

Additions to the moss flora of Greece

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Abstract – *Syntrichia sinensis*, *Ditrichum gracile* and *Orthotrichum cupulatum* var. *fuscum* are reported from the higher parts of the mountains of Southern – Central Greece, being the first records for the country. *Encalypta alpina*, *Syntrichia papillosissima*, and *Timmia bavarica*, rare in the country, are again recorded in Greece. Ecological and chorological remarks are given for each of the reported species.

Greece / Mountain areas / New records / Mosses

INTRODUCTION

Data on bryophyte flora of Greece are scattered and most of the information is due to sporadic visits of foreign researchers to Aegean and Ionian Islands. Besides the checklist of Düll (1995), other papers containing floristic contributions have been recently published (such as Blockeel, 1991, 2010; Papp, 1998, 2003; Blockeel *et al.*, 2002; Lara *et al.*, 2003; Erzberger, 2006; Sabovljević *et al.*, 2008a), and these data have been compiled in the different checklists recently issued on the bryophytes of South-Eastern Europe or the Mediterranean region (Sabovljević & Natcheva, 2006; Ros *et al.*, 2007; Sabovljević *et al.*, 2008b).

In the frame of a research project on the bryophyte diversity of the Mediterranean high mountains, a study on the orophilous bryophyte flora of Southern-Central Greece was carried out in conjunction with an extensive and deep research on the mountainous vascular flora and vegetation of mainland and insular Greece (Musarella *et al.*, 2005; Brullo *et al.*, 2008, 2009). The investigation on bryophytes has discovered some interesting mosses, new or rarely recorded in Greece, some of which are of European conservational interest (ECCB 1995; Sabovljević *et al.*, 2001; Sabovljević *et al.*, 2008b). These mosses were collected in the mountains of Central Greece (Mt. Giona), Attica (Mt. Kitheron) and Peloponnese (Mt. Klokos, Mt. Panachaiko, Mt. Menalon) (Fig. 1), on limestone rocks and in rock crevices.

The *exsiccata* are kept in the *Herbarium* of the Department of Biological, Geological and Environmental Sciences of the University of Catania (CAT). The nomenclature follows Hill *et al.* (2006); the chorotypes are taken from Hill & Preston (1998) or Düll (1984, 1985).

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Fig. 1. Location of the investigated Greek mountains. 1. Mt. Giona; 2. Mt. Khiteron; 3. Mt. Klokos; 4. Mt. Panachaiko; 5. Mt. Menalon.

NEW NATIONAL RECORDS

Syntrichia sinensis (Müll. Hal.) Ochyra

Greece: Central Greece, Mt. Giona, 38°36'50" N, 22°15'41" E, 1890 m a.s.l., 6 July 2007, S. Brullo.

Syntrichia sinensis was collected on Mount Giona at 1890 m a.s.l. within low shrubs of *Thymus pannasicus* Halácsy, where it formed poorly compact, yellowish-green cushions on sunny calcareous rocks. This rare species was found mixed with *Syntrichia montana* Nees, *Schistidium atrofusum* (Schimp.) Limpr., *Grimmia pulvinata* (Hedw.) Sm., and *Tortula inermis* (Brid.) Mont. It is a Boreal-alpine species known in SE Europe only from Slovenia and Romania (Sabovljević *et al.*, 2008b); therefore, it is here first recorded for Greece. The species is currently included in the European Red Data Book (ECCB, 1995) as Rare (R).

Species characters in the Greek specimens. Plants in green turfs 0.5-1 cm high; stems erect; leaves spirally twisted when dry, erect-patent when moist, 2-3 mm long, lingulate-spathulate or oblong-lingulate, constricted at midleaf, unistratose; apex rounded or obtuse; margins weakly recurved up to the middle of the leaf, papillose-crenulate, unbordered; hair point smooth to weakly spinulose, hyaline throughout or sometimes brown at the base, 0.3-0.6(0.8) mm long; costa strong, (70)80-100 μm wide at the leaf base, in transverse section with hydroids, 2 guide cell rows, 4-5 dorsal stereid rows; upper and mid leaf cells quadrate or quadrate-rounded, 12-15(18) μm , pluripapillose, with bifurcate, not pedicellate papillae 2-2.5 μm high; juxtacostal basal cells rectangular, 60-90 \times 16-25 μm , forming a hyaline area up to 35% of the leaf length (Figs 2-4).

The sterile plants of *S. sinensis* could be confused with *S. laevipila* Brid. from which it can be easily distinguished by the shorter hair point, absence of bordered leaves and vegetative diaspores, as well as for the different type of habitat: *S. sinensis* is a terricolous or saxicolous species, whereas *S. laevipila* is corticolous. *Syntrichia sinensis* could also be confused with *Syntrichia norvegica* F. Weber, widespread in the Greek mountains. In *S. norvegica* the most important diagnostic characters are the colour of the hair point, which is orange or reddish, and the cellular differentiation of the dorsal side of the costa in the upper third of the leaf, where the cells are similar to lamina cells (Gallego, 2005). In particular, the specimens collected by the authors in Greece and illustrated in Figs 2-7 show a spinulose, reddish or orange hair point, sometimes hyaline only at the apex, 0.5-1.4 μm long, the costa in transverse section without hydroids, with 2-3 guide cell rows and 2-(3) dorsal stereid rows often disappearing near the leaf apex, 1 row of dorsal surface cells in the upper part of the costa similar to those of the lamina.

***Orthotrichum cupulatum* var. *fuscum* (Venturi) Boulay**

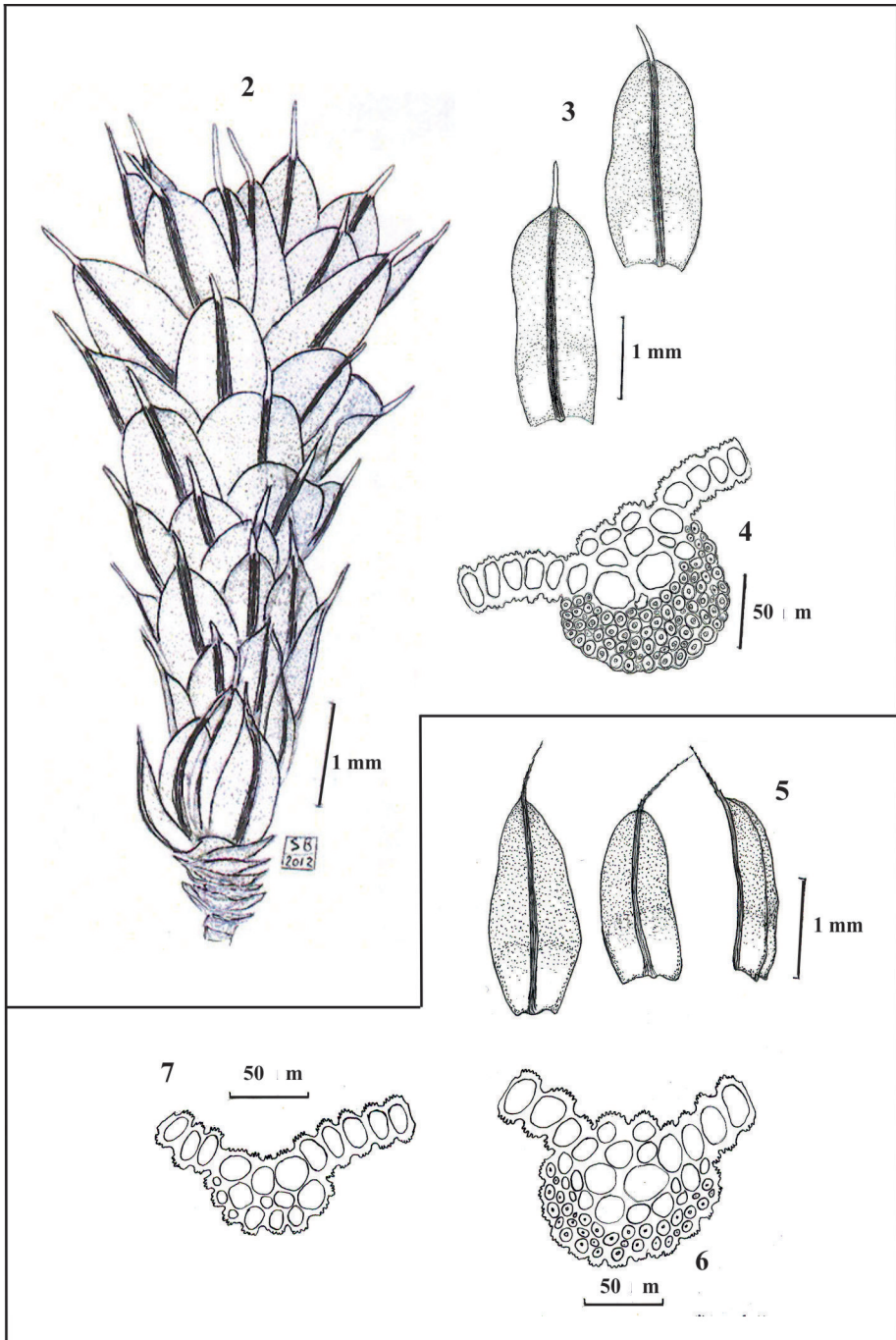
Greece: Central Greece, Mt. Giona, 38°37'01" N, 22°16'08" E, 1720 m a.s.l., 5 July 2007, *S. Brullo*; Peloponnese, Mt. Klokos, 38°09'16" N, 22°03'04" E, 1525 m a.s.l., 2 June 2007, *S. Brullo*.

This moss was found with sporophytes, growing in lax dark green tufts on exposed limestone rocks in two localities: on Mt. Giona in the grassland of high altitude with *Festuca cyllenica* Boiss. et Heldr. together with *Distichum capilla-ceum* (Hedw.) Bruch et Schimp., *Encalypta streptocarpa* Hedw. and *Fissidens dubius* P. Beauv., and on Mt. Klokos within the orophilous cushion-like vegetation dominated by the endemic *Astragalus rumelicus* Bunge mixed with *Syntrichia montana*, *Encalypta alpina* Sm., *Homalothecium sericeum* (Hedw.) Schimp., *Ditrichum flexicaule* (Schwägr.) Hampe, and *Didymodon rigidulus* Hedw. It is a Sub-arctic-alpine taxon, reported in Europe from Austria and Italy, where it was considered vanished, and in Germany, France, Norway, Slovakia, Switzerland and Caucasus, where it is rare; it is listed in the European Red Data Book (ECCB, 1995) with the vulnerable status (V). *Orthotrichum cupulatum* var. *fuscum* is first signaled for Greece and for SE Europe; in the Greek mountains it reaches the southernmost limit of its distribution area.

***Ditrichum gracile* (Mitt.) Kuntze**

Greece: Peloponnese, Mt. Panachaico, 38°12'10" N., 21°50'53" E, 1605 m a.s.l., 1 June 2007, *S. Brullo*; Peloponnese, Mt. Panachaico, 38°12'29" N., 21°50'50" E, 1490 m a.s.l., 1 June 2007, *S. Brullo*; Peloponnese, Mt. Menalon, 37°40'37" N, 22°14'12" E, 1640 m a.s.l., 4 June 2007; Central Greece, Mt. Giona, 38°37'12" N, 22°15'33"E, 5 July 2007, 1705 m a.s.l.

This species was found in four localities of mainland Greece, where it formed lax yellowish green tufts on shady limestone rock crevices and on soil



Figs 2-7. 2-4. *Syntrichia sinensis*. 2. Habit. 3. Leaves. 4. Transverse section of the costa at midleaf. 5-7. *Syntrichia norvegica*. 5. Leaves. 6. Transverse section of the costa in the midleaf. 7. Transverse section of the costa in the upper part of the leaf.

covered calcareous rocks. It was collected at Mt. Panachaico together with *Distichium capillaceum*, *Fissidens dubius* *Didymodon insulanus* (De Not.) M. O. Hill, *Tortula intermedia* and *Tortula subulata* Hedw.; at Mt. Menalon with *Tortella tortuosa* (Hedw.) Limpr. and *Syntrichia virescens*; at Mt. Giona with *Tortella tortuosa*, *Encalypta streptocarpa* and *Pseudoleskea incurvata* (Hedw.) Loeske. It is a Circumpolar Boreo-temperate species known in SE Europe from Bulgaria, Bosnia-Herzegovina, Montenegro, Romania, Slovenia and Serbia (Sabovljević *et al.*, 2008b), and is here first reported from Greece. The species is a characteristic species of the order *Ctenidietalia mollusci* v. Hübschmann *ex* Grgić 1980, which includes post-pioneer, basophytic bryophyte associations typically found in rock crevices.

OTHER INTERESTING RECORDS

Encalypta alpina Sm.

Greece: Peloponnese, Mt. Klokos, 38°09'16" N, 22°03'04" E, 1525 m a.s.l., 2 June 2007, *S. Brullo*.

The moss was collected on sunny calcareous rocks within the *Astragalus rumelicus* pulvinate shrubs, where it formed dull green tufts up to 4-5 cm high, mixed with the already mentioned *Syntrichia montana*, *Homalothecium sericeum*, *Ditrichum flexicaule*, *Didymodon rigidulus* and *Orthotrichum cupulatum* var. *fuscum*. It is a circumpolar arctic-montane species occurring in many countries of SE Europe. However, it is very rare in Greece where it previously was reported only once (Lüth, 2003) from the Vikos-Aoos National Park (NW Greece).

Syntrichia papillosissima (Copp.) Loeske

Greece: Central Greece, Mt. Giona, 38°37'08" N, 22°12'41" E, 1275 m a.s.l., 4 July 2007, *S. Brullo*.

This species was found in the *Astragalus parnassi* Boiss shrubby pulvinate stands, where it was growing on stony soil in lax brownish green to reddish green tufts, together with *Encalypta vulgaris* Hedw., *Homalothecium sericeum* and *Tortella tortuosa*.

It is a Mediterranean montane species that has been signaled throughout the Mediterranean region from northern Africa, Jordan, Lebanon, European Turkey, Spain, Portugal, Italy, Cyprus, and Greece (Gallego, 2005; Sabovljević *et al.*, 2008b). In the last country it was reported by Coppey (1907) and Kramer (1980) from The Peloponnese (Mt. Kelmos), and more recently by Düll (1995) from Crete. Here it is first recorded from Central Greece.

Timmia bavarica Hessel.

Greece. Peloponnese, Mt. Panachaico, 38°12'04" N, 21°51'10" E, 1675 m a.s.l., 1 June 2007, *S. Brullo*; Central Greece, Mt. Giona, 38°37'04" N, 22°15'53" E, 1715 m a.s.l., 5 July 2007, *S. Brullo*.

This species was found in shady, calcareous rock crevices where it formed lax, green brownish tufts, in grasslands of the endemic *Minuartia stellata* (E.D. Clarke) Maire *et* Petitm. at Mt. Panachaico together with *Tortella tortuosa*, *Tortula intermedia*, *Fissidens dubius*, and within the orophilous shrubs of *Astragalus rumelicus* at Mt. Giona together with *Encalypta streptocarpa*, *Tortella tortuosa*

and *Homalothecium sericeum*. It is an Arctic-Montane species found on the main mountain ranges in the Northern Hemisphere (Rocky Mountains, Himalaya, Alps, Pyrénées, Caucasus, Urals) with some disjunct populations in the mountains of Northern Africa, Mexico, and Hawaii (Sotiaux & Vanderpoorten, 2011). It is known from many SE European countries (Sabovljević *et al.*, 2008b). In Greece it was previously reported from Central Greece (Stereia Ellas), Crete and the Ionian Islands (Blockeel, 1991, 2010; Düll, 1995), and is here a new record from the Peloponnese.

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