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First record of *Centropyxis delicatula* Penard, 1902 (Arcellinida: Rhizopoda) from India

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ABSTRACT

This is the first record of *Centropyxis delicatula* Penard, 1902 in India. Specimens were collected from the soil moss habitats of the state of Assam (Mangaldoi) and Tamilnadu (Villupuram, Kaliveli Lake). Distribution details and the key to the Centropyxis species reported from India are also presented.

Key Words: *Centropyxis delicatula*, Assam, Soilmoss, Tamilnadu

INTRODUCTION

Centropyxis is a genus of testate amoeba of the class lobosea with a discoid or flattened test. The Genus *Centropyxis* belonging to the order Arcellinida. It was erected by Stein 1857 with a type species *Centropyxis aculeata* and later it was recorded by many workers worldwide. To date more than 135 species and many varieties were reported from world-wide and according to the natural habitat variability a variety of forms were described under this genus (Wanner & Meisterfield, 1994; Foissner & Korganova, 1995, 2000).Species under this genus exhibit considerable diversity in the habitat preference and also their occurrence varying from moss to fresh water bodies, sea grass associated ecosystem, and also present in arctic tundra (Chattopadhyay & Das, 2003; Bindu *et al*., 2014; Boborov & Wetterich, 2012).

Perusal of literature revealed that a total of 17 species under this genus have been reported (Table.1) from various states of India (Penard, 1907; Nair & Mukherjee, 1968, Das *et al*., 1993, 1995, 2000a, 2000b, 2003; Mahajan, 1971; Mishra *et al*., 1997) and *Centropyxis delicatula* is considered to be a newly added species under the genus *Centropyxis* recorded from India. It has been observed from two different habitats of two states of India, *viz*., Assam and Tamil Nadu.

MATERIAL AND METHODS

The samples examined for the above cited species were collected from the soil moss habitats of the Mangaldai town of Darrang district during the faunal survey of Assam in December, 2012. The district Darrang is situated in the central part of Assam and on the northern side of the river Brahmaputra. The major physiographic variation of this district is its location is a narrow strip of plain lying between the Himalayas and the river Brahmaputra. The district is divided into low-lying plains, covered plains and hills. One of the important tributary of Brahmaputra river flowing through Mangaldai town and is perennial in nature. The average temperature ranges from 10^{o} to 30^{o} C. The monsoon months are usually June to august with precipitation rates of about 2120 mm. It is located at 20^{o} 9' N to 26^{o} 95'N latitude and 91^{o} 45' E to 92^{o} 22' E longitude and an elevation ranges from 50 m to 250 m above sea level.

The same species was also collected by the second author from the soils of the Kaliveli estuary, Villupuram district of Tamil Nadu state during the survey conducted on 05.07.2012. *Centropyxis delicatula* Penard, 1902 is characterised by an

organic shell with yellow to brown or brown grey in colour. The shell bears spines sometimes. Test is hyaline without any xenosomes. Dorsal view of the shell is circular and the lateral view is half spherical or flattened. Oral aperture is centrally located, tubular invaginated with 2-5 bridges.

RESULTS

Systematic account

According to the recent classification of Cavalier-Smith *et al*., 2004 and Adl *et al*., 2005 the status of *Centropyxis* as mentioned below.

Phylum	Luhe, 1913
Class	Lobosea Carpenter, 1861
Order	Arcellinida Kent, 1880
Suborder	Arcellinina Haeckel, 1884
Family	Centropyxidae Jung, 1942
Genus	*Centropyxis* Stein, 1857
	Centropyxis delicatula Penard, 1902

Material Examined

A total of 22 exs. were collected by Jasmine & Party from the soil moss of Mangaldoi district of Assam. The slides are deposited in the National zoological collections of Protozoology section with the register numbers PT. 2901 and PT.2904.

Diagnosis: The shell is yellow to brown and 50 µm in diameter and height of the shell is about 57.8 µm. Shell is circular and hemispherical in lateral view. The aperture diameter is 16 µm wide and slightly eccentric. The shell sculpture is smooth, without xenosomes or idiosomes and therefore transparent. A typical feature is an interior broad ligament with rounded openings. The sides of oral aperture is characterised with 2-4 ridges and are clearly visible (Plate.1).

Measurements

Diameter of the shell: 57.70 -58.79 µm; aperture 14.49 -16.01µm in diameter (Mangaldai, Darrang, Assam)

The specimen collected from Tamil Nadu (4exs.) are smaller in size (Diameter of the Test: 38 µm) compared to Assam specimens. The original description of Penard (1902) reports a length of 35 - 48 µm. Later Hoogenraad & De Groot, 1940 described a mean length of 48 µm. In this study the measurements differ slightly between different specimens collected from different habitats of two states. The Mangaldai, Assam specimen characterised with a mean length of 50 µm (n= 22) and ranges from 50 - 57µm and the specimen from Tamil Nadu with a length of 38 µm (Plate.2).

Distribution: India: Assam (Mangaldoi), Tamil Nadu (Villupuram)

Habitat: Soilmoss (Assam), Kaliveli Lake, (Tamil Nadu).

Key to the *Centropyxis* species reported from India

There are more than 130 species reported worldwide, under the genus *Centropyxis*. However, in India, only 17 species have been reported. The key to the species reported from India is provided below.

1. Test furnished with spine……2
Test without spine……..3

2. Test furnished with a few number of divergent spines in a single row or quite fairly regular row at the border, oral aperture circular or oval ……..……*C.aculeata*
Test furnished with variable number of spines usually (6-8), spines frequently curved and distributed irregularly on dorsal side, oral aperture lobate or circular with irregular border ……*C. spinosa*
Test oblong-eliptical, but fundus more elevated with 3-6 spines mostly located at posterior part of the test…..……...…….. *C. oblonga*
Test hemispherical, oral aperture more or less central, invaginated with 2-5 bridges, shell sometimes with spines…….*C. delicatula*

3. Constriction visible between oral aperture and post-oral region (fundus) of the test in ventral view……4
Constriction between oral aperture and fundus lacking……6

4. Test prolonged, at anterior end resembling a flat lens covering the mouth, a constriction present between oral part and posterior part of the test……...*C. platystoma*

5. Ventrally fundus elliptical in shape with blunt and flat posterior extremity, posterior part of the test slightly arched in lateral view, constriction visible between oral aperture and fundus of the test, oral aperture large, circular and eccentric…… ……*C. mizoramensis*

6. Test circular or nearly circular in ventral view……...……...7
Test more or less ovoidal, elliptical and discoidal in ventral view……..10

7. Test reniform in lateral view and usually more than 100um in diameter, oral aperture nearly circular, bordered with completely or partially covered distorted xenosomes….……*C. plagiostoma*
Test hemispherical in lateral view, oral aperture not bordered by any xenosomes as above…….8

8. Oral aperture obliquely invaginated (plagiostomic) having aperture bridges……*C. laevigata*

Oral aperture plagiostomic without any aperture bridge……..……9

9. Test subspherical in lateral view and small, less than 50um in diameter, oral aperture circular and usually encrusted with siliceous particles……....*C. minuta*
10. Test comparatively large, usually above 70 µm in diameter, encrusted with large stony particles on its dorsal border, oral aperture nearly semi-circular...……*C. orbicularis*
11. Test visible under two distinct parts In lateral view, oral aperture region separated from the rest of the test by a perforated diaphragm…….*C. sylvatica*
    In lateral view no two distinct parts visible, perforated diaphragm is lacking……12
12. Posterior part of the test strongly arched……..13
    Posterior part of the test slightly arched……14
13. In lateral view, boarder of the entire post-oral part of the test convex, test formed of sand particles and one or a few stony particles often attached to its posterior border……...……*C. constricta*
    In ventral view, flanks of the post-oral part of the test initially straight or concave, then convex forming a rounded posterior extremity, test composed of quartz particles, no pebbles attached to it…….……..*C. arunachalensis*
14. Oral margin with well oriented thicker pebbles, test formed with quartz particles intermixed with small pebbles, organic material not or barely visible…….……...*C. cassis*
    Oral margin without any pebble, test formed of quartz/sand particles……..……15
15. Test small about 50 - 80 µm, fundus spheroidal with dorsal face strongly flattened towards oral aperture, aperture semi-circular or elliptical…….16
    Test comparatively large, usually above 100 µm, discoidal, largely elliptical, usually irregular in outline, oral aperture circular or round…*C. ecornis*
16. Test small about 50-80 µm ,ovoid in ventral view, aperture semi-circular……*C. aerophila*
17. Test hemispherical or elliptical in ventral view, oral aperture formed by two convex arcs……..... ……*C. aerophila* var. *sphagnicola*
    Test nearly hemispherical formed of flat sandy particle clothed in a chitinous colourless matrix, oral aperture centrally located, 300-400 µm in diameter……..... *C. penardi*

SUMMARY

The species *Centropyxis delicatula* under the family Centropyxidae has been recorded for the first time from the Indian subcontinent. There are 17 species hitherto known from India under the Genus *Centropyxis* and all of them were reported from the freshwater habitats or terrestrial habitats of various states of India (Chattopadhyay & Das, 2003; Bindu *et al*., 2014). This species is a new addition to the testaceans of India under the Genus *Centropyxis* and it has been observed from the two states of India in various habitats. This study also indicates that the species *Centropyxis delicatula* has an extensive distribution in various habitats with a varying size groups.

Fig 1. *Centropyxis delicatula* Penard, 1902, from Assam, India.

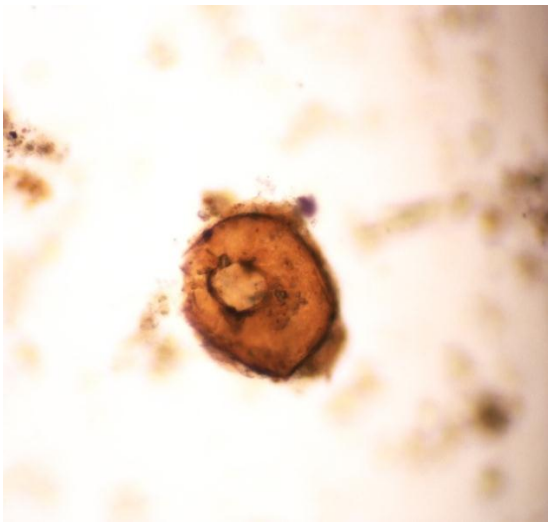

Fig 2. *Centropyxis delicatula* Penard, 1902, from Tamilnadu, India.

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Table. 1. The list of species reported under the genus Centropyxis from various Indian states

Sl. No	Species list		Indian States								
		*WB	*ML	*MZ	*AP	*TR	*SK	*NL	*AR	*MH	*MP
1.	*Centropyxis aculeata* (Ehrenberg, 1832)	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊
2.	*C. aerophila* Deflandre, 1929	◊	◊	◊	◊	◊	◊	◊	◊	—	◊
3.	*C. aerophila* var. *sphagnicola* Deflandre, 1929	—	—	—	◊	—	—	—	—	—	—
4.	*C. arunachalensis* Chattopadhyay & Das, 2003	—	—	—	—	—	—	—	◊	—	—
5.	*C. cassis* (Wallich, 1864)	◊	◊	—	◊	—	—	—	—	—	—
6.	*C. constricta* (Ehrenberg, 1841)	—	◊	◊	◊	◊	◊	—	—	—	—
7.	*C. ecornis* Ehrenberg, 1843	◊	◊	◊	◊	—	◊	◊	◊	◊	◊
8.	*C. laevigata* Penard, 1890	—	—	◊	—	—	◊	—	◊	◊	—
9.	*C. minuta* Deflandre, 1929	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊
10.	*C. mizoramensis* Chattopadhyay & Das, 2003	—	—	◊	—	—	—	—	—	—	—
11.	*C. oblonga* (Deflandre, 1929)	—	◊	—	—	—	—	◊	—	—	—
12.	*C. orbicularis* Deflandre, 1929	—	—	—	◊	—	—	—	—	◊	—
13.	*C. penardi* Deflandre, 1929	◊	—	—	—	—	—	—	—	◊	—
14.	*C. plagiostoma* Bonnet & Thomas,1955	—	—	◊	—	—	—	◊	—	—	—
15.	*C. platystoma* (Penard, 1890)	—	◊	◊	◊	◊	◊	◊	◊	—	◊
16.	*C. spinosa* (Cash and Hopkinson, 1905)	◊	◊	◊	◊	—	◊	◊	◊	◊	◊
17.	*C. sylvatica* (Deflandre, 1929)	—	—	—	—	—	—	—	◊	—	—
	Total species	**7**	**9**	**10**	**10**	**5**	**8**	**8**	**9**	**7**	**6**

*WB: West Bengal, ML: Meghalaya, MZ: Mizoram, AP: Andhra Pradesh, TP: Tripura, SK: Sikkim, NL: Nagaland, AR: Arunachal Pradesh, MH: Maharashtra, MP: Madhya Pradesh.

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