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Some new synonyms of *Herbertus sendtneri* (Nees) Lindb. (Jungermanniidae: Herbertaceae) from the Neotropics

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Abstract – Based on morphological investigation of herbarium material, the binomina *Herbertus grossispinus* (Steph.) Fulf., *H. oblongifolius* (Steph.) Gradst. & Cleef, *Schisma columbiae* Steph., *S. granatense* Steph., *S. lechleri* Steph., *S. striolatum* Steph. and the nomen nudum *Schisma durandii* var. *dissectum* Herzog are placed in the synonymy of *Herbertus sendtneri* (Nees) Lindb.

Herbertaceae / Herbertus / Neotropics

INTRODUCTION

Species delimitation in *Herbertus* Gray (= *Schisma* Dumort., *Herberta* Gray mut. Lindb.; Grolle & Florschütz, 1975) is notoriously difficult and subject to much controversy (e.g., Miller, 1965; Hodgetts, 2003; Feldberg *et al.*, 2004). Until recently, *Herbertus sendtneri* (Nees) Lindb. was known only from the Austrian Alpes, the Inselberg in Thuringia, Germany, and Asia (Müller, 1954; Meinunger & Köckinger, 2002). However, a combined morphological - molecular investigation (Feldberg *et al.*, 2004) revealed the presence of *Herbertus sendtneri* in tropical America where the species was erroneously identified as *H. subdentatus* (Steph.) Fulf. (Fulford, 1963) or *H. dicranus* (Taylor ex Gottsche, Lindenb. & Nees) Steph. (Hodgetts, 2003).

Within Neotropical *Herbertus*, *H. sendtneri* stands out by its yellowish colour and the presence of numerous flagellae (Feldberg *et al.*, 2004). The species is furthermore characterized by strongly secund, papillose leaves (Figs 2, 3) with coarse appendages at the base, and a vitta that bifurcates at *ca* 2/3 up the basal lamina (Figs 1, B, E, H; 2, B, I). Forms with few flagellae or a brownish or reddish colour are often difficult to distinguish from other Neotropical taxa.

About 10 species of *Herbertus* are currently accepted for tropical America (Fulford, 1963; van Reenen, 1982; Gradstein *et al.*, 2001). In the framework of a revision of *Herbertus* for *Flora Neotropica* we studied type material of about 30 related binomials and recognized several new synonyms of *H. sendtneri*. The new synonyms are listed and partly depicted.

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MATERIAL AND METHODS

This study is based on specimens from the herbaria FH, G, JE, MANCH, NY, S, and U. Specimens were analysed using traditional microscopic techniques and scanning electron microscopy. Air dried herbarium specimens were examined by SEM using a ZEISS DMS 960 after fixing on double adhesive tape and sputter coating with gold.

Taxa were filed under *Herbertus sendtneri* when they matched the spectrum of phenotypes identified as *H. sendtneri* in phylogenetical analyses of nrITS sequences of *Herbertus* (Feldberg *et al.*, 2004).

RESULTS AND DISCUSSION

Herbertus sendtneri (Nees) Lindb. *in* Lindberg & Lackström, *Hep. Scand. Exs*., Fasc. 1, no. 4. 1874. ("*Herberta*"); *Schisma sendtneri* Nees, *Naturg. Europ. Leberm*. 3: 575. 1838. **Type:** Austria, Inn Valley, Inziger Alm, 2300 m, *Sendtner s.n.* (Lectotype, designated by Grolle (1975), S).
Figs 1-3; for full description see Feldberg *et al.* (2004)

= *Schisma granatense* Steph., *Spec. Hep*. 4: 14. 1909, **syn. nov**. **Type:** Colombia, Antioquia, Páramo de Sonson, 3050 m, 1874, *Wallis s.n.* (Holotype, G 52078).
= *Herbertus grossispinus* (Steph.) Fulf*., Mem. New York Bot. Gard*. 11: 98. 1963 (« *Herberta grossispina* »); *Schisma grossispinum* Steph., *Spec. Hep.* 4: 10. 1909, **syn. nov. Type:** Venezuela, Mt. Roraima, *Quelch s.n.* (Holotype, G 52084).
= *Schisma lechleri* Steph., *Spec. Hep*. 4: 12. 1909, **syn. nov. Type:** Peru, Tatanara, *Lechler s.n.* (Holotype, G 52079).
= *Schisma karstenii* Steph., *Spec. Hep.* 4: 14. 1909, **syn. nov. Type:** Mexico, *Karsten s.n.* (Holotype, G 42851).
= *Schisma striolatum* Steph., *Spec. Hep*. 4: 13. 1909., **syn. nov. Type:** Colombia, Antioquia, Páramo de Sonson, 3050 m, *Wallis 25* (lectotype, designated by Fulford (1963: 104), G 52644).
= *Herbertus oblongifolius* (Steph.) Gradst. & Cleef, *Proc. Kon. Ned. Akad. Wetensch., Ser. C*, 80: 398. 1977; *Schisma oblongifolium* Steph., *Spec. Hep.* 4: 11. 1909, **syn. nov. Type**: Brazil, Serra do Itatiaia, Agulhas Negras, 2400m, 1894, *Ule 448* (Holotype, G 52085).
= *Schisma columbiae* Stephani, *Spec. Hep.* 6: 357. 1922 (Icones Stephanii Nr. 9368), **syn. nov. Type:** Colombia, Herb. Cardot (Holotype, G 42649).
= *Schisma durandii* var. *dissectum* Herzog, *Rev. Bryol. & Lichénol.* 11: 25. 1938 (*nom. nud*.), **syn. nov. Original material**: Costa Rica, Heredia, Cerros de Zurqui, NE of San Isidro, 2000-2400m, 03.03.1926, *Standley* & *Valerio 50338* (JE).

Although forming a robust monophylum in phylogenetic analyses of nrITS sequences, European *Herbertus sendtneri* differs from the majority of Neotropical phenotypes in the constitution of the leaf apices. Robust Neotropical forms have leaf lobes tapering to an acuminate, 5-25 cellular apex with elongate subterminal cells whereas leaves of European specimens are mostly provided with short lobes (Feldberg *et al.*, 2004). However, the extremes are linked by numerous

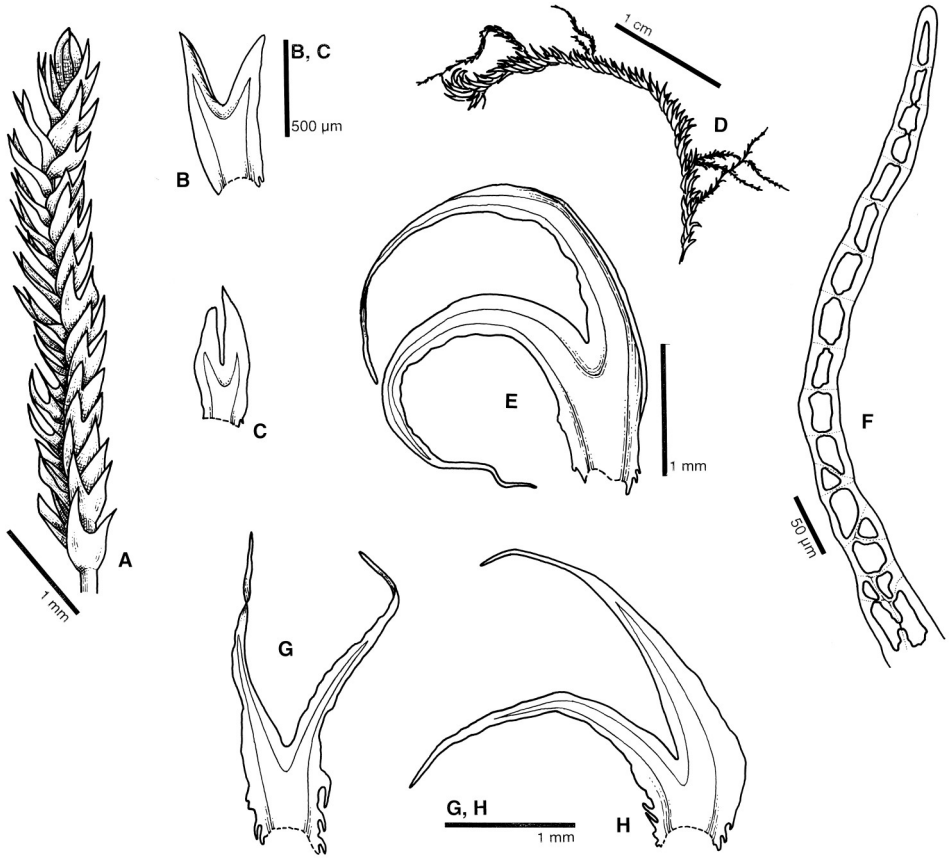

Fig. 1. *Herbertus sendtneri*. **A, D**, parts of shoots, lateral view; **B, E, H**, leaves; **C, G**, amphigastria; **F**, leaf tip (papillae not shown) [A-C from holotype of *S. oblongifolium* (G), D-F from holotype of *S. granatense* (G), G, H from original material of *S. durandii* var. *dissectum* (JE)].

intermediates. *Herbertus karstenii* from Mexico [erroneously placed in the synonymy of *H. subdentatus* by Fulford (1963: 104)] and *H. oblongifolius* (Fig. 1, A-C) from Brazil represent such intermediate forms which are closer to the European than to the Neotropical phenotype spectrum of *H. sendtneri*. *Schisma striolatum* was erroneously synonymized with *H. subdentat*us by Fulford (1963: 104). This taxon represents a well developed, common neotropical form of *H. sendtneri*.

Reappraisal of the type of *H. subdentatus* (Steph.) Fulf. from Mt. Roraima (Hodgetts, 2003; Feldberg *et al.*, 2004) raised the question whether *H. sendtneri* occurs in this area. However, the type of *H. grossispinus* from Mt. Roraima shows all characters of luxuriant Neotropical forms of *H. sendtneri* and is therefore placed in the synonymy of this species. *Herbertus grossispinus* was treated as a distinct species by Fulford (1963), but her description ("lamina at least twice as long than broad") is not in accordance with the holotype. The same author (Fulford, 1963: 99) lowered *Schisma granatense* (Fig. 1, D-F) and *S. lechleri* (Fig. 2, A-G) to

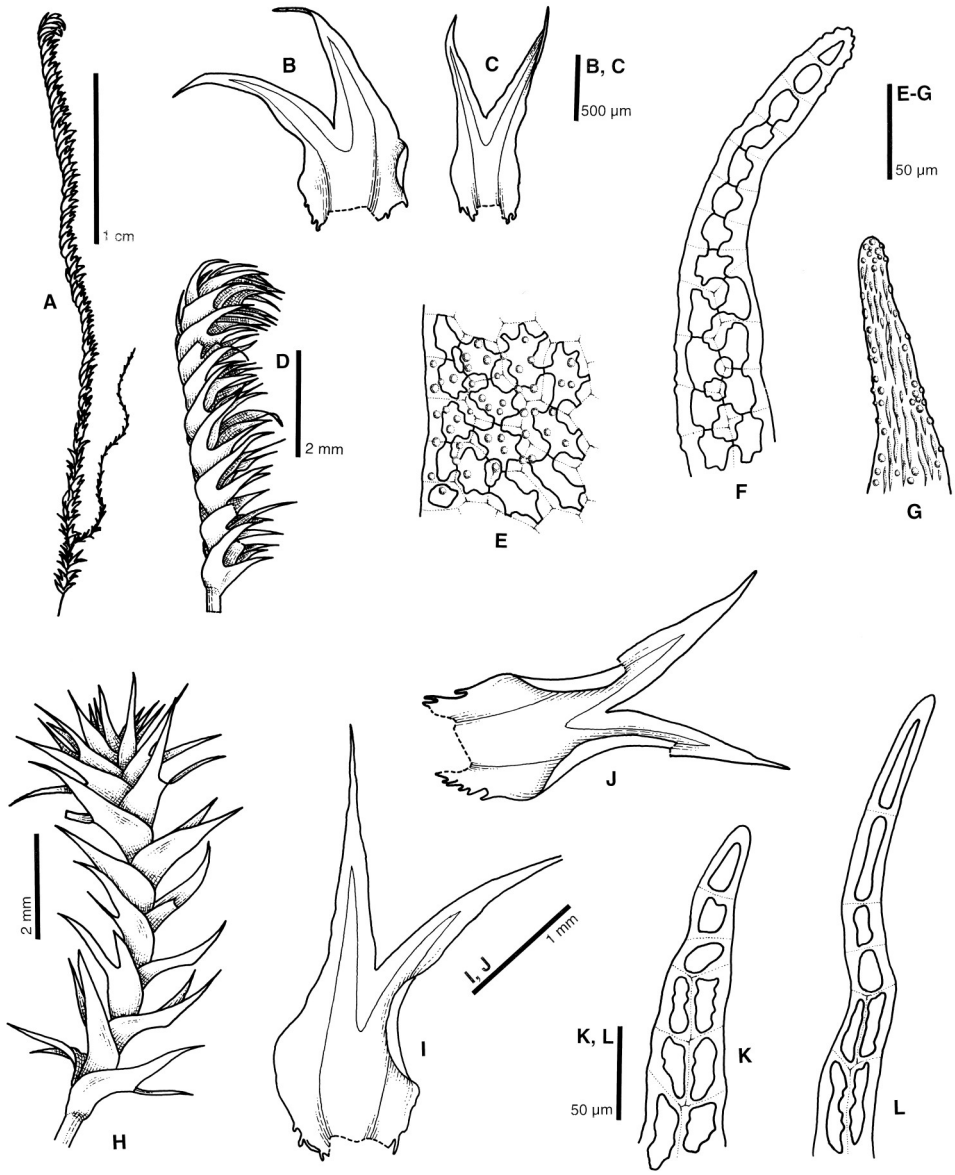

Fig. 2. *Herbertus sendtneri.* **A, D**, parts of shoots, lateral view; **B, I**, leaves; **C, J**, amphigastria, **E**, lamina cells with papillae; **F, K, L**, leaf tips (papillae not shown); **G**, leaf tip with papillae; **H**, top of shoot, dorsal view [A-G from holotype of *S. lechleri* (G), H-L from holotype of *S. columbiae* (G)].

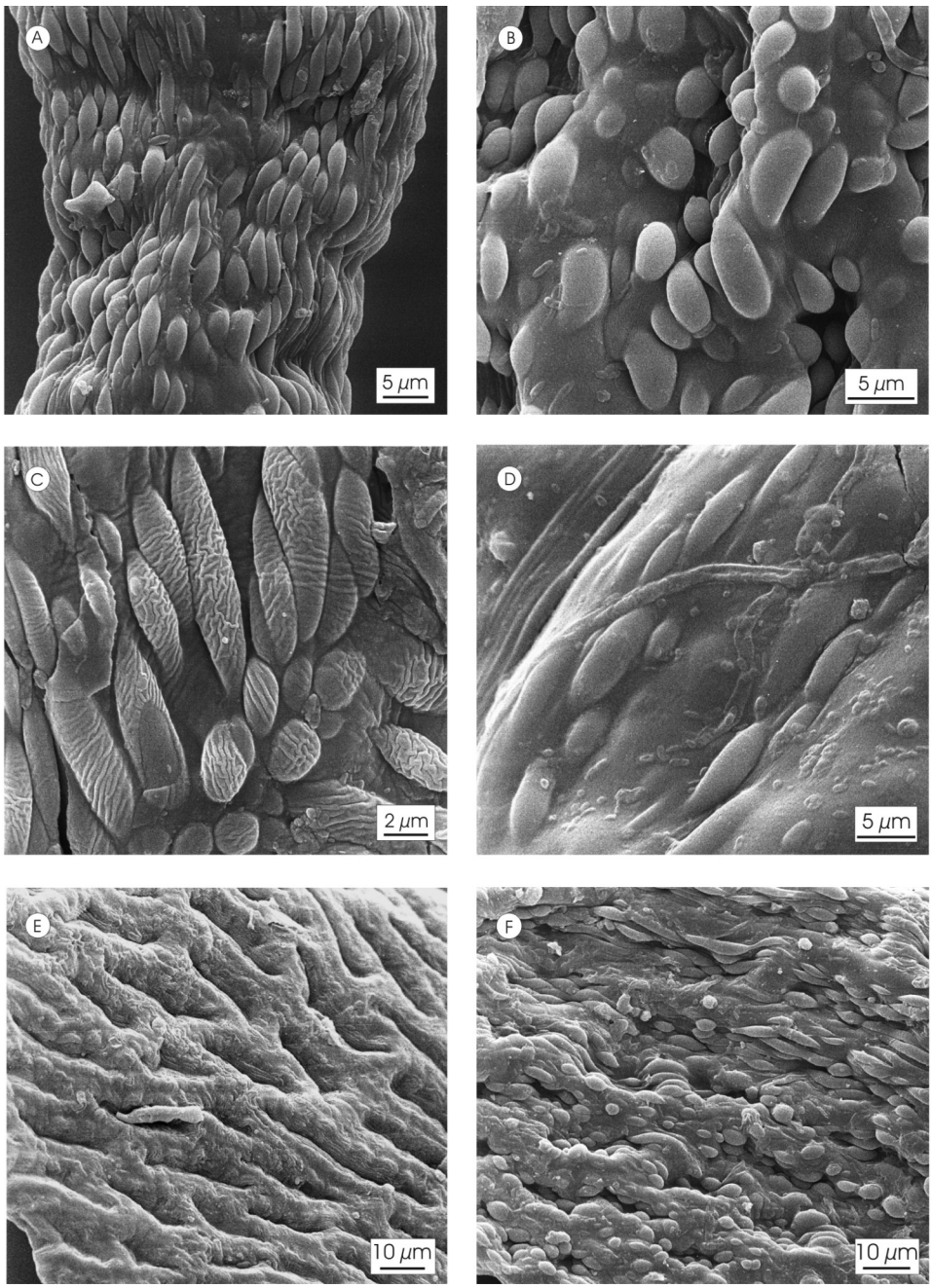

Fig. 3. SEM micrographs of the leaf surface of *H. sendtneri*. **A** from upper part of lobe; **B-F** from lateral parts of lamina [A, B from holotype of *H. grossipinus* (G), C from holotype of *H. oblongifolius* (G), D from holotype of *S. granatense* (G), E from orig. mat. of *S. durandii* var. *dissectum* (JE), F from holotype of *S. lechleri* (G)].

synonyms of *H. acanthelius* Spruce. *Herbertus acanthelius* differs from *H. sendtneri* by unequal leaf lobes that overlap at the base (Van Reenen, 1982), a vitta that bifurcates just below the leaf sinus, and an at most weakly papillose lateral leaf lamina (Feldberg *et al.*, 2004). The investigated type material of *S. granatense* and *S. lechleri* has strongly papillose leaves with equal lobes that do not overlapp, and a vitta that bifurcates far below the sinus. Hence, a conspecifity of these binomina with *H. sendtneri* is more tenable than with *H. acanthelius*. Fulford (1963: 94) regarded *S. columbiae* as conspecific with *H. pensilis* (Taylor) Spruce, a taxon that stands out by slender, long-rectangular leaves with a long lamina (type, FH!). *Schisma columbiae* (Fig. 2, H-L), however, is clearly different and shows all characters of *H. sendtneri*. The overall impression of our revisionary study is that the taxonomy of Neotropical *Herbertus* is in a chaotic state and a revision incorporating molecular and morphological data is urgently needed. Work to obtain these data is underway.

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