

New records of the rare 'bug-on-the-stick' moss (*Buxbaumia aphylla* Hedw.) in Croatia

MARKO DOBOŠ^{1*}, VEDRAN ŠEGOTA²

¹ Public institution Papuk Nature Park, Stjepana Radića 46, 34300 Velika, Croatia

² University of Zagreb, Faculty of Science, Department of Biology, Division of Botany, Marulićev trg 20/ II, HR-10000 Zagreb, Croatia

*Autor za dopisivanje / corresponding author: markodobo@yahoo.com

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About

A rare moss *Buxbaumia aphylla* was only recently found in Croatia. Here we report five new localities, one from Dilj Gora and four from Mt. Papuk. Small populations on bare acidic soil within the forest and along the forest edges were registered.

Keywords: Dilj Gora, ephemeral bryophytes, Mt. Papuk, pioneer species

Doboš, M., Šegota, V. (2023): Novi nalazi rijetke mahovine *Buxbaumia aphylla* Hedw. u Hrvatskoj. Glas. Hrvat. bot. druš. 11(1): 58-63.

Sažetak

Rijetka mahovina *Buxbaumia aphylla* tek je nedavno po prvi puta pronađena u Hrvatskoj. U priopćenju se navodi pet novih nalazišta vrste, jedno na Dilj gori i četiri na Papuku. Pronađene su male populacije na golom kiselom tlu unutar šume i uz rub šume.

Ključne riječi: Dilj gora, efemerne mahovine, Papuk, pionirska vrsta

Introduction

Brown shield-moss or elf-moss (*Buxbaumia aphylla* Hedw.) is a rare circumpolar boreal-montane species (Hill & Preston 1998). In Europe, it is common in the majority of the western and northern countries, but becomes rarer towards the south of the continent (Charissou & Happe 2016). In Southeast Europe, it is known from the majority of countries

except for Greece, Serbia and Kosovo (Hodgetts & Lockhart 2020). Although published for Montenegro (Sabovljević & Stevanović 2000), this record is considered questionable (Hodgetts & Lockhart 2020). The species has been assessed as least concerned (LC) in the European Red List of Mosses, Liverworts and Hornworts (Hodgetts et al. 2019).

The species lacks green leaves, but has disproportionately large capsule on a 5-10 mm long seta, earning it the nickname “bug-on-a-stick” (Atherrton et al. 2010). The capsules are strongly inclined, asymmetric, maturing over winter and releasing spores in late spring and early autumn (Charissou & Happe 2016). It is likely that in the latter stages of development the sporophyte is nutritionally self-supporting (Smith 2004). The species is an ephemeral pioneer on disturbed humus-rich acidic soils, in shaded forest habitats, often on road banks or woodland trails (Frey et al. 1995, Smith 2004). It is highly acidophytic (pH 3.4-4.0) species growing on moderately wet to moderately dry substrates (sandy soils, rotten litter, raw humus or shale debris) (Dierßen 2001).

The first record of *B. aphylla* in Croatia has been recently published (Ellis et al. 2017) from Mt. Papuk. Three populations were registered, the

smallest one with 10 specimens at Sokolina, the second one with 29 specimens at Svinjarevac and the third one with 31 specimens at Konjska smrt. The species occurred on bare acidic soil and on *Sphagnum* peat, under the shade of beech or sessile oak trees. However, during the latest revision of the historical bryophyte collection in Herbarium Croaticum (ZA) (Šegota et al. 2022), the unidentified specimens of the genus *Buxbaumia* collected in 1923 were found and ultimately identified as *B. aphylla*. The specimens stored in two herbarium envelopes (ZA63345 and ZA63346) were collected by renowned Croatian botanist prof. Ivo Horvat at the locality Dubrava (forest near the village of Dubravica in Hrvatsko Zagorje). Moreover, this record was mentioned in Horvat’s article from 1950 (Horvat 1950), which also flew under the radar of the botanical community.

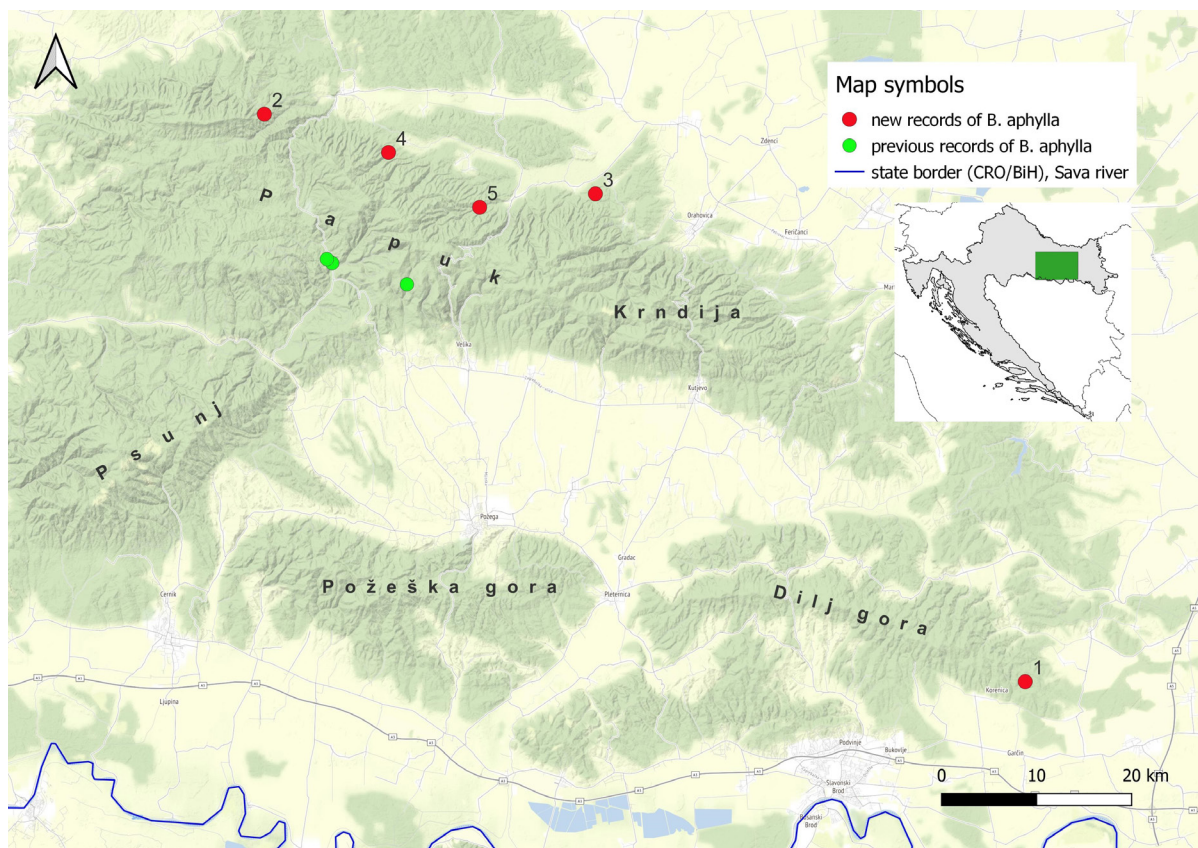


Figure 1. Previous and new records of *Buxbaumia aphylla* on Slavonian mountains.

Methods

Observations were made by chance in 2022 and 2023 during recreational field trips on Mt. Papuk and Dilj Gora in Slavonia. Slavonia is a continental part of the country situated between three large rivers – Sava, Drava and Danube, consisting of alluvial and diluvial plains, along with rather low, solitary mountain massifs reaching almost 1000 m a.s.l. Papuk and Dilj Gora, along with three additional mountains (Krnđija, Požeška Gora and Psunj) create a mountain circle (Fig. 1), but in the terms of genesis, they are quite diverse. Papuk (952 m) makes the northern part of the circle and is geologically the most diverse mountain in Croatia (Pamić et al. 2003) which is one of the reasons why most part of it is protected as Nature Park and as UNESCO Geopark. Geodiversity is one of the main reasons for rich biodiversity of that area. Dilj Gora (471 m) is comprised mostly from tertiary deposits (Šparica et al. 1980). Both mountains are mostly covered with different types of deciduous forest, but there are other habitat types, like seminatural grasslands.

Photo documentation was made for all localities. Specimens were collected for the herbarium collection Herbarium Croaticum (ZA) only from the population W of Voćin and S of Sekulinci on Mt. Papuk. Localities were georeferenced, photodocumented and stored with unique codes in a public database iNaturalist, where identification was additionally confirmed by other specialists.

Results and discussion

We report five new localities of *Buxbaumia aphylla* in Croatia – four from Mt. Papuk and one from Dilj Gora (hill), also a part of the Slavonian mountains (Fig. 1).

The first record was made on February 12, 2022, on the eastern part of Dilj Gora, circa 13 km of air distance NE of the city of Slavonski Brod and 2.5 km NE of Klokočevik village (Ruščik) (TK25) at an altitude of 230 m (45.230125°N, 18.192129°E, iNaturalist code 133245966). The species was not

noticed during the field trip, but was subsequently spotted while reviewing lichen photos. Thus, it was impossible to know the exact number of specimens on site, but based on photo documentation there are at least 13 individuals captured. The specimens were found in mature stage with erect brown-red-dish capsules (Fig. 2) and photographed on the bare acidic soil along the edge of the oak (*Quercus* sp.) forest, near the forest road.

The second record was on October 16, 2022, on the northwestern slopes of Mt. Papuk, 6.5 km W of the settlement Voćin and 780 m SE of Gornji Grot (TK25) at an altitude of 540 m (45.606538°N, 17.472761°E, iNaturalist code 139087015). We counted 12 specimens on site. The specimens were found in immature stage with green-whitish capsules and calyptras (Fig. 2) developed on the bare acidic soil within the beech (*Fagus sylvatica* L.) forest.

The third record was on November 13, 2022 in the northern part of Mt. Papuk, between the villages Pušina and Krajna (area Stražbenica) (TK25) at an altitude of 200 m (45.553875°N, 17.785771°E, iNaturalist code 141918816). Only a single specimen with an immature green capsule was found (Fig. 2), again on the bare acidic soil within the beech (*Fagus sylvatica*) forest.

Young, immature sporophytes of *B. aphylla* with green capsules are rather hard to distinguish from those of *B. viridis*. However, as the seta of *B. aphylla* starts to grow, it rapidly turns red from the base upwards (Hancock & Brassard 1974, Deme & Csiky 2021), which was noticed on our young specimens on first two localities too (Fig. 2). On the contrary, the seta of *B. viridis* begins to change its original pale greenish colour not until when it is fully grown, becoming more brownish than reddish (Hancock & Brassard 1974, Deme & Csiky 2021). In addition, although this requires some experience, knowing the rate of change of well-developed seta and capsule length can be useful too, because it is generally higher in *B. aphylla* than in *B. viridis* (Orbán & Vajda 1983).

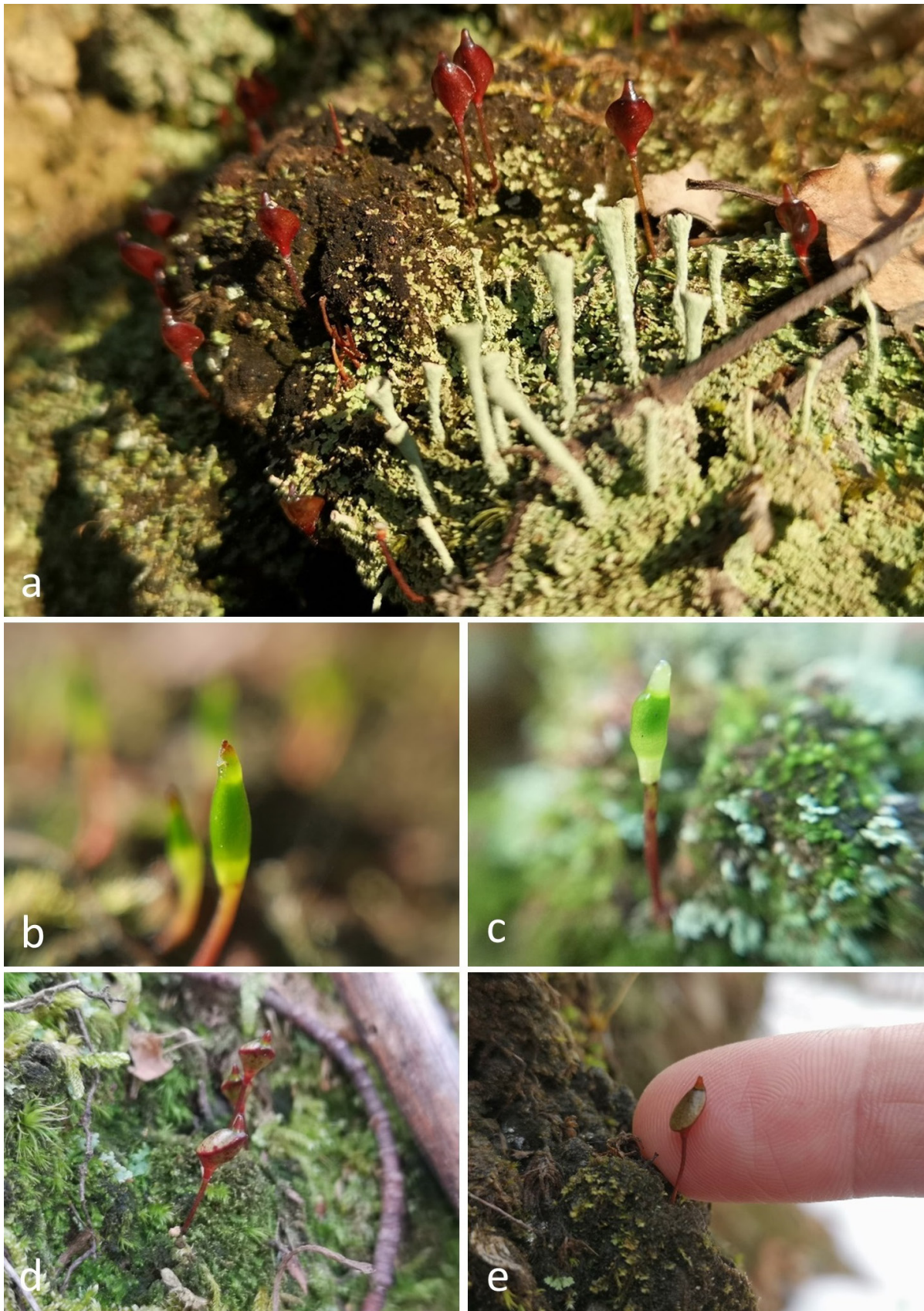


Figure 2. *Buxbaumia aphylla* – mature specimens on Dilj Gora (a), young specimen from the north-western part of Mt. Papuk (b), young specimen from the northern part of Mt. Papuk (c), maturing specimen from Sekulinci (d) and nearly mature specimen from Šumećica (e).

On the top of that those congeneric species prefer dissimilar microhabitats – while *B. aphylla* prefers disturbed humus-rich acidic sandy or clayey soils, *B. viridis* is characterized as an epixylic moss colonizing dead wood (usually conifers, mainly spruce and fir), in an advanced state of decay. Unexpectedly, this paradigm was shifted with the recent research of Deme et al. (2020), who discovered majority of Hungarian population of *B. viridis* existing on acidic soils in managed, acidophytic beech forests. Nonetheless, an important question is still to be answered, what lies behind this unusual substrate preference of *B. viridis* in Hungary: substrate shift at the edge of its area (where sufficient moisture is not provided by the macroclimate) or the underestimation of terricolous populations due to the misconceptions about the ecology of the species.

Fourth record was on December 30, 2022 also in the northern part of Mt. Papuk, SW of Sekulinci village (area Suha Zdjelica) (TK25) at an altitude of 200 m (45.581222°N, 17.590136°E, iNaturalist code 145447324). Ten specimens in different development stages were observed on the site near a rarely used path inside the acidic beech (*Fagus sylvatica*) forest. Most were green coloured and several started to turn brown (Fig. 2).

Last observation was on February 1, 2023 in the canyon of Šumečića creek on Papuk, close to Slatinski Drenovac village at an altitude of 280 m (45.544949°N, 17.676311°E, iNaturalist code 147837294). A single mature specimen was observed on the side of forest road in (*Fagus sylvatica*) forest (Fig. 2).

Buxbaumia aphylla seems to be a poor competitor so it only occurs on the bare soil within the forests or the forest edges. We noticed that it grows on soil that is undisturbed for some time, not covered in dead leaves, and not completely colonized by other mosses and lichens. According to our observations, the accompanying species that occupy the same microhabitat are lichens from *Cladonia pyxidata* (L.) Hoffm. group and *Dibaeis baeomyces* (L.f.) Rambold & Hertel. Their presence might be a good indication while searching *B. aphylla* in future field studies. Since this tiny, ephemeral and rarely

recorded species was spotted as many as five times in a year, it is most likely that additional records will be made in a near future, especially if favourable habitats will be aimed for further research.

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<https://www.inaturalist.org/observations/141918816>
<https://www.inaturalist.org/observations/145447324>
<https://www.inaturalist.org/observations/147837294>