Bryoerythrophyllum berthoanus comb. nov. and B. sharpii (Pottiaceae) in South America

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SUMMARY

Didymodon berthoanus Thér., a rare species endemic to Chile, is transferred to the genus Bryoerythrophyllum P.C.Chen as B. berthoanus (Thér.) comb. nov. Bryoerythrophyllum sharpii R.H.Zander is newly recorded for South America based on fruiting material collected in Ecuador and Peru. Previously, this species was known only from Mexico. Both species are described and illustrated, and compared with other species of Bryoerythrophyllum of the area. The current range worldwide of the two taxa is mapped.

KEYWORDS: Bryoerythrophyllum, Chile, Ecuador, Peru, Pottiaceae, taxonomy.

INTRODUCTION

The moss genus Bryoerythrophyllum P.C.Chen, belonging to the family Pottiaceae, subfamily Barbuloideae (Herzog) Hilp. (Zander, 2006), was described by Chen (1941). This genus is characterized by: the red colour of the plants, papillae of the upper laminal cells bifid and crowded, and basal cells well-differentiated (Zander, 1993). It is an almost cosmopolitan genus of 27 species (Zander, 1993), with 12 species in its main centre of diversity in the Neotropics (Gradstein, Churchill & Salazar-Allen, 2001).

Crum (1957) was the first author studying Bryoerythrophyllum in South America. He treated B. arcuatum (Mitt.) H.A.Crum, B. campylocarpum (Taylor) H.A.Crum and B. janesonii (Taylor) H.A.Crum as distinct species in Ecuador and briefly listed some differences between them. Later, Zander (1978) did a New World synopsis of the genus including a key, full descriptions, illustrations and distribution data for the seven species recognized by him. As a supplement to this work, Zander (1981) added two species previously placed in Barbula: Bryoerythrophyllum calcareum (Thér.) R.H.Zander and B. inaequilunolium (Taylor) R.H.Zander. In his revision of the family Pottiaceae, Zander (1993) transferred three endemic South American species of Tortula Hedw. to Bryoerythrophyllum, T. chimboraensis Mitt., Tortula fascinervia Mitt. and Tortula ligulata Mitt. Currently, Bryoerythrophyllum is represented by nine species in South America: B. bolivianum (Müll.Hal.) R.H.Zander, B. calcareum, B. campylocarpum, B. chimboraense (Mitt.) R.H.Zander, B. fascinervium (Mitt.) R.H.Zander, B. janesonii, B. ligulare (Mitt.) R.H.Zander and B. recurvirostrum (Hedw.) P.C.Chen (He, 1998; Churchill, Griffin & Muñoz, 2000; Matteri, 2003). This paper adds two Bryoerythrophyllum species to the flora of South America, increasing the total number of species to 11.

Didymodon berthoanus Thér. was originally described by Thériot (1926), based on a collection made by M. Bertho from Los Perales de Marga Marga in the region of Valparaiso, Chile. Since its publication, the species has remained totally forgotten and it has only appeared in literature citations (Greene, 1986; He, 1998). Examination of the type material, deposited at PC, revealed that this species does not belong to the genus Didymodon Hedw., but to Bryoerythrophyllum. Furthermore, it is here reported for the first time outside the type locality. The necessary new combination, a complete description, illustrations, and distribution of the species, as well as a comparison with closely related species are given below.

On the other hand, Bryoerythrophyllum sharpii R.H.Zander currently known as sterile from only three localities in Mexico is here newly reported for South America from the Andean Cordillera of Ecuador and Peru. Besides the expanded geographical range, the Peruvian finds of B. sharpii are especially interesting since these include the first fertile material observed in this species. A description of the new South American specimens, including the sporophytic features and the variation observed is provided. This will serve as a complement to the original

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**description of this species. Moreover, its distribution, LM and SEM photographs, and comparisons with other similar species are provided.**

**TAXONOMY**

Type: [Chile] ‘Valparaiso, Los Perales’ 1924, *Bertho s.n.*  
Holotype: PC!  

Plants 0.5–2.5 cm high, growing in dense turfs, red or brown-reddish. Stems erect, generally branched, without hyalodermis, central strand differentiated, scleroderms developed, axillary hairs of 4–8 hyaline cells. Leaves twisted when dry, erect-patent to spreading when moist, lingulate, 1.0–2.1 × 0.4–0.7 mm; lamina unistratose, red with KOH; apex rounded, not apiculate; margins entire, sometimes decurrent at base, recurved below, plane in upper middle part of leaf, unistratose. *Costa* 60–110 μm wide at leaf base, ending below apex, often spurred above mid-leaf; ventral cells of costa, in upper middle part of leaf, quadrate to subquadrate, papillose; dorsal cells of the costa, in upper middle part of leaf, quadrate or rectangular, papillose or smooth; transverse section semicircular; with 2–4 guide cells in 1 layer, 0–1 layer of ventral stereids, sometimes with 1 layer of substereids, 1(–2) layers of dorsal stereids, with hydroids, ventral surface cell layer differentiated, papillate, dorsal surface cell layer differentiated, papillate. Upper and middle laminal cells quadrate, sub-quadrate or shortly rectangular, 5.0–11.5 × 5.0–10.0 μm, with 2–5 bifurcate papillae per cell, generally thick-walled; basal cells rectangular to shortly rectangular, 15.0–55.0 × 8.0–15.0 μm, not differentiated, smooth or papillate, generally thick-walled. Gemmae absent. Dioicus. Perichaetium terminal; perichaetial leaves long-oval to long-lanceolate, sheathing seta in lower 0.5–0.75 of leaf, 1.4–2.4 × 0.4–0.7 mm. Seta 1 per perichaetium, 0.9–1.4 cm long, brown-reddish, spirally twisted to left throughout, occasionally twisted to right in upper part. Capsule erect, cylindrical, 1.1–1.8 × 0.5–0.8 mm, brown. *Annuulus* deciduous in fragments, composed of 1 row of vesiculose cells. Operculum shortly rostrate to conic, 0.4–0.7 mm long. Calyptra cucullate, smooth, 2.5 mm long. Spores 8–13 μm in diameter, weakly papillate, yellowish brown.

**Habitat and distribution.** *Bryoeorthyphyllum berthoanus* is an endemic Chilean species that until now was only known from the type locality in the Valparaíso Region. It is here reported from three further sites in the Maule, Santiago and Valparaíso Regions, where it occurs on rocks and soil at elevations between 20 and 350 m. The distribution of the species is given in Fig. 3.

**Differentiation.** *Bryoeothyphyllum berthoanus* is characterized by its lingulate leaves which are twisted when dry, a rounded leaf apex, plane margins above mid-leaf, a costa ending several cells below the apex, the transverse section of the costa sometimes without ventral stereids and a dioicous sexuality. In addition, the sporophyte has a short and straight peristome of 16 teeth, is 100–200 μm long, and its annulus is deciduous.

According to He (1998) only three *Bryoeothyphyllum* species occur in Chile, *B. fuscinervium*, *B. campyloarpum* and *B. jame sonii*, and none of them is similar to *B. berthoanus*. The former is easily distinguishable from *B. berthoanus* by its ovate-lanceolate leaves with revolute margins and percurrent or shortly excurrent costa, and the last two by their oblong-lanceolate leaves with apiculate apices and dentate margins.

*Bryoeothyphyllum calcaraneum*, a little known species of Mexico, Guatemala, Peru and Bolivia (Sharp, Crum & Eckel, 1994; Churchill et al. 2000) and *B. inaequalifolium*, a widely distributed species worldwide may resemble *B. berthoanus* in the leaf shape, a rounded leaf apex without apiculus, a costa that ends several cells below the leaf apex, and the anatomy of the costa. However, both *B. calcaraneum* and *B. inaequalifolium* differ from *B. berthoanus* in having leaf margins that are recurved or revolute up to the leaf apex or almost so, peristome teeth long and spirally twisted, and masses of unicellular gemmae in the leaf axils.

Another species with which *Bryoeothyphyllum berthoanus* could be confused is *B. bolivianum*, a neotropical alpine species known from Bolivia, Ecuador, Peru and Mexico (Sharp et al., 1994; Churchill et al., 2000). The latter species is distinguished by an overall smaller size of the plants and leaves, ovate leaves that are appressed when dry, and leaf margins that are recurved almost to the leaf apex.

*Bryoeothyphyllum berthoanus* can also be mistaken for some species of *Didymodon* with similar leaf shapes, especially *D. tophaceus* (Brid.) Lisa, but its C-shaped papillae on the upper laminal cells and the hyaline basal cell of the axillary hairs distinguish *B. berthoanus* from them.


*Plants* 0.7 cm high, growing in loose turfs, red or brown-reddish. Stems erect, simple, seldom branched, without hyalodermis, central strand differentiated, scleroderms developed, axillary hairs of 4–8 hyaline cells. Leaves lightly

*Bryoeothyphyllum sharpii* R.H. Zander, Bryologist 89: 13. 1986 (Figs 2, 3)
Figure 1. *Bryoerythrophyllum berthoanus*: (A) transverse section of leaf near base; (B) transverse section of leaf above mid-leaf; (C) leaf; (D) leaf apex; (E) ventral surface of leaf apex; (F) dorsal surface of leaf apex; (G, H) upper lamina cells. All from *Mabu 11893* (MO).
Figure 2. *Bryoerythrophyllum sharpii*: (A) transverse section of leaf near base; (B) transverse section of leaf at mid-leaf; (C) leaf; (D) leaf apex; (E) upper lamina cells; (F) basal lamina cells on dorsal surface; (G) basal lamina cells on ventral surface; (H) peristome. All from Hegewald & Hegewald 5450 (MO).
appressed to incurved when dry, erect-patent to spreading when moist, ligulate, sometimes slightly constricted in lower part, 0.6–1.2 × 0.2–0.4 mm; lamina bistratose in small patches or almost continuously in upper middle part of leaf, red with KOH; apex rounded, not apiculate; margins entire, decurrent at base, recurved below, plane in upper middle part of leaf, unistratose or bistratose above mid-leaf. Costa 0.6–1.2 mm wide at leaf base, ending below leaf apex; ventral cells of costa, in upper middle part of leaf, elongated to rectangular, papillose; dorsal cells of costa, in upper middle part of leaf, shortly rectangular to rectangular, papillose; transverse section semicircular; with 2–4 guide cells in 1 layer, 0–1 layer of ventral stereids, 1–2 layers of dorsal stereids, with hydroids, ventral surface cells layer differentiated, papillose, dorsal surface cells layer differentiated, papillose. Upper and middle laminar cells, subquadrate or shortly rectangular, 5.0–14.0 × 4.0–9.0 μm, with 3–7 C-shaped, simple or bifurcate papillae per cell, generally thick-walled; basal cells shortly rectangular, 10.0–40.0 × 5.0–12.0 μm, differentiated juxtacostally or across leaf, hyaline to yellowish, smooth or papillose, generally thick-walled. Gemmae absent. Dioicus. Perichaetial leaves, long-ligulate to long-lanceolate, sheathing seta in lower 0.5–0.75 of leaf, 1.5–2.6 × 0.4–0.6 mm. Seta 1 per perichaetium, 0.5–1.2 cm long, brown-yellowish, usually spirally twisted to left throughout, but often twisted to right in upper part. Capsule erect, cylindrical to ellipsoidal, 1.0–2.1 × 0.4–0.6 mm, brown. Annulus deciduous in fragments, composed of 1 row of vesicular cells. Peristome of 32 teeth irregularly cleft, filiform, densely spiculate, straight, rudimentary, to 100 μm long, pale-yellow to orange, without basal membrane. Operculum conic to longly conic, 0.3–0.4 mm long. Calyptra not seen. Spores 9–16 μm in diameter, papillose, yellowish brown.


Habitat and distribution. Bryoerythrophyllum sharpii was described from southern Mexico by Zander (1986) based on sterile material. Until now this species was regarded as endemic to Oaxaca and Puebla states where it has been collected in three stations. Here I report its presence in South America for first time, from several localities in Ecuador and Peru, extending its range considerably (Fig. 3). This neotropical species shows a disjunction between the Andean and Mexican stations that is shared with other species of Bryoerythrophyllum such as B. bolivianum and B. fuscincervium (Zander, 1981; Zander, Stark & Marrs-Smith, 1995) and other members of the family Pottiaceae such as Aloinella catenula Cardot, Saitobryum peruvianum (R.S.Williams) R.H.Zander, Hennediella polysta (Müll.Hal.) R.H.Zander and Syntrichia andicola (Mont.) Ochyra (Sharp et al., 1994). Bryoerythrophyllum sharpii was found growing on exposed soil at elevations between 2400 and 4175 m.

Differentiation. There are no significant morphological features distinguishing the Andean samples from the Mexican ones. The Andean specimens differ from Mexican specimens only by a more widely bistratose leaf lamina.

Bryoerythrophyllum sharpii may be confused with B. berthoanus because of similar leaf shapes, rounded leaf apices, plane leaf margins above mid-leaf, a costa ending below the leaf apex, and costa structure. However, B. sharpii has a bistratose leaf lamina, whereas the lamina in B. berthoanus is unistratose. According to Zander (1993) the genera Rhexophyllum Herzog, and especially Mironia R.H.Zander are closely related to Bryoerythrophyllum. Members of both genera can easily be distinguished from those of Bryoerythrophyllum, except B. sharpii, mainly by their bistratose upper leaf laminae. Zander (1986) pointed out that B. sharpii, due to its bistratose lamina, represents a clear link between the three genera.

The genus Mironia consists of four species, of which two occur in South America, M. ehrenbergiana (Müll.Hal.) R.H.Zander and M. elongata (Wilson) B.H.Allen. The former differs from B. sharpii in having a bistratose lamina only at the leaf margins, dentate upper leaf margins and well-developed and spirally twisted peristome teeth. According to Allen (2002), M. elongata, like B. sharpii,
has an irregularly bistratose lamina above mid-leaf, but the former can be differentiated by its acuminate leaf apices, enlarged and caducous leaf tips, and recurved leaf margins above mid-leaf.

*Rhexophyllum subnigrum* (Mitt.) Hilp. is similar to *B. sharpii* in having the leaf lamina bistratose in small patches and leaf margins plane above mid-leaf, but it differs from the latter in having a stem hyalodermis, dentate upper leaf margins and the costa excurrent in a mucro.

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**TAXONOMIC ADDITIONS AND CHANGES: Bryoerythrophyllum berthoanus** (Thér.) J.A. Jiménez, comb. nov.

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