

Nomenclatural and taxonomic notes on Brazilian desmids IV

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This paper is a continuation of a series dealing with taxonomic and nomenclatural updates on Brazilian desmids (Ramos & Moura 2019a, 2019b, 2020a, 2020b). Some new combinations and names are proposed for some representatives of genera *Bourrellyodesmus*, *Closterium*, *Cosmarium*, *Euastrum* and *Staurastrum*.

While analysing the Brazilian taxa of *Xanthidium*, we found recently that some have morphological features most related to other genera such as *Bourrellyodesmus* and *Cosmarium*.

The first group refers to two varieties of *Xanthidium tenuissimum* described by Förster (1974) based on material collected on the Amazon basin, Brazil: *X. tenuissimum* var. *amazonense* Kurt Förster and *X. tenuissimum* var. *constrictum* Kurt Förster. Both taxa have only two spines per semicell, plus a central intumescence, features of the genus *Bourrellyodesmus* as currently conceived. Thus, those varieties are being transferred to the latter genus, but at the species level, as follows:

Bourrellyodesmus amazonensis (Kurt Förster) G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *comb. nov. et stat. nov.*

Basionym: *Xanthidium tenuissimum* var. *amazonense* Kurt Förster, *Algological Studies/Archiv für Hydrobiologie, Supplement 28*: 233. 1981.

Note: “*Xanthidium tenuissimum* var. *amazonense*” Kurt Förster (1974: 165, pl. 8: figs 15–16) was invalid as two collection localities were mentioned in the protologue (“*Poço II in nächster Nähe der Stadt Maués*” [26.1.1941] and “*Rio Paracum*” [14.11.1959], both in the State of Amazonas, northern Brazil), so the designation was not valid as it was not based on a single gathering (ICN Art. 40.2, Turland & al. 2018). Also, a nomenclatural type was thus not designated at this time (Art. 40.1). Förster (1981: 233) validated the name by designating Förster (1974: pl. 8: fig. 16) as the holotype (“*ikonotypus*”) of the validated name.

Bourrellyodesmus constrictus (Kurt Förster) G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *comb. nov. et stat. nov.*

Basionym: *Xanthidium tenuissimum* var. *constrictum* Kurt Förster, *Algological Studies/Archiv für Hydrobiologie, Supplement 28*: 233. 1981.

Note: “*Xanthidium tenuissimum* var. *constrictum*” Kurt Förster (1974: 165, pl. 8: figs 13, 14) is invalid as two collection localities were mentioned in the protologue (“*Rio Maués-mirim*” [15.11.1959] and “*Rio Maués-assú*” [15.11.1959], both in the State of Amazonas, northern Brazil), the name is thus not based on a single gathering (Art. 40.2) and a nomenclatural type was not designated at that time (ICN Art. 40.1). Förster (1981: 233) validated the name by selecting Förster (1974: pl. 8: fig. 8) as the holotype (“*ikonotypus*”) of the validated name.



The second group comprises the *Xanthidium* taxa that have *Cosmarium*-like morphology. We do not consider them members of genus *Xanthidium* because the spines are not confined to the cell angles, instead developing two superimposed series on each side of the semicell rather than continually along the margins.

The Brazilian taxa of *Xanthidium* under discussion were proposed by Kurt Förster based on material gathered in the central (Förster 1964) and northern regions (Förster 1963). There are other species of *Cosmarium* like *Xanthidium* representatives such as *C. horridum* Borge (1899: 23), and *C. paraguayense* Borge (1903: 88), both of which are endemic to South America.

However, *Xanthidium obsoletum* var. *brasiliense* Grönblad (1945: 22, fig. 158), another taxon based on material gathered in northern Brazil, is clearly related to *Cosmarium*. Nevertheless, we do not consider the information from the original description sufficient to propose a new combination for this taxon, as it resembles underdeveloped forms of other species such as *Cosmarium paraguayense* O.Borge (Borge 1903: 88, pl. 2: fig. 16) or *C. guatemalense* W.R.Taylor (Taylor 1939: 117, fig. 1: 1–3). Further studies, preferably at a populational level, are recommended to investigate this taxon as Grönblad included only dimensions from a unique cell that was illustrated only in front view.

Additionally, there is a species originally proposed by Croasdale & Grönblad in Scott & al. (1965) from the Amazon basin, which was renamed subsequently by Croasdale (1971) as *Xanthidium echinatum*.

Cosmarium multispinosum G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Xanthidium multispinosum* Grönblad & Croasdale (in Scott *et al.*), *Acta Botanica Fennica* 69: 47, figs 143–144. 1965, *nom. illeg.*, non *Xanthidium multispinosum* Möbius (1887: 124).

Synonym: *Xanthidium echinatum* Croasdale (in Grönblad & Croasdale), *Acta Botanica Fennica* 93: 40. 1971.

Note: Grönblad in Scott & al. (1965) was at first uncertain about the identification of *X. multispinosum* and suggested the possibility of it being a *Cosmarium* or an *Euastrum*. The rectangular semicells with margins bearing very small spines, largest in the upper lateral corners, as well as the 4 irregular vertical rows of 3 or 4 spines across the face are morphological features most related to *Cosmarium* than *Xanthidium*. *Xanthidium multispinosum* Grönblad & Croasdale while illegitimate when treated as a *Xanthidium* is a valid name and becomes available within *Cosmarium* (Art. 58.1).

Cosmarium eckertii (Kurt Förster) G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *comb. nov.*

Basionym: *Xanthidium eckertii* Kurt Förster, *Hydrobiologia* 23: 410, pl. 26: figs 6–8, pl. 48: figs 8, 9. 1964.

Cosmarium roraimense G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Xanthidium luetzelburgii* Kurt Förster & Eckert in Förster, *Revue Algologique* N.S., 7: 77, pl. 6: fig. 1, pl. 9: fig. 5. 1963, *nom. illeg.*

Note: This taxon requires a new name as the epithet “*luetzelburgii*” is already occupied by *Cosmarium luetzelburgii* Kurt Förster & Eckert in Förster (1964: 395, pl. 23: fig. 2; pl. 42: fig. 17). The new epithet is coined for Roraima State, northern Brazil, from where the species was originally described.

Cosmarium cerradense G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Xanthidium multituberculatum* Kurt Förster & Eckert in Förster, *Hydrobiologia* 23: 411, pl. 25: fig. 14, pl. 48: fig. 7. 1964, *nom. illeg.*

Note: This species requires a new name as the epithet “*multituberculatum*” was already used by *Cosmarium multituberculatum* F.E.Fritsch & M.F.Rich (Fritsch & Rich 1937: 189, fig. 18 A–O). The new epithet refers to the Cerrado biome, the largest savanna-like region in South America, from where the species was originally described.

Cosmarium subaculeatum (Kurt Förster & Eckert) G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *comb. nov.*

Basionym: *Xanthidium subaculeatum* Kurt Förster & Eckert in Förster, *Hydrobiologia* 23: 413, pl. 26: fig. 4. 1964.

Note: *Cosmarium subaculeatum* comprises also specimens described originally as “*Xanthidium subaculeatum* Kurt Förster & Eckert forma” (Förster 1964: 413, pl. 26: fig. 5, effectively a “*sensu*” and not intending to describe a forma”) differing from the typical form of the species by having a large wart above the isthmus in addition to 12 pairs of spines on the margins.

Cosmarium decedens* var. *scrobiculatum (Kurt Förster & Eckert) G.J.P.Ramos & C.W.N.Moura, *comb. nov. et stat. nov.*

Basionym: *Cosmarium sublobatum* [var. *brasiliense*] f. *scrobiculatum* Kurt Förster & F.Eckert in Förster, *Hydrobiologia* 23: 405, pl. 20: fig. 9; pl. 46: fig. 9. 1964.

Note: Förster & Eckert in Förster (1964) proposed *Cosmarium sublobatum* var. *brasiliense* f. *scrobiculatum* based on material collected from “Rio das Femmeas, Goyaz” (currently Tocantins State), central Brazil. Although *Cosmarium sublobatum* var. *brasiliense* is currently the basionym of *Euastrum sublobatum* var. *brasiliense*, the f. *scrobiculatum* has cells morphologically closer to *Cosmarium decedens*, particularly to var. *sinuosum* (P.Lundell) Raciborski. The main diagnostic feature of the Brazilian material is the presence of a scrobicule in the mid-region of each semicell. We thus propose to transfer this forma to *Cosmarium decedens*, but at the varietal level.

Cosmarium spinulosum G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Cosmarium aculeatum* Kurt Förster & Eckert (in Förster) *Hydrobiologia* 23: 386, pl. 22: fig. 25, pl. 45: fig. 14. 1964, *nom. illeg., non Cosmarium aculeatum* Wolle (Wolle 1883: 17, pl. XXVII: fig. 12).

Note: While Förster’s original description lacks an explicit designation of type, a single gathering was indicated “Rio das Femmeas bei Porta Azul (Goyaz)”, currently Tocantins State (ca. 13° S, ca. 48° W), which serves to validate the name (Art. 40.2). The new epithet derives from the spiny cell wall. It should also be noted that “*Cosmarium aculeatum* Corda” (Corda 1839: 218), is an invalid name as it cited “Euastr. Ehr. 1. c . fig . II .”, a clear reference to Ehrenberg (*Atlas* 1838: legend to pl. XII [12], fig. II [2]) a *lapsus calami* for *Euastrum apiculatum* Ehrenberg, 1838 (see text p. 112) and is thus an invalid name. Additionally, “*Cosmarium aculeatum* Brébisson” [in Meneghini 1840: 218, based on “*Binatella aculeata* Brébisson” (Brébisson & Godey 1835: 58, pl. VII *pro parte*; also invalid) is invalid as a pre-starting point name for the group even though it was provided with a description and an illustration. Both of the latter designations were validated as *Micrasterias apiculata* Meneghini ex Ralfs (1848: 209).

Euastrum cerradense G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Euastrum rotundatum* Kurt Förster & Eckert (in Förster) *Hydrobiologia* 23: 368, pl. 7: fig. 9; pl. 41: fig. 15. 1964, *nom. illeg., non Euastrum rotundatum* F.Gay (Gay 1884: 58, pl. I: fig. 14).

Note: While Förster's original description lacks an explicit designation of type, a single gathering was indicated "Rio das Femmeas bei Porta Azul (Goyaz)", currently Tocantins State (ca. 13° S, ca. 48° W), which serves to validate the name (Art. 40.2). The new epithet refers to the Cerrado biome, the largest savanna-like region in South America, from which the species was collected.

Closterium lunula* var. *nordstedtii G.J.P.Ramos, C.E.M.Bicudo & C.W.N.Moura, *nom. nov.*

Replaced name: *Closterium lunula* var. *giganteum* (Nordstedt) A.J.Brook & D.B.Williamson, *nom. illeg.*, *A monograph on some British desmids...* (2010: 267), *non Closterium lunula* var. *giganteum* (C.Bernard) Playfair (1908: 605).

Synonyms: *Closterium turgidum* subsp. *giganteum* Nordstedt (in Wittrock & Nordstedt 1880: 120), *Closterium turgidum* var. *giganteum* (Nordstedt) De Toni (1889: 828).

Note: The epithet is named for Carl Fredrik Otto Nordstedt (1838–1924), who originally described this material under the name *Closterium turgidum* subsp. *giganteum* Nordstedt (in Wittrock & Nordstedt 1880: 120, no fig.) based on material collected in a stream near Pirassununga, São Paulo State, Brazil.

Coesel & Meesters (2013: 117) transferred *Staurastrum pseudosebaldi* Wille to *Staurastrum manfeldtii* var. *pseudosebaldi* (Wille) Coesel & Meesters, implying a reevaluation of taxonomic position of other varieties of *Staurastrum pseudosebaldi*. In Brazil, there are three varieties of *Staurastrum pseudosebaldi* reported in the literature: *Staurastrum pseudosebaldi* var. *planctonicum* Teiling (Förster 1969, 1974), *Staurastrum pseudosebaldi* var. *compactum* A.M.Scott & Grönblad (Ramos & al. 2018), and *Staurastrum pseudosebaldi* var. *unguiculatum* Borge (Borge 1925, Grönblad 1945, Oliveira & al. 2017).

We consider that *Staurastrum pseudosebaldi* var. *planctonicum* Teiling as depicted by Förster (1969, 1974) is a misapplied name, and should be considered representative of *Staurastrum johnsonii* West & G.S.West. Coesel & Meesters (2013) studied representatives of the latter species from Europe and found specimens with 2(–3)-radiate semicells in apical view, with either an elliptic to fusiform or a triangular semicell. The Brazilian specimens correspond to the 3-radiate form of *Staurastrum johnsonii*.

On the other hand, the varieties *compactum* and *unguiculatum* are quite different from *Staurastrum manfeldtii*, particularly in apical view. The var. *compactum* has a triangular apical view with almost straight sides furnished with numerous bifid verrucae, and similar verrucae forming semicircles within the margins. Additionally, this variety has shorter processes (cell breadth with processes 45–54 µm) than *Staurastrum manfeldtii* (cell breadth with processes 60–100 µm), and the isthmus is much wider with no basal inflation. Therefore, we consider these features sufficiently different to separate this variety from *S. manfeldtii* and consequently raise it to the species level, as follows:

Staurastrum mississippiense G.J.P.Ramos & C.W.N.Moura, *nom. nov. et stat. nov.*

Replaced name: *Staurastrum pseudosebaldi* var. *compactum* A.M.Scott & Grönblad, *Acta Societatis Scientiarum Fennicae, Nova Series B*, 2(8): 44, pl. XXV: figs 1, 2. 1957.

Note: *Staurastrum mississippiense* is a rare species known only from a pond on old road, 6 miles east of Pearlinton, Mississippi (Scott & Grönblad 1957: 8, 44) and from Bahia, north-eastern Brazil (Ramos *et al.* 2018). As the epithet "*compactum*" is already occupied at the species level by *Staurastrum compactum* Whelden (Whelden 1947: 99, pl. VI: fig. 7), we chose "*mississippiense*" to replace it based on the type locality.



Staurastrum cyrtocerum var. *unguiculatum* (Borge) G.J.P.Ramos & C.W.N.Moura, *comb. nov.*
Basionym: *Staurastrum pseudosebaldi* var. *unguiculatum* Borge, *Arkiv for Botanik* 19(17): 41, pl. 3: figs 19 a–d [“forma” fig. 20]. 1925.

Note: The variety *unguiculatum* was described by Borge (1925) based on samples collected in the São Luiz de Cáceres region, western Brazil. The main characteristic of this variety is the presence of convergent processes, which are much curved and like a helix in apical view. We consider, nevertheless, that the diagnostic features of this variety are more related to those of *Staurastrum cyrtocerum* Brébisson than *Staurastrum manfeldtii* Delponte, so a new combination is proposed here.

Förster (1969: 44) applied the name *Actinotaenium peniomorphum* var. *latius* (A.M.Scott & Prescott) Kurt Förster to material collected in the Amazon basin, Brazil. However, *Actinotaenium peniomorphum* is an illegitimate name as it is based upon *Cosmarium peniomorphum* A.M.Scott & Prescott, an illegitimate replacement name for *Penium variolatum* West & G.S.West (West & West 1897: 77, pl. 368: fig. 23). Thus, *Actinotaenium peniomorphum* var. *latius* is also an illegitimate varietal name as it is included in an illegitimate species. Taxonomically, *A. peniomorphum* var. *latius sensu* Kurt Förster should be referable *Actinotaenium crassiusculum* (De Bary) Teiling.

Actinotaenium crassiusculum (De Bary) Teiling (1954: 406)

Basionym: *Penium crassiusculum* De Bary, *Untersuch. Conjugaten*: 73, pl. V: figs 5–7. 1858.

Synonym: *Actinotaenium peniomorphum* var. *latius* (A.M.Scott & Prescott) Kurt Förster, *Amazoniana* 2(1–2): 44, pl. 11: figs 9–10. 1969, *nom. illeg.*

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