



### Three new records to the bryophyte flora of Turkey

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#### Abstract

*Rhabdoweisia crispata* (Dicks. ex With.) Lindb. and *Tortula guepinii* (Bruch & Schimp.) Broth. are recorded for the first time from Turkey and also *Tortella bambergeri* (Schimp.) Broth. is newly reported for SW Asia. Illustrations of the new records together with taxonomical, ecological and distributional remarks are presented.

**Key words:** Bryophyta, *Rhabdoweisia*, *Tortula*, *Tortella*, Turkey

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#### Türkiye biryofit florasına üç yeni kayıt

#### Özet

*Rhabdoweisia crispata* (Dicks. ex With.) Lindb., *Tortula guepinii* (Bruch. & Schimp.) Broth. ve *Tortella bambergeri* (Schimp.) Broth. Türkiye’ den ilk kez kayıt edilmiştir. Ayrıca *T. bambergeri* Güneybatı Asya için de yeni kayıttır. Yeni kayıtların çizimleri, taksonomik, ekolojik ve dağılımlarıyla birlikte sunulmuştur.

**Anahtar kelimeler:** Biryofit, , *Rhabdoweisia*, *Tortula*, *Tortella*, Turkey

#### 1. Introduction

Despite increasingly ongoing bryophyte collection activities within the last two decades in Turkey, the bryophyte flora of the country still harbors new records which contribute to the country’s phytodiversity and increase the number of species. These novelties often are of outstanding phytogeographical importance, as they extend present known distribution ranges and/or bridge larger distributional gaps of the taxa.

The occurrence of these species in Turkey and SW Asia was unknown up till now and considerably extends their distribution range. All findings are systematically arranged according to Hill et al. (2006) and deposited in AYDN (Herbarium of Adnan Menderes University, Aydın, Turkey).

##### 1. New Records

##### 1.1. *Rhabdoweisiaceae*

##### ***Rhabdoweisia crispata* (Dicks. ex With.) Lindb.**

(Figure 1.a-h)

[Syn: *R. denticulata* (Brid.) Bruch & Schimp.; *R. kusenevae* Broth.; *Bryum crispatum* Dicks. ex With.]

TURKEY: Giresun, Espiye district, Karılar Madeni (old mine), on iron-rich rock, 40° 55’ N, 038° 42’ E, altitude ca. 160 m, leg. M. Çelik Karakaya & N. Karakaya (AYDN 3276), M. Kırmacı (AYDN 3294), 26 August 2011, det. M. Kırmacı & H. Kürschner; ditto, Lahanos Madeni (old mine), on iron-rich rock, 40° 50’ N, 038° 41’ E, altitude ca. 620m, leg. M. Çelik Karakaya & N. Karakaya (AYDN 3277), 15 July 2005, det. M. Kırmacı & H. Kürschner.

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**Distribution:** Wide spread species: South America (Bolivia); Europe (Canary Islands, Bulgaria, Spain, France, Italy, and Slovenia); Asia (Kazakhstan, China, Korea, Japan, Java), North Africa; North and South America, Greenland and Pacific Islands (Hawaii, Juan Fernández Islands) (Heras and Infante, 2001; Smith, 2004; FNA Editorial Committee, 2007; González-Mancebo *et al.*, 2009; Hradílek *et al.*, 2011). Previously known in Southwest Asia only from a single locality in Lebanon (Bizot, 1955; Kürschner and Frey, 2011). It was recorded for the first time in Turkey.

At present, three taxa, *R. crenulata*, *R. crispata* and *R. fugax*, were distinguished in Central Europe. *R. crispata* is somewhat intermediate between *R. crenulata* and *R. fugax*. One of the reliable characters to distinguish the species from others is the larger size, the leaf width near the apex (5-7 cells wide on each side of the costa) and the more coarsely toothed leaves. Also, one of the other reliable characteristics to differentiate it from other related taxa is peristome teeth (Smith 2004). However, despite sporophytes being common to European specimens, we were not able to observe any sporophyte on our specimens (Figure 1.a-h).

**Ecology:** Plants forms lax tufts on moist rocks and shady habitats in crevices of acidic rocks. At the Turkish locality, *R. crispata* forms large cushions of ca 30 cm in diameter on wet rocks laying in the flow of mineralized water (Figure 1.e) leaching from the rocks, abandoned mines, and tailings. The water contaminated with the metal sulfides is often discharged into surface waters that seep into the groundwater and causing severe, long term contamination of surface and ground water and soil. Due to the low pH (~2,5) of these waters, containing heavy metals such as Cu, Zn, Cd, Fe, As, and Pb, can be leached from the rock and mobilized (Karakaya *et al.*, 2005). The only accompanying species here is *Dicranella heteromalla* (Hedw.) Schimp.

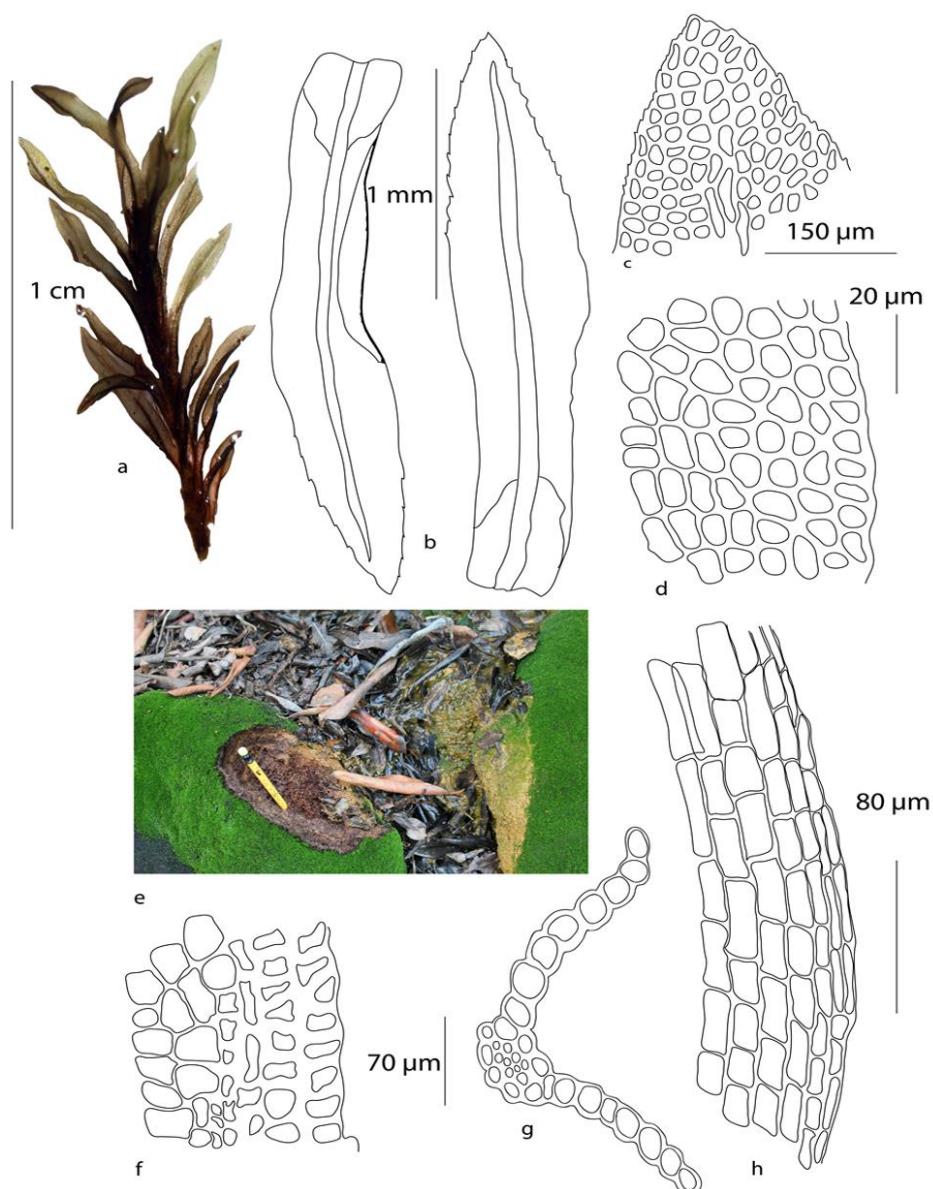


Figure 1. *Rhabdoweisia crispata*. **a.** Habit (wet); **b.** Leaves; **c.** Leaf apex; **d.** Mid – leaf cells; **e.** Colony of *R. crispata*; **f.** Marginal mid-leaf cells; **g.** Cross section of leaf; **h.** Basal leaf cells (based on AYDN 3294)

## 1.1. Pottiaceae

1.1.1. *Tortula guepinii* (Bruch. & Schimp.) Broth.

(Figure 2.a-h)

[Syn: *Desmatodon guepinii* Bruch. & Schimp.]

Specimen examined: Turkey, province Aydın, Çine Town, Alabanda Antic City. on soil, 37° 35' N, 027° 58' E, altitude ca. 90 m, leg. G. Aslan & M. Kirmacı (AYDN 3234), 23 March 2011, det. M. Kirmacı & H. Kürschner.

**Distribution:** Europe (mainly in the southern part), North and Central America, North Africa (Morocco) and Southwest Asia (Israel) (Ros et al., 2000; Heyn and Hernstadt, 2004; Kürschner and Frey, 2011). It was recorded for the first time in Turkey.

*Tortula guepinii* (Bruch & Schimp.) Broth can be confused with *T. lindbergii* Broth. However, *T. guepinii* has upper laminal cells with 4–6 bifurcate, c-shaped papillae per cell (Figure 2.a-g), and a peristome of 16 teeth. The segments are regular, filiform, and sometimes anastomosing, but perforations or interruptions are lacking. By contrast, the peristome of *T. lindbergii* is irregularly cleft, with 2(3) longitudinal segments, often anastomosing and perforated or interrupted. The other species which is confuse with *T. guepinii* is *T. hoppeana*. But the second one has big leaves (more than 2 mm) and cells of the leaf marjins are more papillose at the apex. (Ros and Werner, 2006; FNA Editorial Committee, 2007).

**Ecology:** *T. guepinii* was collected very dry habitats exposed to sun and irradiation resulting strong desiccation during the dry period lasting nearly 7 months in a year. The total precipitation per year is 600 mm/year with a clear maximum during the spring and specially winter period.

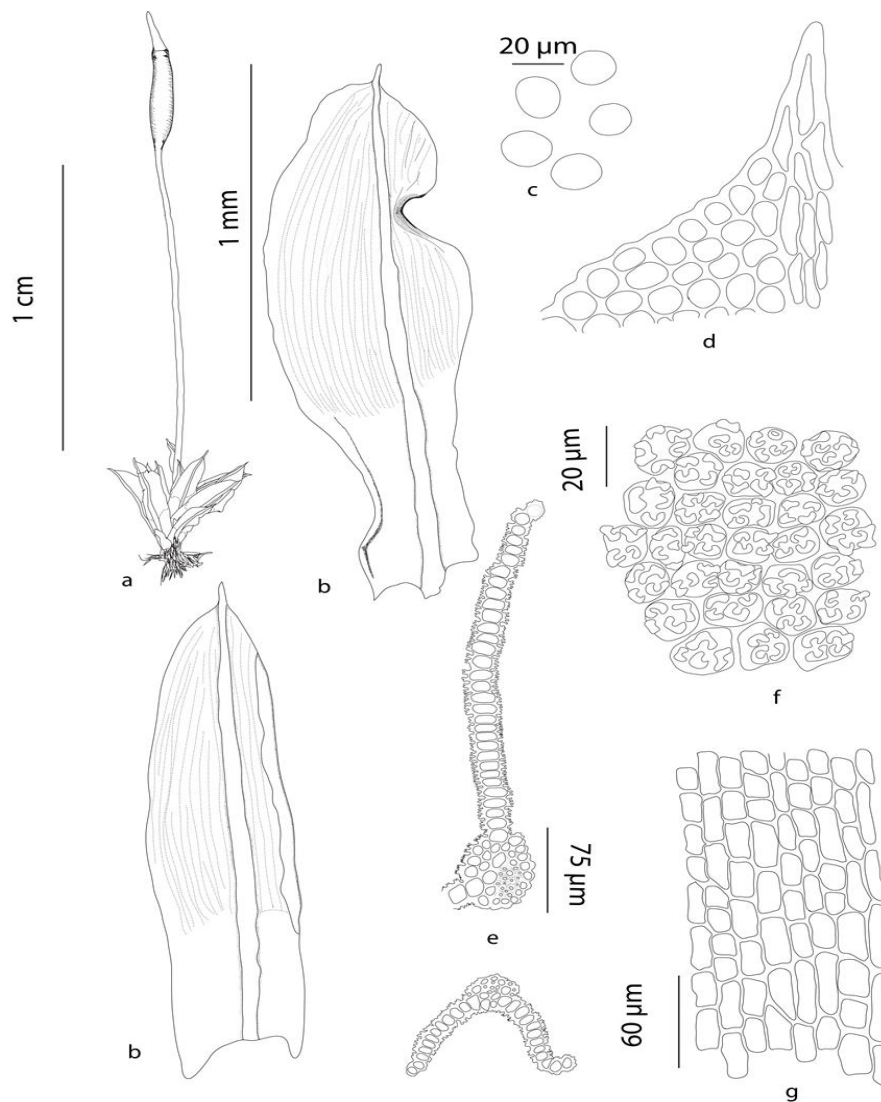


Figure 2. *Tortula guepinii*. **a.** Habit (wet); **b.** Leaves; **c.** Spores; **d.** Leaf apex; **e.** Cross section of leaf (middle and upper part); **f.** Mid – leaf cells; **g.** Basal leaf cells (based on AYDN 3234)

The collection site is situated in the Menderes massif showing a highly diverse geology and geomorphology. The core of the massif consists of orthogneiss blanketed by biotite-quartz, schists and phyllites. The soils mostly include weathering products from the metamorphic rocks, are acidic (Göney, 1975).

The average annual temperature is 17,1 °C the mean temperature in January varies between 4-8°C, whereas the summers are dry and hot (maximum temperatures in July more than 30°C) (Aydın Province Environment Situation Report, 2006). The common Mediterranean vegetation is a maquis, dominated by *Olea europea* L., *Quercus coccifera* L., *Cistus creticus* L., *C. salviifolius* L., *Asphodelus aestivus* Brot. and *Pinus brutia* Ten.

Accompanying species at the Cine site are *Lunularia cruciata* (L.) Dumort. ex Lindb., *Reboulia hemisphaerica* (L.) Raddi, *Riccia glauca* L., *Sphaerocarpos texanus* Austin, and *Targionia hypophylla* L. (Marchantiophyta), as well as *Bartramia pomiformis* Hedw., *Bryum dichotomum* Hedw., *Didymodon acutus* (Brid.) K.Saito, *Entosthodon pulchellus* (H.Philib.) Brugués, *Pterogonium gracile* (Hedw.) Sm. and *Scorpiurium circinatum* (Bruch) M.Fleisch. & Loeske (Bryophyta).

### 2.2.2. *Tortella bambergeri* (Schimp.) Broth.

(Figure 3)

[*T. tortuosa* (Hedw.) Limpr. var. *bambergeri* (Schimp.) Düll]

Specimen examined: Turkey, province Trabzon, Maçka, Akarsu Valley, on soil, 40° 41' N, 039° 35' E, altitude ca. 1500 m, leg. M. Kırmacı & H. Kürschner (AYDN 3293), 21 June 2011, det. M. Kırmacı & H. Kürschner.

**Distribution:** The general distribution of this species is nearly unknown, as the taxon was long placed into the synonymy of *T. tortuosa* in many of the previous floras (e.g. Mönkemeyer, 1927; Frey et al. 1995). Till now it is known from Europe, Macaronesia, North America and Russia (Eckel, 2010; Dirkse and Losada-Lima, 2011). It was recorded for the first time in Turkey and Southwest Asia.

*Tortella bambergeri* is described and discussed in detail by Bosanquet (2006), Ignatova & Doroshina (2008), Brugués *et al.* (2009) and Eckel (2010). The Turkish specimen is quite similar to the European and the Russian ones. On a first look, it resembles fragile-leaved forms of *T. tortuosa*, however, differs by having a central strand, quadrate and papillose cells on the abaxial surface of the costa near the leaf apex (elongate and smooth in *T. tortuosa*) (Figure 3.a-b), and peristome teeth twisted only half a turn to the left (against 1 ½-3 times in *T. tortuosa*). From *T. fragilis* it can be distinguished by the throughout unistratose leaf lamina, which is bistratose in the upper part of leaf in *T. fragilis*.

**Ecology:** In Central Europe on base rich, soil-covered calcareous rocks, in rock fissures and on boulders; xerophytic, photophytic to ± sciophytic. In Russia it was collected on carbonate bedrocks under sub-mediterranean climate. Turkish specimen was collected on acidic soil in mixed *Fagus orientalis* and *Picea orientalis* forest.

Accompanying species in Turkey include *Blepharostoma trichophyllum* (L.) Dumort., *Diplophyllum albicans* (L.) Dumort. (Marchantiophyta), *Bartramia halleriana* Hedw., *Dicranodontium denudatum* (Brid.) E.Britton, *Isoetecium myosuroides* Brid., *Leucobryum glaucum* (Hedw.) Ångstr., *Mnium spinosum* (Voit) Schwägr., *Orthotrichum anomalum* Hedw., *Plagiomnium confertidens* (Lindb. & Arnell) T.J.Kop., *Plagiothecium cavifolium* (Brid.) Z.Iwats., and *Sciuro-hypnum starkei* (Brid.) Ignatov & Huttunen (Bryophyta).

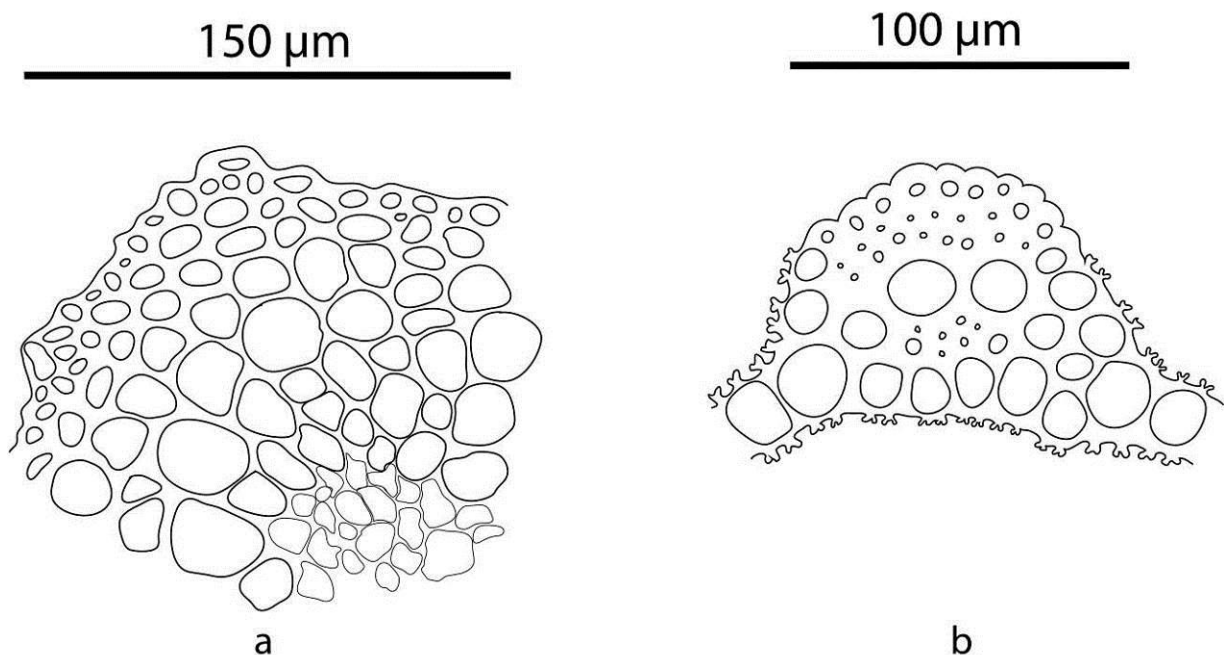


Figure 3. *Tortella bambergeri*. **a.** Cross section of stem; **b.** Cross section of leaf; (based on AYDN 3293)

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