelt. *Bergens Museum Arbog Afhandlingar og Arsberetning*, 1905; 5: 4-29.
20. Tokioka T, *Ascidians of Sagami Bay*. Tokyo: Iwanami Shoten, 1953; p. 1-313.
21. Sluiter CP, Die Tunicaten der Siboga - Expedition Pt.2. Die merosomen Ascidiens. *Siboga Expedition*, 1909; 56: 1-112.
22. Rho BJ, On the classification and the distribution of the marine benthic animals in Korea 3. Ascidiens. *Journal of Korean Research Institute for Better Living*, 1975; 15: 121-169.
23. Nishikawa T, Ascidiens from the coast of Kii Peninsula, Middle Japan, with descriptions of two new species. *Memoirs of the National Science Museum*, Tokyo, 1980; 13: 97-111.
24. Kott P, Goodbody I, The ascidians of Hong Kong. In: Morton, B.S. & C.K. Tseng (eds). *Proceedings of the First International Marine Biological Workshop: The flora and Fauna of Hong Kong and Southern China*, Hong Kong. (Hong Kong University Press: Hong Kong), 1980; 1: 503-504.
25. Nishikawa T, The ascidians of the Japan Sea I. *Publications of the Seto Marine Biological Laboratory*, 1990; 34(4-6): 73-148.
26. Monniot F, Monniot C, Ascidiens from the tropical Western Pacific. *Zoosystema. Bulletin du Museum d'Histoire Naturelle*. Paris, 2001; 23(2): 201-383.
27. Tokioka T, Ascidiens collected by Messrs Renzi Wada and Seizi Wada from the Pearl Oyster bed in the Arafura Sea in 1940. *Publications of the Seto Marine Biological Laboratory*, 1952; 2(2): 91-142.

28. Kott P, The ascidians of Australia III. Aplousobranchiata Lahille: Didemnidae Giard. *Australian Journal of Marine and Freshwater Research*, 1962; 13(3): 265-334.
29. Kott P, Tunicata, in Wells, A. & Houston, W.W.K. (eds) Zoological Catalogue of Australia, Hemichordata, Tunicata, Cephalochordata. (CSIRO Publishing: Melbourne), 1998; 34: 51-292.
30. Hastings AB, Tunicata. *Scientific Reports of the Great Barrier Reef Expedition*, 1931; 4(3): 69-109.
31. Tokioka T, Pacific Tunicata of the United States National Museum. *Bulletin, United States National Museum*, 1967; 251: 1-242.
32. Millar RH, Ascidians from the Indo-West Pacific region in the Zoological Museum, Copenhagen (Tunicata: Ascidiacea). *Steenstrupia*, 1975; 3(20): 205-336.
33. Monniot F, Monniot C, New collections of ascidians from the western Pacific and southeastern Asia. *Micronesia*, 1996; 29(2): 133-279.
34. Kott P, The Australian Ascidiacea Part 4, Aplousobranchia (3), Didemnidae. *Memoirs of the Queensland Museum*, 2001; 47(1): 1-410.