Nomenclatural and taxonomic notes on Brazilian desmids II: *Closterium, Haplotaenium, Planotaenium,* and *Xanthidium* together with some nomenclatural corrections

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This is the second paper of a series dealing with nomenclatural and taxonomic updates on Brazilian desmids. In the first paper we dealt with the filamentous genera (Ramos & Moura 2019a), whereas here the following genera are updated: *Closterium, Haplotaenium, Planotaenium,* and *Xanthidium.*

Closterium libellula Focke ex Nordstedt (Nordstedt 1873: 41) has been made a synonym of *Closterium closterioides* (Ralfs) A.Louis & Peeters (Louis & Peeters 1967: 410), which necessitates the transfer of the following name:

Closterium closterioides* var. *angusticeps (Grönblad) G.J.P.Ramos & C.W.N.Moura, *comb. nov.*
Basionym: *Closterium libellula* var. *angusticeps* Grönblad, *Acta Societatis Scientarum Fennicae* 2(6): 9, pl. 1, fig. 12, 1945.
Note: This variety differs from the nominate variety by having fusiform cells with narrower and attenuated apices.

Closterium pritchardianum* var. *brasiliense (Kurt Förster & Eckert) G.J.P.Ramos & C.W.N.Moura, *stat. nov.*
Basionym: *Closterium pritchardianum* f. *brasiliense* Kurt Förster & Eckert in Förster, *Revue Algologique N.S.* 7: 45, Tab. 1, fig. 9, tab. phot. 8, fig. 2, 1963.
Note: This taxon differs from the nominate variety by having larger cells and broader apices. We consider these features sufficiently relevant taxonomically to raise this form to level of variety.

Docidium minutum Ralfs (1848: 158) has been transferred to *Haplotaenium minutum* (Ralfs) Bando (1988: 176), which necessitates the transfer of the following taxa

Haplotaenium minutum* var. *subattenuatum (Kurt Förster) G.J.P.Ramos & C.W.N.Moura, *comb. nov.*
Basionym: *Pleurotaenium minutum* var. *subattenuatum* Kurt Förster, *Algological Studies/Archiv für Hydrobiologie*, Supplement Volume 28: 232, 1981.
Note: *Pleurotaenium minutum* var. *subattenuatum* Kurt Förster, *Amazoniana* 2(1/2): 27, pl. 5, figs. 13-15. 1969, was invalid as two collection localities were mentioned in the protologue (Lago Muretá and Lago Jurucui, both in north Brazil) so that the name is not based on a single gathering (ICN Art. 40.2, Turland *et al.* 2018) and a type was thus not automatically designated at this time. Förster (1981: 232) validated the name by selecting Förster (1969: fig. 14) as the holotype ("ikonotypus").

Haplotaenium minutum* var. *foersteri G.J.P.Ramos & C.W.N.Moura, *nom. nov.*
Replaced synonym: *Pleurotaenium minutum* [var. *cylindricum*] f. *minus* Kurt Förster, *Revue Algologique* N.S. 7: 47, 1963.
Note: The present taxon differs from *Haplotaenium minutum* var. *cylindricum* (O.Borge) Azevedo & C.E.M.Bicudo in Bicudo, Azevedo & Castro (2014:106) by having smaller cells (2-3

times) with parallel sides and slightly conical, rounded apices. Here we consider those features sufficient to treat this form as described by Förster as a distinct variety and we give it a new name in honour of Kurt Förster (1918-1983).

The chloroplast arrangement (transversely divided) is the main reason to transfer the following two taxa to genus *Planotaenium*

Planotaenium prescottii G.J.P.Ramos & C.W.N.Moura, *nom. nov.*

Replaced synonym: *Netrium digitus* [var. *naegelii*] f. *minus* Prescott, *The Machris Brazilian Expedition. Botany: Chlorophyta. Euglenophyta,* 8, Pl. 1, fig. 25, 1957, *nom. illeg*. (*non Netrium digitus* var. *minus* Roll, 1924)

Note: Prescott (1957) considered that the interrupted chloroplast together with the small size could be considered features that warrant species designation. Despite this, he proposed the taxon in question as a forma in the genus *Netrium* based on cell morphology. However, *N. digitus* is characterized by having two chloroplasts per cell, with longitudinal ridges that are deeply notched at the free margins. The taxon under discussion has four chloroplasts, two per semicell with one large pyrenoid in each. Thus, we consider these features sufficient to raise it to species level, but in the genus *Planotaenium* and we name the species in honour of Gerald Webber Prescott (1899-1988).

Planotaenium closterioides G.J.P.Ramos & C.W.N.Moura, *nom. nov.*

Replaced synonym: *Penium closterioides* f. *interruptum* West, *Journal of the Royal Microscopical Society* 1892: 721, no fig., 1892 (‘*interrupta’*)

Synonyms

Penium libellula var. *interruptum* (West) West & G.S.West, *A monograph of the British Desmidiaceae* 1: 74, pl. VII: figs 9, 10. 1904.

Closterium libellula var. *interruptum* (West) Donat, *Pflanzenforschung* 5: 7, 1926.

Note: *Planotaenium closterioides* is similar to *P. prescottii* in that both species have cells broadly fusiform with poles narrowly rounded and four chloroplasts per cell. However, the former has larger cells (143 µm x 22.5 µm) and terminal vacuoles, whereas the latter has smaller cells (62.4 µm x 13 µm) and terminal vacuoles are absent. In Brazil, this species occurs in the Amazon region (Förster 1963, 1969).

Xanthidium antilopaeum var. *mamillosum* Grönblad (1945: 21) has been raised to species level, *Xanthidium mamillosum* (Grönblad) Kurt Förster (1964: 411), which necessitates the transfer of the following intraspecific taxon.

Xanthidium mamillosum* var. *groenbladii G.J.P.Ramos & C.W.N.Moura, *nom. nov.*

Replaced synonym: *Xanthidium antilopaeum* [var. *mamillosum*] f. *longispinum* Grönblad, *Acta Societatis Scientarum Fennicae* 2(6): 22, pl. 7: fig. 150, 1945 (‘*longispina*’).

Note: This variety differs from the nominate variety by having smaller cells, is subelliptical in apical view, the semicells are rounded in frontal view, the sinus is shallow and the spines are longer and narrower, and generally curved. Here we propose a new name in honour of the desmidologist Rolf Leo Grönblad (1895-1962), author of the replaced synonym, as the name *Xanthidium mamillosum* var. *longispinum* was previously introduced by Förster (1974:162).

Xanthidium protuberans (Kurt Förster) G.J.P.Ramos & C.W.N.Moura, *comb. nov. et stat. nov.*

Basionym: *Arthrodesmus westii* var. *protuberans* Kurt Förster & Eckert in Förster, *Revue Algologique*, ser. 2, 7: 79, pl. 5: fig. 36. 1963.

Synonyms

"*Xanthidium controversum* var. *protuberans"* Thérézien*, Bibliotheca Phycologica* 72: 121. 1985. *nom. inval.*

"Xanthidium westii var. *protuberans"* (Kurt Förster) C. Bicudo & S.M.M.Faustino in Bicudo *et al.* (2018), *Flora Ficológica do Estado de São Paulo: Zygnemaphyceae*, vol.4(4): 244, fig. 452. 2018. *nom. inval.*

Note: The designation "*Xanthidium controversum* var. *protuberans*" proposed by Thérézien (1985a) as a new combination of *Arthrodesmus westii* var. *protuberans* is invalid because a full and direct reference to basionym was not provided (ICN Art. 41.5, Shenzhen Code, Turland *et al*. 2018). Bicudo & Faustino in Bicudo et al. (2018) proposed "*Xanthidium westii* var. *protuberans*" as a new combination for *Arthrodesmus westii* var. *protuberans* Kurt Förster. However, this name is also invalid because Bicudo did not provide a diagnosis or description or indicate a holotype for "*Xanthidium westii*" C.Bicudo *nom. inval.* as it does not meet there requirements of ICN Art. 35.1 (Shenzhen Code, Turland et al. 2018). *Arthrodesmus westii* (West) Kurt Förster and *Xanthidium controversum* West & G.S. West currently are regarded as synonyms of *Octacanthium controversum* (West & G.S.West) Compère; however, var. *protuberans* should be placed in the genus *Xanthidium,* as mentioned by Thérézien and Bicudo & Faustino, because of the central ornamentation of the semicell. Here, we consider this feature as well as its morphology (semicells subhexagonal with apices straight to slightly concave) sufficient to raise the variety to species level in *Xanthidium*.

Recently, just after our first note of the series has been published (Ramos & Moura 2019a), we found that the three new intraspecific combinations to *Sphaerozosma laeve* have been incorrectly made (ICN Art. 55), as they already had been proposed before by Thomasson (1966) and Thérézien (1985b), as follows:

Sphaerozosma laeve var. *macracanthum* (Grönblad) Thomasson (1966:38)
Sphaerozosma laeve var. *rectangulare* (Grönblad) Thérézien (1985b:562)
Sphaerozosma laeve var. *subrectangulare* (Grönblad) Thérézien (1985b: 562)

It was recently also brought to our attention that the basionym assigned for *Spondylosium simplex* (Ramos & Moura 2019b) was mistakenly based on Förster (1981:232) instead of Förster (1964:437). The attempted validation of *Phymatodocis simplex* by Förster (1981) was superfluous because the name was already valid, as the species was described based on a single gathering from Minas Contas and specified in the protologue (Förster 1964), which is therefore automatically the type (ICN Art. 40.2). The combination is thus validated here:

Spondylosium simplex (Kurt Förster & Eckert) G.J.P.Ramos & C.W.N.Moura, *comb. nov.*
Basionym: *Phymatodocis simplex* Kurt Förster & Eckert in Kurt Förster, *Hydrobiologia* 23: 437, pl. 37: fig. 9, 1964.

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