

Studies on Neotropical Lejeuneaceae (Jungermanniopsida). New synonyms and *Ceratolejeunea temnantha* (Spruce) comb. nov.

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(Received 14 December 2010, accepted 27 January 2011)

Abstract – Based on the study of type material of Neotropical Lejeuneaceae, the following new combination and synonyms are proposed: *Ceratolejeunea temnantha* (Spruce) comb. nov. (basonym: *Lejeunea temnantha*), *Lejeunea huctumalcensis* Lindenb. et Gottsche (= *Hygrolejeunea grossereticulata* Gottsche ex Steph., = *H. sacculata* Steph., = *H. wrightii* Steph.), *Lepidolejeunea involuta* (Gottsche) Grolle (= *Hygrolejeunea glaziovii* Steph.), *Mastigolejeunea plicatiflora* (Spruce) Steph. (= *Lejeunea plicata* Spruce). *Ceratolejeunea temnantha* is described and illustrated.

Ceratolejeunea / *Hygrolejeunea* / *Lejeunea* / *Lejeuneaceae* / *Lepidolejeunea* / *Mastigolejeunea* / *Potamolejeunea* / synonyms / taxonomy

INTRODUCTION

Lejeunea temnantha was collected by Spruce in São Gabriel, Amazonas, and was not revised since its original description (Spruce, 1884-1885). Study of the fertile type material revealed that it is better placed under *Ceratolejeunea* (Spruce) Schiffn. In the recent revision of the latter genus (Dauphin, 2003a) no species was found that matches the features of *Lejeunea temnantha*. Therefore, the new combination *Ceratolejeunea temnantha* is proposed here, accompanied by a description including data on the sporophyte and illustrations.

Study of type material of other poorly known *Hygrolejeunea* and *Lejeunea* species revealed new synonyms for the widely distributed Neotropical *Lejeunea huctumalcensis* Lindenb. et Gottsche, *Lepidolejeunea involuta* (Gottsche) Grolle and *Mastigolejeunea plicatiflora* (Spruce) Steph.

1. *Ceratolejeunea temnantha* (Spruce) M.E.Reiner **comb. nov.** **Figs 1-12**

Lejeunea temnantha Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 250. “*Potamo-Lejeunea*”, 1884. *Potamolejeunea temnantha* (Spruce) Steph., *Sp. Hepat.* 5: 640. 1914. **Type.** Brazil. Amazonas, São Gabriel [da Cachoeira], “in truncis fl. Negro inundatis”, *Spruce s.n.* (holotype, MANCH 12918 [autoicous, c.per.]; isotypes, MANCH 12919, MANCH 12920, G 010037 [autoicous, c. per. + spor.], G 19894, JE). Illustrations: Stephani 1985 (Icon 8105).

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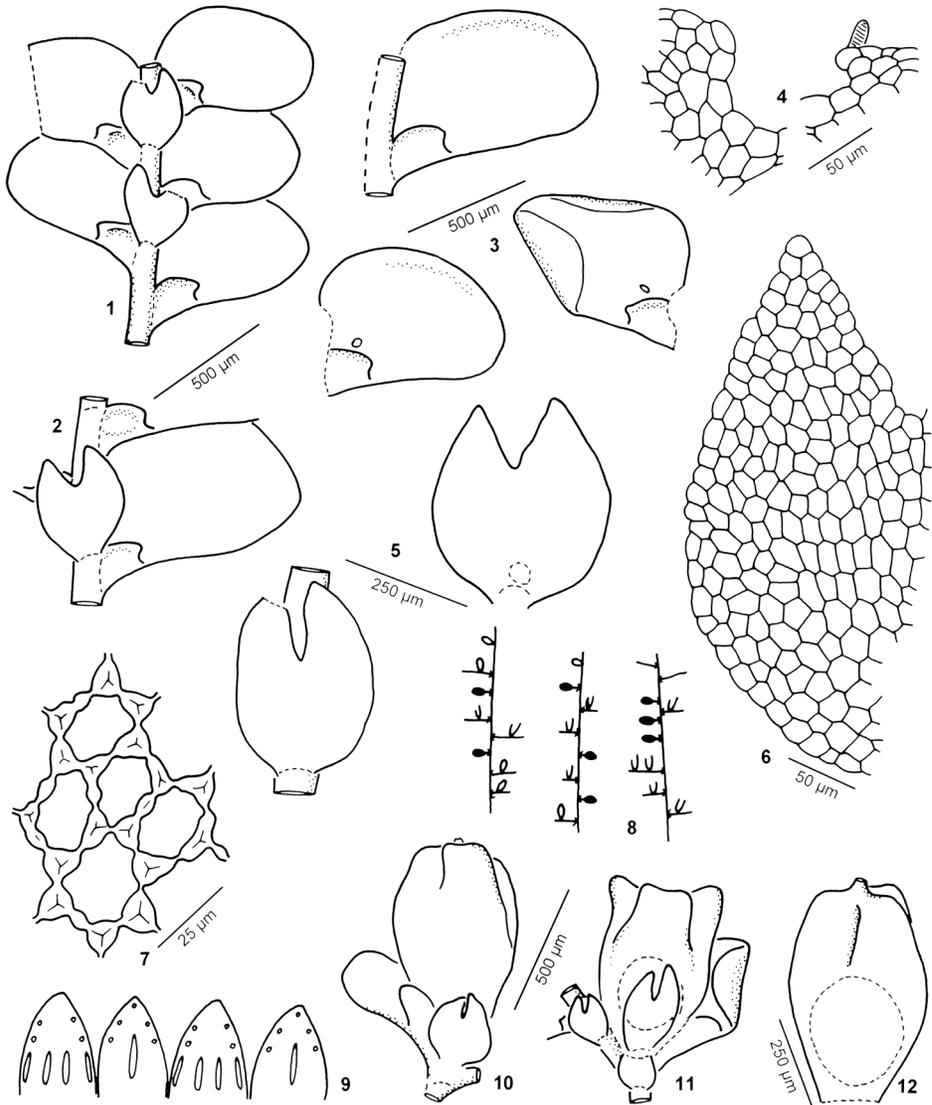


Fig. 1-12. *Ceratolejeunea temnantha*. 1-2. Shoot sectors, ventral view. 3. Leaves, p.p. with ocelli. 4. Lobule apices, right with hyaline papilla. 5. Underleaves. 6. Lobe of underleaf. 7. Median leaf cells. 8. Cladographs of fertile plants. 9. Scheme of elaters distribution on the four capsule valves. 10-11. Gynoecia with perianths, ventral view. 12. Perianth, dorsal view. All from G010037 (isotype of *Lejeunea temnantha*).

Plants dark brown to blackish in herbarium, 1.2-1.7 mm wide; irregularly branched, branches of the *Lejeunea*-type, mostly fertile; flagelliferous branches not seen. **Stems** 60-80(-100) µm wide, ventral merophyte 2 cells wide. **Leaves** imbricate to contiguous, widely spreading. **Leaf lobes** ovate, slightly concave, 650-950 µm

long \times 450-600 μm wide, margin entire, apex broadly rounded, plane or recurved, dorsal margin arched, ventral margin \pm straight. Leaf cells thick-walled, with \pm elongated, triradiate trigones and 0-1 intermediate thickening per side, walls pale brown, middle lamellae darker, median leaf cells hexagonal to isodiametrical, 15-20 \times 25-30 μm ; cuticle smooth; oil-bodies not seen; 0-1-2 or more ocelli (not or slightly larger than surrounding cells) at the base of the lobe. **Leaf lobules** when reduced a small quadrate fold of 4-6 cells, when well developed oblong to rectangular, 200-250 μm long \times 120-150 μm wide, inflated, free margin \pm involute, apical tooth rounded to oblong, slightly differentiated, hyaline papilla marginal, proximal of the tooth. **Utriculi** not seen. **Underleaves** distant to contiguous, oblong, longer than wide, 230-350 μm wide, 3-3.5 \times the stem width, 300-450 μm long, 30-40 % bifid, sinus V-shaped, narrow, lobes 10-12 cells wide at base, ending in one cell, margin entire, base cuneate, insertion line slightly curved. **Autoicous**. **Androecia** terminal on branches, not proliferating, without vegetative leaves at the base, 4-10 pairs of bracts, imbricate, hypostatic, 1(-2) bracteoles at the base of the spike, antheridium not seen. **Gynoeceia** terminal on short branches, with or without vegetative leaves at the base, with one pycnolejeuneoid-type innovation, innovation mostly sterile, seldom with a second gynoeceium. Female bract lobes oblong, 500 μm long \times 300 μm wide, margin entire, apex rounded; bract lobules 300 μm long \times 130 μm wide, apex rounded, keel slightly arched; bracteole oblong, bifid to ca. 1/3 its length. **Perianths** emergent 1/3 to 1/2 its length between the bracts, obovate, 400-480 μm wide \times 600-800 μm long, 5-keeled, keels \pm 1/3 the length of the perianth, 2 ventral and 2 lateral keels \pm extended into short horns or not extended at all, dorsal keel shorter and less pronounced than the other ones, keels slightly crenate, perianth margin strongly crenate due to globose cells, beak 30-50 μm long. **Sporophyte** (data based on few capsules). **Seta** articulate. **Capsule** splitting 2/3 into four erect valves after dehiscence, capsule valves 200 μm wide \times 400 μm long, hyaline, cells of the inner layer with nodular thickenings. Opposite valves with 5 marginal elaters (one apical and four lateral) and 1 additional elater in the centre of the valve, or with 4 marginal and 4 additional elaters (2 in the centre of the valve and 2 marginal); elaters ca 400 μm long, free end dilated, yellowish to hyaline, spiral bands reduced. Spores not seen. **Vegetative reproduction**: leaves fragile and often broken (regenerants on leaf margin not seen).

Distribution and ecology: Only known from the type material collected by Spruce in São Gabriel, Rio Negro, Amazonia. According to the protologue the plants were growing on stems, flooded by the Rio Negro. The shoots of *Ceratolejeunea temnantha* are partly covered by Bacillariophyta. The dark colour of the plants, partially almost blackish, corresponds with the observations by Dauphin (2003 a: 7) for *Ceratolejeunea* “the plants become darker when growing in extremely wet and submerged habitats”.

The citation of *Potamolejeunea temnantha* from the Rio Juruá, Brazil, leg. *Ule 541* and *542* (Stephani, 1905, 1912-1917) is based on a misidentification. The mentioned collections represent a mixture of *Lejeunea juruana* Gradst. et M.E.Reiner (= *Neopotamolejeunea uleana* (Steph.) M.E.Reiner) and *Cephalantholejeunea temnanthoides* (R.M.Schust.) R.M.Schust. (Reiner-Drehwald, 2000; Reiner-Drehwald & Weis, 2001; Gradstein & Reiner-Drehwald, 2007).

Discussion: The placement of *Lejeunea temnantha* in *Ceratolejeunea* was already proposed by Grolle in 1976 on label (isotype JE), Reiner-Drehwald (2000) and also Spruce (1884-1885: 251) compared his new taxon with a species of *Ceratolejeunea*.

Lejeunea temnantha is transferred to *Ceratolejeunea* in the present paper for the following combination of features: dark, almost blackish colour of the plants, leaf cell walls that become darker in the middle lamella, presence of ocelli in leaf lobes, gynoecia with pycnolejeuneoid-innovations, perianth with (4-)5 keels, with the ventral and lateral keels \pm extended into short horns. The ocelli in the leaf lobe base are difficult to recognize, as they are only slightly larger than the surrounding cells and only herbarium material (over 100 years old) could be studied. The number, position and other characteristics of the ocelli should be confirmed by investigation of fresh material.

The perianth keels in the genus *Ceratolejeunea* are variable, they can be low and rounded or more often developed as hollow horns, long or indistinct, or seldom bulbous (Dauphin, 2003 a). Perianths with indistinct or short horns as in *Ceratolejeunea temnantha* are also found in other neotropical species, such as *C. minuta* G.Dauphin and *C. confusa* R.M.Schust. and also in the Asian *C. minor* Mizut. (Dauphin, *loc. cit.*; Zhu *et al.*, 2005).

According to the subgeneric classification accepted by Dauphin (2003 a) *Ceratolejeunea temnantha* is a member of *C. subg. Caduciloba*, characterized by bifid underleaves and perianth horns not bulbous.

Spruce (1884-1885: 251) compared *Lejeunea temnantha* (as subgenus *Potamolejeunea*) with *Ceratolejeunea coarina*. It differs however by the presence in the latter of a perianth with long horns [110-200(-600) μm], different lobe and lobule shape and thin-walled cells (Dauphin, 2003 a).

Ceratolejeunea temnantha is a rather isolated species in the genus, compared with the taxa described by Dauphin (*loc. cit.*). It is similar to *C. confusa* R.M.Schust. by the perianth without long horns, entire-margined leaves, leaf cells with large trigones and intermediate thickenings. It differs however by the distinctly falcate lobe, and the basal lobule portion almost spherical and constricted near apex in *C. confusa* (Schuster, 1956; Dauphin, 2003a). Also the habitat of the species differ, *C. confusa* grows on bark in the rainforest canopy in rather open environments (Dauphin, 2003b) while *C. temnantha* was found on stems flooded by the Rio Negro.

2. *Lejeunea huctumalcensis* Lindenb. et Gottsche in Gottsche, Lindenb. & Nees, *Syn. Hepat.* 762. 1847

= *Hygrolejeunea grossereticulata* Gottsche *ex* Steph., *Sp. Hepat.* 5: 536. 1914. **Type.** Cuba. *Wright s.n.* ("1242" on label, probably not collecting number), (holotype, G 18806 [G00061075], not seen; isotype, JE [1 shoot]; gyn. juv.). **Syn. nov.**

= *Hygrolejeunea sacculata* Steph., *Sp. Hepat.* 5: 541. 1914. **Type.** Cuba. *Wright s.n.* ("1213" on label, probably not collecting number), (holotype, G 18810; isotype, JE [2 shoots]; gyn. juv.). **Syn. nov.**

= *Hygrolejeunea wrightii* Steph., *Sp. Hepat.* 5: 542. 1914. **Type.** Cuba. *Wright s.n.* ("1224" on label, probably not collecting number), (holotype, G 11837 p.p. [+ *Ceratolejeunea coarina* (Gottsche) Schiffn., c. per.]; isotype, JE [1 shoot]; gyn. juv.). **Syn. nov.**

Description and illustrations: Reiner-Drehwald & Ilkiu-Borges, 2007; Stephani, 1985 (Icons 4348, 4361, 4364).

Discussion: The three Cuban collections of Charles Wright described by Stephani (1912-1917) as *Hygrolejeunea grossereticulata*, *H. sacculata* and *H. wrightii* represent the same species with leaf ocelli, leaf lobule with proximal hyaline papilla, gynoecia with pycnolejeuneoid-type innovations and greenish to yellowish colour in herbarium. They match the features of *Lejeunea huctumalcensis*, a

widespread and variable Neotropical taxon (Reiner-Drehwald & Ilkiu-Borges, 2007), and are therefore proposed here as new synonyms of the latter. It should be mentioned, however, that one of the most typical characters of *L. huctumalcensis*, namely the five perianth keels developed as entire or \pm ramified laciniae could not be found in the mentioned collections with only juvenile gynoecia and lacking perianths.

3. ***Lepidolejeunea involuta*** (Gottsche) Grolle, *J. Hattori Bot. Lab.* 55: 504. 1984. *Lejeunea involuta* Gottsche, in Gottsche, Lindenb. & Nees, *Syn. Hepat.* 350. 1845

= *Hygrolejeunea glaziovii* Steph., *Sp. Hepat.* 5: 546 (“glaziovii”). 1914. **Type.** Brazil. *A.F.M. Glaziou s.n.*, ex herb. Kew (holotype, G; c. per. [perianth horns strongly inflated]). **Syn. nov.**

Description and illustrations: Piippo, 1986; Reiner-Drehwald, 1998; Stephani, 1985 (Icons 4377-78).

4. ***Mastigolejeunea plicatiflora*** (Spruce) Steph., *Sp. Hepat.* 4: 766. 1912. *Lejeunea plicatiflora* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 104. 1884

= *Lejeunea plicata* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 98. 1884. **Type.** Venezuela. Amazonas: San Carlos del Río Negro, *Spruce L 97* (**lectotype**, MANCH CC 15906 [per. with several ventral keels], **here designated**; paralectotypes, MANCH CC 15904 [sterile], MANCH 15905 [male]). **Syn. nov.**

Description and illustrations: Gradstein, 1994; Gradstein & Costa, 2003.

Discussion: Four collections of *Lejeunea plicata* were found in Spruce's herbarium in MANCH. They represent two different taxa; the collection from Peru is *Mastigolejeunea auriculata* (Wilson) Schiffn. (Peru, San Martín, Tarapoto, *Spruce L 220* [MANCH CC 15903, autoicous, per. juv. with one ventral keel]). The three other collections from Venezuela represent *M. plicatiflora*. The only specimen which contains mature perianths is chosen here as lectotype, as they were described by Spruce (1884-1885) in the protologue [... perianthiis 6-8 plicatis...].

Acknowledgments. I am grateful to the curators and directors of G, GOET, JE and MANCH for the loan of herbarium material, including many types.

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