Original Research Article

EXTENDED DISTRIBUTION OF TWO SPECIES OF TESTATE AMOEBAE (TUBULINEA: CENTROPYXIDAE) TO INDIAN FAUNA

ABSTRACT

Testate amoebae are a group of unicellular free-living protozoa which are characterized by morphologically distinct shells (tests) which play an important role in the natural ecosystems as bio-indicators. This communication reports 2 new additions of moss inhabitant testate amoebae *viz*., *Centropyxis lata* Jung, 1942 and *Centropyxis longispina* Decloitre, 1979 to Indian testate fauna from Sholayar forest reserve, Kerala and Singalila National park, West Bengal

Keyword : Moss, Protozoa, Testate amoebae, New records, Kerala, West Bengal

INTRODUCTION

Testate amoebae are an extremely diverse group of phylogenetic eukaryotic microorganisms characterized by the presence of an outer test. They inhabit marine and freshwater habitats, mosses, and soils. The test, formed from secreted organic or inorganic material or assembled from ingested particles, serves as an important taxonomic character, especially when used in taxonomy of species since it can be living and fossilized, and as a result is relevant to the diagnostics and classification of the species [1]. The genus *Centropyxis* is a morphologically diverse group of testate amoebae in the family Centropyxidae. This unicellular eukaryote has a test that is normally oval, circular, or pear-shaped and is commonly made of organic material embedded with mineral particles or diatoms picked from its surrounding [2,3]. They adapt to different ecological niches owing to the variation in morphology and composition of the tests, allowing them to survive in varying habitat conditions [4]. This genus is well represented in acidic and oligotrophic environments, where it also plays a role in nutrient cycling and organic matter decomposition [5]. The present communication reports two species of testate amoebae *viz*., *Centropyxis lata* Jung, 1942 and *Centropyxis longispina* Decloitre, 1979 as new additions to Indian testate fauna.

MATERIALS AND METHODS

The samples examined for the above cited species were collected from the moss habitats of Sholayar forest reserve, Kerala and Singalila National Park, West Bengal. Moss samples from Sholayar Forest reserve was provided by Kerala Forest Research Institute, Kerala and from Singalila National park samples were obtained from Zoological Survey of India, Head Quarters, Kolkata. Moss samples (100- 200gms.) from tree barks were collected by scraping the upper surface by quadrant sampling ($1m^2$) and brought to the laboratory in polythene envelops. The samples were cultured and processed in the lab with non-flooded petri dish method as described by Foissner [6] and examined under the compound microscopes Nikon 50i and Leica DM 2000 for species level identification. Permanent slides were prepared for the identified specimens and deposited in the National Zoological collections of two regional centres of Zoological Survey of India *viz*., Marine Biology Regional Centre, Chennai, Tamil Nadu and Western Ghat Regional centre, Kozhikode, Kerala.

RESULTS

The details of new additions of testate species to India are provided below.

Phylum Tubulinea Smirnov *et al*., 2005

Class Elardia Kang *et al*., 2017

Order Arcellinida Kent, 1880

Family Centropyxidae Jung, 1942

Genus *Centropyxis* Stein, 1857

Test mostly discoid, membraneous and encrusted with foreign particles or covered with sandy material, dorso-ventrally flattened, swollen at posterior portion and tapering towards apertural region, aperture eccentric, typically invaginated without a raised rim. At the posterior end or all around the periphery some spines may be present.

Description of species

1. *Centropyxis lata* Jung, 1942 (Fig.1)

   Material examined: Reg. No. INV.28743, 2 examples; date of collection, 31.xii.2021 (10.572°N and 76.5703°E); Tree moss, Sholayar Forest Reserve, Kerala

Diagnostic characters

Test large in size, coarse-scaled, embedded with a mix of diatoms and coarse materials; test is broad and tapering towards the posterior end, pseudostome large, ventral side mostly steeply sloping over the inner, pseudostomal edge is irregular, lip margin quite wide, covered with relatively thick plates. Length of the shell is 105-120 µm and width 86-96 µm.

Fig.1. *Centropyxis lata* Jung, 1942

2. *Centropyxis longispina* Decloitre, 1979 (Fig.2)

Material examined: Reg. No. Mi.886, 2 examples; date of collection, 10.iv.2019 (27.0653°N and 88.0016°E); Tree moss, Singalila National park, West Bengal

Diagnostic characters

Test dark in colour, built of dark xenosomes, with thick cement; pseudostome almost semi-circular; spines are thin and very long, hollow, and placed irregularly on very different positions. Some spines are straight and some are slightly curved. Test spherical and slightly flattened in the apertural region. Test length is 46µm and spine length is 80-90 µm.

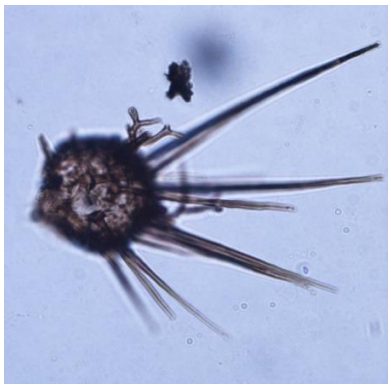

Fig.2. *Centropyxis longispina* Decloitre, 1979

DISCUSSION

The present communication reports the extended distributional range of two species of testate amoebae under the genus *Centropyxis* Stein, 1857 *viz*.,*Centropyxis lata* Jung, 1942 and *Centropyxis longispina* Decloitre, 1979 to Indian testate fauna from West Bengal and Kerala respectively. Perusal of literature shows that 23 species under the genus *Centropyxis* have already been reported from various states of India[7,8, 9,10, 11,12,13,14,15,16]. The present study adds 2 more species to the Indian testate fauna. There is difficulty with several groups of individuals which shared common features and thus some of the species are synonimised. Decloitre described *Centropyxis longispina* as *Centropyxis spinosa* in 1956 but this name was already preoccupied and in 1979 Decloitre changed the name to *longispina*. Even slight variations in the shell shape have resulted in the establishment of new forms or species regardless of the range of variability that individual taxon exhibits. Intensive studies on testate amoebae in India initiated only in the 2nd half of the 20th century. The total number of testates in India is 209 as per the recent check list published by Zoological Survey of India [11]. Testate amoebae's importance in monitoring ecosystem dynamics and environmental changes speaks to their remarkable utility. Their full ecological understanding and evolutionary history remain unsolved problems especially in the under-studied countries like India. Studies should be made in a wide spectrum and more workers should come forward to explore the actual diversity of testate fauna in India.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (Chat GPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

REFERENCES

1. Charman, D. J. (2001). Biostratigraphic and palaeoenvironmental applications of testate amoebae. *Quaternary Science Reviews*, **20**(16-17), 1753–1764.
2. Chardez, D.(1965). Les Thécamoebiens (Rhizopoda Testacea). *Biologia Gabonica*.**1**:33-40.
3. Meisterfeld, R. (2002).Testate Amoebae with Filopodia. In J.J. Lee, G.F. Leedale, & P.C. Bradbury (Eds.), *An Illustrated Guide to the Protozoa* (Vol. 2, pp. 1054–1084) Society of protozoologists, Lawrence, Kansas.

4. Smith, H.G., Bobrov, A., & Lara, E.(2008). Diversity and biogeography of testate amoebae. *Biodiversity and Conservation*,**17**, 329–343. https://doi.org/10.1007/s10531-007-9260-5
5. Payne, R.J., & Mitchell, E.A.D. (2011). Testate amoebae and niche separation: Studies of environmental gradients in peatlands. *Microbial Ecology*, **61** :509–522. https://doi.org/10.1007/s00248-010-9782-8
6. Foissner W.(1992). Estimating the species richness of soil protozoa using non-flooded petridish method. *In Protocols in Protozoology*. Lee, J.J and Soldo, A.T.(eds), Allen Press.
7. Bindu, L., G. Sivaleela, Rajkumar Rajan and K. Venkataraman.(2014). Protozoans and other fauna associated with sea grass ecosystems of Palk Bay. *Rec. zool. Surv. India*, **114** (Part- 2), 191-210.
8. Bindu, L. (2013). Protozoa: Rhizopoda. In Faunal diversity of Pangi Valley,Himalayan Ecosystem Series, Zool. Surv. India, **3**:13-30.
9. Bindu, L.(2019). Extended distribution of testate amoebae (Protozoa: Rhizopoda) to Indian fauna from Sangla Valley, Himachal Pradesh, India. International Journal of Biodiversity and Conservation, **11**(7): 183-186.
10. Bindu.L. (2023).New Records of Testate Amoebae from Shendurney Wildlife Sanctuary, Kerala, India: Insights into Microbial Biodiversity, *Journal of Scientific Research and Reports*, **29**(9):55-63.
11. Bindu L, Purushothaman J, Ambili A & Chaudhary A. (2024)Checklist of Fauna of India:Testate Amoeba (Protozoa: Tubulinea;Cercozoa;Stramenopiles). Version 1.0. *Zoological Survey India*, DOI:https://doi.org/10.26515/Fauna/1/2023 /Protista:Tubulinea; Stramenopiles.
12. Chattopadhyay, P & Das, A. K. (2003). Morphology, morphometry and ecology of moss dwelling testate amoebae (Protozoa: Rhizopoda) of north and north-east India. Mem. Zool. Surv. India. **19**(4), 1-16.
13. Das, A. K., Mondal, A. K & Sarkar, N. C. (1993).Free living Protozoa. *Zool Surv. India State Fauna Series*,3, *Fauna of West Bengal*, Part 12, 1-134.
14. Das, A. K., Tiwari, D. N & Sarkar, N. C. (1995). Protozoa. *Zool. Surv. India. State Fauna Series* 4, *Fauna of Meghalaya*, Part 10, 1- 107.
15. Das, A. K., Mondal, A. K., Tiwari, D. N & Sarkar N. C. (2000). Protozoa. *Zool. Surv. India. State Fauna Series* 7, *Fauna of Tripura*, Part 4, 1-52.

16. Nair, K. N., Das, A. K & Mukherjee, R. N.(1971). On some freshwater rhizopoda and heliozoa (Protozoa) from Calcutta and its environs. Part I. *Rec. Zool. Surv. India*, **65:**1-16.