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FIRST RECORD OF THE GENUS *STRANGOSPORA* (STRANGOSPORACEAE, ASCOMYCOTA) FROM BULGARIA

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Abstract

The first Bulgarian record of the lichenized fungus *Strangospora moriformis* is reported. Description, comments, and illustrations based on Bulgarian specimen are provided. *Lecanora pulicaris*, *L. subintricata*, and *Mycocalicium subtile* were found growing together with *S. moriformis* and are reported for the first time from the Balkan Range.

Key words: Bulgaria, coniferous wood, lignicolous lichens, old forests

Introduction. *Strangospora* is a small genus of uncertain position within the Pezizomycotina [1]. It comprises ten lichenized species growing mostly on wood and some species on rocks and bryophytes [2,3].

A decorticated standing deadwood of *Pinus sylvestris* with high diversity of epixylic lichens was found during field surveys in *Pinus peuce* stands near Petrohan Pass (Balkan Range) (Fig. 1). The dominant epixylic lichen was *Strangospora moriformis* (Ach.) Stein, an unknown lichenized fungus and genus for the Bulgarian lichenized mycota. In this article, *S. moriformis* is reported for the first time from Bulgaria with description and illustrations. Additional comments are provided on the importance of deadwood for lichen diversity and conservation.

Materials and methods. Studied specimen was deposited in the Mycological Collection of the Institute of Biodiversity and Ecosystem Research, Sofia

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Fig. 1. A decorticated standing deadwood of *Pinus sylvestris* (snag) near Petrohan Pass (Balkan Range) where *Strangospora moriformis* was found

(SOMF). The length and width of the ascospores and conidia are given as: (min–)$\{\overline{x}–SD\}–\overline{x}–\{\overline{x}+SD\}$(–max), where min and max are the extreme values, $\overline{x}$ is the arithmetic mean, and SD the corresponding standard deviation; n represents the number of measurements. The measurements of all microstructures were made in water. The observations and photographs were made under a Windaus Labortechnik D-38678 dissecting microscope (Windaus-Labortechnik GmbH & Co., Germany) equipped with a Canon PowerShot A630 digital camera (Canon Inc., Japan) and a Boeco MB-180/T/SP microscope with a digital camera Boeco B-CAM10 (Boeckel GmbH & Co., Germany). Nikon D7200 (Nikon Inc. Japan) was used for photographs in the field. Taxonomically important colour reactions of lichen substances (I – Lugol's solution, K – 10% potassium hydroxide, K/I – pretreatment with 10% potassium hydroxide and consequent applied Lugol's solution, N – nitric acid) were made following Orange et al. [4].

Results and discussion.

Strangospora moriformis (Ach.) Stein, in Cohn, Krypt.-Fl. Schlesien, Flecht.: 176, 1879 (Fig. 1, 2(A-C)).

Thallus crustose, endoxylic or irregularly granular, pale gray, usually inapparent. Apothecia 0.25–0.5 mm in diam., black, with convex disk; exciple poorly developed or absent; epithecium and upper layers of hymenium blue or emerald

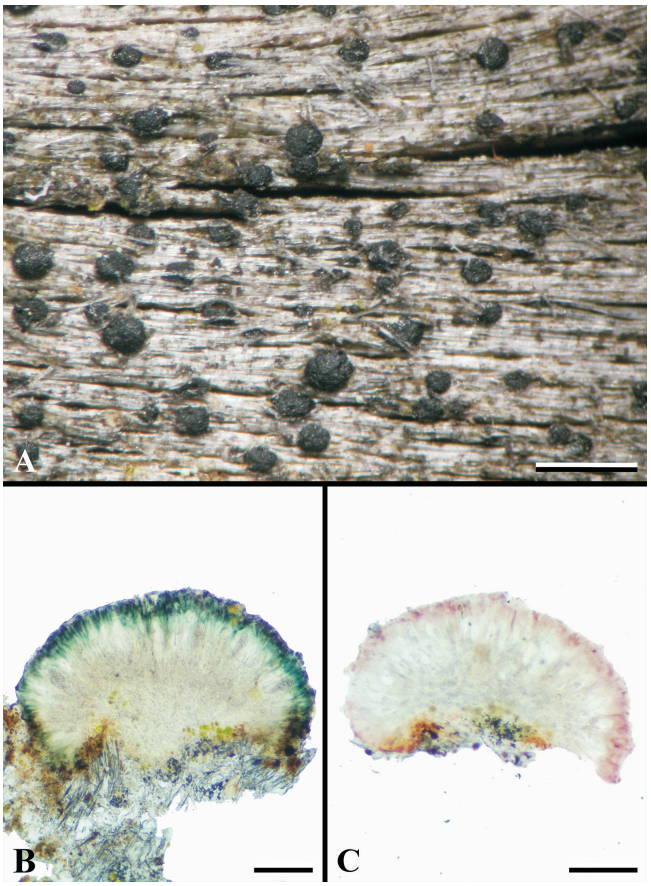

Fig. 2. Species of *Strangospora moriformis* from Bulgaria: A – general habit (SOMF 31109), B – cross-section of apothecium in water with epithecium and upper layers of hymenium with blue to emerald green colour, C – cross-section of apothecium in nitric acid giving mauve-purple colour. Scale bars: A = 1 mm; B, C = 100 µm

green, sometimes also with partially violet pigment, N+ mauve-purple, K- (K+ pale greenish gray colour appears in the hymenium, but the bluish pigments remain unchanged). Hamathecium of paraphyses, 0.7–1 µm thick, branched and anastomosing, in some apothecia with inflated wider cells in the paraphysal base; apical cells narrowly clavate, 1.2–2.5 µm thick. Asci multispored, with more than 100 spores, clavate, with thickened wall, K/I+ blue; apical dome K/I+ blue. Ascospores (1.3–)2.2–2.7–3.2(–3.5) µm, n = 100, globose, simple, hyaline. Pycnidia 60–75 µm in diam., ± globose, appear brownish on thallus; pycnidial wall in cross-section emerald green in the upper half, becoming brown to hyaline in the base. Conidia (2.5–)2.9–3.2–3.5(–3.7) × (1.1–)1.2–1.3–1.5(–1.6) µm, n = 10, oblong, hyaline, aseptate.

Specimen examined. BULGARIA, Balkan Range, Petrohan Pass, near Petrohan Chalet, on decorticated wood of *Pinus sylvestris* L., N:43.11482°, E:23.13137°, alt.: 1463 m, 15 October 2022, V. Shivarov (SOMF 31109).

Ecology and distribution. A boreal to temperate lignicolous species that becomes rare in the south where it is restricted to the montane regions. Known from Europe, Asia and North America [2, 5, 6].

Comments. *Strangospora moriformis* is easily recognizable by the black apothecia; multispored asci with thickened wall and apical dome K/I+ blue; bluish to emerald green pigments in epithecium, which turn mauve-purple in nitric acid and remain unchanged in potassium hydroxide. The size of ascospores and paraphysal width were used for distinguishing infrageneric taxa in taxonomic keys, but these values are variable depending on the number of measurements. Furthermore, ascospore sizes in the main literature sources for *S. moriformis* differ significantly, 1.5–2.5 µm [2,5,7], and 3.0–3.5 µm [8, 9]. Both ranges fall well into the variation found in the Bulgarian specimen (see above).

In Bulgaria, the species was found on a snag of *P. sylvestris* close to bogland in area with frequent fogs. *Strangospora moriformis* occurs as a dominant species on the sun exposed part of the snag growing together with *Lecanora pulicaris* (Pers.) Ach., *L. subintricata* (Nyl.) Th. Fr., *Mycocalicium subtile* (Pers.) Szatala, *Micarea* spp. and juvenile thalli of *Hypogymnia physodes* (L.) Nyl. *Lecanora subintricata* and *S. moriformis* are early colonizers of decorticated coniferous wood. Both species were thought to become common in last decades in destroyed forests in Western Carpathians by the activity of the bark beetle *Ips typographus* [10]. In a similar study in the Harz National Park (Germany), only *L. subintricata* was reported as common on coniferous wood without detection of *S. moriformis* [11]. However, *S. moriformis* is assessed Endangered in France [13], and Near Threatened in the Czech Republic [14] and Italy [15]. *Strangospora moriformis* was found in Bulgaria only on one snag and absent on the nearby ones, which were in a shaded place in the forest. It seems that the species depends on narrow environmental conditions and should be expected as a rare species in Bulgaria. The intensification of bark beetle infections in old forests in Bulgaria [12], and the occurrence of rare lignicolous lichens need to be further studied.

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