

## *Rhaphidostegium planifolium* is a synonym of *Calliergonella lindbergii* var. *lindbergii*, and a note on the variety *americana*

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ABSTRACT. — *Rhaphidostegium planifolium* Kindb. is a scarcely known species based solely on the type specimen collected in 1905 near Ironton, Missouri. Examination of a syntype revealed it to be conspecific with *Calliergonella lindbergii* var. *lindbergii* (Mitt.) Hedenäs, a widespread and common species in North America. In addition, the new combination *C. lindbergii* var. *americana* (Renauld & Cardot) J.J. Atwood & Brinda is proposed for a variety that currently has no available name in *Calliergonella* Loeske.

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*Rhaphidostegium planifolium* Kindb. was described from a specimen collected by Nels L. T. Nelson (1862–1932) labelled as ‘Trenton,’ Missouri in 1905 (but see locality discussion below). Kindberg (1907) characterized this species as dioicous and having pale-red to green, subpinnate stems, and somewhat flattened branches; loosely arranged leaves in nearly two rows; curved, ovate-oblong leaves with short-acuminate to acute apices; plane, entire leaf margins; linear upper and median leaf cells; and inflated, hyaline or reddish alar cells. The genus *Rhaphidostegium* (Schimp.) De Not. is no longer available for use following lectotypification of the earlier name *Sematophyllum* Mitt. with the same type (*Hypnum demissum* Wilson).

Regardless, the described morphology of *R. planifolium*, such as the dioicous sexuality, pale-red to green stems, and loosely arranged leaves, is more indicative of species of Hypnaceae Schimp. *s.lat.* rather than any *Sematophyllum* known from North America. Brotherus (1908) mentioned *R. planifolium* alongside *H. pseudodrepanium* Müll. Hal. & Kindb. [= *Calliergonella lindbergii* var. *lindbergii* (Mitt.) Hedenäs] in his treatment of *Stereodon* (Brid.) Brid., but did not make a new combination in the genus to accommodate it. Grout’s (1932) treatment of Hypnaceae *sensu stricto* did not include *R. planifolium*, and Gier (1955) cited the species in his checklist of Missouri bryophytes with a question mark after it. No mention of *R. planifolium* was made by Redfearn (1972) in *Mosses of the Interior Highlands* and Crum and Anderson (1981, p. 1208) excluded *R. planifolium* from their Hypnaceae treatment without speculating on its correct placement. More recently, *R. planifolium* did not appear in the *List of mosses of North America north of Mexico* (Anderson et al. 1990) or in the second part of the moss treatments in the *Flora of North America* (Flora of North America Editorial Committee 2014).

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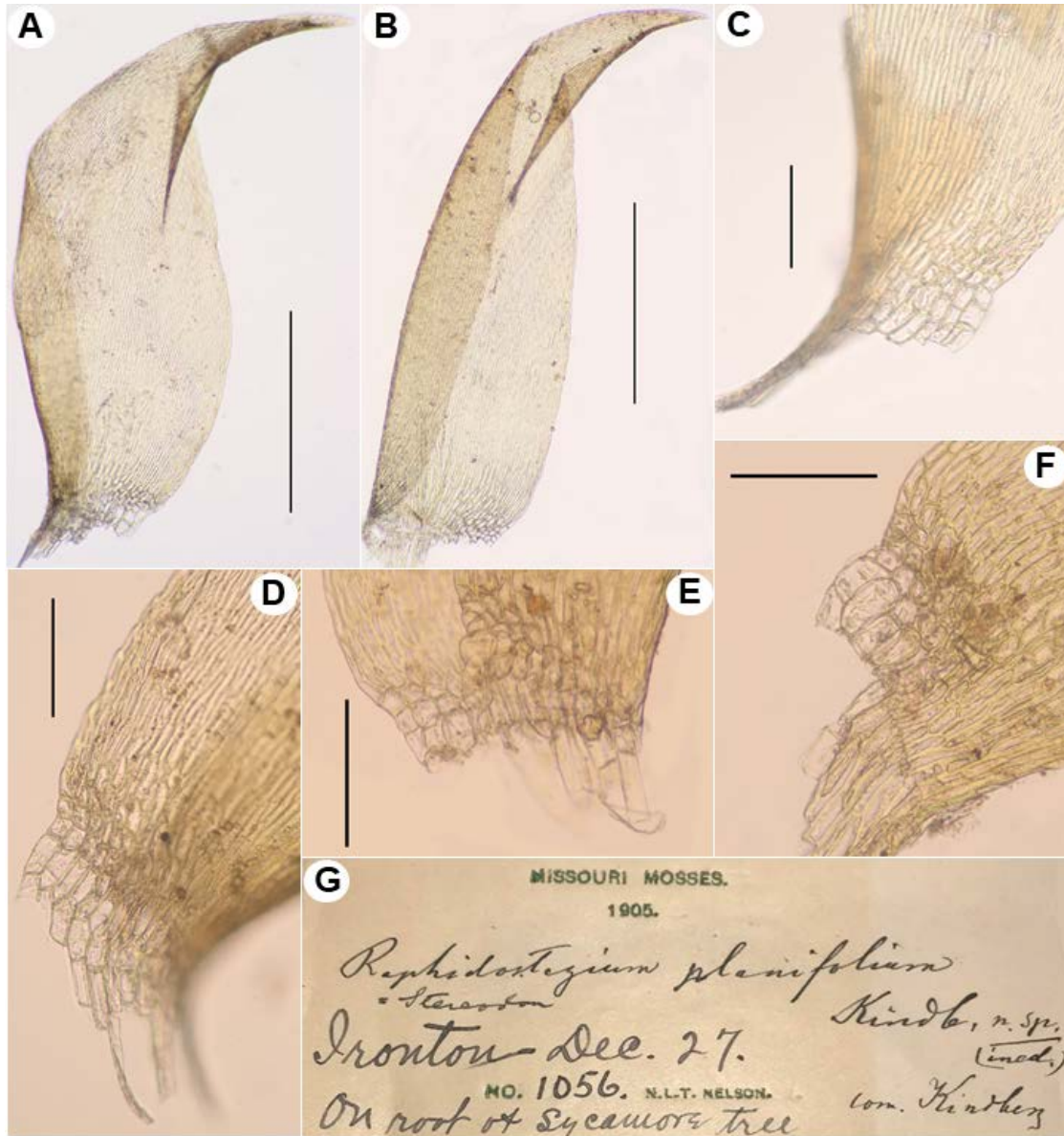
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Nils C. Kindberg's (1832–1910) personal herbarium is deposited at the Swedish Museum of Natural History (S). A search for the species in the museum's online specimen catalog (<http://herbarium.nrm.se/>) revealed a specimen of *R. planifolium* marked 'holotype.' However, that specimen (B178168) is currently inaccessible for study due to museum renovations. Another type specimen was located in Viktor F. Brotherus's (1849–1929) herbarium, now deposited at the Finnish Museum of Natural History at the University of Helsinki (H). Since Kindberg (1907) did not formally designate a holotype for *R. planifolium*, both the S and H specimens are syntypes. A lectotype is not selected here because these two types could not be compared and the specimen in S is likely to be much larger.

An image of the H syntype specimen and label is available at the Global Plants database (<http://plants.jstor.org/stable/10.5555/al.ap.specimen.h3301454>). The specimen label (Fig. 1G) has 'Missouri Mosses. 1905.' printed across the top, and 'N.L.T. Nelson' printed at the bottom. Beneath the heading is handwritten '*Rhaphidostegium planifolium* Kindb. n.sp. ined.' Attached on a separate piece of paper is a brief species description. The description matches the protologue of *R. planifolium* almost verbatim, and along with the determination, appears to be in Kindberg's handwriting, based on comparison with a sample of his handwriting in the archives of the Missouri Botanical Garden (MO). The remaining information on the label, 'Ironton, on root of sycamore tree, Dec. 27, [No.] 1056' is in Nelson's handwriting, as confirmed by similar specimen labels at MO. Kindberg's use of the locality 'Trenton' in the type citation is a misreading of Nelson's handwriting for the city of 'Ironton.' Although Trenton is a city in northern Missouri more than 300 road miles northwest of Ironton, two similarly numbered bryophyte specimens at MO, also collected by Nelson near Ironton on the same date (27 December 1905), corroborate Ironton as the correct locality.

Examination of the type material from H found the glossy, yellowish plants to be about 1.5–2.0 cm long with somewhat complanate-foliate shoots and a few irregularly spaced, short branches. The loosely arranged leaves are mostly erect-spreading, but become falcate-secund near the stem and branch tips. The stems have short, broadly triangular scale leaves that are approximately  $100 \times 85\text{--}100 \mu\text{m}$  and axillary hairs composed of a single quadrate cell terminated by 2–3 elongated cells. The dissected shoots show a distinct stem hyalodermis, with some of the enlarged stem cells attached to the leaf insertion after removal of the leaves. The concave, mostly oblong-lanceolate stem leaves (Fig. 1A–B) are  $1.2\text{--}1.6 \times 0.4\text{--}0.7 \text{ mm}$ , and have falcate-secund, broadly acuminate apices, as well as plane and entire margins, slightly decurrent bases and short, double costae that extend about 1/5 the leaf length. The apical and median cells are linear-flexuose,  $40\text{--}65 \times 2.5\text{--}4 \mu\text{m}$ , with firm walls, while the basal cells are linear-rectangular,  $22\text{--}34 \times 4\text{--}6 \mu\text{m}$ , and sometime porous-pitted. The alar region (Fig. 1C–F) consists of 1–3 rows of quadrate cells,  $10\text{--}16 \times 8\text{--}10 \mu\text{m}$ , with thick walls positioned above 2–3 rows of differentiated, hyaline, oblong to rectangular cells,  $20\text{--}36 \times 10\text{--}16 \mu\text{m}$ , with thin walls. These morphological characters are diagnostic for *C. lindbergii* var. *lindbergii* (Mitt.) Hedenäs, a widespread and common species in Missouri and throughout North America (Schofield 2014, as *H. lindbergii* Mitt.).



**Figure 1.** *Rhabdostegium planifolium* Kindb. A–B. Stem leaves. C–F. Alar cells. G. Specimen label. Scale bars: 0.5 mm for A–B; 50  $\mu$ m for C–F. All from syntype (Nelson 1056, H-0465005).

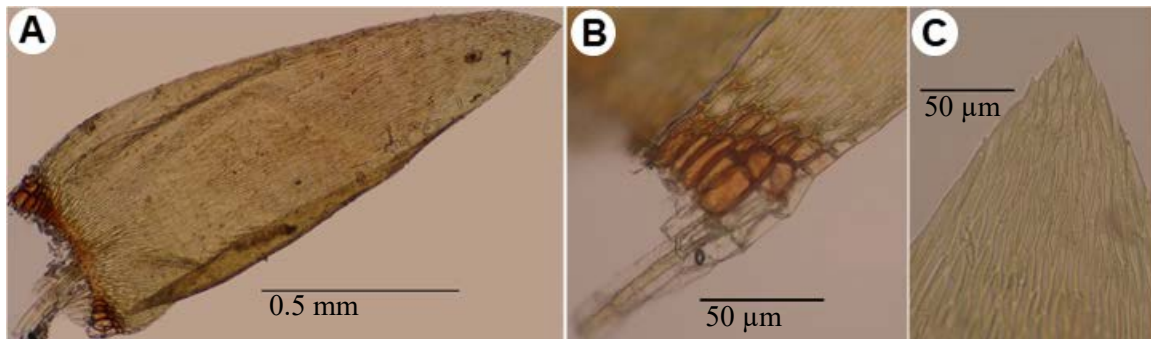
Although a direct comparison was not made between the type material of both *R. planifolium* and *C. lindbergii*, the specimen of *R. planifolium* compares well with numerous non-type specimens of *C. lindbergii* var. *lindbergii* deposited at MO. Additionally, the *R. planifolium* specimen matches several illustrations of *C. lindbergii* var. *lindbergii* from North American manuals (Allen 2014: Fig. 183, Breen 1963: Pl. 84, Crum 1976: Figs. 923–924, Crum and Anderson 1981: Fig. 579A–H, Grout 1965: Fig. 188 as *H. patientiae*, Jennings 1951: Pl. 50 as *S.*

*patientiae*, Welch 1957: Fig. 194 as *H. arcuatum*). Therefore, the formal synonymy of *R. planifolium* with *C. lindbergii* var. *lindbergii* is given below.

*Calliergonella lindbergii* var. *lindbergii* (Mitt.) Hedenäs, *Lindbergia* 16:167. 1990 [1992]; ≡ *Hypnum lindbergii* Mitt., *J. Bot.* 2: 123. 1864, new name for *H. (Drepanium) arcuatum* Lindb. *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad.* 18: 371. 1861 (1862), illegitimate homonym, not *H. arcuatum* Hedw., *Sp. Musc. Frond.* 245. 1801. ≡ *H. curvifolium* subsp. *lindbergii* (Mitt.) Kindb., *Canad. Rec. Sci.* 6: 74. 1894; ≡ *Stereodon lindbergii* (Mitt.) Braithw., *Brit. Moss Fl.* 3: 157. 1902; ≡ *Drepanium lindbergii* (Mitt.) G. Roth, *Eur. Laubm.* 2: 628. 1904; ≡ *Breidleria lindbergii* (Mitt.) W. Schultze-Motel, *Nova Hedwigia* 5: 88. 1963. **Type Citation:** Bryac. Scand. exsicc. fasc. IX, N:o 270. **Type Specimens:** 270. *Hypnum arcuatum* Lindb. In terra argillaceae circa Holmiam. leg. S. O. Lindberg, in R. Hartman: Bryac. Scand. exsicc. (lectotype, S (ac:B213052, not seen), selected by Hedenäs (1992, p. 167); isolectotype: BM (bc:BM000851575, not seen).

= *Rhaphidostegium planifolium* Kindb., *Rev. Bryol.* 34: 25. 1907. **Type Citation:** [U.S.A.] Missouri on root of sycamore tree near Trenton, 1905, *N. L. T. Nelson s.n.* **Type Specimens:** U.S.A., Missouri, Ironton, on root of sycamore tree, 27-Dec-1905, *N. L. T. Nelson 1056*. (syntypes: H-BR! (ac:0465005/bc:H3301454); S (ac:B178168, not seen), *syn. nov.*

In Missouri, *C. lindbergii* var. *lindbergii* is morphologically similar to *C. lindbergii* var. *americana* (Renauld & Cardot) J.J. Atwood & Brinda **comb. nov.** (basionym: *Hypnum arcuatum* var. *americanum* Renauld & Cardot, in Delamare et al., *Ann. Soc. Bot. Lyon* 15: 120. 1887 [1888]). As compared to the typical variety, the var. *americana* has straight to weakly falcate leaves; shorter, blunt to broadly acute apices with denticulate margins; interior alar cells and cells across the leaf insertion that tend to have a reddish-orange coloration; and slightly narrower and more acuminate scale leaves (Fig. 2; also Crum and Anderson 1981: Fig. 580 as *H. lindbergii* var. *americanum*).



**Figure 2.** *Calliergonella lindbergii* var. *americana* (Renauld & Cardot) J.J. Atwood & Brinda. **A.** Stem leaf. **B.** Alar cells. **C.** Leaf apex. All from *Holmberg 2988* (MO-6166351).

Schofield (2006) provisionally noted that the var. *americana* (as *H. lindbergii* var. *americanum*) might be elevated to species rank after a more thorough study of its morphology is undertaken. Presently, the variety ranges from North Carolina, south to Florida, and west to Missouri and Texas. We note in passing that Whitehouse's (1954) earlier combination for var. *americana* under *Hypnum lindbergii* is invalid. She cites "Bot. Gaz. 14: 99. 1889" which cannot be corrected because in that work Renaud & Cardot give a clear reference to the original place of publication as "Florule de l'île Miquelon, 56" (Art. 41.8, Ex. 25; Turland et al. 2018).

The numerous new North American taxa described by Kindberg have been the subject of much criticism by North American bryologists, due to his lack of experience with the flora (Steere 1977, Steere and Crum 1977). In addition to *R. planifolium*, Kindberg described 21 other North American taxa from specimens either collected or communicated by Nelson (Steere and Crum 1977). Of these, *Ditrichum rhynchostegium* Kindb. is the only currently accepted species that is reasonably well-known (Flora of North America Editorial Committee 2007). Two Colorado species (*Bryum coloradense* Kindb. and *Pohlia excelsa* Kindb.) remain insufficiently known because of the lack of new information about them since their original publication (Crosby et al. 1999). The remaining eighteen taxa have since been combined at a subspecific rank (Tropicos.org), or are now synonyms of other taxa. Now added to that list is *R. planifolium*, a new synonym of *C. lindbergii* var. *lindbergii*.

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#### LITERATURE CITED

- Allen, B.H. 2014. Maine mosses: Drummondiaceae – Polytrichaceae. *Memoirs of the New York Botanical Garden* 111: 1–607.
- Anderson, L.E., H.A. Crum, and W.R. Buck. 1990. List of the mosses of North America north of Mexico. *The Bryologist* 93: 448–499.
- Breen, R.S. 1963. *Mosses of Florida*. Gainesville: University Presses of Florida.
- Brotherus, V.F. 1908. *Stereodon*. In: A. Engler and K. Prantl, eds. *Die Natürlichen Pflanzenfamilien*. 1(3): 1067–1074. Leipzig: Wilhelm Engelmann.
- Crosby, M.R., R.E. Magill, B.H. Allen, and S. He. 1999. A checklist of the mosses. St. Louis: Missouri Botanical Garden, published by the authors.
- Crum, H.A. 1976. *Mosses of the Great Lakes Forest*, second edition. Contributions from the University of Michigan Herbarium.
- Crum, H.A. and L.E. Anderson. 1981. *Mosses of Eastern North America*. 2. New York: Columbia University Press.
- Delamare, E., F. Renaud, and J. Cardot. 1887 [1888]. *Florule de l'île Miquelon (Amérique du Nord)*. Énumération systématique avec notes descriptive des phanérogames, cryptogames

- vasculaires, mousses, sphaignes, hépatiques et lichens. Annales de la Société Botanique de Lyon 15: 65–143.
- Flora of North America Editorial Committee. 2007. Flora of North America North of Mexico 27: Bryophytes: Mosses. New York: Oxford University Press.
- Flora of North America Editorial Committee. 2014. Flora of North America North of Mexico 28: Bryophyta, part 2. New York: Oxford University Press.
- Gier, L.J. 1955. Missouri Bryophytes. Transactions of the Kansas Academy of Science 58: 24–49.
- Grout, A.J. 1932. Moss Flora of North America North of Mexico. III, Part 3. Newfane, VT: published by the author.
- Grout, A.J. 1965. Mosses with a Hand-Lens and Microscope. Ashton, MD: Eric Lundberg.
- Hedenäs, L. 1990 (1992). Taxonomic and nomenclatural notes on the genera *Calliergonella* and *Breidleria*. Lindbergia 16: 161–168.
- Jennings, O.E. 1951. A manual of the mosses of western Pennsylvania and adjacent regions. Second edition. American Midland Naturalist Monograph 6.
- Kindberg, N. 1907. New or less known Bryineæ from N. America. Revue Bryologique 34: 25–29.
- Redfearn Jr., P.L. 1972. Mosses of the Interior Highlands of North America. Annals of the Missouri Botanical Garden 59: 1–103.
- Schofield, W.B. 2006. *Hypnum*. In: Flora of North America Editorial Committee (eds.). Flora of North America North of Mexico, 28 (Bryophyta, part 2). St. Louis: Missouri botanical Garden provisional publication, 6 April 2006.  
[<http://www.mobot.org/plantscience/bfna/V2/HypnHypnum.htm>]
- Schofield, W.B. 2014. *Hypnum*. Pages 532–549. In: Flora of North America Editorial Committee (eds.). Flora of North America North of Mexico 28, Bryophyta, part 2. New York: Oxford University Press.
- Steere, W.C. 1977 [1978]. North American muscology and muscologists — a brief history. The Botanical Review (Lancaster) 43: 285–343.
- Steere, W.C., and H.A. Crum. 1977. New combinations and new taxa of mosses proposed by Nils Conrad Kindberg. Memoirs of the New York Botanical Garden 28: 1–220.
- Tropicos.org. Missouri Botanical Garden. <http://www.tropicos.org>. Accessed 5 February 2020.
- Turland, N.J., J.H. Wiersma, F.R. Barrie, W. Greuter, D.L. Hawksworth, P.S. Herendeen, S. Knapp, W.-H. Kusber, D.-Z. Li, K. Marhold, T.W. May, J. McNeill, A.M. Monro, J. Prado, M.J. Price, and G.F. Smith. 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159: 1–254.
- Welch, W.H. 1957. Mosses of Indiana. 478 pp. Bookwalter Co., Indianapolis.
- Whitehouse, E. 1954. *Hypnum lindbergii* Mitt. var. *americanum* (Ren. & Card.) Whitehouse, comb. nov. Field & Laboratory 22: 30.