Contribution to the bryological flora of Argentina. *Sphagnum perichaetiale* Hampe. and *S. recurvum* P. Beauv. (Sphagnaceae)

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Contribution to the bryological flora of Argentina. *Sphagnum perichaetiale* Hampe. and *S. recurvum* P. Beauv. (Sphagnaceae)

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Abstract. *Sphagnum perichaetiale* Hampe and *S. recurvum* P. Beauv. are reported as new to Argentina based on collections from the Corrientes province. The presence of *S. recurvum* in this province is the southernmost locality in America. *Sphagnum magellanicum* Brid. and *S. cuspidatum* Ehrh. ex Hoffm. should be excluded from the bryological flora of the province of Corrientes. Descriptions, illustrations, SEM photographs, habitat, ecology and distribution are given.

Keywords. bryophyte taxonomy, flora, distribution, Corrientes, Iberá, Argentina.

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In Argentina, the Iberá Region is a complex ecosystem with predominance of the marshy environments that interconnect extensive slightly deep lakes converged on by different watersheds. The lake is one of the major superficial sources of fresh water in Argentina, and together with the surrounding marshy fluvial habitats houses more than 4000 plants and animals species (Neiff 2004). Its surface is about 12000 km^2 and it was declared Natural Reserve (Arbo & Tressens 2002). Previous floristic studies in this region reveal the presence of what it might be a peat-bog known as Turbera Laureltí, located in the NW extreme of the Laguna Iberá (Vanni & López 2006).

Eleven species and one variety of *Sphagnum* are reported from Argentina (Matteri 2003), with *S. flaccidum* Besch. (Sect. Subsecunda) the only species known from Corrientes until Vanni & López (2006) reported *S. magellanicum* Brid. and *S. cuspidatum* Hoffm from Iberá (Corrientes). Here we revise the *Sphagnum* flora in the Corrientes province providing descriptions, illustrations, habitat and distribution information for the species.

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Material and Methods

This study is based on material collected by the authors during field expeditions in 2008 at The Reserva Natural Provincial del Iberá, and on herbarium specimens kept at BA, CTES, MACB and MA-MUSCI.

Study area. The Reserva Natural Provincial del Iberá and surroundings occupy an area of 245 km^2. The Laureltí peat-bog is located on an islet or holm approximately 600m long and 120m wide, extending parallel to the lagoon. It is 1 m deep. The substratum is formed by a dense, stable layer of organic matter and bryophytes, with *Sphagnum* as the dominant moss (Vanni & López 2006). The environments that characterize this unit are tidelands, dominated by Cyperaceae (*Cyperus giganteus* Vahl), associated almost always with *Fuirena robusta* Kunth and diverse species of *Scirpus sp. Scirpus cubensis* Poepp. & Kunth dominates in initial stages and, when

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mature, it is much richer in species that tidelands, including arboreal elements (Carnevalli 1994).

This locality is included in the Chaqueño Domain, in the biogeographical Chaqueña Province of the Neotropical Region (Cabrera 1976). The area of the Laguna Iberá is characterized by subtropical-wet climate. The annual average temperature is 21−22 °C. The relative humidity is always high, with an average of 60% in summer and above 75% in winter. The annual precipitation varies between 1200 and 1800 mm, with more frequency and concentration on summer and autumn. The driest months are June and July (Neiff 2004).

The Species

Sphagnum perichaetiale and *S. recurvum* are reported as new to the bryoflora of Argentina. These records are based in part on recent collections but also on revisions of historical collections. Indeed, all samples of *S. magellanicum* and *S. cuspidatum* collected in Corrientes province belong in fact to *S. perichaetiale* and *S. recurvum*, respectively.

Sphagnum perichaetiale Hampe, *Syn. Musc. Frond.* 1: 93. 1848. **Figs. 1A–C.**

Type: Ind. loc. "Brasilis, Rio Janeiro in Juntas, *S. perichaetiale* sub. *cymbifolium. Longifolium, leg.* Beyrich, "*fide* A. Eddy (Herb.Hampe 1881) (holotype: BM 000918524!; isotype BM 000918525!).

(≡ *Shagnum negrense* Mitt. 1869 − *S. peruvianum* Mitt. 1869 − *S. becarii* Hampe 1872 − *S. puiggarii* Müll. Hal. 1887 − *S. brevicaule* Warnst 1900).

Illustrations: Warnstorf (1911). Fig. 78 a,b; Anderson et al. (2009) Fig. 10.

Description. Plants robust, 4−8 cm, yellowish-green to brownish-green, often with a reddish-brown color, forming small and compact cushions. Capitula convex, 2.0−2.5 cm diameter, crowded short branches, densely imbricate. Stems with a developed cortex, brown to brown-reddish; outer layer with hyaline cells quadrate to subrectangular, with pores 1(−3) and spiral fibrils; cross section of stem 0.5 mm diameter; cortical cells thin walled, in 3(−4) layers, the outer cells usually with 1 single large pore (35−65 μm). Stem leaves lingulate to lingulate-spatulate, 1.40−1.80 × 0.80−1.00 mm, apex broadly rounded, moderately fringed all around; weakly bordered, long linear cells, rather longer than broad, entire margins; hyaline cells often 1(−2) septate, rarely undivided, almost always porose and fibrillose on both surfaces, membrane gaps at the apex on adaxial surface. Branches in fascicles of 4−5, rather dimorphic, 2 of them spreading, tumid, blunt, 2.0−2.5 cm, attenuate distally, leaves green, imbricate, in 5 rows, pendent branches 2(−3), deflexed, hyalines, applied to the stem, relatively thin, equally long or longer than the erect ones; branch in cross section with cortical cells in 1 layer, sometimes one pore or eporose and efibrillose, retort cells well-differentiated, with inconspicuous neck. Branch leaves erect-spreading, broadly ovate-lanceolate, concave, 1.90−2.25 × 0.90−1.20 mm, apex rounded, cucullate, scabride on abaxial surface, due to projecting, partially reabsorbed hyaline cells; border of a single row of narrow cells, margin entire; hyaline cells on the abaxial surface with few, small, ringed or unringed pores, scattered along the commisures, on the upper surface generally in groups of 3 at adjacent corners; on the adaxial surface only few, elliptic, unringed pores along commisures; in cross section, hyaline cells convex on both surfaces and green cells elliptic to narrowly rectangular, with more o less thickened end walls, exposed equally on both surfaces, sometimes more broadly exposed to the adaxial surface. Dioicous. Spores 22−35 μm, barely rugose to almost smooth.

Ecology. In the Laureltí peat-bog, Iberá lagoon, *Sphagnum perichaetiale* grows in intermediately mineral-rich wetlands, it appears in mounds, in the firmest and consolidated zones of the islets on meso-moist habitats that usually is subject to periodic weting and drying.

Distribution. In Argentina the species is only known from Corrientes, Reserva Natural Provincial del Iberá. Elsewhere the species is known from America: (U.S.A., Mexico, Panama, Brazil, Colombia, Paraguay), Africa (Madagascar), Asia (The Philippines) and Australia (New Zealand), and probable absent from Europe.

Discussion. *Sphagnum perichaetiale* may be confused with *S. magellanicum*, but it differs clearly by the elliptic or narrowly rectangular green cells compared to the oval elliptical green cells that are completely embedded and very thin end walls in *S. magellanicum*. The specimens of *S. perichaetiale*

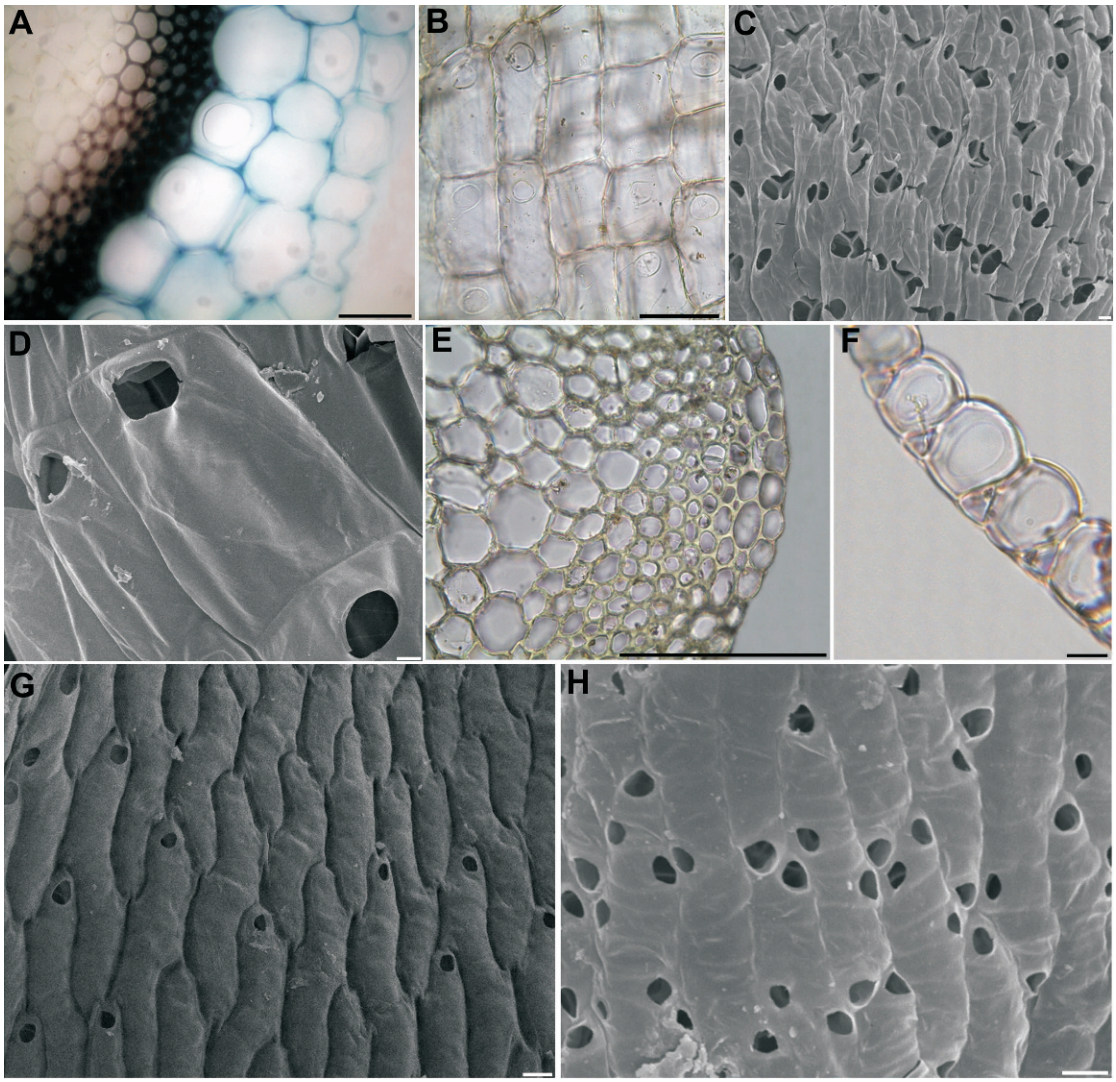

Figure 1. *Sphagnum perichaetiale* A–D, *S. recurvum* E–H. *Sphagnum perichaetiale*. **A.** Stem section and hyalodermis layers. **B.** Outer stem cortical cells showing pores (Scale bars = 0.1 mm). **C & D.** SEM photographs of branch leaves and outer stem cortical cells. **C.** Detail of pores on abaxial surface of branch leaves; **D.** Detail of pores on outer surface of hyalodermis cells. (Scale bars = 10 µm). *Sphagnum recurvum*. **E.** Hyalodermis cells of stem section (Scale bar = 0.1 mm). **F.** Transverse section of branch leaves showing green and hyaline cells (Scale bar = 0.01 mm). **G & H.** SEM photographs of branch leaves. **G.** Adaxial surface of lamina cells of branch leaves showing pores and hyaline cells shape. **H.** Abaxial surface of lamina cells of branch leaves showing pores and hyaline cells (Scale bars = 10 µm).

sometimes presented very limited stems and the most eminent characteristic was the great size of the capitula, dull whitish, often speckled with brown spots. Some of these plants are hemi-isophyllous, have stem leaves with undivided hyaline cells, densely fibrillated apices, pores and membrane gaps are usually frequent.

All specimens of *Sphagnum magellanicum* from Corrientes correspond to *S. perichaetiale*. In Argentina *S. magellanicum* is broadly distributed from the Antarctic and Sub-Antarctic regions (Tierra del Fuego, Santa Cruz) to western central province of Neuquén (Fuertes & Rodriguez 2009). *Sphagnum flaccidum* mentioned in Corrientes by Hübschmann (1986) has not been found by the authors neither in the field nor in the herbaria.

***Selected specimens examined* (total 32 specimens).** Argentina, corrientes: Departamento de San Martin, Parque Regional de los Esteros del Iberá,

28°30′S 57°09′W, *Fuertes, Oliván & Jiménez* 2008 (MACB 101592, MA-MUSCI); Costa W de la Laguna Iberá, *Tressens, Beccaceci, & Vanni 1992* (CTES 4305b as *Sphagnum magellanicum* Brid.); Departamento San Miguel, 12 km NE de San Miguel, Ea. Toro-y, interior, *Vanni, Cáceres, López & Radovancich 1990* (CTES 1457 as *Sphagnum*).

Sphagnum recurvum P. Beauv., *Prodr. Aethéogam.* 88. 1805. **Figs. 1E–H**

TYPE. Ind. loc. "Montmorency, France", Bescherelle s.n. 1864, selected by Warnstorf (1911, 237), *non vid.*

(≡ *Sphagnum acutifolium* var. *recurvum* (P. Beauv.) Sw. 1829 − *S. pulchricoma* Müll. Hal. 1848 − *S. cuspidatum* var. *recurvum* (P. Beauv.) Wilson 1854 − *S. cuspidatum* subsp. *recurvum* (P. Beauv.) Hérib. 1899.

Illustrations: Warnstorf (1911). Fig. 38 a,b; Anderson et al. (2009) Fig. 35, g–I.

Description. Plants slender, bright-green to pale yellowish, 15–20 cm long, forming loose turfs. Capitula flat when submerged, 5-radiated, 1.50–2.50 cm diameter, terminal bud not visible. Stems rigid, outer layer of cortical cells rectangular elongate, without spiral fibrils and pores; cross section of stem 0.70–1.00 mm diameter, 2(−1) layers of well developed thin-walled hyaline cells. Stem leaves rather small, triangular-lingulate, equilateral to short isosceles-triangular with slightly rounded sides, rounded or truncate at apex, usually fimbriate, 1.10–1.30 × 0.80–1.00 mm; hyaline cells long at base, shorter at apex, without fibrils, eporose, sometimes fibrillose on the abaxial surface near the apex; adaxial surface entirely resorbed at the apex; border of 4–6 rows of linear cells, broader at base, gradually narrower at apex. Branches in fascicles of 4–5, with 2 of them spreading, short, stout and blunt, and 3(–2) pendent; branch in cross section with cortical cells in 1 layer. Branch leaves densely arranged, ovate-lanceolate, concave-cucullate when moist, 1.4–2.5 × 0.40–0.90 mm, apex truncate, dentate; border of 3–4 rows of cells wide, margin entire; hyaline cells on abaxial surface with a rounded single end pore or a membrane gap at the upper end; hyaline cells on adaxial surface with thicker walls, fibrillose and with a few pores mostly adjacent to the cell corners. In cross section hyaline cells plane on the abaxial surface, convex on the adaxial; the green cells are isosceles-triangular, with the free base exposed towards abaxial surface and the apex is strongly enclosed between the hyaline cells, almost reaching the surface adaxial from the leaves. Dioicous. Antheridial branches orange or brownish. Perichaetial leaves widely ovate, concave, convolute, apex broadly rounded. Spores yellowish, smooth or finely papillose, 24–28 µm diameter.

Ecology. In Corrientes, *Sphagnum recurvum* is the principal component of the peat-bog of the Iberá system. It grows in intermediately mineral-rich fens, usually submerged in small lagoons, it forms wide mounds with emergent, overwhelmed capitula, at the base of bushes of *Osmundastrum cinnamomeum L. C. Presl.* (Vanni & López 2006) and *Sphagnum perichaetiale.*

Distribution. In Argentina, the species is only known from Corrientes, Reserva Natural Provincial del Iberá. Elsewhere, the species with a primarily circumboreal distribution is reported from Eastern North America (Anderson et al. 2009), South America (Venezuela, Colombia, Ecuador, Bolivia) (see Tropicos.org 2011), and Azores Islands (Dias et al. 2009).

Discussion. *Sphagnum recurvum* has been frequently confused with *S. cuspidatum.* The ligulate-triangular stem leaves with cuspidate or obtuse apex distinguish *S. cuspidatum* from *S. recurvum*, which has broadly truncate stem leaves with obtuse-fimbriate apex. The stem section of *S. recurvum* is typically bistratose (rarely unistratose), whereas in *S. cuspidatum* the cortex is typically tri, and rarely bistratose. In cross section of branch leaves of *S. recurvum*, the green cells are triangular isosceles, and exposed on abaxial surface, and the apex is strongly closed by the hyaline cells, almost reaching the adaxial surface of leaves. By contrast, the green cells of *S. cuspidatum*, are trapezoidal in shape with walls exposed on both leaf surfaces.

***Selected specimens examined* (total 94 specimens).** ARGENTINA, CORRIENTES: Departamento de Mercedes, Parque regional de los Esteros del Iberá, 28°30′S 57°09′W, *Fuertes, Oliván & Jimenez* 2008 (BA, MACB 101522); Departamento San Martín, Reserva Natural Provincial del Iberá, Costa W de la

Laguna Iberá, *Tressens, Beccaceci & Vanni* 1992, (CTES 4305, as *Sphagnum cuspidatum* Ehrh. ex Hoffman var. *cuspidatum*); Departamento Ituzaingó, Reserva Natural Provincial, 28° 04′S 56°49′ W, *Arbo, Schinini & Seijo* 1999, (CTES 8494, as *Sphagnum sp.*); Departamento Santo Tomé, Canal de Acceso a la Laguna Galarza, borde de embalsado, 28° 05′S 56°41′ W and 28°04′S 56°42′ W, *Arbo, Schinini & Seijo* 1999 (CTES 8455, as *Sphagnum sp.*); Bosques de Iberá, *Neiff* (CTES 1196 as *Sphagnum* sp.).

In Argentina, the presence of *Sphagnum perichaetiale* and *S. recurvum* is very rare, they are restricted at only one locality: the Laureltí peat-bog (Corrientes); this place and two localities of *S. perichatiale* in Río Grande do Sul (Brazil) (see Tropicos org. 2011) are the southernmost distributional boundary in Southamerica. The presence of *S. recurvum* in Corrientes (Argentina) is the southernmost locality in the New World.

All samples of *Sphagnum cuspidatum* collected in Corrientes have been identified as *S. recurvum*. We consider that *Sphagnum magellanicum* and *S. cuspidatum*, mentioned by Vanni & López (2006), should be excluded from the bryological flora of Corrientes.

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