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Archidium oblongifolium (Archidiaceae, subg. *Archidiella*), a new species from Brazil

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Abstract – *Archidium oblongifolium* (Archidiaceae, subg. *Archidiella*) is proposed, described and illustrated as a new species based on collections from central Brazil. It is characterized by oblong leaves and lax leaf cells. *A. oblongifolium* is currently known only from three specimens from a single area, and could thus be considered vulnerable or threatened.

***Archidiella* / cleistocarpous / Brazilian savanna / reduced sporophyte**

Résumé – *Archidium oblongifolium* (Archidiaceae, subg. *Archidiella*), est proposé, décrit et illustré comme une espèce nouvelle sur la base de récoltes provenant du centre du Brésil. Cette espèce est caractérisée par ses feuilles oblongues et son tissu laminaire lâche. *A. oblongifolium* n'est connu que de trois échantillons d'une seule localité et peut être considéré comme vulnérable ou en danger.

***Archidiella* / cleistocarpique / savanne brésilienne / sporophyte réduit**

Archidium Brid., the sole genus of the Archidiaceae Schimp., comprises approximately 34 species (Crosby *et al.*, 1999; Gradstein *et al.*, 2001). All species are cleistocarpous, and the indehiscent capsule encloses between 4 and 176 spores that vary in size between 50 and 310 µm (Snider, 1975). *Archidium* has been considered a member of the Dicranales (e.g., Dixon, 1932) until the unique development of its sporophyte (Snider, 1975; Brown & Lemmon, 1985) suggested that it marks an early divergence among mosses with an arthrodontous peristome (Vitt 1982, 1984), supporting Limpricht's (1890) view of accommodating the genus in its own order, Archidiales. Inferences from DNA sequences suggest that the genus is likely a member of the Haplolepideae (Goffinet *et al.*, 2001; Qiu *et al.*, 2006; Cox *et al.*, 2010), although with uncertain affinities and hence best retained in the Archidiales (Goffinet *et al.*, 2008; Stech & Frey, 2008).

The family is widely distributed and most diverse in Africa, which harbours 13 species, mostly in southern Africa (Vitt, 1982). Ten species are endemic to Africa and four species to the South African Cape Province. However, overall most species

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are known from few collections (Snider, 1975). The genus seemed then underrepresented in South America, and in particular in Brazil, for which Snider (1975) listed no species. Peralta & Vital (2006), however, reported eight species from Brazil based on collections from the SP herbarium alone: *A. amplexicaule* Müll. Hal., *A. clavatum* I.G. Stone, *A. donnellii* Austin, *A. hallii* Austin, *A. julicaule* Müll. Hal., *A. microthecium* Dixon & P. de la Varde, *A. ohioense* Schimp. ex Müll. Hal. and *A. tenerrimum* Mitt. Although Yano (2011) maintained *A. alternifolium* (Hedw.) Schimp. as occurring in Brazil, Peralta & Vital (2006) excluded this species because the only sample cited from Brazil by Yano (1993) belonged to *Philonotis*. *Archidium alternifolium* is known from the Mediterranean (Blockeel, 2007; Ros *et al.*, 2013)

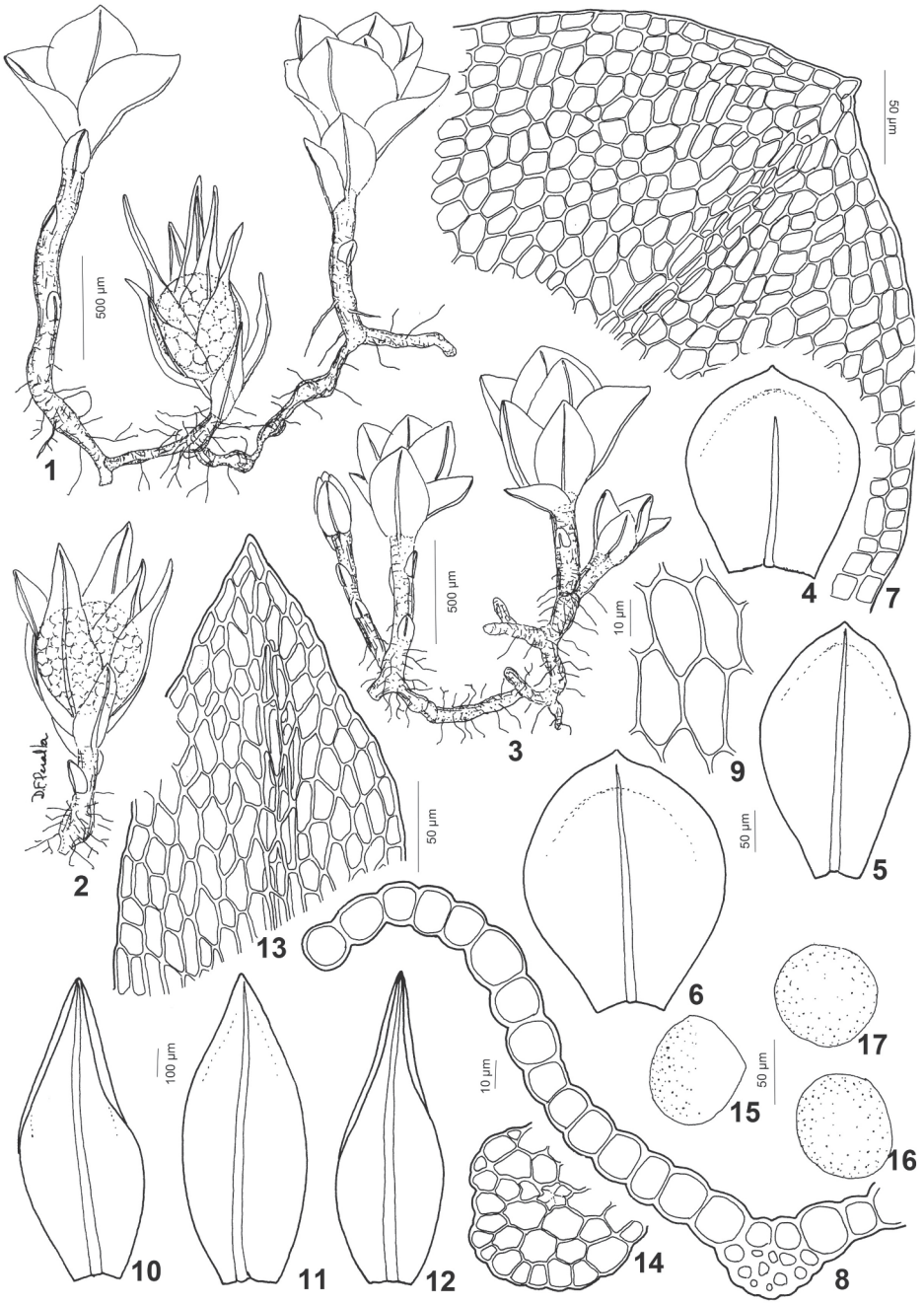
During our survey of the bryophytes in the Brazilian savanna (Cerrado) in the "Área de proteção Ambiental Morro do Macaco", Goiás state, municipality of Iporá, a population of scattered tiny plants with immersed capsules was collected. The small spores did not point to the Archidiaceae, and initially affinities within the Funariaceae were sought. Blasting sequences from two chloroplast loci (*rps*4: GenBank accession number KP226182; *psb*A-*trn*H: KP226181) against data available on GenBank, however, revealed that this population belonged to the Archidiaceae (results not shown). Based on spore features the species would be placed in the unispecific subg. *Archidiella* (Irmsch.) Snider, that is only known from South Africa. The Brazilian material differs in the architecture of the leaf, and is therefore proposed to represent a species new to science.

Archidium oblongifolium **D.F. Peralta, A.B.M. Rios & Goffinet, sp. nov.**
Figs 1-17

Type: Brazil. Goiás State: município de Iporá, Área de proteção Ambiental Morro do Macaco (16°25'21''S, 51°02'46''W), terricola, gametófitos pequenos e verdes, cerrado rupestre, 5-XII-2010, *A.B.M. Rios 141* (holotype SP, isotype CONN).

Plants perennial, 1.5-2 (-2.5) mm high, pale green to yellow-green, gregarious, rhizoidal tubers not seen. **Fertile stems** erect, simple to 1-2-branched, 1 or 2 sterile or fertile innovations arising from axils of outer perichaetial leaves usually after sporophyte development, **stem leaves** broadly oblong to obovate, short-apiculate, 0.3-0.5 × 0.3-0.4 mm, concave, becoming reduced to bracts below; margins entire; costa strong, ending 3 or 4 cells below the apex, shorter in the leaves below; median cells irregularly rhombic-hexagonal, 25-30 × 10-12 μm, thick walled, becoming long-rectangular and thin-walled toward leaf base, marginal cells quadrate to rhombic-hexagonal. **Asexual reproduction** not observed. **Paroicous**, antheridia and archegonia mixed in terminal bud, but female terminal and male below without leaves between them; **perichaetial leaves** erect, concave, broadly oblong-lanceolate to lanceolate, acute to apiculate, 0.7-0.8 × 0.3-0.4 mm, inner leaves larger than the outer ones, margins entire, incurved above; costa ending 3 or 4 cells below the apex; median cells rhombic to hexagonal, thick walled, becoming long rectangular and thin walled at leaf base, marginal cells quadrate to rhombic-retangular. **Seta** virtually absent. **Capsules** immersed, globose, 300-450 μm in diameter, **operculum and peristome** absent. *Spores* 96-120(-130) per capsule, irregularly rounded-tetrahedral, 80 μm (75.0-85.4 μm) in greatest diameter, yellow, surface irregular granulose to verrucose. **Calyptra** not seen.

Etymology. The epithet *oblongifolum* refers to the leaf shape.



Figs 1-17. *Archidium oblongifolium* D.F. Peralta, A.B.M. Rios & Goffinet. **1-3.** Plants with capsule. **4-6.** Vegetative leaves. **7.** Apex of vegetative leaf. **8.** Vegetative leaf cross section. **9.** Detail of laminal cells. **10-12.** Perichaetial leaves. **13.** Apex of perichaetial leaf. **14.** Stem cross section. **15-17.** Spores (from the holotype, drawing by DFP).

Distribution and ecology. Terrestrial on sandy soil in exposed sites, often amongst grasses in the central Brazilian plateau, in rocky cerrado vegetation. The plants are perennial and reproduce by subsequent innovations and disintegration of the older stem parts. The innovations arise from rhizoids at the stem base or in the leaf axils when buried in soil. The plants show seasonal growth related to the dry and wet seasons.

Discussion. Following the treatment of Peralta & Vital (2006) the new species clearly differs from all known members of the genus by its very uniform rhomboic to hexagonal cells. *Archidium oblongifolium* may be a member of subg. *Archidiella* based on Snider's (1975) systematic concept because in this subg. the spores are less than 100 µm (in *A. oblongifolium* 75.0-85.4 µm) in greatest diameter, and average the number of 112, varying from 36-176 (in *A. oblongifolium* 96-120(-130)) per capsule. This subgenus was unispecific and included only *A. dinteri* (Irmsch.) Snider, a species endemic to South Africa. Both species have ovate to oblong stem leaves but differ in the length of the costa and the shape and size of the laminal cells: the costa is subpercurrent to excurrent in *A. dinteri*, versus always ending 3 to 4 cells below apex (subpercurrent) in *A. oblongifolium*, and the laminal cells of *A. dinteri* are irregular long-hexagonal and large averaging 45-70 × 11-16 µm versus rhombic to hexagonal and smaller in *A. oblongifolium* (25.0-30.0 × 10.0-12.0 µm). Both species are also monoicous, but *A. dinteri* is autoicous with distinct perigonia and perichaetia whereas *A. oblongifolium* is paroicous, with antheridia and archegonia mixed in terminal bud, but female terminal and male below without leaves between them. The gametophyte of *Archidium oblongifolium* is morphologically more similar to *A. julaceum* Müll. Hal., a South American species, that differs, however, by the strong costa, denticulate margin, smaller laminal cells and larger spores.

Archidium oblongifolium is known only from central Brazil, in the Brazilian savanna (cerrado), where it occurs on red oxisol clay. It was not encountered among the many Brazilian collections from all regions, surveyed by Peralta & Vital (2006) in their review of the family, and the species of tiny plants is therefore considered rare, and vulnerable and potentially threatened. However, because this species could easily be misi-dentified as a member of Bryaceae it is possible that material from other regions could be unidentified or misfiled in Brazilian herbaria.

Additional specimens examined. Brazil. Goiás State: município de Iporá, Área de proteção Ambiental Morro do Macaco (16°25'21''S, 51°02'46''W), terricola, gametófitos verdes, cerrado rupestre, 20-XI-2010, *A.B.M. Rios 108* (SP, CONN); idem, terrícola, pouca iluminação, presença de cupins e besouros (mixed with *Riccia wainionis* Steph.), 5-XII-2010, *A.B.M. Rios 144* (SP, CONN).

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