



Novel records of two testate amoebae of the family Hyalospheniidae (Tubulinea: Arcellinida) from India

Bindu Lajapathi

Marine Biology Regional Centre, Zoological Survey of India, 130, Santhome High Road, Chennai-600 028
E mail: bindulajapathi40@gmail.com

Article History

Received: 14 September 2020

Accepted: 29 October 2020

Published: November 2020

Citation

Bindu Lajapathi. Novel records of two testate amoebae of the family Hyalospheniidae (Tubulinea: Arcellinida) from India. *Species*, 2020, 21(68), 325-329

Publication License



This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note

Article is recommended to print as color digital version in recycled paper.

ABSTRACT

The present study reports two species of moss inhabitant testate amoebae viz., *Porosia paracarinata* Bobrov and Kosakyan, 2015 and *Quadrulella elegans* Gauthier-Lievre, 1958 as new additions to Indian testate fauna from moss habitats of Singalila National Park and Agastyamala BR, India. The detailed description of the specimens studied are also provided.

Key words: Protozoa, Testate amoebae, Hyalospheniidae, Singalila NP, Agastyamala BR, Moss

1. INTRODUCTION

Taxonomy of hyalospheniid testate amoebae is being always complex and confusing. Hyalospheniidae Schultze, 1877 are one of the well studied groups among testate amoebae. This is a speciose rich family of testate amoebae reported from moss habitats and detailed studies have been done with regard to distribution, taxonomy and ecology and considered as important bioindicators for

ecological and environmental monitoring (Stefan Luketa, 2017). During the last decade a number of taxonomic studies have been done on this complex group in various parts of the world (Todorov, 2010; Heger *et al.*, 2011; Kosakyan *et al.*, 2013, 2016; Bobrov and Kosakyan, 2015; Perez-Juarez *et al.*, 2017; Stefan Luketa, 2017) and in India it is being least attended. Present communication reports two species as novel records to Indian testate fauna from the family Hyalospheniidae under the genera *Quadrullella* Cockerell, 1909 and *Porosia* Jung, 1942.

Quadrullella is a genus of testate amoebae which secretes characteristic square plates and comprises most species of hyalospheniid testate amoebae. The taxonomic status of most of the species are poorly studied. *Quadrullella symmetrica* (Wallich, 1863) Kosakyan *et al.*, 2016 is the type species with cosmopolitan distribution. According to the recent studies by Kosakyan *et al.*, (2016) this genus includes eleven valid species in which shells composed of self secreted siliceous quadrangular plates. The members of this genus inhabit in peatlands, wet mosses and humus rich soils. Genus *Porosia* (Jung, 1942) Bobrov & Kosakyan, 2015 is characterized with pyriform test with rounded posterior end and laterally compressed. The type species is *Porosia bigibbosa* (Penard) Jung, 1942. The presence or absence of a keel is an important distinctive character between species. The habitat is sphagnum mosses and soil and only two species have been reported under this genus and present record turns the second report of *P. paracarinata* in global status.

2. MATERIALS AND METHODS

The moss samples for the present study were collected during the survey to Agastyamala BR and Singalila NP, West Bengal as part of the annual programme of Zoological Survey of India. Moss samples (100-200gms) from tree barks and rock were collected by scraping the upper surface by quadrant sampling (1m²) and brought to the laboratory in polythene envelopes. The samples were cultured and processed in the lab with non-flooded petri dish method as described by Foissner (1987, 1992) and examined under the compound microscope Nikon 50i for species level identification. Permanent slides were prepared for the identified specimens and deposited in the National Zoological collections of the Marine Biology Regional Centre, Zoological Survey of India, Chennai, Tamil Nadu, India.

3. RESULTS

In the present communication two species *viz.*, *Porosia paracarinata* Bobrov and Kosakyan, 2015 (Fig.1) and *Quadrullella elegans* Gauthier-Lievre, 1958 (Fig.2) are reported as new additions to Indian testate fauna.

Systematic position (Classification followed is Adl *et al.*, 2019)

Phylum Tubulinea Smirnov *et al.*, 2015

Class Elardia Kang *et al.*, 2017

Order Arcellinida Kent, 1880

Family Hyalospheniidae Schultze, 1977

Genus *Porosia* Jung, 1942

Porosia paracarinata Bobrov and Kosakyan, 2015

This species is obtained from the moss sample (tree moss) of Singalila National Park (N 27° 06' 748'' and E 08° 80' 0598'') at an altitude of 3409 metres. Only two species under the Genus *Porosia* have been reported worldwide *viz.*, *Porosia bigibbosa* (Penard, 1890) and *Porosia paracarinata* Bobrov and Kosakyan, 2015 and this communication reports the extended distribution of the species *Porosia paracarinata* to Indian testate fauna.

Diagnosis

Test is comparatively larger than *P. bigibbosa*, laterally compressed; posterior part is clearly rounded; two lateral depressions with two large invaginated pores are present about 1/3rd of test length from aperture. A clear lateral keel is visible which is the typical character of this species distinguishes from *P. bigibbosa* at about half of the length of the test from aperture. Test is composed of various types of irregular plates embedded in unstructured cement. Length of test is 221 – 228.81µm, Breadth 140. 62 -142 µm. Aperture is oval (68-69.24µm), slightly curved outwards with a thick organic lip around. The specimens are deposited in the National Zoological collection of Marine Biology Regional Centre, Zoological Survey of India, Chennai, India (Reg Nos. Mi- 845 and Mi 845/1).

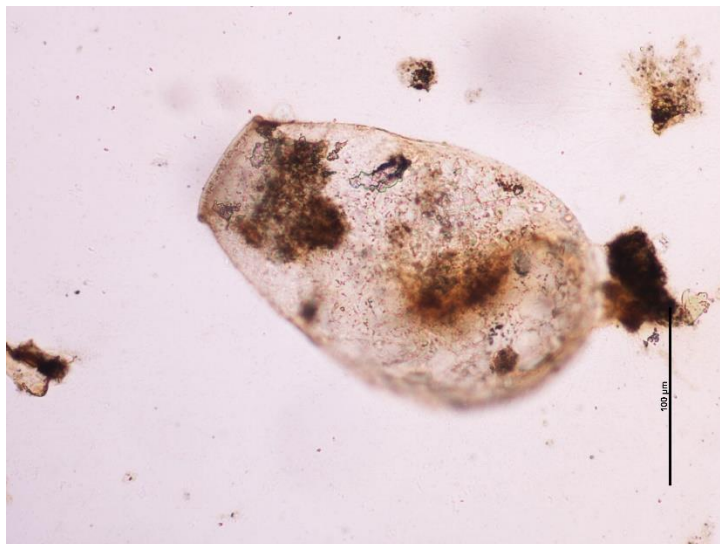


Fig. 1. *Porosia paracarinata* Bobrov and Kosakyan, 2015



Fig. 2. *Quadrulella elegans* Gauthier-Lievre, 1958

Genus *Quadrulella* Cockerell, 1909

Quadrulella elegans Gauthier-Lievre, 1958

This species is identified from the moss samples (rock moss) collected from Peppara WLS (Kerala), Agastyamala Biosphere reserve, India (N 08° 41.260' and E 077° 11.214'; altitude 1151metres). This is the novel report of *Quadrulella elegans* to Indian testate fauna and of the 12 valid species reported worldwide only three species under the genus *Quadrulella* viz., *Quadrulella symmetrica*, *Quadrulella quadrigera* and *Quadrulella tropica* have been reported from India. The type species is *Quadrulella symmetrica* (Wallich, 1864) Cockerell, 1909.

Diagnosis

Shell is pyriform with the lateral sides tapering towards the aperture with a distinct neck which secretes characteristic square plates to reinforce the test; pseudostome ends with a rounded base, flanks stretching regularly from the posterior side towards the aperture; the shell is divided into almost two equal parts by the clearly pronounced constriction. Two lateral pores are disposed at a distance of about 1/4th from the pseudostome to the fundus. Length of the test is 98.42- 101μm, breadth 35.32-37μm and aperture width is 25. 50 -27μm. The specimens are deposited in the National Zoological collection of Marine Biology Regional Centre, Zoological Survey of India, Chennai, India (Reg Nos. Mi-1060 and Mi- 1061).

Distribution: Africa: Ivory coast, Republic of Congo, Zimbabwe, Seychelles, Republic of South Africa; South America: Paraguay, Argentina; Brazil, Australia: New Guinea.

4. DISCUSSION

The family Hyalospheniidae were included by a few genera (Leidy 1874, Schulze 1877). Most hyalospheniid species were grouped into the genus *Nebela* (Leidy, 1879). The present communication reports the extended distribution of two species of the genera viz., *Porosia* and *Quadrulella* of the family Hyalospheniidae to Indian testate fauna. The genus *Porosia* was proposed to include a single species, *N.bigibbosa* Penard, 1890 which differs from other Nebellids by the presence of two lateral pores situated on each side (Jung, 1942). *Porosia paracarinata* shares some morphological features with other hyalospheniid genera such as *Nebela*, particularly *Nebelacarinata* and *N. marginata* with the presence of a distinct keel. But *Porosia paracarinata* can be easily distinguished from the *Nebela* species which do not have lateral depressions with large invaginated pores. The present report of *Porosia paracarinata* is the second record globally and this species was described from Japan by Bobrov and Kosakyan (2015). *P. paracarinata* differs from the only reported species under this genus *P. bigibbosa* by larger dimensions and the presence of a distinct lateral keel. However, unlike *Porosia* the number of valid species reported globally under the Genus *Quadrulella* is 12 (Kosakyan *et al.*, 2016 and Perez-Juarez *et al.*, 2017) and there are much variations among species have been noticed. *Quadrulella* differs from *Nebela* and *Hyalosphenia* by the presence of square, siliceous self secreted plates in the construction of the shell. In the present study the size and well expressed lateral pores confirmed that the species is *Quadrulella elegans*. In size and nature of the test it closely resembles *Q. debonti* Van Oye, 1959, but lateral pores are lacking. This report is the extended distribution of the species to Indian testate fauna in addition to the early reported 3 species viz., *Quadrulella symmetrica*, *Quadrulella quadrigera* and *Quadrulella tropica* which have been reported from Himachal Pradesh and North Eastern states of India. Testate amoebae exhibits much cryptic speciation and the number may be much more than the existing and systematic studies should be made in a serious approach to explore the exact diversity.

Acknowledgement

The author is grateful to the Director, Zoological Survey of India, Kolkata, for sanctioning the project and providing the facilities and Dr.Sheela.S, Scientist, Head Quarters, Kolkata for providing the moss samples from Singalila NP.

Conflict of interest

The author has no conflict of interest to declare that are relevant to the content of this article.

Funding:

This research received no external funding.

Peer-review:

External peer-review was done through double-blind method.

Data and materials availability:

All data associated with this study are present in the paper.

REFERENCES AND NOTES

- Bobrov, A and Kosakyan, A.2015. A new species from mountain forest soils in Japan: *Porosia paracarinata* sp. nov., and taxonomic concept of the genus *Porosia* Jung, 1942. *ActaProtozool.* 54, 289-294.
- Foissner, W. 1987. Soil Protozoa: Fundamental problems, ecological significance, adaptations in ciliates and testaceans, bioindicators and guide to the literature. *Progr.Protistol.*, 2 : 69- 212.
- Foissner, W. 1992. Estimating the species richness of soil protozoa using the 'non-flooded petridish method'. In *Protocols in Protozoology*. Lee, J. J and Soldo, A.T(eds.), Allen Press, Lawrence, Kansas B-10.1- B-10.2.
- Heger, T. J., Booth, R.K., Sullivan, M.E., Wilkinson, D.M., Warner, B.G., Asada, T., Mazei Yu., Meisterfeld R and Mitchel, E. A. D.2011. Rediscovery of *Nebelaansata* (Amoebozoa: Arcellinida) in eastern North America: biogeographical implications. *J. Biogeogr.* 38: 1897-1906.
- Jung, W. 1942. Illustrierte Thekamoben-Bestimmungstabellen. I. Die Systematik der Nebelinen. *Arch. Protistenkd.*95, 357-390.
- Kosakyan, A., Gomma, F., Mitchell, E. A. D., Heger, T.J and Lara, E. 2013. Using DNA barcoding for sorting out protist species complexes: a case study of the *Nebelatincta-collaris-*

- bohémica* group (Amoebozoa; Arcellinida, Hyalospheniidae). *Eur.J.Protistol.* 183: 222-237.
7. Kosakyan, A., Lahr, D.J.G., Mulot, M., Meisterfeld, R., Mitchell, E. A. D and Lara, E.2016. Phylogenetic reconstruction based on COI reshuffles the taxonomy of hyalosphenid shelled (testate) amoebae and reveals the convoluted evolution of shell plate shapes. *Cladistics.* 32: 606-623.
 8. Leidy, J. 1874. Notice of some new freshwater rhizopods. *Proc. Acad. Nat. Sci. Phila.*, 3 : 77- 79.
 9. Leidy, J.1879. Fresh water rhizopods of North America. *Rep. US Geo. Surv.Terr.* 12 : 1-324.
 10. Perez-Juarez, H., Serrano-Vazquez, A., Kosakyan, A., Mitchell, E.A.D., Rivera Aguilar, V.M., Lahr, D.J.G., Hernandez Moreno, M.M., Cuellar, H.M., Eguiarte, L.E and Lara, E. 2017. *Quadrulellatexcalense* sp. nov. from a Mexican desert: An unexpected new environment for hyalospheniid testate amoebae. *Eur.J. Protistol.* 61(A), 253-264.
 11. Schulze, F. E. 1877. Rhizopodenstudien VI: *Arch. Mikrosk. Anat.* 13 : 9-30.
 12. Stefan Luketa. 2017. Taxonomy of *Quadrulellalongicollis* and *Q. symmetrica* (Arcellinida: Hyalospheniidae) from the central part of the Balkan Peninsula. *Protistology*, 11 (4): 215-230.
 13. Todorov, M. 2010. *Nebelagolemansky* sp. Nov., a new sphagnicolous testate amoebae from Bulgaria (Amoebozoa: Arcellinida, Nebelidae). *ActaProtozool.* 49: 37-43.