

GRIMMIA ARCUATIFOLIA AND G. LEIBERGII (MUSCI, GRIMMIACEAE), TWO NEGLECTED SPECIES FROM NORTHWESTERN NORTH AMERICA

by
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Resumen

MUÑOZ, J. (1999). *Grimmia arcuatifolia* y *G. leibergii* (Musci, Grimmiaceae), dos especies olvidadas del noroeste de Norteamérica. *Anales Jard. Bot. Madrid* 57(1): 7-13 (en inglés).

Se reconoce a *Grimmia arcuatifolia* y *G. leibergii* como especies independientes. Ambas crecen en áreas limitadas del noroeste de Norteamérica. *Grimmia alternuata* y *G. procera* son sinónimos de *G. arcuatifolia*.

Palabras clave: Briófitos, taxonomía, nomenclatura, distribución, tipificación.

Abstract

MUÑOZ, J. (1999). *Grimmia arcuatifolia* and *G. leibergii* (Musci, Grimmiaceae), two neglected species from Northwestern North America. *Anales Jard. Bot. Madrid* 57(1): 7-13.

Grimmia arcuatifolia and *G. leibergii* are recognized as distinct species. Each is known from restricted areas in northwestern North America. *Grimmia alternuata* and *G. procera* are synonyms of *G. arcuatifolia*.

Key words: Bryophytes, taxonomy, nomenclature, distribution, typification.

INTRODUCTION

In the list of mosses of continental USA and Canada, ANDERSON & *al.* (1990) recognized 36 *Grimmia* taxa. ALLEN (1995) evaluated seven species of *Grimmia* previously neglected, all of which were found to be the same as described species. Revisionary work by MUÑOZ (1998a, 1998b) has shown that *G. caespiticia* (Brid.) Jur. and *G. ungeri* Jur. are present in North America, and changed the status of previous names.

During ongoing taxonomic studies on North American *Grimmia* two species so far considered synonymous with other taxa were found to be worthy of recognition; this raises the number of *Grimmia* species for North American to 40.

RESULTS

Grimmia arcuatifolia Kindb., Bull. Torrey Bot. Club 16: 93. 1889

Type. Canada. British Columbia: Vancouver Island, Mount Tolmie, near Victoria, 48° 26' N, 123° 22' W, 21-IV-1887, *Macoun s.n.* (lectotype, here designated, CANM!; isolectotype, FH!)

Racomitrium alternuatum Müll. Hal. & Kindb., Cat. Canad. Pl., Musci 73. 1892. *Grimmia alternuata* (Müll. Hal. & Kindb.) Kindb., Eur. N. Amer. Bryin. 2: 228. 1897 [1898] [attenuata]. *Type.* Canada. British Columbia: Along the C. P. R'y at the summit of Roger's Pass, Selkirk Mountains, 51° 18' N, 117° 31' W, 6-VIII-1890,

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Macoun s.n. [Macoun, Canadian musci, no. 524] (lectotype, FH! Note: All other duplicates are *G. elatior* Bals.-Criv. & De Not. and are excluded from the type). Syn. nov.

Grimmia procera Kindb., Rev. Bryol. 23: 18. 1896, nom. illeg., non Bals.-Criv. & De Not., 1838. *Type*. Canada. British Columbia: Vancouver Island, Parson's Mt., 48° 26' N, 123° 22' W, 19-V-1893, *Macoun s.n.* [Macoun, Canadian mosses no. 88a, no. 133] (lectotype, here designated, CANM!; isolectotypes, CANM!, NY!). Syn. nov. (fig. 1)

Dioicous? (male buds not seen). *Plants* glossy, olive-green with red-brownish areas above, black below. *Stems* ascending, to 6 cm long, central strand lacking. *Leaves* erect and appressed when dry, erect to patent when moist, 2.75-3.75 × 0.5-0.8 mm, lanceolate, acuminate, keeled, not plicate; *margins* broadly recurved to 1/2-2/3 the leaf length proximally on one side, and flat or narrowly recurved to 1/3 the leaf length proximally on the other side; *costa* reniform, differentiated from the lamina, ventral epidermis 4-6(8) cells wide in cross-section; *lamina* 1-2-stratose, 2(4)-stratose at margins and at apex, sometimes pseudopapillose; *distal cells* 9-13 µm long, isodiametric to rectangular, irregularly triangular cells sometimes present, not bulging, not papillose, walls sinuous; *proximal paracostal cells* 50-105 × 7-15 µm, rectangular (4-7:1), walls thick, nodulose; *proximal marginal cells* 12-35 × 8-14 µm, rectangular (1.5-4.0:1), the transverse walls thicker than the longitudinal walls; *hyaline hair-points* terete, rigid, squarrose when dry, to 1.1 mm long, denticulate to dentate. *Perichaetial leaves* 4.0 × 0.8 mm, convolute proximally and prolonged into a very narrow acuminate distal half, larger than vegetative leaves (1.5×). *Setae* cygneous, 4 mm long. *Capsules* exserted, ovoid, symmetric, smooth, straw-yellow, with stomata at the base; *exothecial cells* 30-70 × 12-25 µm, oblong (2-3:1), thin-walled, but incrassate at the corners; *annulus* compound and revoluble; *peristome teeth* 60 µm wide at the

mouth, entire, outer surface nearly smooth below and papillose above, inner surface papillose throughout, orange, contrasting in color with the urn; *opercula* not seen; *calyptrae* not seen; *spores* 14-18 µm, coarsely granulose.

Habitat. On exposed rocks and cliffs. Further data unavailable.

Grimmia arcuatifolia is a robust species with long, nearly unbranched, ascendent stems, a ± reniform costa 4-6(8) cells-wide on the ventral side, smooth capsules, cygneous setae, and triangular, entire peristome teeth. *Grimmia elatior*, a similar species known from the same area, approaches *G. arcuatifolia* in its robust habit, ascendent and nearly unbranched stems, cygneous seta, and entire peristome teeth. However, in *G. elatior* the costa is 2 cells-wide in the ventral band and irregularly furrowed dorsally, the capsules ribbed, and most populations have strongly bulging, papillose leaf cells.

Grimmia arcuatifolia is also macroscopically similar to *Racomitrium macounii* subsp. *alpinum* (E. Lawton) Frisvoll and *R. sudeticum* (Funck) Bruch & Schimp., which occasionally have arcuate setae (FRISVOLL, 1988, and pers. obs.). *Grimmia arcuatifolia*, however, differs from all *Racomitrium* species in its comparatively weakly sinuous leaf cell walls, entire, triangular peristome teeth, and cygneous setae. In contrast, *Racomitrium* taxa have more strongly sinuous-nodulose leaf cell walls, peristome teeth divided for most of their length into two filiform prongs, and usually straight setae which sometimes are arcuate, but never cygneous.

Specimens agreeing completely with the protologue of *G. arcuatifolia* have not been found, a problem experienced also by FRISVOLL (1988: 228). A further complication is that most of the specimens identified as *G. arcuatifolia* by Kindberg or Macoun are other species, principally *Racomitrium heterostichum* (Hedw.) Brid. The only specimen in S that is *G. arcuatifolia* does not match the protologue, either by locality or date, although it might be part of the original

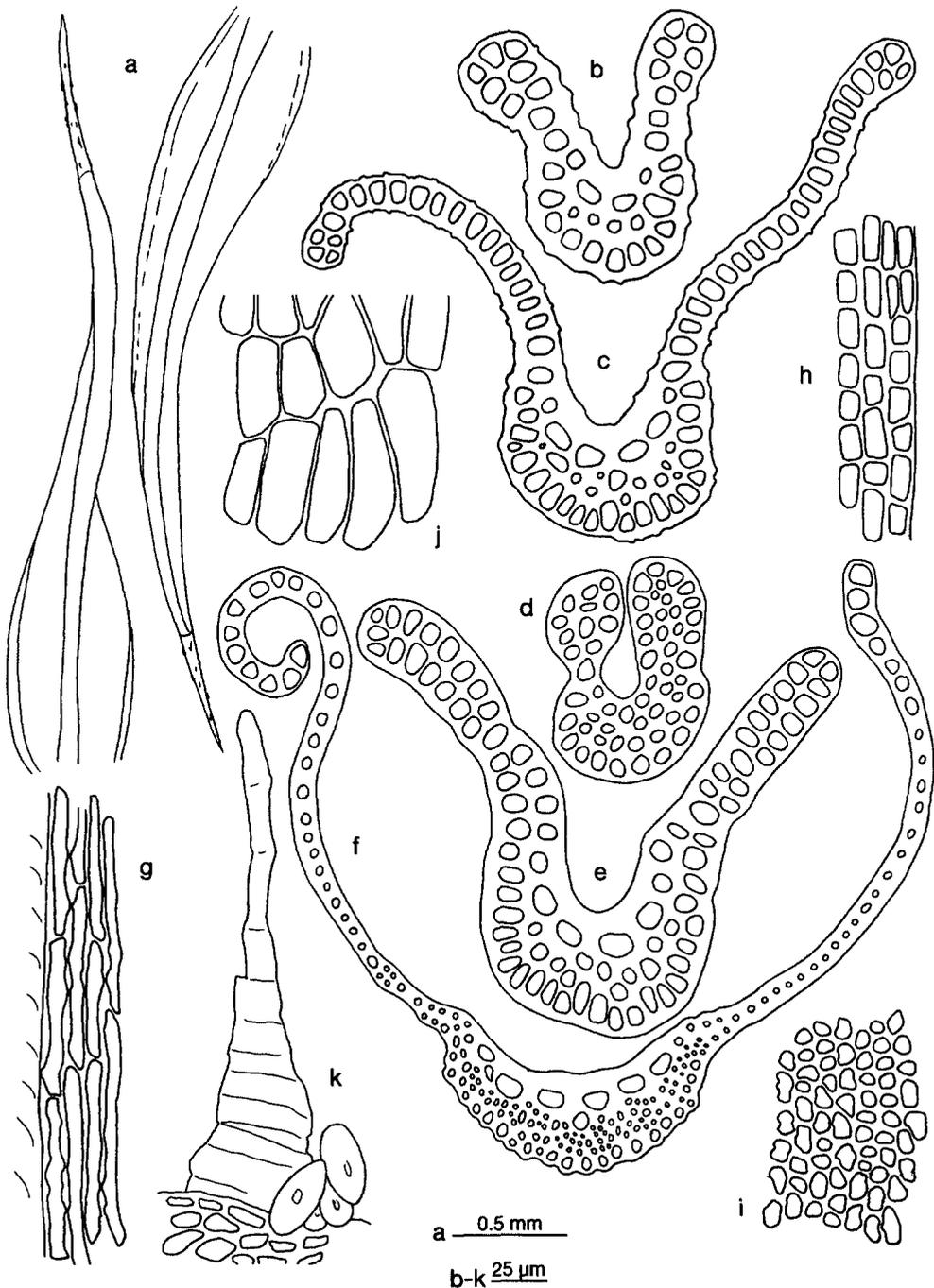


Fig. 1.—*Grimmia arcuatifolia*: a, leaves; b, d, transverse sections through apical part of leaf; c, e, transverse sections through medial part of leaf; f, transverse sections through basal part of leaf; g, proximal paracostal leaf cells; h, proximal marginal leaf cells; i, distal leaf cells; j, medial exothelial cells; k, peristome tooth and annulus (only contour shown, not papillosity). (a-c, f-k: *Schofield 61331*, MO; d, e: *Macoun s.n.*, FH.)

collection. Thus, I prefer to select as lectotype a specimen in CANM that most closely approaches the protologue.

Racomitrium alternatum Müll. Hal. & Kindb. was considered close to *R. macounii* Kindb. when described (MACOUN & KINDBERG, 1892: 73), but subsequently KINDBERG (1898: 228) transferred *R. alternatum* to *Grimmia*. However, since JONES (1933: 57) it has been considered by American authors to be the same as *R. macounii*. FRISVOLL (1988: 228-229) showed that it belongs to *Grimmia*. The typification of this name reveals some of the problems found in dealing with Kindberg/Macoun names. The protologue gives Macoun's "Canadian musci" no. 524 as type of the name, and gives the type locality as "... Avalanche Mountain, Roger's Pass, Selkirk Mountains, B.C., Aug. 5th, 1890. (Macoun)". The printed labels of Macoun's "Canadian musci" no. 524 consistently read "... Aug. 6th...", which could be considered a typographical error, but the problem is further complicated because all specimens, except one of the exsiccata examined, have other dates handwritten on the packet or on additionally enclosed packets. To complicate the situation more, different specimens of the exsiccata represent different species, or are mixed collections. Kindberg's herbarium is in S and it is very unlikely that he returned to Macoun the material on which his descriptions are based, but no specimen was found in S fitting the information in the protologue (Hedenäs, pers. comm.). The only "Canadian musci" no. 524 that is *G. arcuatifolia* is one in FH, whereas all other specimens studied are *G. elatior* Bals.-Criv. & De Not. Since *G. arcuatifolia* fits the protologue of *R. alternatum* better than *G. elatior*, and the FH specimen is the only one without additional handwritten dates, I have selected this specimen as the lectotype of *Racomitrium alternatum*.

Additional specimens examined

CANADA. BRITISH COLUMBIA: Vancouver Island, 14-V-1887, *Macoun s.n.*, H-BR1, PC1, S1! Vancouver Island, Parson's Mt., 49° 00' N, 124° 43' W, 19-V-1893, *J. Macoun s.n.*, CANM! Vancouver Island, Old Baldy Mtn., E shore of Shawinigan Lake, 48° 38' N, 123°

38' W, *Halbert 4461, 4478*, FH! Victoria, 48° 26' N, 123° 22' W, 19-V-1893, *Macoun s.n.*, NY! Quadra Island, Gowlland Harbour, 50° 04' N, 125° 13' W, *Schofield 61331*, IBA1, MO1, S1, UBC! Summit of Malahat Hwy., 48° 25' N, 123° 35' W, *Schofield 77369*, H!

USA. CALIFORNIA: Humboldt Co., Bear Butte, 40° 11' N, 123° 50' W, *Branscomb & Greenman 22826*, MO!

Grimmia leibergii Paris, Index Bryol. 2: 528. 1895

Grimmia pachyphylla Leiberg, Bull. Torrey Bot. Club 20: 113. 1893, nom. illeg., non Müll. Hal., 1885. *Type*. USA. Idaho: Kootenai Co., Post Falls, 47° 50' N, 116° 50' W, *Leiberg 250* (holotype, US?, not seen; isotypes, NY! 5 replicates, PC!) (figs. 2, 3)

Dioicous. *Plants* yellow-green to golden. *Stems* prostrate to ascending, to 12 cm long, central strand lacking. *Leaves* erect, falcate and flexuous when dry, falcate when moist, 3.0-3.5 × 0.8-0.9 mm, lanceolate, acuminate, canaliculate, not plicate; *margins* broadly recurved proximally, to 2/3 the leaf length on both sides or somewhat less on one; *costa* reniform, differentiated from the lamina, ventral epidermis 4-6 cells wide in cross-section; *lamina* 1-stratose except for the 2-stratose 2-3 marginal rows in the distal 2/3, occasionally pseudopapillose; *distal cells* 10-25 µm long, rectangular, not bulging, not papillose, walls sinuous; *proximal paracostal cells* 40-130 × 8-12 µm, rectangular (4-18:1), walls thick and nodulose; *proximal marginal cells* 8-25 × 10-12 µm, oblate to rectangular, the transverse walls thicker than the longitudinal walls; *hyaline hair-points* flat, flexuous, erect, to 2 mm, entire to weakly denticulate. *Perichaetial leaves* 3-4 × 1 mm, convolute proximally and prolonged into a very narrow acuminate distal half, slightly larger than vegetative leaves (1.1-1.3×). *Androecia* terminal. *Setae* cygneous, 3-4 mm long. *Capsules* exserted, ovoid, symmetric, ribbed, straw-yellow, with stomata at the base; *exothecial cells* 30-70 × 15-26 µm, oblong (1.5-5.0:1), moderately thick-walled, incrassate at the corners; *annulus* compound and revoluble; *peristome teeth* 80-120 µm wide at the mouth, cribose throughout and irregularly cleft at apex, outer surface nearly

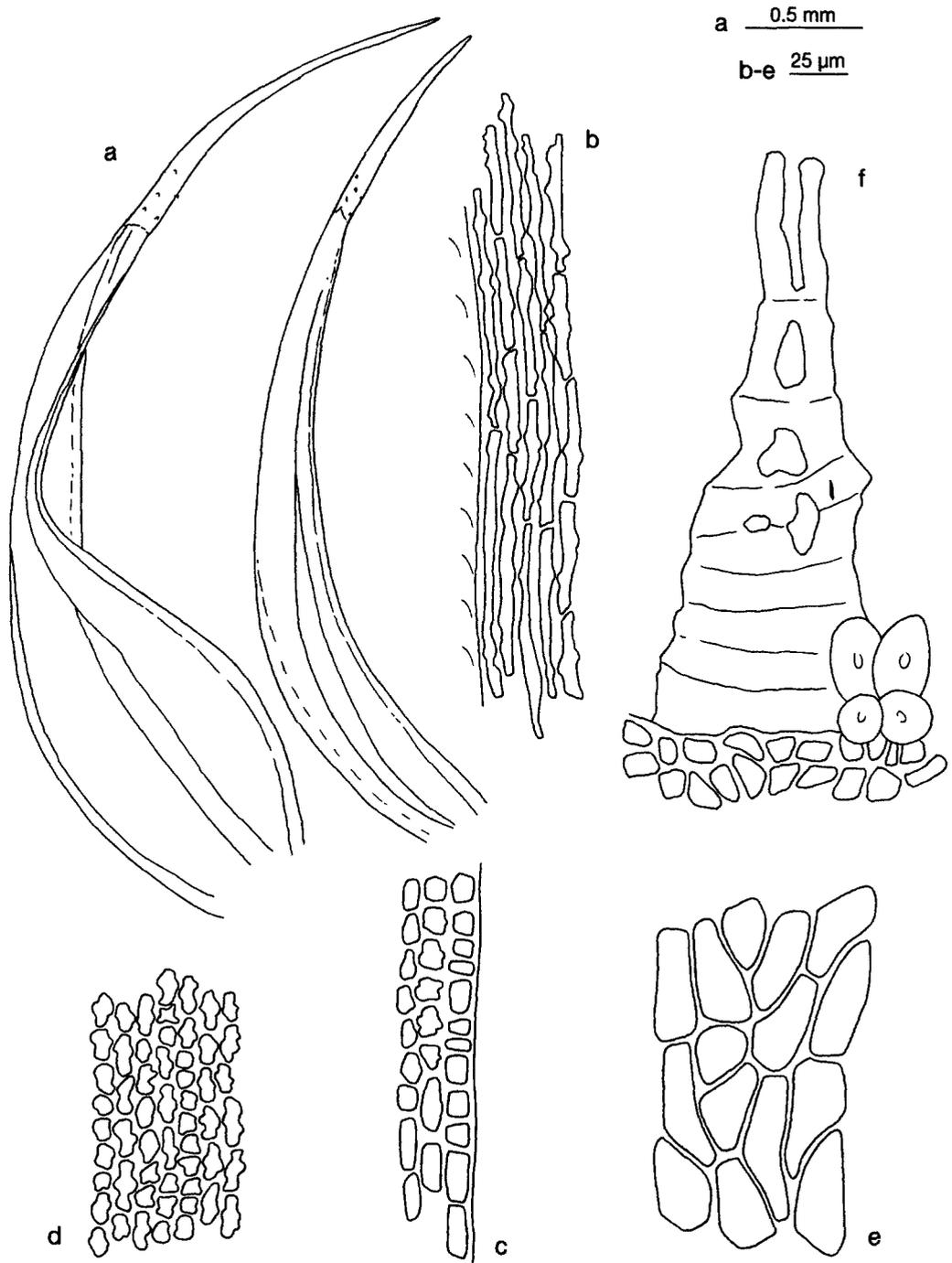


Fig. 2.—*Grimmia leibergii*: a, leaves; b, proximal paracostal leaf cells; c, proximal marginal leaf cells; d, distal leaf cells; e, medial exothelial cells; f, peristome tooth and annulus (only contour shown, not papillosity). (*Leiberg s.n.*, PC, isotype.)

smooth below and papillose above, inner surface papillose throughout, orange to reddish, contrasting in color with the urn; *opercula* rostrate, beak long and straight; *calyptrae* mitrate; *spores* 14-16 μm , minutely granulose.

Habitat. On granite. Further data unavailable.

Grimmia leibergii is characterized by its prostrate to ascending *Racomitrium*-like habit, unistratose lamina, margins recurved for more than half the lamina length, flat hair-points, reniform costa 4-6 cells wide, dioicous sexual condition, ribbed capsules, and cygneous setae. It has a decided *Racomitrium*-like macroscopic appearance, but leaf areolation and sporophyte characters indicate *Grimmia* as the correct genus for the species (see discussion under *G. arcuatifolia*).

Grimmia leibergii is sharply distinct from any other species in the genus, and it is surprising that it has not been considered worthy of recognition except by JONES (1933: 40), who treated *G. leibergii* as an independent taxon although he expressed doubts about its distinction from *G. decipiens* (Schultz) Lindb. Jones stated that *G. leibergii* would be identical with *G. decipiens* except for its dioicous sexual condition and annulus structure. However, besides differences in its sexual condition, *G. decipiens* has erect stems, terete hair-points, and the lamina is partially to totally bistratose, not just at the margins as in *G. leibergii*.

Subsequently, LAWTON (1971: 133) studied the type of *G. leibergii* and discussed its relationships with *G. decipiens* and *G. trichophylla* Grev. She concluded that it was distinct from *G. decipiens* but not from

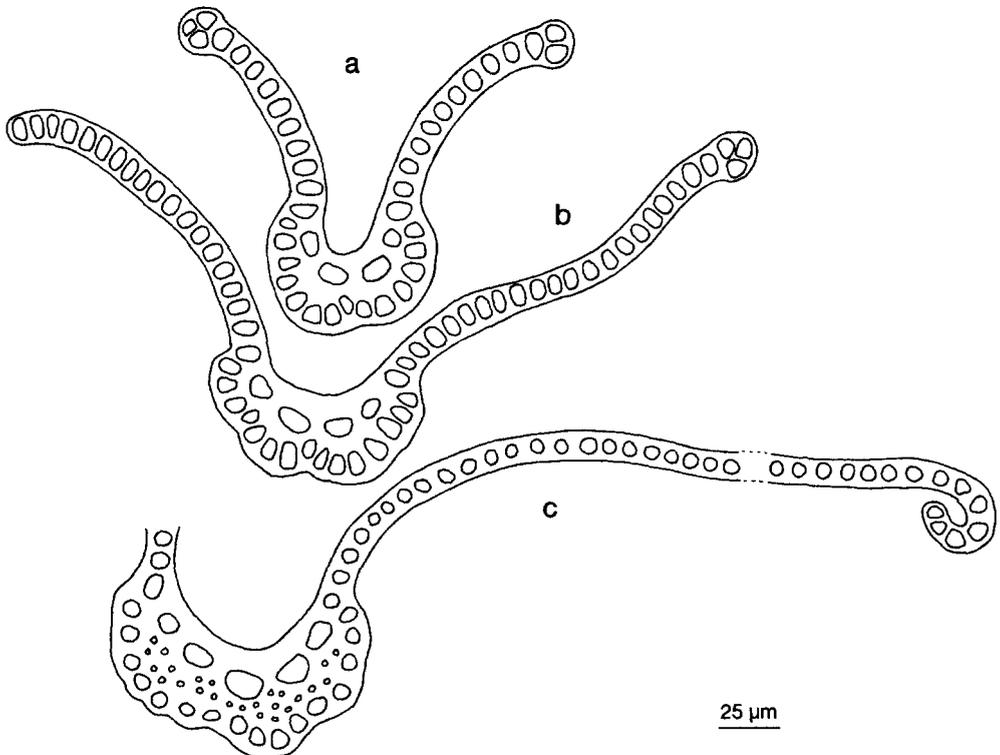


Fig. 3.—*Grimmia leibergii*: transverse sections through parts of leaf: a, apical; b, medial; c, basal. (*Leiberg s.n.*, PC, isotype.)

G. trichophylla, from which she considered *G. leibergii* merely a form. This decision was accepted by CRUM & al. (1973: 116). Lawton based her conclusions on variability in costal structure of the type of *G. leibergii*, which, according to her, showed intermediates with typical *G. trichophylla*. I agree with the differences between *G. leibergii* and *G. decipiens* stated above, but I do not see the supposed intergradation in costa structure between collections of *G. leibergii* and *G. trichophylla*. *Grimmia trichophylla* differs from *G. leibergii* in being a much smaller plant with a different habit, having erect stems, terete hair-points, and a semiterete costa with two ventral cells as seen in cross section.

Additional specimens examined

USA. CALIFORNIA: Placer Co., Applegate, 39° 00' N, 120° 59' W, *Heid 101*, MO! Stanislas Co., Southern part of Orestimba Creek Trail, Henry Coe State Park, 37° 11' N, 121° 22' W, *Whittemore 6584*, IBA!, MO! IDAHO: Kootenai Co., 1892, *Sandberg 152*, NY! Kootenai Co., Hope, 47° 43' N, 116° 38' W, *Sandberg 1169*, FH!, NY!

ACKNOWLEDGEMENTS

This research was supported by a postdoctoral grant from the Spanish Ministry of Education and Culture. I thank the curators cited in the text for the loan of specimens, especially Lars Hedenäs, who searched for obscure types among Kindberg's specimens. Bruce Allen and Ronald Pursell made valuable comments on the original manuscript.

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Editado por Carlos Lado
Aceptado para publicación: 9-III-1999