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# Three remarkable new moss records for South-West Asia from northern Turkey

**Güray UYAR*, Muhammet ÖREN**
Department of Biology, Sciences and Arts Faculty, Bülent Ecevit University, 67100, Zonguldak, Turkey

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**Abstract:** *Grimmia anomala* Schimp., *Pohlia filum* (Schimp.) Mårtensson, and *Hookeria acutifolia* Hook. & Grev. are noteworthy moss species reported here for the first time in South-West Asia from specimens collected in north-eastern and north-western Turkey. The diagnostic characters, habitat preferences, illustrations, and updated ranges of the treated species are given together with notes comparing them with those of related taxa.

**Key words:** *Grimmia, Pohlia, Hookeria*, moss flora, new records, South-West Asia, Turkey

## 1. Introduction

Bryofloristical knowledge of South-West Asia is still insufficient because large areas, often in barely accessible regions, have not yet been visited by bryologists. Despite the publication of the latest checklists for Turkey (Uyar & Çetin, 2004; Kürschner & Erdağ, 2005; Özenoğlu Kiremit & Keçeli, 2009), the recent floristic catalogue for South-West Asia (Kürschner & Frey, 2011), and additions from Turkey and South-West Asia since 2005 (Uyar & Ören, 2005; Keçeli & Çetin, 2005, 2006; Kürschner & Parolly, 2006a, 2006b; Abay et al., 2007, 2009; Keçeli & Abay, 2007a, 2007b; Uyar et al., 2008; Özdemir, 2008; Özdemir & Uyar, 2008; Özdemir et al., 2008; Erdağ & Kürschner, 2009; Erdağ & Kırmacı, 2010; Frey & Kürschner, 2010; Lara et al., 2010; Ören et al., 2010; Erdağ & Kürschner, 2011; Ezer & Kara, 2011; Keçeli et al., 2011; Zare et al., 2011; Ören et al., 2012), the bryophyte flora of Turkey and South-West Asia still requires more detailed investigation. In our opinion, increasing bryophyte and fungi research activities in these areas will lead to the discovery of quite a number of new records (Demirel & Kaşık, 2012; Akata et al., 2012). In addition, older collections from Turkey, which are sometimes difficult to find, are kept at various herbaria worldwide and provide another rich source of specimens. One of these is the Turkish bryophyte collection of E. Nyholm, which includes 5500 specimens and is kept at the Swedish Museum of Natural History (S).

While the first author was studying this important collection, 2 remarkable new records [*Grimmia anomala* Schimp. and *Pohlia filum* (Schimp.) Mårtensson] were discovered; during our recent field trip around Trabzon Province, a noteworthy new record (*Hookeria acutifolia* Hook. & Grev.) for the moss flora of Turkey and South-West Asia was discovered (Uyar & Çetin, 2004; Kürschner & Erdağ, 2005; Kürschner & Frey, 2011).

This paper reports on *Grimmia anomala*, which was collected by Elsa Nyholm in 1982 from Ovid pass located between the towns of İkizdere and İspir; *Pohlia filum*, which was collected by Elsa Nyholm in 1978 from the northern part of Uludağ; and *Hookeria acutifolia*, which was collected by the authors from the Çamburnu district of Sürmene during a field trip in 2011. These 3 records constitute the first records of these species in Turkey and South-West Asia (Figure 1). All localities are situated in the Euro-Siberian phytogeographical region of Turkey, which has a typical oceanic, and sometimes temperate, Mediterranean climate (Akman, 1999). The specimens are stored in the private bryophyte collection at UYAR (Zonguldak).

Among these noteworthy records, *Grimmia anomala* and *Pohlia filum* are typical circumpolar species. The localities nearest to the records collected from Turkey are in Bulgaria and Georgia (Ignatov et al., 2006; Lüth, 2007). *Hookeria acutifolia* is a warm-temperate species and has a tropical distribution; it is rare and scattered in America, South-East Asia, and Japan (Crum & Anderson, 1981; Noguchi, 1991; Tan & Robinson, 1990). Nevertheless, the distribution of *Hookeria acutifolia* is unknown in Europe (Hill et al., 2006; Sabovljević et al., 2008). The locality nearest to the *Hookeria acutifolia* collected in Turkey is in Georgia (Ignatov et al., 2006). Apparently, the current study uncovers a remarkable distributional gap

* Correspondence: gurayuyar@hotmail.com

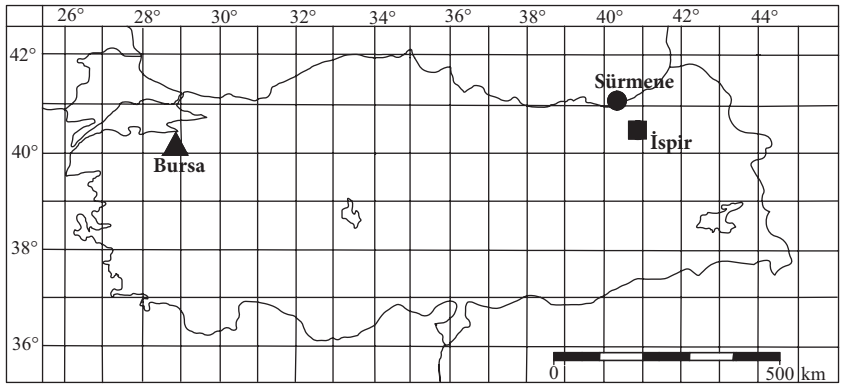


**Figure 1.** Distribution of the new moss records in Turkey. *Grimmia anomala* (■), *Pohlia filum* (▲), *Hookeria acutifolia* (●).

in these species towards South-West Asia. Illustrations of diagnostic morphological characters and information on the distribution of these species in Turkey, based on our own records, are presented in this bryological note. These new records are reported systematically, arranged in familiar order.

## 2. Results

**Grimmiaceae** Arn.

***Grimmia anomala*** Hampe ex Schimp. (Figure 2).

Plants form dark green flat patches, varying from 1 to 2.5 cm deep, with abundant globular, multicellular, yellowish-green to orange gemmae present on leaf tips, and its leaves are about 2–3 mm long. The ovate-lanceolate leaves are loosely imbricated when dry, spreading when moist and keeled above, concave below, with eroded hyaline apex to 0.35 mm long. The leaf margins are recurved on one or both sides, and the distal areolation is unistratose but bistratose in margins. Costa terete, at the leaf base 4–5 layers of nearly homogeneous thick-walled cells, 3–4 layers near the apex. Upper and median leaf cells with long cuticular ridges resembling papillae in cross-section. The mid-leaf cells are rounded-quadrate 6–10 µm long, the walls slightly sinuose, the basal marginal cells are rectangular with

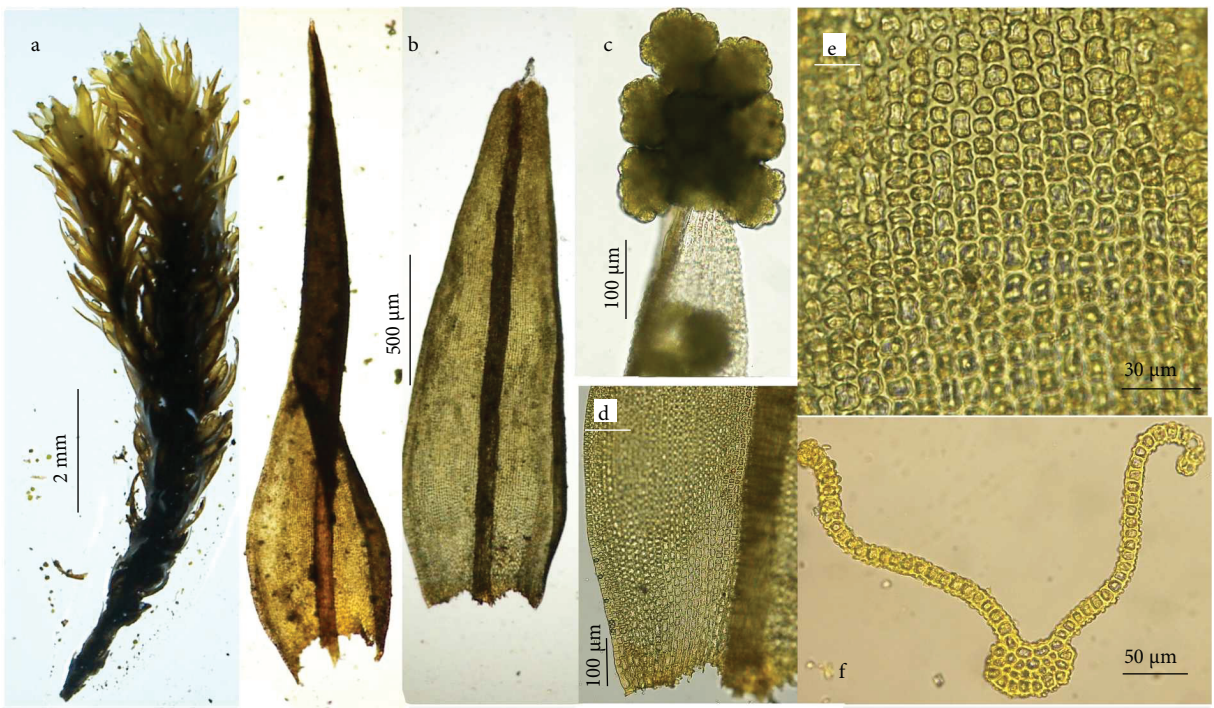


**Figure 2.** *Grimmia anomala*: a- habit, b- leaves, c- leaf tip with gemmae, d- leaf base, e- middle laminal cells, f- cross-section from upper part of the leaf.

transverse walls thickened and not porose. Hair-points are absent or very short. Gemmae are green to yellowish green, multicellular, on upper leaf tips 70–120 µm (mostly 80 µm) in diameter, common on sterile plants.

This species looks similar to *Grimmia hartmanii* and like it has gemmae at the leaf apex, but has cuticular ridges resembling papillae in lamina and a different nerve structure in cross-section. Moreover, it fills the place of *G. hartmanii*, which is mainly a forest plant, in higher altitudes above the timber line.

**Specimen examined. Turkey:** Rize Province, between İkizdere and İspir, near Ovid pass, shady sides of the road, in alpine region, on soil, ca. 1950 m a.s.l., 07.10.1982, *Elsa Nyholm* 119/82 (Herb. (S) reg. nr. B94911).

**World distribution:** Ukraine (Carpathians), Russian Europe (north-west, middle, and south Urals), Georgia, south Siberia, north Far East, from Scandinavia to Spain in mountainous regions of Europe, North America (Canada and northern states of USA), and Asia (Japan and India) (Ignatova & Muñoz, 2004; Ignatov et al., 2006).

**Mielichhoferiaceae** Schimp.

***Pohlia filum*** (Schimp.) Mårtensson (Figure 3).

Plants 1.5–2.5 cm high, grow up in loose turfs, yellowish green and sometimes slightly shiny when dry. Leaves are loosely imbricate, erect or almost so when moist, ovate to ovate lanceolate, usually keeled, somewhat concave, longly decurrent, 0.3–0.4 × 0.9–1.2 mm, apex sharply pointed, very rarely obtuse in young leaves. Leaf margins are plane, rarely slightly recurved at the base of leaf, and somewhat denticulate towards the apex. Nerve is strong, 40–45 µm at leaf base, green turning brown with age, and ending below apex. Middle laminal cells are longly rhomboidal, 9–13 × 40–80 µm, and not narrower at margins. However, basal cells are mainly rectangular, 10–13 × 60–90 µm. Sterile plants usually have yellow, ovate solitary bulbils, 300–400 µm long, in the axils of the upper leaves with their rudimentary leaves confined to the tips of the bulbils. Capsules are rare. Barely, they appear in late spring or early summer. Capsules are ovate, cernuous or pendulous; lids are convex or mamillate.

*P. filum* may be confused with *P. drummondii* especially in the absence of bulbils, which have a characteristic shape. However, *P. filum* has more triangular, more longly decurrent, and also appressed leaves. Above all,


**Figure 3.** *Pohlia filum*: a- habit, b- mature capsule, c- leaf, d- axillary bulbils, e- mid-leaf cells.

bulbils of *P. filum* are yellowish, not reddish brown and their rudimentary leaves confined to tips of the bulbils; nevertheless, *P. drummondii* has reddish brown bulbils with rudimentary leaves extending to half way down the sides of the bulbils (Nyholm, 1993; Smith, 2004; Guerra, 2007).

**Specimen examined. Turkey:** Bursa Province, the northern ridge of Uludağ, on sandy moist sloping ground in alpine region, ca 1600 m a.s.l., 09.07.1978, *Elsa Nyholm* 582/78 (Herb. (S) reg. nr. B87842).

**World distribution:** The mountainous regions of Europe, Faeroes, Iceland, Russian Europe (polar, subpolar, and north Urals), Caucasus (Georgia, Armenia, and Russian part of Caucasus), Siberia, north Far East, North and Central America, and Greenland (Smith, 2004; Ignatov et al., 2006; Sabovljević et al., 2008).

**Hookeriaceae** Schimp.

***Hookeria acutifolia*** Hook. & Grev. (Figure 4).

The Hookeriaceae differs from closely related families with the absence of a costa in the leaves of the members. In addition, *Hookeria* Sm. is the type genus of the family Hookeriaceae [Type: *H. lucens* (Hedw.) Sm.]. It is easy to recognise in the field by its thin, flat, pale green colour and silky lustre, somewhat transparent leaves and large, net-like areolation. However it is similar to some liverwort species in general appearance. This genus has 10 main

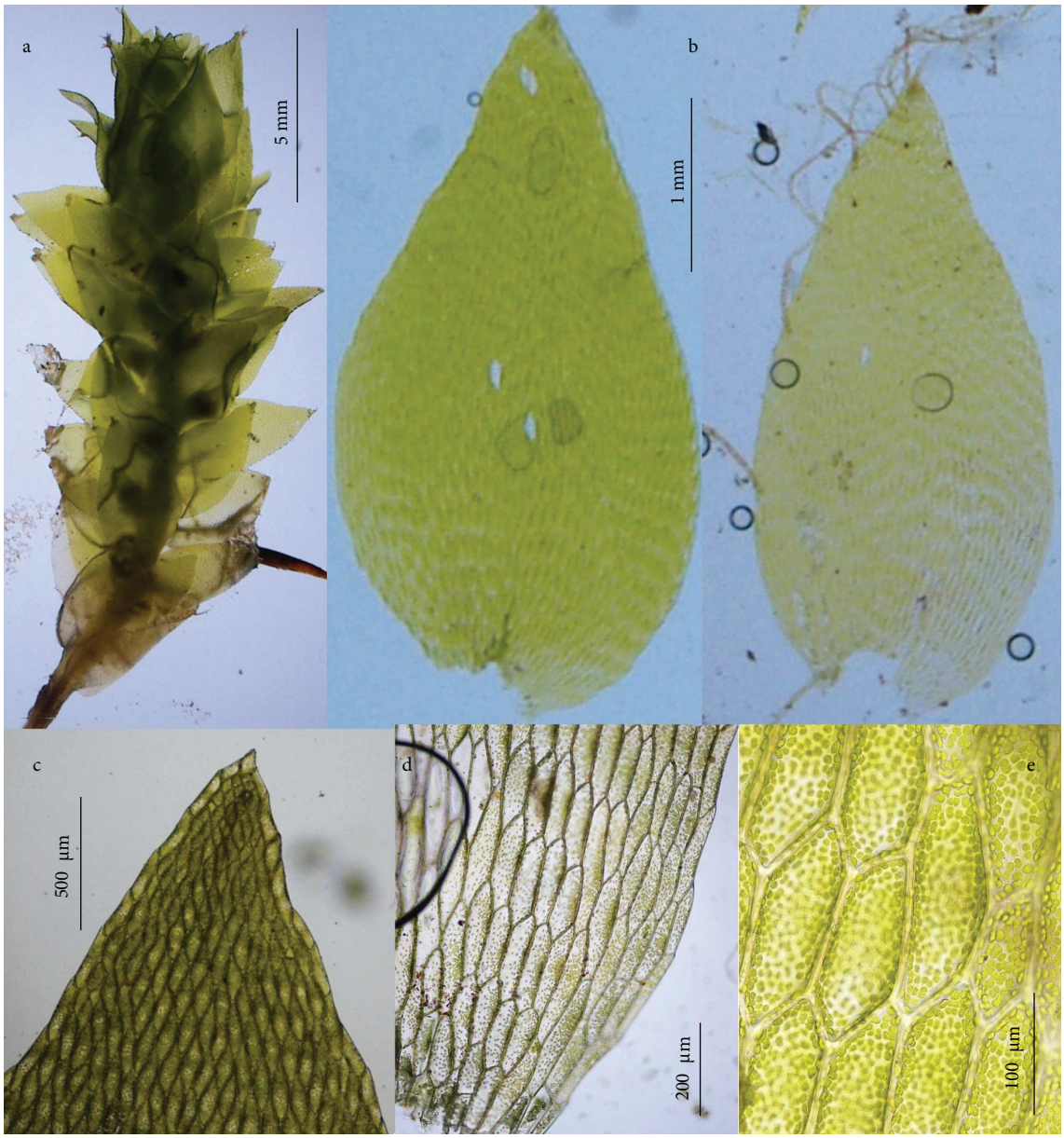


**Figure 4.** *Hookeria acutifolia*: a- habit, b- leaves, c- leaf tip, d- basal cells, e- mid-leaf cells.

species. Among them, *H. acutifolia* Hook. & Grev. and *H. lucens* (Hedw.) Sm. are well known.

The leaves of *H. acutifolia* are 3–5 mm long, oblong-ovate to elliptic acute, often radiculose at the tips; sometimes bearing among the radicles brownish, ± papillose, cylindric to shortly filiform gemmae. Leaf cells are 50–56 µm wide and 2–3:1 (Crum & Anderson, 1981).

*H. acutifolia* differs from *H. lucens* with its acute leaves, filamentous rhizoids that are often produced at leaf apices, and also elongate marginal laminal cells in a single row, narrower than median cells. Although the general characters of Turkish plants lie within the variability range of *H. acutifolia*, a few different characters such as broadly acuminate leaves terminating with 1 noticeably large cell; but sometimes rhizoid bearing tips rough and longly rhomboidal basal marginal cells (25–35 × 180–300 µm) observed in this study.

This species often occurs in areas of sandstone outcropping at rocky habitats. The gathering was abundant and contained preserved material that grew together with *Fissidens taxifolius* Hedw., *Fissidens adianthoides* Hedw., and *Bryum capillare* Hedw.

**Specimen examined. Turkey:** Trabzon Province, Sürmene town, Çamburnu district, under mixed forest consisting of mainly *Pinus sylvestris* L., on stream sides close to a waterfall in deep shade of evergreens and mixed deciduous forest, ca 230 m a.s.l., 40°55′06.5″N, 40°13′05.8″E, 16.04.2011, *Uyar* 863.

**World distribution:** North and Central America and also northern parts of South America, South-East Asia, Japan, Java, Hawaii, China, Taiwan, the Philippines, and Borneo (Crum & Anderson, 1981; Noguchi, 1991; Tan & Robinson, 1990). It was unknown in Europe (Hill et al., 2006; Sabovljević et al., 2008).

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