

New records of nivicolous myxomycetes from the South-Eastern European mountains

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Abstract. Five species of strictly nivicolous myxomycetes are reported from two mountain areas in Bulgaria (the Pirin Mts) and Slovenia (the Kamniško-Savinjske Alpe): *Diderma alpinum*, *Diderma niveum*, *Diderma peyerimhoffii*, *Lamproderma cribrarioides* and *Physarum albescens*. The records from the South-Eastern Alps provide first data concerning the nivicolous slime moulds in Slovenia. Two of the reported taxa are new for the Bulgarian mountains.

Key words: Balkan Peninsula, Bulgaria, *Diderma*, *Lamproderma*, *Physarum*, Pirin, Slovenia, South-Eastern Alps

Introduction

Nivicolous myxomycetes occur early in the season during a short period of time when the snow cover lying in the mountainous locations melts slowly with the increasing temperature in spring (e.g. Lado 2004). Therefore, field search for this interesting group of organisms requires special attention and in many regions relevant data are very scarce or lacking.

During our botanical and mycological field works in 2006 we recorded, relatively late in the season (in the beginning of summer), a few species belonging to this peculiar ecological group, which formed sporangia at the margins of last persisting snow patches in alpine grasslands, in two mountain areas in the South-Eastern Europe: the Kamniško-Savinjske Alpe in Slovenia and the Pirin Mts in Bulgaria. There are very few data on the diversity of myxomycetes in the South-Eastern European countries. Only 57 species of myxomycetes are known from Bulgaria (Drumeva-Dimcheva & Gyosheva-Bogoeva 1998) and only two of them belong to the ecological group of strictly nivicolous organisms, namely: *Diderma alpinum* (Meyl.) Meyl. (as *D. globosum* var. *alpinum* Meyl.) and *Lamproderma carestiae* (Ces. & De Not.) Meyl. (as *L. violaceum* var. *carestiae* (Ces. & De Not.) Meyl. Both species were reported from the Vitosha massif near Sofia (Hinkova 1951; Hinkova & Draganov 1964). There are also very few data concerning slime moulds of Slovenia. In the updated and annotated checklist of

myxomycetes from former Yugoslavia, Ing & Ivancevic (2000) provide 34 taxa found in this country. Most records are from the vicinity of Ljubljana and no nivicolous species are listed in this paper. Our records, although scarce and random, provide therefore a new contribution to the chorological knowledge on nivicolous slime moulds in Europe, where the occurrence and diversity of these organisms in more southerly located areas are of particular interest.

In this communication we present the list of species found by us in the Bulgarian and Slovenian mountains. All species collected in Slovenia are new to this country and two species found in the Pirin Mts are new to Bulgaria.

Material and Methods

The material was collected in June and July 2006 during two collecting trips. In Slovenia the specimens were collected during a botanical excursion to the mount Storžič in the Kamniško-Savinjske Alpe (south-easternmost part of the Alps), (Figs 1a, c). In Bulgaria the collection was made during a field work mainly devoted to alpine fungi, in the Pirin Mts (one of the highest ranges of the Balkan Peninsula), on the slopes of its highest peak Vihren (2914 m), (Figs 1b, c). In both spots the myxomycetes were found in alpine meadows, close to the margins of patches of melting snow.

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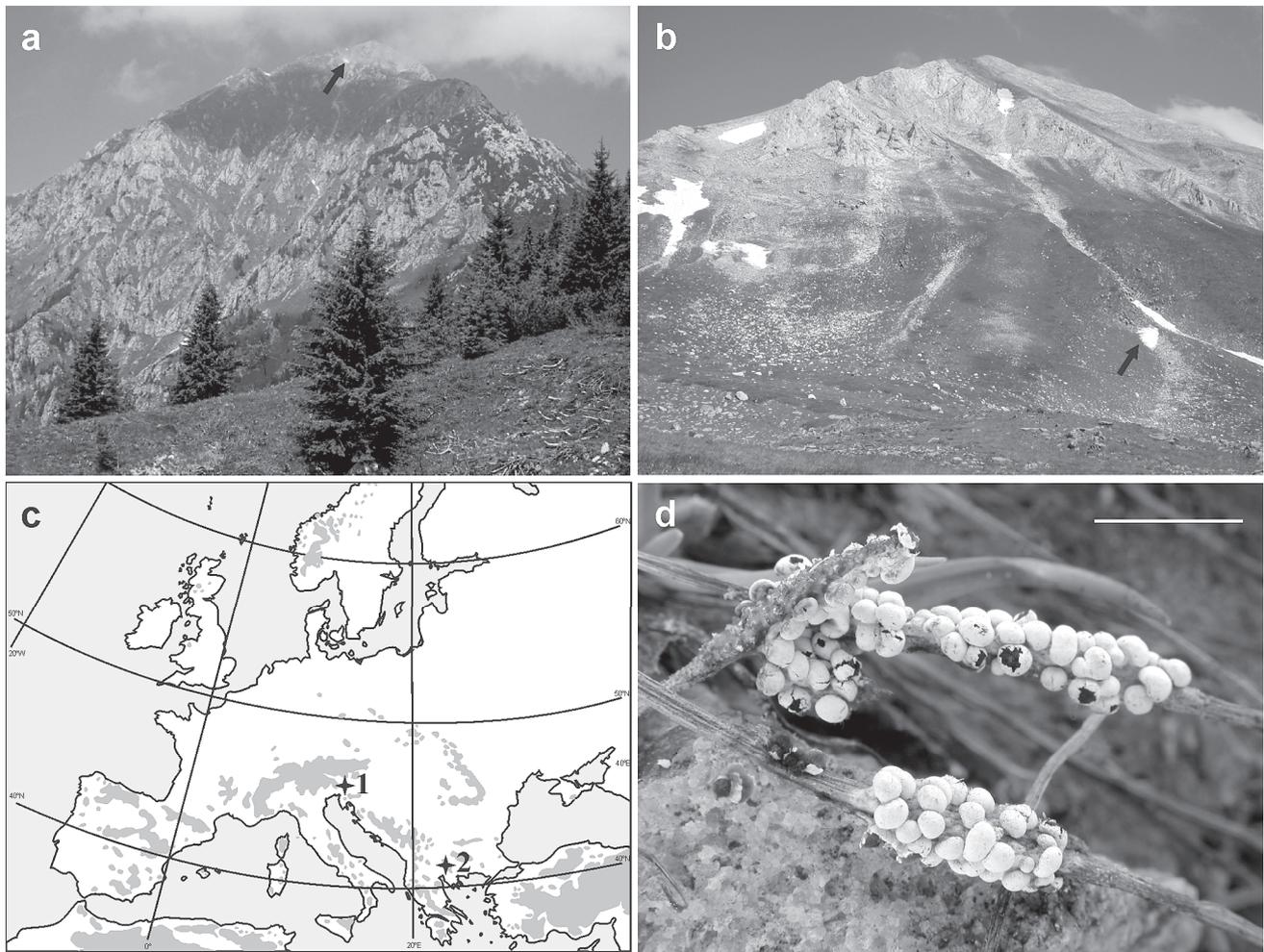


Fig. 1 (a-c). Location of the collection sites at the persisting snow patches (arrows): **a** – Mt. Storžič, the Kamniško-Savinjske Alpe, Slovenia; **b** – Mt. Vihren, the Pirin Mts, Bulgaria; **c** – (1) the Storžič massif, (2) the Vihren massif. **Fig. 1d**. Sporangia of *Diderma niveum* from the locality in the Pirin Mts. Bar = 1 cm

Standard methods used in the taxonomy of myxomycetes were applied to study the collected material. Microscope preparations and measurements were made in Hoyer's medium. Scanning electron microscopy (SEM) analysis was carried out in the Laboratory of Field Emission Scanning Electron Microscopy and Microanalysis at the Institute of Geological Sciences, Jagiellonian University (Kraków). Specimens prepared according to a critical-point drying technique were coated with gold and examined on Hitachi S-4700 scanning electron microscope, at 10 kV. Nomenclature follows Hernández-Crespo & Lado (2005).

Results and Discussion

Five species of strictly nivicolous myxomycetes were recorded in our samples. Three species were collected in the Slovenian Alps and three species were found in the Pirin Mts.

Nivicolous myxomycetes usually form sporangia during a relatively short period of time. In the Mediterranean

area, e.g. in the Pyrenees, the best time for observing them extends from the end of March to June (rarely July), while in the French Alps, situated further North and being much higher – until August (Lado 2004). Although the Pirin Mts are located as far south as the Pyrenees, we could surprisingly still find some nivicolous myxomycetes there at the vicinity of persisting snow patches in July. This is interesting, because the Pirin Mts are more than 500 m lower than the Pyrenees, so it could be expected that the period suitable for nivicolous myxomycetes should be shifted to earlier months. According to our preliminary observations, however, the phenology of not only myxomycetes but also alpine fungi and alpine plants in the Southern massifs of the Balkan Peninsula was comparable to the Tatra Mts (Western Carpathians) situated much further to the North.

Records of nivicolous myxomycetes in the mountains of Southern Europe are particularly interesting, when considering the dependence of this group on a specific set of ecological factors present in the spring in mountain habitats and particularly on long-term snow coverage. In recent years

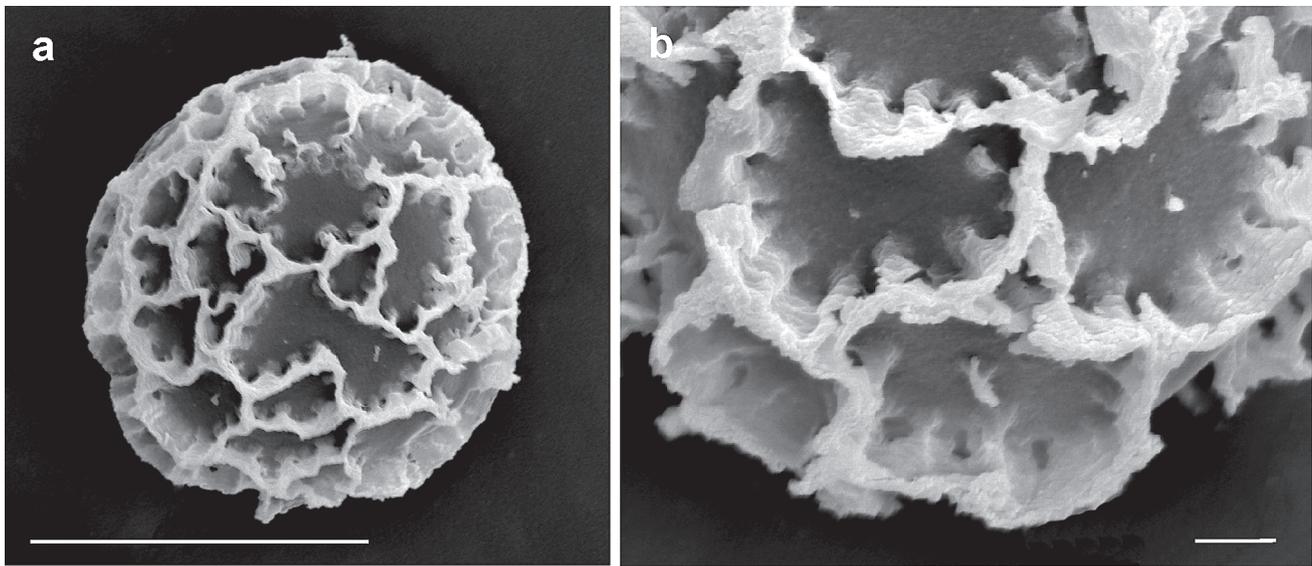


Fig. 2. Spores of *Lamproderma cribrarioides* in SEM (KRAM M-1275). Bars: a = 10 μ m, b = 1 μ m

several extensive studies were published from the Iberian Peninsula (e.g. Sánchez *et al.* 2002; Moreno *et al.* 2003; Lado *et al.* 2005), while virtually nothing is known about the presence of this group in the South-Eastern Europe. Our findings of vestigial occurrence of several species in the summer suggests that future dedicated field prospects in the phenological optimum of this group would be very rewarding.

List of species

Diderma alpinum (Meyl.) Meyl.

Specimens examined: **BULGARIA:** the Pirin Mts, E slopes of the mount Vihren, 23°24'10" E, 41°45'33" N, alpine meadow, at the margin of a small patch of melting snow, alt. 2400 m, on grass culms, 16 Jul 2006, A. Ronikier & M. Ronikier (KRAM M-1280); **SLOVENIA:** the South-Eastern Alps, Kamniško-Savinjske Alpe, summit area of the mount Storžič (2132 m), 14°24'17" E, 46°21'00" N, alpine calcicolous grassland, at the margin of a small patch of melting snow, alt. 2050-2100 m, on grass culms, 17 Jun 2006, M. Ronikier (KRAM M-1273, duplicate in MA).

Remarks: This species counts among the most common and abundant nivicolous species. It was previously reported from Bulgaria, the Vitosha massif near Sofia (Hinkova 1951).

Diderma niveum Rostaf.

Fig. 1d

Specimens examined: **BULGARIA:** the Pirin Mts, E slopes of the mount Vihren, 23°24'10" E, 41°45'33" N, alpine meadow, at the margin of a small patch of melting snow, alt. 2400 m, on grass culms, 16 Jul 2006, A. Ronikier & M.

Ronikier (KRAM M-1277); ditto (KRAM M-1278); ditto (KRAM M-1279).

Diderma peyerimhoffii (Maire & Pinoy) H. Neubert, Nowotny & K. Baumann

Specimens examined: **SLOVENIA:** the South-Eastern Alps, Kamniško-Savinjske Alpe, summit area of the mount Storžič, 14°24'17" E, 46°21'00" N, alpine calcicolous grassland, at the margin of a small patch of melting snow, alt. 2050-2100 m., on grass culms, 17 Jun 2006, M. Ronikier (KRAM M-1272, duplicate in MA).

Lamproderma cribrarioides (Fr.) R.E.Fr. (*L. atosporum* var. *pseudocribrarioides* Mar. Mey. *et al.*)

Specimens examined: **BULGARIA:** the Pirin Mts, E slopes of the mount Vihren, 23°24'10" E, 41°45'33" N, alpine meadow, at the margin of a small patch of melting snow, alt. 2400 m, on grass culms, 16 Jul 2006, A. Ronikier & M. Ronikier (KRAM M-1274); ditto (KRAM M-1275).

Remarks: *L. cribrarioides* is characterized by dehiscence of sporangium wall in small pieces, funnel-shaped ends of capillitial threads and reticulate spores. The ornamentation can be in form of a complete reticulum or of irregular ridges with spongy perforations in lower part (Moreno *et al.* 2002). The second kind of reticulation was observed in the Bulgarian specimens (Fig. 2).

Physarum albescens Ellis ex T. Macbr.

Specimens examined: **SLOVENIA:** the South-Eastern Alps, Kamniško-Savinjske Alpe, summit area of the mount Storžič, 14°24'17" E, 46°21'00" N, alpine calcicolous grassland, at the margin of a small patch of melting snow, alt. 2050-2100 m, on grass culms, 17 Jun 2006, M. Ronikier (KRAM M-1270, duplicate in MA); ditto (KRAM M-1271).

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