

NEW DATA ON THE DISTRIBUTION OF *CAMPYLOPUS* *INTROFLEXUS* (HEDW.) BRID. IN HUNGARY

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Abstract: As a result of the research conducted between 2016 and 2018, 12 new populations of *Campylopus introflexus* were discovered in Hungary, of which 5 occurrences were from the Transdanubian region and 7 were from Nyírség. The majority of new locations are connected to pine plantations, where they mainly appear on mixed raw forest humus.

Keywords: invasive moss, planted pine forests, distribution map, Eastern Hungary

INTRODUCTION

The work of Hassel & Söderström (2005) summarized the expansion and temporal dynamics of two neophytic mosses, one of them *Campylopus introflexus*. By now this species has reached Southeastern Europe, its presence in Croatia, the ecological background of its spread and its potential invasion was discussed by Algero *et al.* (2018).

In Hungary, the first record of this newcomer species was reported in 2007 (Szűcs & Erzberger 2007), where today it forms stable populations and based on its ecological needs we can expect further expansion not only in the secondary but also in native forest communities. As a result of a few targeted studies the bryophyte was found mainly in pine plantations, furthermore its largest population appeared in disturbed native forests with an acidic soil surface (Szűcs *et al.* 2014). More recently, its presence has been detected in Transdanubian region (Somogy and Tolna County) and in Praematricum (Bács Kiskun County) (Csiky *et al.* 2017, Matus *et al.* 2018).

This study publishes new data on its distribution, and based on the published data it presents a map of the current distribution of the species in Hungary.

MATERIAL AND METHODS

Site details (descriptions of localities) include data in the following order: settlement, habitat, substrate, population size, GPS-coordinates, quadrat according to the Central European Flora Mapping System, altitude, date of collection, associated bryophytes and bryophytes within 50 meters. The identifiers of the quadrates according to the Central European Flora Mapping System were indicated in square brackets (Király *et al.* 2003). Each specimen was collected and determined by the author. The nomenclature follows Király (2009) for vascular plants, Söderström *et al.* (2016) for liverworts, Hill *et al.* (2006) for mosses.

Collected specimens are stored at the Cryptogamic Herbarium of the Department of Botany and Plant Physiology at the Eszterházy Károly University, Eger (EGR).

RESULTS AND DISCUSSION

New localities in Hungary

Győr-Moson-Sopron region

1. Sopron, *Quercus rubra* plantation, on mixed raw forest humus, 1 dm², N47°38'50.4" E16°33'24.0" [8365.3] 400 m, 01.11.2016. Associated bryophytes: *Dicranum montanum*, *Dicranum tauricum*, bryophytes within 50 meters: *Dicranum scoparium*, *Hypnum cupressiforme*, *Polytrichum formosum*, *Bryum capillare*.

2. Gönyű, old *Pinus nigra* plantation, on sandy soil, 2 dm², N47°43'41.1" E17°48'53.2" [8272.4], 120 m, 02.11.2016. Associated bryophytes: *Hypnum cupressiforme*, *Ceratodon purpureus*; bryophytes within 50 meters: *Bryum moravicum*, *Brachythecium rutabulum*.

Hajdú-Bihar region

3. Debrecen Martinka, old *Pinus sylvestris* plantation, on mixed raw forest humus, 4 dm², N47°34'19.4" E21°47'21.0" [8496.2] 132 m,

09.09.2017. Associated bryophytes: *Dicranum scoparium*, *Hypnum cupressiforme*, *Polytrichum formosum*; bryophytes within 50 meters: *Bryachytecium rutabulum*, *Dicranum scoparium*, *Hypnum cupressiforme*, *Leucobryum* sp., *Pohlia nutans*, *Polytrichum formosum*, *Pseudoscleropodium purum*.

4. Létavértes, in an *Pinus sylvestris* plantation, on decayed *Pinus nigra*, 1,5 cm², N47°23'47.6" E21°50'53.4", [8697.1] 124 m, 09.09.2017. Associated bryophytes: *Hypnum cupressiforme*, *Ceratodon purpureus*, *Dicranum montanum*; bryophytes within 50 meters: *Bryachytecium rutabulum*, *Ceratodon purpureus*, *Hypnum cupressiforme*.

5. Monostorpályi, at the edge of an old *Pinus sylvestris* plantation, on mixed raw forest humus, 0,5 m², N47°24'51.9" E21°47'10.2" [8596.4] 115 m, 09.09.2017. Associated bryophytes: *Hypnum cupressiforme*, *Ceratodon purpureus*; bryophytes within 50 meters: *Aulacomnium androgynum*, *Ceratodon purpureus*, *Dicranum scoparium*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Polytrichum piliferum*.

6. Vámospércs, in an old *Pinus sylvestris* plantation, on mixed raw forest humus, 1 cm², N47°29'55,5", E21°56'06.4" [8597.2] 137 m, 09.09.2017. Associated bryophytes: *Hypnum cupressiforme*, *Ceratodon purpureus*, Another bryophytes within 50 meters: *Dicranum scoparium*, *Leucobryum* sp., *Pseudoscleropodium purum*, *Ptilium crista-castrensis*.

7. Nyírácsád, Asszonyrész tanya, border of an old *Pinus nigra* plantation, on decayed *Pinus nigra* trunk, 1 cm², N47°38'36.2" E21°56'43.5" [8397.4] 160 m, 01.04.2018., bryophytes within 50 meters: *Brachytecium albicans*, *Brachytecium rutabulum*, *Bryum* sp., *Ceratodon purpureus*, *Dicranella heteromalla*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Pseudoscleropodium purum*.

8. Nyírábrány, glade of an old *Pinus sylvestris* plantation, on sandy soil surface, 1 dm², N47°34'57.0" E21°59'54.6" [8497.2] 152 m, 01.04.2018. Associated bryophyte: *Ceratodon purpureus*; bryophytes within 50 meters: *Brachytecium albicans*, *Brachytecium rutabulum*, *Bryum* sp., *Ceratodon purpureus*, *Dicranum polysetum*, *Dicranum scoparium*, *Dicranum tauricum*, *Eurhynchium angustirete*, *Hylocomium splendens*, *Hypnum cupressiforme*, *Plagiomnium affine*, *Pleurozium schreberi*, *Pohlia nutans*, *Polytrichum formosum*, *Pseudoscleropodium purum*, *Ptilium-crista castrensis*.

9. Nyírbéltek, an old *Pinus sylvestris* plantation, on sandy soil surface, 1 dm², N47°42'09.6" E22°08'50.9" [8298.4] 154 m, 01.04.2018., Associated bryophytes: *Hypnum cupressiforme*; Bryophytes within 50 meters: *Atrichum undulatum*, *Brachytheciastrum velutinum*, *Brachythecium albicans*, *Brachythecium rutabulum*, *Brachythecium salebrosum*, *Ceratodon purpureus*, *Funaria hygrometrica*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Polytrichum juniperinum*, *Pseudoscleropodium purum*.

Komárom-Esztergom region

10. Nagyszentjános, old *Pinus nigra* plantation, on decayed *Pinus nigra* trunk, 4 cm², N47°43'55.6" E17°53'39.0" [8273.3] 125 m, 02.11.2016. Associated bryophytes: *Hypnum cupressiforme*, *Herzogiella seligeri*, *Brachythecium rutabulum*. Bryophytes within 50 meters: *Abietinella abietina*, *Dicranum montanum*, *Eurhynchium angustirete*, *Hypnum cupressiforme*, *Lophocolea heterophylla*, *Plagiomnium affine*, *Plagiomnium undulatum*, *Pohlia nutans*, *Pseudoscleropodium purum*,

Somogy region

11. Szenta, in an old *Pinus sylvestris* plantation, on sandy soil surface, 1 dm², N46°15'26.7" E17°13'43.6" [9769.1] 163 m, 21.06.2018. Associated bryophytes: *Ceratodon purpureus*; bryophytes within 50 meters: *Bryum argenteum*, *Brachythecium rutabulum*, *Dicranum scoparium*, *Dicranum polysetum*, *Frullania dilatata*, *Hypnum cupressiforme*, *Platygyrium repens*, *Pleurozium schreberi*, *Polytrichum formosum*, *Polytrichum juniperinum*.

12. Nagybajom, in *Pinus sylvestris* plantation, on bare, sandy soil surface, 2 dm², N46°24'02.1" E17°28'34.8" [9570.4] 150 m, 21.06.2018. Associated bryophytes: *Hypnum cupressiforme*; Bryophytes within 50 meters: *Brachytheciastrum velutinum*, *Brachythecium rutabulum*, *Dicranum polysetum*, *Dicranum scoparium*, *Hypnum cupressiforme*, *Plagiomnium cuspidatum*, *Pleurozium schreberi*, *Polytrichum formosum*, *Pseudoscleropodium purum*.

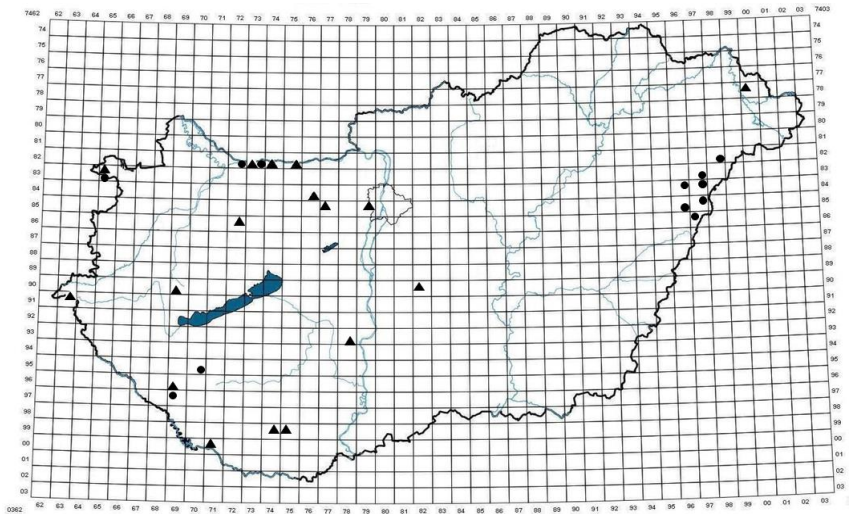


Figure 1. Distribution of *Campylopus introflexus* in Hungary; ● new occurrence, ▲ published occurrence (based on Szűcs *et al.* 2014, Csiky *et al.* 2017 and Matus *et al.* 2018).

During the investigations 12 new inland populations were successfully identified, of which 5 were from the Transdanubian region and 7 from Nyírség (Figure 1). Regarding their binding to substrate, we can claim that the majority of the moss cushions were bound to mixed raw forest humus of pine forests, less often to sandy soil, and in three case to decayed *Pinus*. The occurrence in Sopron was on colline level (400 m above sea), the rest was on lowland level (125-170 m above sea). The size of the cushions was between 4cm² and 0,5 m², the biggest one was located at the border of Monostorpályi village. The most common moss species to form associations were *Hypnum cupressiforme* and *Ceratodon purpureus*. In the population of Vámospércs *Ptilium crista-castrensis*, a threatened species listed on the national red list was also present (Mesterházy *et al.* 2017).

The majority of identified localities were bound to pine plantations, so the significance of this habitat (Szűcs *et al.* 2014) was successfully proven for inland populations.

The 12 localities are divided among 7 microregions (Kelet Belső Somogy, Nyugat Belső Somogy, Soproni-hegység, Győr-Tatai teraszvidék, Dél-Nyírség, Délkelet-Nyírség, Érmelléki löszös hát). Of these new are data of the moss species coming from Kelet Belső

Somogy, Dél-Nyírség, Délkelet-Nyírség, Érmelléki löszös hát microregions, as well as from Berettyó-Kőrös-vidék and Nyírség mesoregions.

Previously published records of *C. introflexus* are mainly from the Transdanubian region (Szűcs *et al.* 2014, Csiky *et al.* 2017, Matus *et al.* 2018), the currently identified Eastern Hungarian populations are far away from the majority of these known localities. Gusztáv Jakab in 1997 (Jakab 1997) published his work bryophyte flora of the Nyírség which does not mention the neophytic moss species. We can assume that *Campylopus introflexus* reached the pine forests of Nyírség in the past 20-30 years and formed several bigger populations since then. These current investigations also included several *Corynephorus canescens* grass populations in the Nyírség, however the species was not found there.

Based on the stable populations of *Campylopus introflexus* in Eastern Hungary, there is a likelihood that the moss species is also present in the pine forests of Western Romania located by the border.

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