



Cosmarium bromelicola sp. nov. (Desmidiaceae, Zygnematophyceae), a new desmid species from Northeast Brazil

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Abstract

Cosmarium bromelicola sp. nov. is a new desmid species described from samplings carried out in bromeliad tanks (phytotelmata) from an area of rocky outcrops at Serra da Jiboia, Bahia State, Northeast Brazil. Presence of subtrapeziform cells with a deep depression at the apical region and twisted X-shaped cell in side view are the diagnostic features for the species. Relationships with the morphologically closest taxa are discussed.

Keywords: *Alcantarea nahoumii*, algae, bromeliad, phytotelm.

Cosmarium bromelicola sp. nov. (Desmidiaceae, Zygnematophyceae), uma nova espécie de desmídia do nordeste do Brasil

Resumo

Cosmarium bromelicola sp. nov. é uma nova espécie de desmídia descrita a partir de amostragens realizadas em tanques de bromélias (fitotelmata) de uma área de afloramentos rochosos na Serra da Jiboia, Bahia, nordeste do Brasil. A presença de células trapeziformes com uma depressão profunda na região apical e célula em forma de X em vista lateral são as características diagnósticas da espécie. Relações com os táxons morfológicamente próximos são discutidas.

Palavras-chave: *Alcantarea nahoumii*, algas, bromélias, fitotelmo.

1. Introduction

Phytotelmata are aquatic habitats formed by vegetal structures capable of maintaining several associated organisms, including algae (Varga, 1928; Kitching, 2000). Among the major algal groups inhabiting the bromeliad phytotelmata are the desmids, especially *Cosmarium* Corda ex Ralfs considered the largest desmid genus in terms of number of species (over 2,000), and one of the oldest names among the placoderm desmids (Prescott et al., 1981; Sophia et al., 2004; Bicudo and Menezes, 2017; Brook and Johnson, 2011).

Cosmarium is characterized by having generally solitary cells, semicells rounded, reniform, pyramidate, quadrate with entire or undulate margin; subcircular to elongate-oval (biradiate) in apical view; cell wall smooth with scattered pores or ornamented; one to several chloroplasts per semicell, axial or parietal, and as well as other desmids generally inhabit acidic, oligotrophic, aquatic environments and occasionally subaerial or in basic, eutrophic water (Guiry and Guiry, 2017).

In Brazil, 157 species and 146 taxonomic varieties of *Cosmarium* were inventoried so far (Felisberto and Rodrigues, 2004; Oliveira et al., 2011; Menezes et al., 2015), 18 of which were reported from bromeliad phytotelmata (Ramos et al., 2018).

Present report describes a new desmid species, *Cosmarium bromelicola* sp. nov., collected from tanks of *Alcantarea nahoumii* (Leme) J.R. Grant, an endemic bromeliad from Bahia, inhabiting rocky outcrops of the Serra da Jiboia, Brazil. This bromeliad is considered a vulnerable species per the IUCN standards and usually suffer with burning and extraction, as well as other threats (Forzza et al., 2013).

2. Material and Methods

“Serra da Jiboia” is located in the South “Recôncavo”, i.e. the eastern part of Bahia State, Brazil, made up by a complex of small hills (Pioneira, Oiti, Monte Cruzeiro, Água Branca, etc.) occupying an area of approximately 22,500 ha at the maximum altitude of 850 m above the

sea level. The South “Recôncavo” region is located at the outskirts of the Atlantic Forest and the Semi-Arid Domains. Local vegetation includes plants inhabiting granitic rocky outcrops of the top, tropical rain forest on the east slope, and “Caatinga” on the west and north (Juncá and Borges, 2002).

Eighty samples were collected during January, July, September and November 2015 (20 in each month) in tanks of *Alcantarea nahoumii* (Bromeliaceae), at the top of “Monte da Pioneira” (Santa Teresinha municipality), with the aid of a 50 mL syringe coupled on a polyethylene hose. Water abiotic information such as temperature, pH, and conductivity, was measured using a Hanna multiparameter probe. After collection, part of the samples was kept alive for two weeks at 25 °C in the UEFS Phycology Laboratory for morphological observations, and the other part preserved with Transeau solution (Bicudo and Menezes, 2017). All the samples collected were registered on Herbarium of the State University of Feira de Santana (HUEFS).

Morphological features and cell dimensions of the specimens were derived from light microscope (LM) (Olympus Model BX 43) observations. A population of about 100 individuals was analyzed which allowed a detailed examination of their morphological features.

The images were captured with a digital camera (5.0 MP QImaging) using the Image-Pro Premier 9.1.4 software. First step before starting the SEM protocol was the addition of a 2% CTAB solution during 24 h to remove the excess of mucilage surrounding the cells (Tavera and Calderón, 2013). To study more details of cell wall we prepare SEM samples adapting the protocol from Van Westen (2015) for desmids (acetone series: 30%, 50%, 70%, 85%, 95%, 100%, 100%).

3. Results

3.1. Taxonomic account

Cosmarium bromelicola G.J.P.Ramos, C.E.M.Bicudo and C.W.N.Moura, sp. nov. (Figures 1-13).

Cells solitary, as long as broad, median constriction deep, sinus linear, narrow, expanded near the isthmus; semicell subtrapeziform, apical view elliptic with a central, deep median depression, side view subpyramidal, focused internally has X-shaped similar to a chromosome, lateral margins divergent towards the apex; cell wall granulate, with rows of well-marked pits (scrobicle), each of them bearing a distinct pore, lateral margin granulate; chloroplast axial, 2 pyrenoids per semicell. Zygosporium unknown. Cell dimensions: 50-63 µm length, 50-61.4 µm breadth, 17.5-21.6 µm isthmus.

3.2. Differential diagnosis

Cosmarium bromelicola differs from all other species of the genus by having subtrapeziform semicells with a central median depression at the apical region, and subpyramidal in side view, when focused internally is X-shaped, like a chromosome

3.3. Habitat

Bromeliad tanks (*Alcantarea nahoumii*); water temperature 21.7-31 °C; pH 4.3-6.6; conductivity 0.05-0.65 mS.cm⁻¹.

3.4. Material examined

Brazil, Bahia, Santa Teresinha, Serra da Jiboia, 12°51'07.1" S, 39°28'36.0" W, 20/11/2015, G.J.P. Ramos, C.W.N. Moura and C.A. Ribeiro s.n. (Holotype: HUEFS 220176!). Paratypes: HUEFS 155295, 224653, 224654, 224658, 224661, 224666, 224673, 224676, 224686, 224687, 224688, 224693, 224698, 224712, 224716, 224724, 224728.

3.5. Etymology

The epithet is derived from bromeliad, plant which the species inhabit.

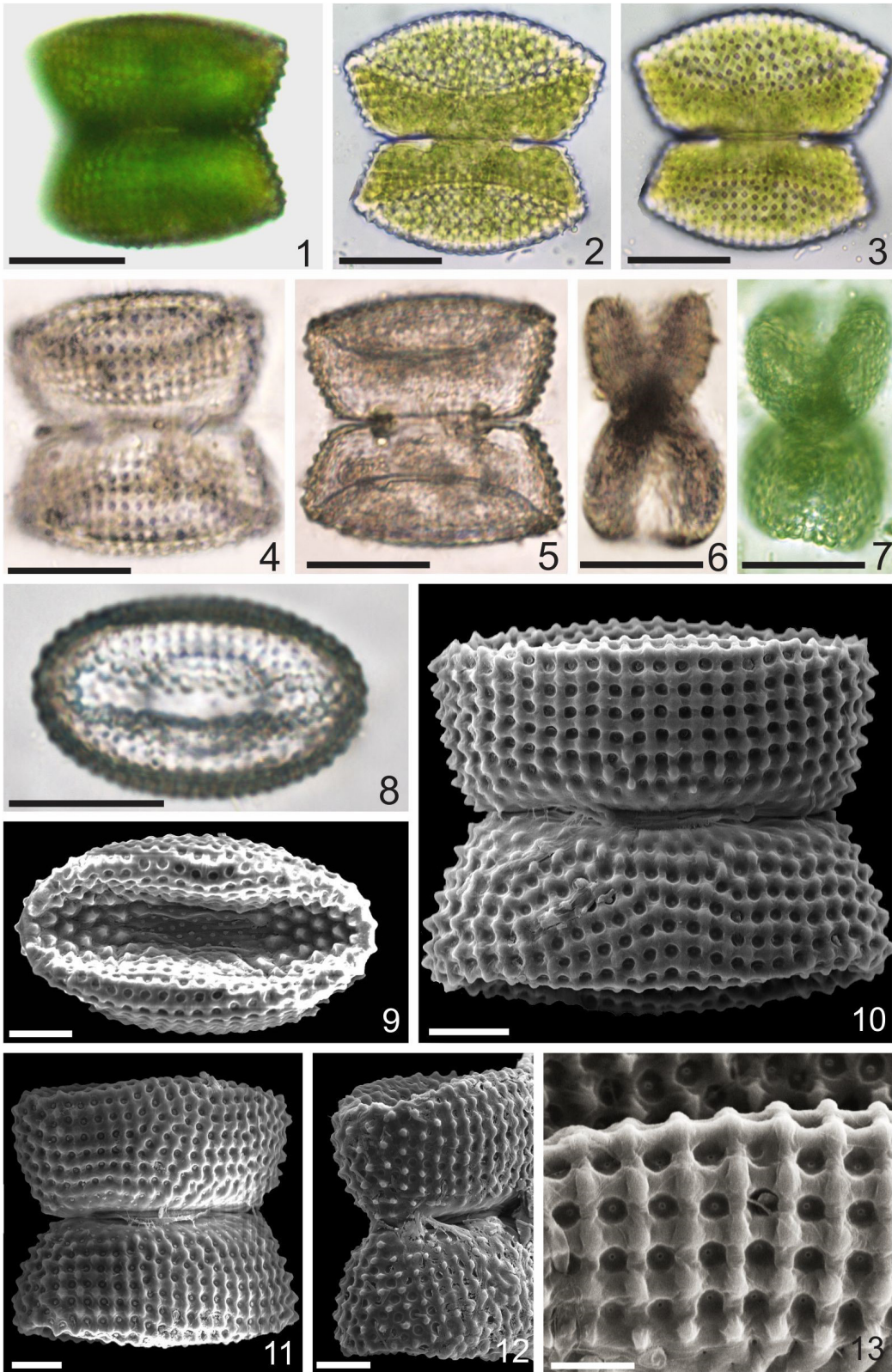
4. Discussion

Cosmarium bromelicola has a unique morphology among all *Cosmarium* species, i.e. the presence of a usually deep depression at the apical region of cell that gives the semicell the shape of a bowl in the front view. In addition, when the cell is focused in side view, the X-shaped look like a chromosome, also a distinctive pattern among the other *Cosmarium* species.

Although easily identifiable through the above features, *C. bromelicola* can be somewhat confused with *Cosmarium* species with subtrapeziform semicells as *C. biretum* Brebisson ex Ralfs and *C. latifrons* P.Lundell. *Cosmarium biretum* differs from *C. bromelicola* by having semicells elliptical, with a visible protuberance at the mid of the apical view, and the subcircular-ovoid semicells in the side view. In other hand, *C. latifrons* is distinct from *C. bromelicola* in the smaller elliptical semicells with a 3-granular median protuberance in apical view and the ovoid side view. In addition, limited geographic distribution of *Cosmarium latifrons* to the temperate and polar regions (Prescott et al., 1981) can also be used for its distinction from *C. bromelicola*.

Due to this apical depression, this species can be also easily confused with collapsed cells of some *Cosmarium* species, mainly those possessing a fragile cell wall. However, the occurrence of collapsed cells does not apply to *C. bromelicola* because the apical depression was present in all specimens analyzed, with the same pattern observed in living populations, i.e. this morphology, in this case, does not due to be related to over-strength preservative. Other desmids also were described having apical concavity as *Vincularia roraimae* K. Fučíková and J. Kaštovský, which was found from various types of habitats in top of Mont Roraima (Fučíková and Kaštovský, 2009).

Cosmarium bromelicola is probably a rather susceptible species to environmental changes when compared with other *Cosmarium* species present in the *A. nahoumii* tanks in the area, such as *C. elegantissimum* P.Lundell and *C. pseudoconnatum* Nordstedt. We observed that the latter was kept alive for two weeks, but *C. bromelicola* easily lost the natural features of its chloroplast after a short period (1-2 days), giving the cells with a senescent look (brown color). This phenomenon happened during



Figures 1-13. *Cosmarium bromelicola* sp. nov. 1-8. LM images. 1-5. Front view. 6-7. Side view. 8. Apical view. 9-13. SEM images. 9. Apical view. 10-11. Front view. 12. Side view. 13. Detail of cell wall pores. Scale Bars = 30 μ m (1-8), = 10 μ m (9-13).

the four months' period in which the samples were collected. *Cosmarium bromelicola* occurred in 18 from a total of 80 samples collected and zygospores were not found. Finally, further phycological studies are needed, not only in bromeliads, but also in other plants capable to form phytotelmata.

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