

Tortella alpicola (Pottiaceae) from Spain, new to western Europe

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ABSTRACT. The moss *Tortella alpicola* Dixon (Pottiaceae) is reported as new to western Europe (west of the Urals), where it was found in the south of Spain (Sierra Nevada range). Its distribution, diagnostic characters and differentiation from some closely related European taxa, with which it may be confused, are discussed. A map of its known distribution and light microscope micrographs are provided.

KEYWORDS. European moss flora, *Tortella alpicola*, Spain, Sierra Nevada, Pottiaceae.



The species *Tortella alpicola* Dixon was described from India (the Himalayas) by Dixon (1930), but Zander (1993) considered *Tortella tortelloides* (S. W. Greene) H. Rob., published 40 years after *T. alpicola*, to be conspecific, consequently considerably enlarging its distribution range. The distribution of this species ranges from the Antarctic to the Arctic. In the Southern Hemisphere it is known from Alexandra Island in Antarctica, where *T. tortelloides* was described as *Sarconeuron tortelloides* S. W. Greene (Greene et al. 1970). In the Northern Hemisphere it has been reported from high mountains of tropical areas in Colombia by Churchill and Linares (1995) under the name *T. tortelloides* and in Hawaii by Zander and Hoe (1979) as *T. fragilis* var. *tortelloides* (S. W. Greene) R. H. Zander & Hoe. In North America it was first reported by Eckel (1991) from the state of Wyoming in the U.S.A. and the Northwest Territories in Canada as *T. tortelloides*. Later Eckel (1997, 1998) provided more localities for *T. alpicola* from North America, such as the Yukon Territory, Alberta and Quebec provinces in Canada and the states of Alaska, Arizona, Colorado, Idaho, Montana, Nebraska and Utah in the U.S.A. More recently, Otnyukova et al. (2004) reported its presence in Eurasia from different regions of Russia and from

Uzbekistan, Kyrgyzstan and Mongolia, which are nearer to the type locality in Asia (Fig. 1).

The new record of *Tortella alpicola* was collected while studying the bryophyte flora of the Sierra Nevada range (southern Spain), and represents the first report for Europe west of the Urals. It was found only in one site, situated at 3070 m on the southern face of the mountain system, where it grew on sheltered mica-ceous schist rock crevices near a wet meadow.

Distribution. Apparently the distribution of *T. alpicola* is still not well known, because new findings are frequently reported from different parts of the world. Eckel (1991) indicated that the distribution of the species known at that time might only be a fragment of a broader one. Otnyukova et al. (2004) found that the species is not rare in Eurasia, but had been much overlooked in previous studies. Eckel (1991) supposed that the distribution of the taxon might correspond to that of an arctic-montane-alpine species. The present data confirm this supposition. The species seems to grow in alpine stations, in accordance with the specific epithet “*alpicola*.” However, the species is not restricted to high mountains. In some localities it has been found as low as 25, 50 or 450 m, which is the case of some localities in the Northwest Territories of Canada (Eckel 1997)



Figure 1. Known distribution of *Tortella alpicola*. Shaded areas indicate the U.S.A. states and Canadian provinces and territories where the species has been recorded. The black dots show the specific sites where it has been collected.

and the Republic of Saha/Yakutia in Russia (Otnyukova et al. 2004), where its needs are presumably met by the high latitude. In our opinion the species may yet be found in other montane systems of the world, probably in the Pyrenees, the Alps and in Scandinavia.

Diagnostic characters. This species is characterized by plants reaching to 1.5 cm high; the absence of a red tomentum; the presence of a central strand in the stem; papillose-crenulate margins throughout the leaf, lobed distally in scallop-shapes; leaf bases with a peculiar snow-white color that extends to a moderate height; proximal laminal cells abruptly differentiated from distal cells; upper laminal cells relatively large, to 14 μm wide, forming scattered bistratose patches; and caducous leaf tips that show a barrel-shaped segmentation, very easily broken off at the constriction points and composed of papillose cells on all sides (Eckel 1998).

No sporophytes were found, nor was it possible to observe the heterophylly described by Zander and Hoe (1979), since the Spanish material does not have perichaetial leaves (Fig. 2). Detailed descriptions and illustrations are provided by Eckel (1998) and Otnyukova et al. (2004).

Differentiation. *Tortella alpicola* can be confused with *T. fragilis* (Hook. & Wilson in Drumm.) Limpr. and *T. tortuosa* (Hedw.) Limpr. var. *fragilifolia* (Jur.) Limpr. because of the fragile leaves, although both are usually more robust plants (more than 1–1.5 cm high), with no central strand, well-developed rhizoidal tomentum, pale-yellowish to almost colorless leaf base (no specific snow-white aspect), and leaf cells with a average width of 12 μm or less. The colorless smooth basal cells extend to a moderate height in *T. tortuosa* var. *fragilifolia* and almost reach the fragile tip of the leaf in *T. fragilis*. Furthermore, in *T. fragilis*, the lamina is regularly bistratose in the apical portion, the caducous leaf apex has no regular constrictions, and the lateral faces of the propagula are formed by non-papillose cells, while in *T. tortuosa* var. *fragilifolia*, the lamina shows irregularly bistratose sections like those of *T. alpicola* but, although the leaves are often fragile, the separating fragments are flat, wide and have developed lamina (Eckel 1998).

Tortella nitida (Lindb.) Broth. and *Oxystegus tenuirostris* (Hook. & Taylor) A. J. E. Sm. can also be confused with *T. alpicola*. *Oxystegus tenuirostris* is phylogenetically very closely related to *Tortella* and it

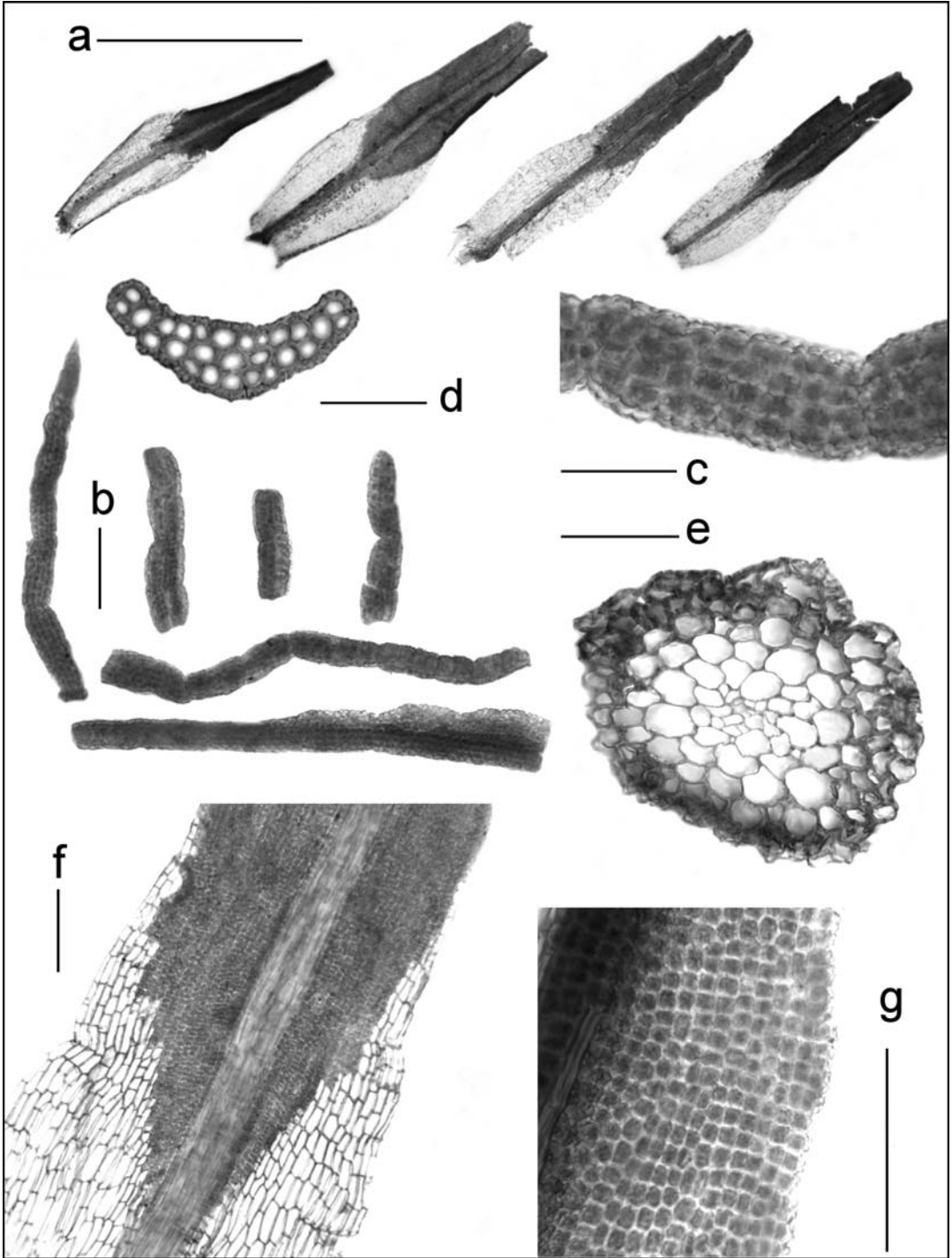


Figure 2. Light microscope micrographs of *Tortella alpicola* from western European material (MUB 18439). **a.** Vegetative leaves. **b.** Subulate costa and propagula. **c.** Detail from propagulum. **d.** Leaf transverse section in distal part. **e.** Stem transverse section. **f.** Abrupt transition from proximal to distal laminal cells. **g.** Detail from distal laminal cells. (Scale bars: a = 1 mm; b, f, g = 100 μ m; c, d, e = 50 μ m).

could belong to the genus, as shown by the ITS sequence data of Werner et al. (2005). These three species share the presence of stem central strand and laminal fragility. However, the first two species have no subulate propaguloid leaf apex, and the proximal laminal cells are gradually differentiated from the distal cells (Eckel 1998). In the case of *O. tenuirostris*, the proximal colorless cells never extend upward along the margins and they do not form the differentiated characteristic V-shaped zone of the genus as in *T. nitida*.

Specimen studied. SPAIN. GRANADA PROVINCE: Sierra Nevada, Loma de Culo Perro, cerca de Siete Lagunas, 3,070 m, *Rams* (MUB 18439).

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LITERATURE CITED

Churchill, S. P. & E. L. Linares. 1995. Prodrómus Bryologiae Novo-Granatensis. Introducción a la flora de musgos de

- Colombia. Parte 1. Adolotheciaceae a Funariaceae. Biblioteca "José Jerónimo Triana" 12: [i–viii] 1–453, i–xxvi.
- Dixon, H. N. 1930. Additions to the moss flora of the north-western Himalayas. *Annales Bryologici* 111: 51–70.
- Eckel, P. 1991. *Tortella tortelloides* (Musci: Pottiaceae) new to North America. *The Bryologist* 94: 84–87.
- . 1997. The moss *Tortella alpicola* Dix. new to Alberta and the Yukon Territory with a discussion of its range and comments on related species. *Canadian Field-Naturalist* 111: 320–322.
- . 1998. Re-evaluation of *Tortella* (Musci, Pottiaceae) in conterminous U.S.A. and Canada with a treatment of the European species *Tortella nitida*. *Bulletin of the Buffalo Society of Natural Sciences* 36: 117–191.
- Greene, S. W., D. M. Greene, P. D. Brown & J. M. Pacey. 1970. Antarctic moss flora. 1. The genera *Andreaea*, *Pohlia*, *Polytrichum*, *Psilopilum* and *Sarconeuron*. *British Antarctic Survey Science Report* 64: 1–118.
- Otnyukova, T. N., E. A. Ignatova, M. S. Ignatov & V. E. Fedosov. 2004. New records of *Tortella alpicola* Dix. in Eurasia. *Arctoa* 13: 197–201.
- Werner, O., R. M. Ros & M. Grundmann. 2005. Molecular phylogeny of Trichostomoideae (Pottiaceae, Bryophyta) based on nrITS sequence data. *Taxon* 54: 361–368.
- Zander, R. H. 1993. Genera of Pottiaceae: Mosses of harsh environments. *Bulletin of the Buffalo Society of Natural Sciences* 32: 1–378.
- & W. J. Hoe. 1979. Geographic disjunction and heterophylly in *Tortella fragilis* var. *tortelloides* (= *Sarconeuron tortelloides*). *The Bryologist* 82: 84–87.
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