

A contribution to the Bulgarian bryoflora

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Abstract. *Dicranella staphylina* and *Gymnocolea inflata* have been recorded as species new to Bulgaria. *Dicranella staphylina* is a recently described species widespread in the Northwestern Europe. It prefers open soils in different habitats. In Bulgaria, it occupies a disturbed open calcareous spring in Mt Lozenska. It was accompanied by *Bryum klinggraeffii*, *Eucladium verticillatum* and *Pohlia wahlenbergii*, which have been also reported as new species for this floristic region (Mt Sredna Gora – Western). *Gymnocolea inflata*, a common bog species in the Northern, Western and Central Europe, has been found in an alpine spring fen fed by extremely acid and mineral-poor waters in the Rila Mts. It was accompanied by *Aulacomnium palustre*, *Polytrichum commune*, *Sphagnum compactum*, *S. russowii*, *Straminergon stramineum*, and fen sedges. *Calliergon richardsonii* and *Meesia triquetra* are species of reported occurrence in the current checklist of Bulgarian bryophytes, to be confirmed by herbarium vouchers. Since these species have not been found during an extensive study of the Bulgarian mires, we revised the specimens and found that they have been incorrectly determined. The occurrence of these boreal species in Bulgaria is therefore uncertain.

Key words: Bryophyte, *Calliergon richardsonii*, *Dicranella staphylina*, fen, *Gymnocolea inflata*, herbarium revision, *Meesia triquetra*, spring, wetlands

Introduction

Since the publication date of the new checklist of Bulgarian mosses (Natcheva & Ganeva 2005) five new species have been found on the Bulgarian territory: *Scorpidium cossonii* (Schimp.) Hedenäs, *Meesia longiseta* Hedw., *Amblyodon dealbatus* (Hedw.) P. Beauv., *Campyliadelphus elodes* (Lindb.) Kanda and *Bryum klinggraeffii* Schimp. (Blockeel & al. 2006a, b; Natcheva & Ganeva 2007). In this paper, we present the following new species for the Bulgarian bryoflora: *Dicranella staphylina* H. Whitehouse and *Gymnocolea inflata* (Huds.) Dumort. They were found in 2005 and

2002, respectively, during our extensive field research of fen and wet-meadow vegetation. The specimens of both species are kept in the private herbarium of Petra Hájková and in SOM in Sofia.

Our further aim in this paper is to present the results of the herbarium specimen revision, which bring about some changes in the checklist of Bulgarian bryophytes. Occurrence of *Calliergon richardsonii* (Mitt.) Kindb. and *Meesia triquetra* (Jolycl.) Ångstr. in Bulgaria has proved uncertain, because of the misidentification of specimens that were to evidence it. The aim of this paper is to furnish details about these changes.

New species for the Bulgarian flora

Dicranella staphylina H. Whitehouse

Mt Sredna Gora (Western): Mt Lozenska, near the footpath ca 700 m above the Lozen village, in a disturbed calcareous spring, 920 m, 27.06.2005, 23°29'01"E, 42°35'26"N, coll. P. Hájková & M. Hájek, det. V. Plášek (private herbarium of Petra Hájková Ha06/89; SOM).

Dicranella staphylina was described earlier by Whitehouse (1969). Prior to that, owing to the small proportions and absence of sporophytes, the species was undistinguished from other *Dicranella* species, and in particular from *D. varia* (Hedw.) Schimp. and *D. rufescens* (With.) Schimp. A year later, in 1970, the species was found on the European Continent (Neu 1970). It is now a widespread and occasionally abundant species in Northwestern Europe, Spain, Italy, and Hungary (Frey & al. 2006). Its occurrence in Bulgaria probably represents the southeast limits of the species' distribution range. *Dicranella staphylina* is missing in the national checklists of Albania (Colacino & Sabovljević 2006), Greece (Preston 1984) and Turkey (Uyar & Cetin 2004). In the Balkan region, the species is reported only from Romania (Balint & Orban 2003). In Northwestern Europe, it is documented from places with acid to neutral pH (Dierssen 2001). Contrary to this, the species occupies mineral-rich places, such as disturbed calcareous springs and fens in the Central Europe (e.g. Hájek 1998). Generally, it prefers open soils in different habitats, such as fields (Kresáňová & al. 2005), wet meadows or trail banks.

The character of the Bulgarian locality was similar to that of the Central European ones. *Dicranella sta-*

phylina occupied a disturbed calcareous spring wetland, with water pH of 7.2 and water conductivity of about 500 $\mu\text{S}\cdot\text{cm}^{-1}$. The vegetation was rich in bryophytes. *Dicranella staphylina* was accompanied by e.g. *Barbula unguiculata* Hedw., *Brachythecium mildeanum* (Schimp.) Schimp., *Bryum klinggraeffii*, *B. pseudotriquetrum* (Hedw.) P. Gaertn., B. Mey & Scherb., *Calliergonella cuspidata* (Hedw.) Loeske, *Cratoneuron filicinum* (Hedw.) Spruce, *Eucladium verticillatum* (Brid.) Bruch & Schimp., *Eurhynchium hians* (Hedw.) Sande Lac., *Palustriella commutata* (Hedw.) Ochyra, *Pellia endiviifolia* (Dicks.) Dumort., and *Pohlia wahlenbergii* (F. Weber & D. Mohr) A.L. Andrews. In the herb layer, several characteristic species of mineral-rich, wet and disturbed soils co-dominated: *Lythrum salicaria* L., *Pulicaria dysenterica* (L.) Bernh., *Agrostis stolonifera* L., *Blasmus compressus* (L.) Link., and *Juncus inflexus* L. The vegetation corresponded to the association *Junco inflexi-Menthetum longifoliae* Lohmeyer ex Oberdorfer 1957, the same association in which the species has been frequently found in Central Europe (e.g. Hájek 1998).

Morphological specificities

The plants are about 1 cm high, forming mainly bright-green tufts. Leaves are erect, lanceolate, tapering to an acute apex, often with few obscure teeth towards the apex. Costa is thin, ending below the leaf apex. The species can be easily recognized by the constantly present brownish rhizoidal gemmae (Fig. 1). They are irregular in shape and mostly isodiametric (50–100 \times 50–80 μm). Sporophytes were seldom observed (Arts 1985). A comparison of the diagnostic features within a group of similar species (*D. staphylina*, *D. varia* and *D. rufescens*) is shown in Table 1.

Table 1. Comparison of the diagnostic features within a group of similar species from genus *Dicranella*.

Features	<i>D. staphylina</i>	<i>D. varia</i>	<i>D. rufescens</i>
Color of stems	bright-green	green	red
Length of leaves (mm)	0.5–1.0	1.5–2.0	up to 2.0
Width of the costa in the leaf base	40	55–85(–100)	30–40
Leaf margin	plane or recurved below	recurved	plane
Leaf dentation	few obscure teeth towards the apex	entire or slightly denticulate near the apex	denticulate at least in the upper part
Cell size of leaves (μm)	10–14 \times 30–70	5–9 \times 40–50	8–14 \times 50–100
Gemmae	very frequent, built-up of 10–15 cells	frequent, built-up of 10–15 cells	rare, built-up of 2–3 cells

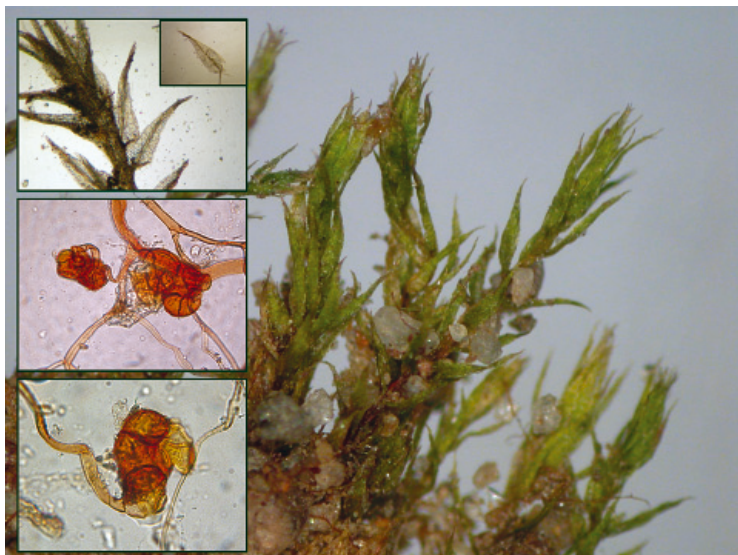


Fig. 1. Growth habit, detail of leaves and gemmae of *Dicranella staphylina*. (Photo V. Plášek).

***Gymnocolea inflata* (Huds.) Dumort.
subsp. *inflata***

Rila Mts: Sedemte lakes, acidic subalpine spring fen 0.3 km E of the peak Haydouta (2465), 2350 m, 27.06.2002, 23°19'30"E, 42°11'54"N, coll. P. Hájková & M. Hájek, det. V. Plášek (private herbarium of Petra Hájková Ha06/59; SOM).

Gymnocolea inflata is a common bog species in Northern, Western and Central Europe (cf. Rybníček & al. 1984; Rodwell 1991). In Southeast Europe it is a rather rare species, absent in many countries neighbouring on Bulgaria (e.g. Albania, Greece, Serbia, Turkey). Nevertheless, it occurs in Romania and R Macedonia (Söderström & al. 2002). According to Dierssen (2001), it is a boreosubtropical, montane and arctic species, which occupies mainly peat areas, but also wet rocks, wet heathlands and rocky banks. This species is tolerant of pollution. In some Central European bogs influenced by atmospheric pollution in the past, *G. inflata* has replaced the *Sphagnum* species in the bog hollows and meadows (Rybníček & Houšková 1994).

During our extensive research of the Bulgarian wetlands, we failed to record any typical ombrotrophic bog with a well-developed hommock-hollow structure – a typical habitat of the species (Hájková & al. 2006). In the Rila Mts, *G. inflata* occupied a subalpine spring fen fed by extremely acid and mineral-poor waters (pH 4.4, conductivity 13 $\mu\text{S}\cdot\text{cm}^{-1}$). *Sphagnum compactum* Lam. & DC. dominated in the moss layer, other bryophytes such as *Aulacomnium palustre* (Hedw.)

Schwägr., *Polytrichum commune* Hedw., *Sphagnum russowii* Warnst., and *Straminergon stramineum* (Brid.) Hedenäs were also present. The vegetation corresponded to the association *Primuletum exiguo-deori* Horvat & al. 1937, which is endemic to the Bulgarian high mountains (Hájková & al. 2006). In the herb layer, *Carex echinata* Murray, *C. nigra* (L.) Reichardt., *Gentiana pyrenaica* L., *Primula deorum* Velen., and *Nardus stricta* L. co-dominated.

Morphological specificities

These are dark-green to nigrescent plants, growing scattered among the mosses (mainly among the *Sphagnum* species), or forming crowded mats in the exposed sites. Stems are slender, about 0.5–3 cm long, irregularly branched. Leaves are formed by two symmetrical lobes, distant to scarcely imbricate, spreading, flat or more often concave, as long as wide, or slightly longer. Underleaves are mostly absent.

This species can be confused with *Cladopodiella fluitans* (Nees) H. Buch. (a species not present in Bulgaria), which occurs in very similar habitats, but forms leaves with two unsymmetrical lobes.

Results of herbarium revision

***Calliergon richardsonii* (Mitt.) Kindb.**

This species was documented both in literature and by a herbarium specimen from the Rila Mts. However, a revision of the only specimen of this

species from Bulgaria collected by S. Petrov in the Rila Mts (SOM) has shown that it was confused with *Straminergon stramineum* (Brid.) Hedenäs. A specimen of *C. richardsonii* from the same locality was also kept at the Hungarian Natural History Museum (BP). This specimen was also re-identified as *Straminergon stramineum* (rev.: K. Karczmarz 1966). Misidentification could be due to similar leaf costa that do not reach the leaf apex. Nevertheless, these species clearly differ in the leaf shape, shape of the leaf apex and alar cell groups (Hedenäs 2003). *Calliergon richardsonii* is a species of wet mineral-rich habitats of fens, ditches, pool shores, or lakes. The Rila Mts mainly constitute of acid, mineral-poor bedrock, so suitable habitats for the occurrence of this species are very rare in this region. Even during our extensive research of the Bulgarian mountain fens and springs we did not find any locality of *C. richardsonii*. The species is widespread in Northern Europe and is scattered or absent further south. According to Hedenäs (2003), there is no reliable report (i.e. herbarium specimen) of *C. richardsonii* from Southeast Europe. Therefore, we consider the occurrence of *C. richardsonii* in Bulgaria to be uncertain.

Meesia triquetra (Jolycl.) Ångstr.

A herbarium specimen of this species (deposited in SOM) originates from the same locality as the specimens of *Scorpidium scorpioides* and *Meesia uliginosa* Hedw. This locality is in the central part of the Balkan Range, on the northern slopes of Mt Bolovan. Whereas *S. scorpioides* was correctly determined and has really occurred in this locality in the past, the specimen of *M. triquetra* contains another *Meesia* species, *M. uliginosa*. Unfortunately, our efforts to confirm the recent occurrence of *S. scorpioides*, *M. uliginosa* and/or *M. triquetra* in the field proved unsuccessful, and these endangered bryophyte species have probably become extinct due to overgrazing in the past. Anyway, the locality represents a complex of small subalpine spring fens: habitats where occurrence of *M. uliginosa* is more plausible than occurrence of *M. triquetra*.

Finally, there is no herbarium specimen of *M. triquetra* in Bulgaria. There are literature reports from the Rila Mts, Western Rhodopi Mts and Mt Vitosha (Natcheva & Ganeva 2005). A distribution centre of this species exists in the boreal zone of Europe. In oth-

er regions, the species is treated as a glacial relict and becomes very rare (e.g. Šoltés 1999). Its occurrence in Bulgaria, even historically, has a low probability. Nevertheless, a surprise finding of a distributionally similar species, *M. longiseta*, in the Eastern Rila Mts (Blockeel & al. 2006b) has shown, that it is not completely excluded.

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References

- Arts, T. 1985. Young sporophytes of *Dicranella staphylina* Whitehouse (*Musci*). – *Lindbergia*, **11**: 55-58.
- Balint, L. & Orban, S. 2003. Bryofloristical researches of the Harghita Mountains (Romania). – *Contr. Bot.*, **38**: 13-18.
- Blockeel, T.L., Chlebicki, A., Hájková, P., Hájek, M., Hradílek, Z., Kürschner, H., Ochyra, R., Parolly, G., Plášek, V., Quandt, D., Townsend, C.C. & Vanderpoorten, A. 2006a. New national and regional bryophyte records, 12. – *J. Bryol.*, **28**(1): 68-70.
- Blockeel, T.L., Bednarek-Ochyra, H., Ochyra, R., Hájková, P., Hájek, M., Kučera, J., Kurchner, H., Muller, F., Oliván, G., Parolly, G., Porley, R.D., Rams, S., Séneca, A., Sérgio, C., Townsend, C.C., Tyshchenko, O. & Vieira, C. 2006b. New national and regional bryophyte records, 13. – *J. Bryol.*, **28**(2): 151-155.
- Colacino, C. & Sabovljević, M. 2006. Bryophyte flora of Albania: a preliminary checklist. – *Cryptog. Bryol.*, **27**(4): 11-16.
- Dierssen, K. 2001. Distribution, ecological amplitude and phytosociological characterization of European bryophytes. – *Bryophyt. Biblioth.*, **56**: 1-289.
- Frey, W., Frahm, J.P., Fischer, E. & Lobin, W. 2006. *The Liverworts, Mosses and Ferns of Europe*. The English edition revised and edited by T.L. Blockeel. Harley Books.
- Hájek, M. 1998. The wetland vegetation in the White Carpathians. – *Sborn. Přír. Kl. Uherské Hradiště, Suppl.* **4**: 1-158 (in Czech).
- Hájková, P., Hájek, M. & Apostolova, I. 2006. Diversity of wetland vegetation in the Bulgarian high mountains, main gradients and context-dependence of the pH role. – *Pl. Ecol.*, **184**: 111-130.
- Hedenäs, L. 2003. The European species of the *Calliergon-Scorpidium-Drepanocladus* complex, including some related or similar species. – *Meylania*, **28**: 1-117.

- Kresáňová, K., Mišíková-Janovicová, K. & Kubinská, A.** 2005. Diversity of bryophytes in agro-coenoses of Slovakia. – *Biologia (Bratislava)*, **60**: 9-15.
- Natcheva, R. & Ganeva, A.** 2005. Checklist of the bryophytes of Bulgaria with data on their distribution. II. Musci. – *Cryptog. Bryol.*, **26**: 209–232.
- Natcheva, R. & Ganeva, A.** 2007. New species to the bryophyte flora of Bulgaria. – *Phytol. Balcan.*, **13**(2):
- Neu, F.** 1970. Das Laubmoos *Dicranella staphylina* Whitehouse in Münsterland. – *Natur & Heimat (Münster)*, **30**(4): 97-99.
- Preston, C.D.** 1984. A checklist of Greek mosses. – *J. Bryol.*, **13**: 43-95.
- Rodwell, J.S.** (ed.). 1991. *British Plant Communities. Mires and Heaths*. Vol. 3. Cambridge Univ. Press, Cambridge.
- Rybníček, K. & Houšková, E.** 1994. Vegetation and environmental changes in bogs in the Jizerské Hory Mts between 1980 and 1991. – *Příroda (Praha)*, **1**: 129-136 (in Czech).
- Rybníček, K., Balátová-Tuláčková, E. & Neuhäusl, R.** 1984. Plant communities of mires and wet meadows in Czechoslovakia. – *Stud. Českoslov. Akad. Věd.*, **8**: 1-123 (in Czech).
- Söderström, L., Urmi, E. & Váňa, J.** 2002. Distribution of *Hepaticae* and *Anthocerotae* in Europe and Macaronesia. – *Lindbergia*, **27**: 3-47.
- Šoltés, R.** 1999. Glacial moss relic *Meesia triquetra* in Slovakia. – *Ochr. Prír. (Banská Bystrica)*, **18**: 41-49 (in Slovak).
- Uyar, G. & Cetin, B.** 2004. A new checklist of mosses of Turkey. – *J. Bryol.*, **26**: 203-220.
- Whitehouse, H.L.K.** 1969. *Dicranella staphylina*, a new European species. – *Trans. Brit. Bryol. Soc.*, **5**: 757-765.
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