

The *Hedwigia ciliata* (Hedw.) Ehr. ex P.Beauv. Complex in Turkey, with a New Record, *H. ciliata* var. *leucophaea* Bruch & Schimp. (*Hedwigiaceae*, *Bryopsida*)

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Abstract: *Hedwigia ciliata* (Hedw.) Ehrh. ex P.Beauv. var. *leucophaea* Bruch & Schimp. is recorded as a new taxon for the bryophyte flora of Turkey. It belongs to the *H. ciliata* complex *sensu lato* that consists of three different taxa: *H. stellata*, *H. ciliata* var. *ciliata*, and *H. ciliata* var. *leucophaea*. As all three taxa occur in Turkey, a key to the species, descriptions, illustrations of the diagnostic characters, as well as their distribution in Turkey are presented.

Key Words: Bryophyte flora, Musci, Hedwigiaceae, taxonomy, Turkey.

Türkiyede *Hedwigia ciliata* (Hedw.) Ehr. ex P. Beauv. Kompleksi; Yeni Bir Kayıt *H. ciliata* var. *leucophaea* Bruch & Schimp. (*Hedwigiaceae*, *Bryopsida*) İle Birlikte

Özet: *Hedwigia ciliata* (Hedw.) Ehrh. ex P.Beauv. var. *leucophaea* Bruch & Schimp. Türkiye bryofit florası için yeni bir takson olarak kaydedilmektedir. *H. stellata* Hedenäs, *H. ciliata* var. *ciliata* ve *H. ciliata* var. *leucophaea* olarak üç farklı takson içeren *H. ciliata* kompleksine aittir. Türkiye’de yayılış gösteren bu taksonların, tür tanı anahtarı, tanımları, ayırt edici karakterlerinin çizimleri ve Türkiye’deki yayılışı ile birlikte sunulmuştur.

Anahtar Sözcükler: Biryofit florası, Musci, Hedwigiaceae, taksonomi, Türkiye

Introduction

Hedwigia ciliata (Hedw.) Ehrh. ex P.Beauv. is a well-known European species, easily recognised by its dull, hoary appearance with numerous immersed capsules, growing over periodically dry, usually acidic rocks. Although not completely homogeneous, varieties have generally not been recognised in recent bryophyte floras (e.g., Smith, 1978; Frahm & Frey, 1992). The re-evaluation of the *H. ciliata* complex by Hedenäs (1994) revealed three different phenotypes, often growing intermixed in Northern Europe. The three taxa are the well known *H. ciliata* var. *ciliata*, *H. ciliata* var. *leucophaea* Bruch & Schimp. (as forma *leucophaea* in Mönkemeyer, 1927), and a new species, *H. stellata* Hedenäs. Hitherto known species of the *H. ciliata* complex in Turkey include

the variety *ciliata*, and *H. stellata*, which was recorded more recently from South-West Anatolia (cf. Frey & Kürschner, 1991; Kürschner et al., 1997).

Bryophyte collections near Reşadiye (Tokat Province) revealed an almost pure white *H. ciliata*, with a long hyaline upper part of leaves and strongly papillose leaf cells, which turned out to be the variety *leucophaea*, which is new to Turkey. With this new record, all three taxa of the *H. ciliata* complex are present in Turkey. They may be separated from *H. ciliata* (*sensu lato*) by the key presented below. In addition, descriptions, illustrations of the diagnostic characters and the distribution of these taxa in Turkey, based on our own and published records, are given.

Results

Key to the *H. ciliata* complex in Turkey (based on Erzberger, 1996; Hedenäs, 1994)

- 1 Leaf apices of dry shoots recurved or stellately reflexed; cells in mid-leaf 1-2 papillose, abaxial papillae usually peltate, strongly branched, 10-13 µm long; apical leaf-cell pointed, not pluripapillose *H. stellata*
- 1* Leaf apices of dry shoots erect to patent or following leaf curvature; cells in mid-leaf (1-) 2-4 (-5) papillose, abaxial papillae not peltate, simple or branched, 5-7 µm long; apical leaf-cell mostly distinctly truncate and pluripapillose 2
- 2 Hair-point usually shorter than 1/2 of leaf length, strongly papillose only in lower part, greyish-white when dry *H. ciliata* var. *ciliata*
- 2* Hair-point usually longer than 1/2 of leaf length, strongly papillose throughout except near apex, almost pure white when dry *H. ciliata* var. *leucophaea*

Hedwigia stellata Hedenäs (Figs. 1 and 4)

Plants small to medium sized, up to 5 cm long, green to brownish, greyish when dry; shoot apices ± curved downwards when dry, leaf apex recurved or strongly reflexed, giving the plants a stellate appearance; leaves ovate to broadly ovate, gradually narrowed to acuminate apex, 1.5-2.5 mm long; hyaline portion of leaf mostly less than 1/3 of leaf length; apical leaf-cell pointed; leaf margin recurved in lower part or plane; mid-leaf cells 10-25 x 10-15 µm, quadrate to rectangular, incrassate, with 1-2 papillae on both sides; papillae on abaxial side usually peltate and strongly branched; capsule shortly obovoid; lid slightly conical with low mamilla; spores up to 30 µm, distal side with elongate papillae.

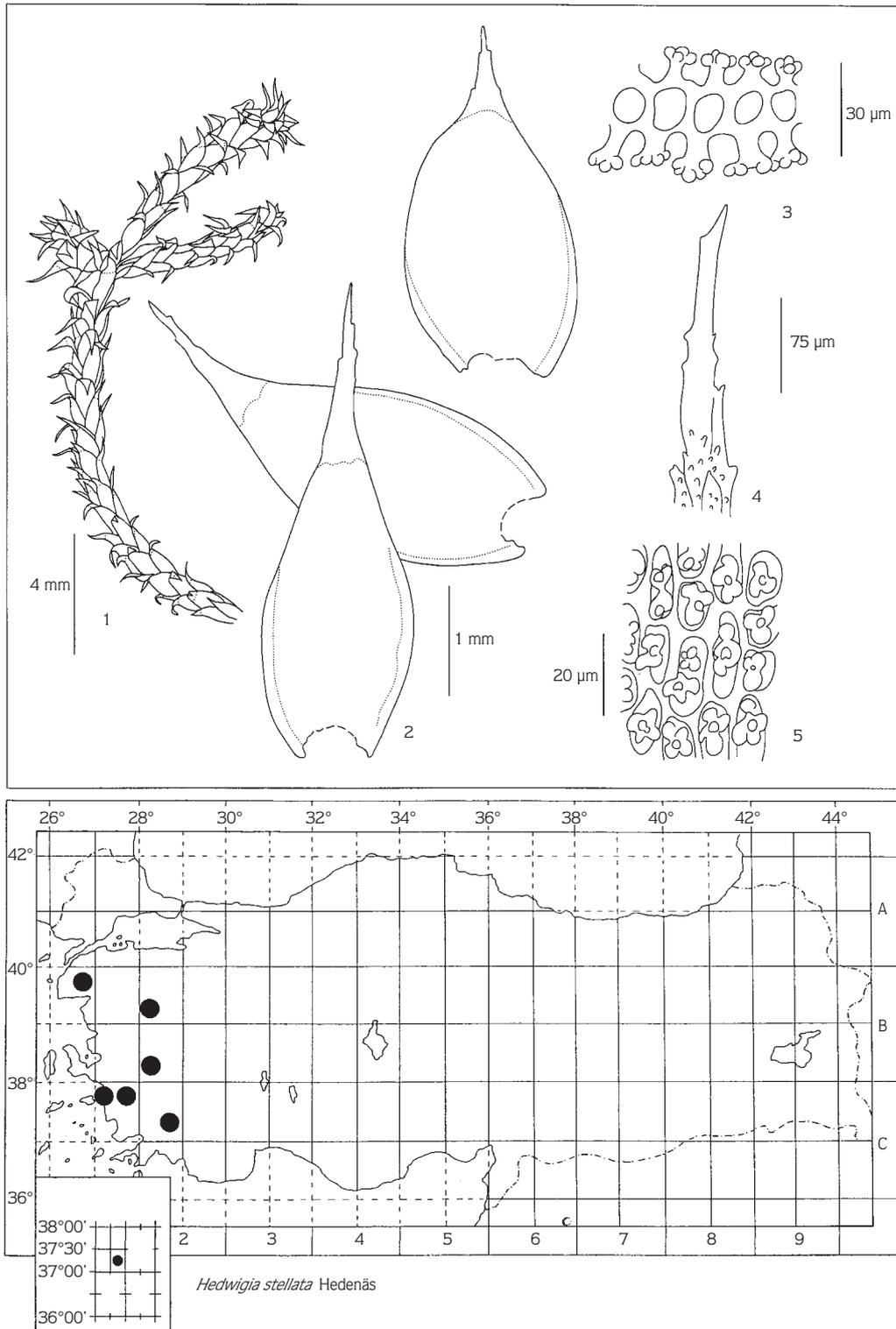
Specimen examined: Turkey: Balıkesir Province: Kaz mts., Üçpınarlar, alt. 1260 m, on rock, 30 December 1993, A. Erdağ (Erd. 410); Balıkesir Province: Dursunbey, Alaçam mt., Candere valley, alt. 750 m, on rock, 1 June 2001, A. Erdağ (Erd. 2682); Balıkesir Province: Sındırgı, Bulak village, Karagöl, alt. 1000 m, on rock, 31 May 2001, A. Erdağ (Erd. 2682); Aydın Province: Gökbel mts., south of Emirler village, alt. 800

m, on rock, 23 March 2001, A. Erdağ (AYDN 610); Aydın Province: Beşparmak mts., between Buçak and Yediler, alt. 120 m, on rocks, 18 March 1998, H. Kürschner & G. Parolly (98-50); Muğla Province: Yılanlı mts. east of Muğla, alt. 1200 m, on rocks, 12 March 1997, H. Kürschner, Ö. Tonguç & A. Yayıntaş (97-6); Muğla Province: Yılanlı mts., between Boyalıdere and Akyer, alt. 1000 m, on rocks, 12 March 1997, H. Kürschner, Ö. Tonguç & A. Yayıntaş (97-37).

Hedwigia ciliata (Hedw.) Ehrh. ex P.Beauv. var. *ciliata* (Figs. 2 and 4)

Plants medium sized, up to 5-8 cm long, green or brownish-green, greyish when dry; shoot apices straight; leaf apices erect to erecto-patent, following leaf curvature; leaves broadly to narrowly ovate, ± gradually narrowed to acuminate apex, erecto-patent to patent, slightly falcate when dry, 1.5-2.5 mm long; hyaline portion of leaf mostly less than 1/2 of leaf length; apical leaf-cell mostly distinctly truncate, pluripapillose; leaf margin plane or slightly recurved at base; mid-leaf cells 10-30 x 10-18 µm, quadrate to rectangular, incrassate, with 1-3 (-4) papillae on both sides; papillae on abaxial side strongly branched, but not peltate; capsule short-obovoid; lid flat to lowly conical; spores 25-35 µm; distal side with ± elongate papillae.

Specimen examined: Turkey: Aydın Province: Çine, Madran mts., Gürlendere bridge, alt. 750 m, on rock, 9 April 2000, A. Erdağ (AYDN 326); Aydın Province: Çine, between Topçam and Gürlendere, alt. 750 m, on rock, 9 April 2000, A. Erdağ (Erd. 1498); Aydın Province: Çine, Madran mts., road to Topçam, alt. 700 m, on rock, 9 April 2000, A. Erdağ (AYDN 323); Aydın Province: Çine river, around Roman bridge, alt. 300 m, on rock, 14 April 2000, A. Erdağ (Erd. 1567, 1569); Aydın Province: Çine, Madran mts., north of Kavşit village, alt. 600 m, on rock, 25 February 1998, A. Erdağ (Erd. 1045); Aydın Province: Mersinbeleni, alt. 750 m, on rock, 20 April 2001, M. Hekil (41, 43); Aydın Province: Bafa Gölü, near Kapıkırı (Herakleion), alt. 50 m, on gneiss rock, 31 July 1997, H. Kürschner (97-287); Aydın Province: Bafa Gölü, near Kapıkırı, alt. 60 m, on gneiss rock, 19 March 1998, H. Kürschner & G. Parolly (98-85); Aydın Province: Beşparmak mts., Çavdar village, alt. 600 m, on rock, 27 June 1998, A. Erdağ (AYDN 144); Aydın



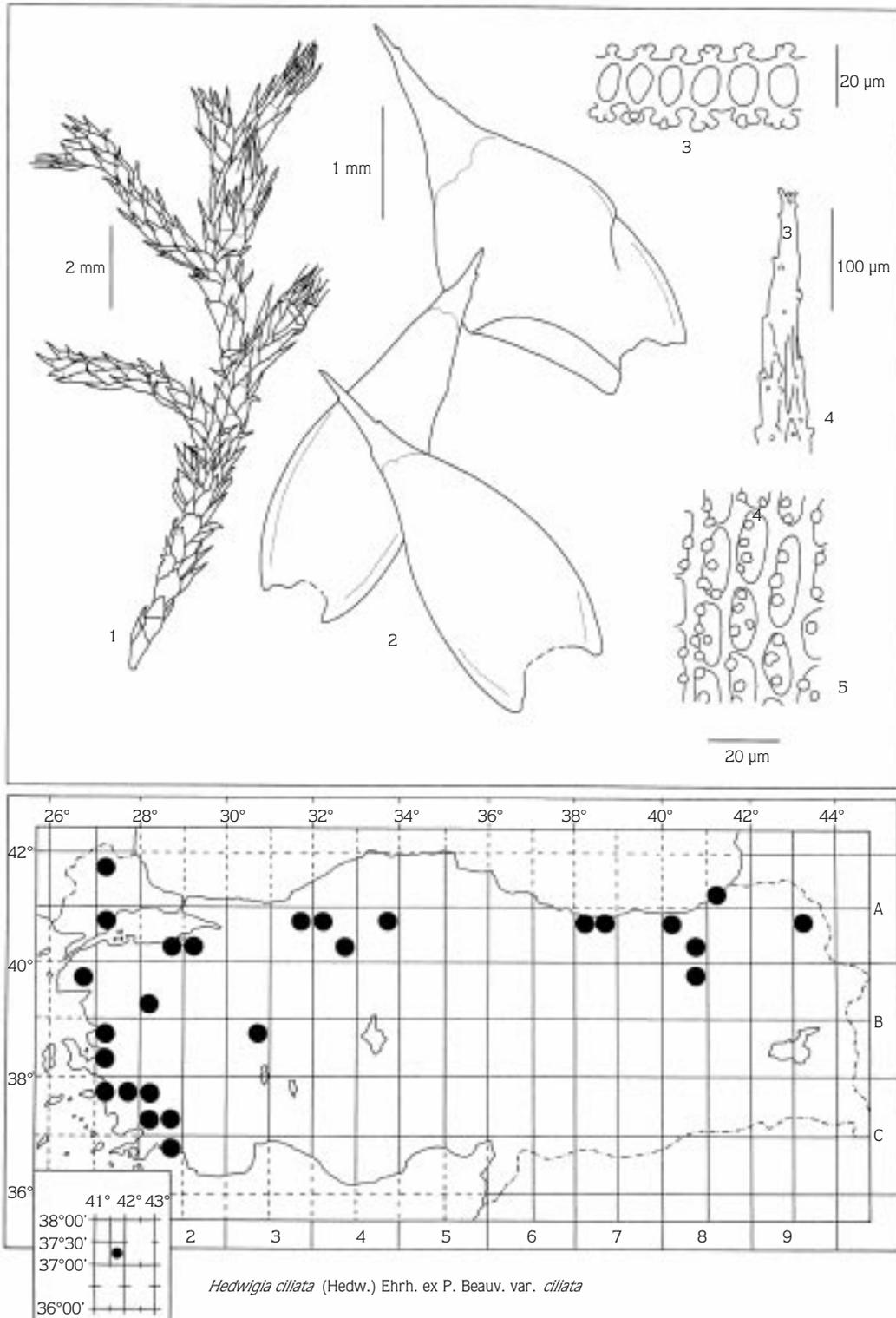


Figure 2. *Hedwigia ciliata* (Hedw.) Ehrh. ex P.Beauv. var. *ciliata* (Erd. 1045). 1, Habit; 2, leaves; 3, cross-section of leaf; 4, apical cell of hyaline leaf portion; 5, mid-leaf cells; 6, distribution in Turkey (based on our own and published records).

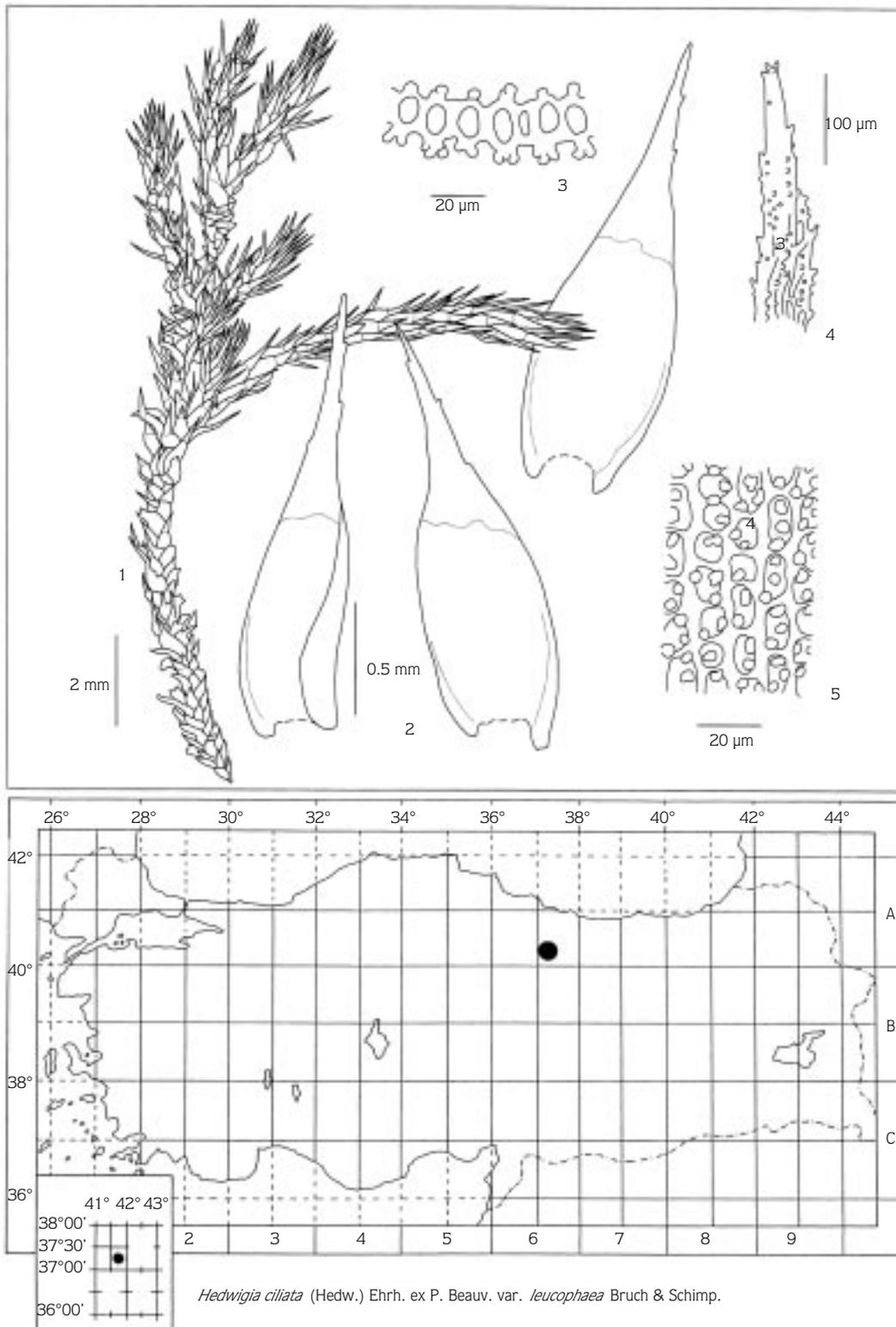


Figure 3. *Hedwigia ciliata* (Hedw.) Ehrh. ex P. Beauv. var. *leucophaea* Bruch & Schimp. (MKır 875b). 1, Habit; 2, leaves; 3, cross-section of leaf; 4, apical cell of hyaline leaf portion; 5, mid-leaf cells; 6, distribution in Turkey (based on our own records).

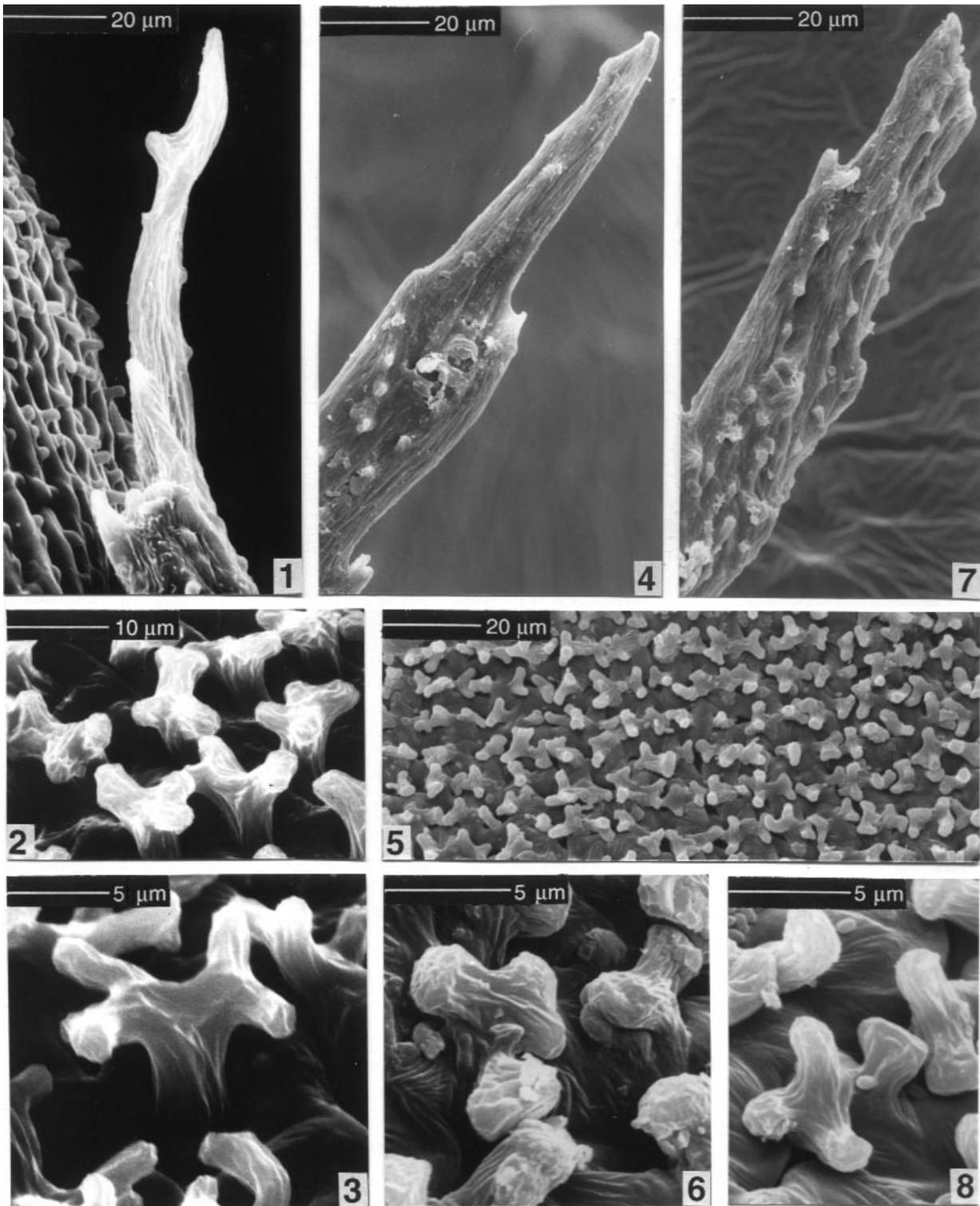


Figure 4. Diagnostic characters (SEM photographs) of the three *Hedwigia* species. 1-3: *Hedwigia stellata* Hedenäs (Kü 97-37). 1, Pointed leaf hair-point; 2, peltate papillae; 3, peltate and strongly branched papillae of the abaxial side of the leaf. 4-6: *H. ciliata* (Hedw.) Ehrh. ex P.Beauv. var. *ciliata* (Erd. 326). 4, Truncate, weakly papillose leaf hair-point; 5, branched papillae; 6, branched papillae of the abaxial side of the leaf. 7-8, *H. ciliata* var. *leucophaea* Bruch & Schimp. (MKır 875b). 7, Truncate, strongly papillose leaf hair-point; 8, branched papillae of the abaxial side of the leaf.

Province: Gökbel mts., Başınar forestry store, alt. 800 m, on rock, 10 March 1998, A. Erdağ (Erd. 1149); Aydın Province: Savrandere village, alt. 100 m, on rock, 28 May 2000, M. Kırmacı (MKır. 85a).

Hedwigia ciliata (Hedw.) Ehrh. ex P.Beauv. var. *leucophaea* Bruch & Schimp. Bryol. Eur. 3: 153 (1846). (Figs. 3 and 4)

Plants small to medium sized, up to 5 cm long, green or brown-green, white or greyish-white when dry; shoot apices straight or slightly curved when dry; leaf apices erect to erecto-patent; leaves ovate to broadly ovate, erecto-patent to patent, slightly falcate when moist, gradually narrowed to acuminate apex, 1.5-2.0 mm long; hyaline portion of leaf usually more than 1/2 of leaf length, ± strongly papillose throughout except near apex; apical leaf-cell mostly distinctly truncate, pluripapillose; leaf margin plane throughout to recurved at base; mid-leaf cells 7-10 x 20-25 µm, quadrate to rectangular, incrassate, with 1-4 (-5) papillae on both sides; papillae on abaxial side strongly branched, but not peltate; capsule shortly obovoid; lid flattened, with low or indistinct mamilla; spores 20-28 µm, distal side with long ridges.

Specimen examined: Turkey: Tokat Province, Reşadiye, 1 km from Çakmak village, alt. 1500 m, 23 June 2002, M. Kırmacı (MKır. 875b).

Distributional remarks

Hedwigia stellata usually grows on exposed rocks and boulders. It occurs in North America (British Columbia, coastal California, Oregon, Washington; Buck & Norris, 1996), throughout Central and Northern Europe (Belgium, British Isles, Denmark, Faroe Islands, Finland,

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France, Germany, Iceland, Luxembourg, Norway, Sweden; Erzberger, 1996; Hedenäs, 1994) and is also recorded from the Mediterranean region (Greece, Italy, Portugal; Dia & Campisi, 1995; Düll, 1994; Frahm, 1995). In Turkey it is widespread in West and South-West Anatolia (Fig. 1.6), where it grows especially under subhumid climatic conditions (Kürschner et al., 1997). These records represent the easternmost localities of this thermophytic taxon of the *H. ciliata* complex. *H. stellata* is easily recognised by its mostly recurved or reflexed hyaline leaf apices in the upper shoots when dry, giving the plants a star-like (stellate) appearance.

Against that, *H. ciliata* var. *ciliata* is of almost cosmopolitan distribution. It grows on rocks and boulders in both sun-exposed and more shady sites. It is found on siliceous substrata or slightly base-rich habitats and occasionally is also found growing on tree trunks and rotten wood. In Turkey, it is widely distributed, ranging from the eastern Black Sea coast to South-West Anatolia (Fig. 2.6). It is easily separated from *H. stellata* in having truncate, pluripapillose, and not recurved leaf apices.

H. ciliata var. *leucophaea* mainly grows on exposed rocks and seems to prefer slightly base-rich habitats. It has a more northern distribution in Europe, but is also recorded from North America and North Africa. In Turkey, it is known to date from only a single locality near Reşadiye (surroundings of Çakmak village, Fig. 3.6). From the typical variety, it can be distinguished by a longer, more strongly papillose and white leaf apex.

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