

Acta Biologica Plantarum Agriensis 7: 116–126 (2019) DOI:10.21406/abpa.2019.7.116
ISSN 2061-6716 (Print), 2063-6725 (Online) Research article
<http://abpa.ektf.hu/>

THE BRYOPHYTE FLORA OF THE ERDŐTELEK ARBORETUM IN HUNGARY

Péter Szűcs & Gabriella Fintha*

*Eszterházy Károly University, Institute of Biology, Department of Botany and Plant
Physiology, H-3300 Eger, Leányka str. 6, Hungary;
E-mail: szucs.peter@uni-eszterhazy.hu

Abstract: According to the present investigations 54 bryophyte species were collected in the Arboretum of Erdőtelek, including 3 liverworts and 51 mosses. Most of this species are common in Hungary, one of them is vulnerable (*Orthotrichum patens*) and three species are listed as near threatened in the Hungarian Red Data List: *Brachythecium glareosum*, *Cirriphyllum piliferum* and *Orthotrichum obtusifolium*. In the recent paper a comparison of the number of bryophytes recorded in Hungarian botanical gardens and arboretums is presented.

Keywords: bryophyte diversity, NE-Hungary, comparison, red-list status, size of territories

INTRODUCTION

There are only a few publications on the bryophyte flora of the arboretums and botanical gardens of central and eastern european countries, for example Czech Republic (Hradílek 2012; Soldán 1999; Wallnerová 2015) Slovakia (Godovičová 2017) Romania (Ștefureac and Lungu 1961; Plămadă 1963), Poland (Wolski *et al.* 2012) and Ukraine (Mamchur *et al.* 2018).

The first significant description of the bryophyte flora of the hungarian botanical gardens were from Vácrátót (Vajda 1954) and Szigliget (Vajda 1968). Since then several new investigations were published in succession on mostly unexplored botanical gardens, arboretums, and parks: Tata (Agostyán) (Szűcs 2009), Zirc (Galambos 1992, Szűcs 2013), Martonvásár (Nagy *et al.* 2016), Soroksár (Németh and Papp 2016), Eger (Szűcs *et al.* 2017),

Gyöngyös (Mátraháza) (Szűcs *et al.* 2018), Budapest (Rigó *et al.* 2019) and Göd (Fintha *et al.* in press).

This paper introduces the bryophyte flora of the Arboretum of Erdőtelek, based on the investigations conducted in 2016 and 2019. Results were also compared with the bryophyte diversity of other Hungarian botanical gardens or arboretums.

MATERIALS AND METHODS

The nomenclature follows Söderström *et al.* (2016) for liverworts, Hill *et al.* (2006) for mosses. To establish the indicator and conservation status of taxa the Hungarian Red List was used (Papp *et al.* 2010). Site detail descriptions (in the *Appendix*) include data in the following order: habitats, GPS-coordinates, and date of collection. The designation of the quadrates according to the Central European Flora Mapping System were indicated in square brackets (Király *et al.* 2003). We used the Sørensen index (1948) for the comparison of the species composition of different localities. Collected specimens are deposited at the Cryptogamic Herbarium of the Department of Botany and Plant Physiology at the Eszterházy Károly University, Eger (EGR).

Study area

As a part of the Heves Plains (Hevesi sík) microregion, the present research area is located on the alluvium of the Laskó and Eger streams, at an altitude of 107-118 m. The area's topography has low lying ground, floodless, slightly undulating plain surface. Its climate is moderately warm and dry with an average annual temperature of 10-10.2 °C and annual precipitation is approximately 520-560 mm. The microregion, due to the low water flow, is typically a dry, water-scarce area with a mosaic like soil formation. In the study area the most characteristic are loess materials, covering river and swamp clay on which brown Chernozem forest soils developed. On the western part of the microregion the formerly sandy vegetation has disappeared, but near Erdőtelek, by the spring of Hanyi-rill, there is a remnant of an alder swamp (Dövényi 2010).

The arboretum of Erdőtelek is located on the outskirts of the Great Plain (Alföld) in Heves County, which total area is 25.5 hectares, of which only 6 hectares can be visited by public. The

garden was established and transformed by József Kovács from the castle park into a rich dendrological collection. His important merit was to create an arboretum rich in evergreens on one of the dry, warm and low rainfall areas of the Great Plain. After World War II, the garden was almost destroyed due to damage caused by incompetent workers. It was declared as a nature reserve in 1950. Occasionally, the tree trunks and the soil surface are covered by *Hedera helix*. Currently, the arboretum is a unit belonging to the Eszterházy Károly University. Maintenance consists of seasonal and local lawn mowing and leaf litter collection. There is an intensive horticulture activity in its the north-western part.

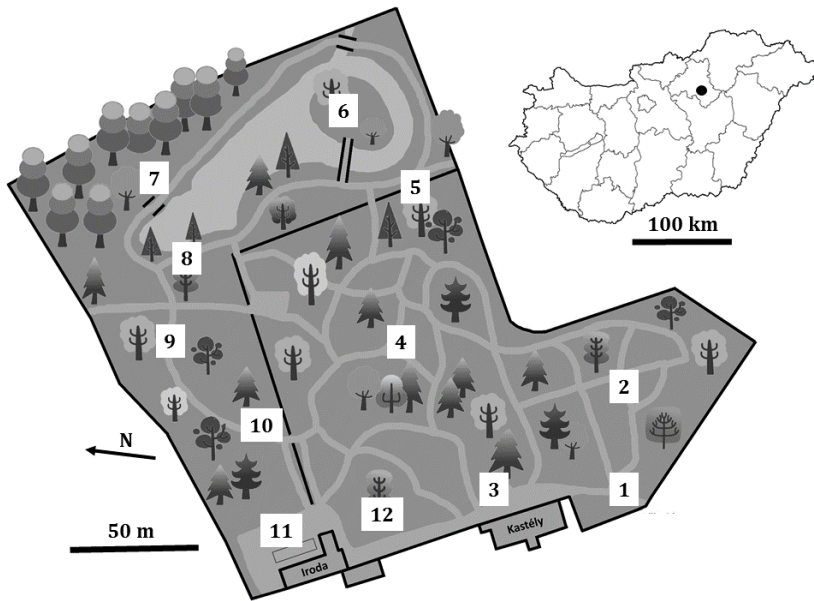


Figure 1. The collecting points in the Arboretum of Erdőtelek (map designed by Jana Táborská).

RESULTS AND DISCUSSION

Altogether 54 bryophyte species were identified from the Arboretum of Erdőtelek, including 3 liverworts and 51 mosses. Besides the common and frequent taxa, mosses which are still not threatened, but need attention (LC-att) according to the Hungarian Bryophyte Red List (Papp *et al.* 2010): *Brachythecium albicans*,

Orthotrichum speciosum, *Orthotrichum striatum*, *Tortula lanceola*, *Tortula papillosa* and *Tortula virescens*.

Near threatened (NT) species were: *Brachythecium glareosum*, *Cirriphyllum piliferum* and *Orthotrichum obtusifolium*. *Orthotrichum patens* belong to vulnerable (VU) category according to the red list. Indicator bryophytes which by their mere presence denote the higher level of conservation value of the habitat, also occur in the arboretum are *Cirriphyllum piliferum*, *Orthotrichum speciosum*, *Orthotrichum striatum*, *Tortula lanceola* and *Tortula papillosa*.

Some common species of the most measured Hungarian botanic gardens and arboretums, includes: *Amblystegium serpens*, *Barbula unguiculata*, *Brachythecium rutabulum*, *Bryum argenteum*, *Ceratodon purpureus*, *Hypnum cupressiforme*, *Leskea polycarpa*, *Orthotrichum anomalum*, *Orthotrichum diaphanum*, *Oxyrrhynchium hians*, *Radula complanata*, *Syntrichia ruralis* and *Tortula muralis* occur also in the Arboretum of Erdőtelek.

The low number of liverworts in the territory is similar to the majority of other Hungarian botanic gardens, arboretums and parks (Szűcs 2017).

Table 1 shows a comparison between the species composition of the Erdőtelek Arboretum with other previously bryologically explored man made habitats (Botanical Garden of Eger, Mátrai Sanatorium park, Balaton village) species in the region calculated by Sørensen index. The greatest similarity was found in the Botanical Garden of Eger (0.7), but not far behind the value of Balaton village (0.67). The biggest difference was found in comparison with the Mátrai Sanatorium park (0.53).

Table 1. Comparison the territory, the distance of localities, the altitude, the number of taxa and calculated Sørensen index of other territories with Arborétum of Erdőtelek.

Name of locality	territory (hectare)	distance from Arb. of Erdőtelek (km)	alt (meter)	number of taxa	Sørensen index
Bot. garden of Eger (Szűcs <i>et al.</i> 2017)	1	25	230	46	0.7
Mátrai Sanatorium, Mátraháza (Szűcs <i>et al.</i> 2018)	14	36	650- 700	65	0.53
Balaton village (Zsolyom & Szűcs 2018)	82	45	290- 320	61	0.67

Compared to the above mentioned gardens, the following taxa occur only in Erdőtelek: *Anomodon viticulosus*, *Brachythecium albicans*, *Leptobryum pyriforme*, *Orthotrichum patens*, *Plagiomnium rostratum*, *Porella platyhylla*, *Pseudocrossidium hornschuchianum*.

Figure 2 indicates the number of bryophytes identified in Hungarian botanical gardens, arboretums and parks compared to the size of these collection gardens.

It can be stated that most gardens have a larger area with higher species numbers. The arboretum of Erdőtelek, with its 6 hectares and 54 species, also reinforces this tendency and has almost the same value as the Huzella Garden in Göd (Fintha *et al.* in press). The difference is remarkable compared to Soroksár and Martonvásár. The different value of Tata (Agostyán) is also due to the fact that the complete bryophyte flora of the arboretum has not been investigated yet (Szűcs 2009).

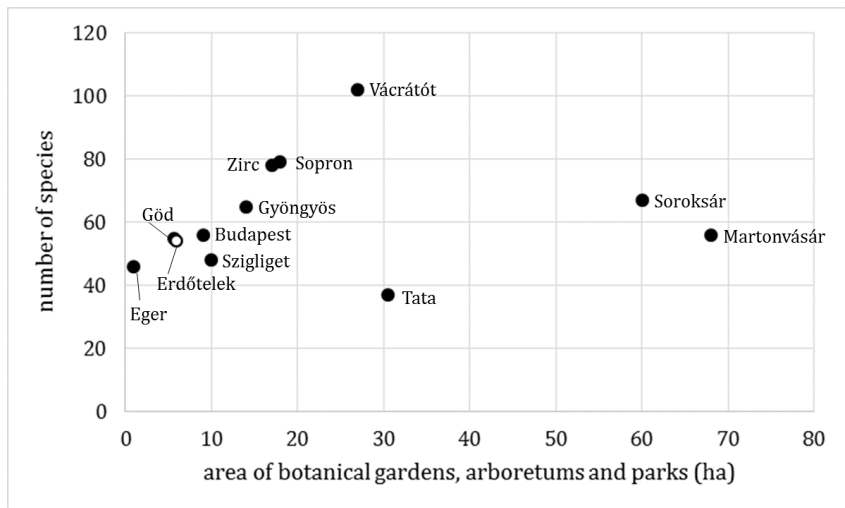


Figure 2. The number bryophytes recorded in Hungarian botanical gardens, arboretums and parks, in comparison to their sizes.

The data were obtained from the following sources: Tata (Agostyán) (Szűcs 2009), Budapest (Rigó *et al.* 2019), Eger, botanical garden (Szűcs *et al.* 2017), Erdőtelek (present work), Göd (Fintha *et al.* in press), Gyöngyös (Mátraháza) (Szűcs *et al.* 2018), Martonvásár (Nagy *et al.* 2016), Sopron (Szűcs 2017), Soroksár (Németh and Papp 2016), Szigliget (Vajda 1968), Vácrátót (Vajda 1954), Zirc (Galambos 1992, Szűcs 2013).

List of species

Numbers refer to sites (*Figure 1.*) listed in *Appendix*. The substrates given after a semicolon refer to all listed sites.

Marchantiophyta

Marchantia polymorpha L. – 11: soil in flower pots

Porella platyphylla (L.) Pfeiff. – 4: bark of old *Fraxinus*

Radula complanata (L.) Dumort. – 4: bark of old *Fraxinus* and *Quercus robur*; 7: bark of *Alnus glutinosa*; 10: bark of *Magnolia obovata*

Bryophyta

Amblystegium serpens (Hedw.) Schimp. – 1: decayed stump, tar paper; bark of *Castanea sativa* and *Padus cerasus*; 2: plaster; 4: bark of old *Fraxinus*, *Acer cappadocicum*, *Aesculus hippocastanum*, *Berberis vulgaris*; *Fraxinus excelsior*, *Tilia miranda*, *Tilia platyphyllos*, and *Malus halliana*; 5: tree base of *Betula pendula*; 8: bark of *Liriodendron tulipifera*

Anomodon viticulosus (Hedw.) Hook. & Taylor – 4: bark of not identified tree; 8: bark of *Liriodendron tulipifera*

Barbula unguiculata Hedw. – 2, 10, 12: soil; 11: soil in flower pots

Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen – 4: bark of *Quercus robur*; 5: soil

Brachythecium albicans (Hedw.) Schimp. – 5: tree base of *Betula pendula*

Brachythecium rutabulum (Hedw.) Schimp. 1, 4, 5: soil; 8: bark of *Liriodendron tulipifera*

Brachythecium glareosum (Bruch ex Spruce) Schimp. – 6: concrete

Bryum argenteum Hedw. – 12: disturbed and bare soil

Bryum caespiticium Hedw. – 11: soil in flower pots; 12: disturbed and bare soil

Bryum moravicum Podp. – 1: bark of *Castanea sativa*, tar paper, bark of old *Quercus robur*; 4: bark of *Quercus robur*, *Acer negundo*, and *Fagus sylvatica*; 8: bark of *Liriodendron tulipifera*

Calliergonella cuspidata (Hedw.) Loeske – 1, 2, 3, 4, 5, 10: soil

Campyliadelphus chrysophyllus (Brid.) R.S.Chopra – 11: soil in flower pots

- Ceratodon purpureus*** (Hedw.) Brid. – 11: soil in flower pots
Cirriphyllum piliferum (Hedw.) Grout – 1, 2, 3, 4, 5, 10: soil
Cirriphyllum crassinervinum (Taylor) Loeske & M.Fleisch. – 4:
bark of *Prunus*; 12: soil
Fissidens taxifolius Hedw. – 4, 5: shaded soil
Funaria hygrometrica Hedw. – 11: soil in flower pots; 12:
disturbed soil
Grimmia pulvinata (Hedw.) Sm. – 1: artificial rock, bark of *Padus
cerasus*
Homalothecium lutescens (Hedw.) H.Rob. – 1, 4: soil, bark of
Prunus
Homalothecium philippeanum (Spruce) Schimp. – 5: tree base of
Betula pendula
Hypnum cupressiforme Hedw. – 1: bark of *Castanea sativa*, *Padus
cerasus* and *Quercus robur*; 4: bark of *Prunus serrulata*, *Celtis
occidentalis*, *Crataegus oxyacantha*, *Acer cappadocicum*, *Acer
negundo*, *Aesculus hippocastanum*, *Berberis vulgaris*; *Fraxinus
excelsior*, *Quercus robur*, *Tilia miranda*, *Tilia platyphyllos*, and
Malus halliana; 7: bark of *Alnus glutinosa*; 10: bark of *Hibiscus
syriacus*; 12: bark of *Acer pseudoplatanus*
Isothecium alopecuroides (Lam. ex Dubois) Isov. – 4: tree base of
Quercus robur
Leptobryum pyriforme (Hedw.) Wilson – 12: disturbed soil
Leptodictyum riparium (Hedw.) Warnst. – 10: tree base of
Magnolia obovata
Leskea polycarpa Hedw. – 1: decayed stump; on bark of *Castanea
sativa* and old *Quercus robur*, and *Padus cerasus*; 3, 12: bark of
Acer pseudoplatanus; 4: bark of *Celtis occidentalis*, *Acer
cappadocicum*, *Acer negundo*, *Aesculus hippocastanum*, *Berberis
vulgaris*, *Fagus sylvatica*, *Fraxinus excelsior*, *Lonicera maackii*,
Tilia miranda, *Tilia platyphyllos*, and *Malus halliana*; 8: bark of
Liriodendron tulipifera; 10: bark of *Hibiscus syriacus*
Orthotrichum affine Schrad. ex Brid. – 1: bark of *Berberis vulgaris*;
5: bark of *Morus alba*; 10: bark of *Hibiscus syriacus*
Orthotrichum anomalum Hedw. – 1: tar paper; artificial rock
Orthotrichum diaphanum Schrad. ex Brid. – 4: bark of *Lonicera
maackii*; 7: bark of *Alnus glutinosa*; 10: bark of *Hibiscus syriacus*
Orthotrichum obtusifolium Brid. – 1: bark of *Padus cerasus* and
Berberis vulgaris; 4: bark of *Lonicera maackii*; 8: bark of
Liriodendron tulipifera; 10: bark of *Hibiscus syriacus*

- Orthotrichum pallens*** Bruch ex Brid. – 5: bark of *Morus alba*
Orthotrichum patens Bruch ex Brid. – 5: bark of *Morus alba*; 10: bark of *Magnolia obovata*
Orthotrichum speciosum Nees – 4: bark of *Prunus serrulata*; 10: bark of *Hibiscus syriacus*
Orthotrichum stramineum Hornsch. ex Brid. – 1: bark of *Padus cerasus*
Orthotrichum striatum Hedw. – 5: bark of *Morus alba*
Oxyrrhynchium hians (Hedw.) Loeske – 1, 2, 3, 4, 6, 7, 9: soil
Phascum cuspidatum Hedw. – 9: bare soil; 12: disturbed soil
Physcomitrium pyriforme (Hedw.) Bruch & Schimp. – 11: soil in flower pots
Plagiomnium cuspidatum (Hedw.) T.J.Kop. – 1: bark of old *Quercus robur*
Plagiomnium rostratum (Schrad.) T.J.Kop. – 12: bare soil
Plagiomnium undulatum (Hedw.) T.J.Kop. – 1, 2, 3, 4, 5, 10: wet soil
Pseudocrossidium hornschuchianum (Schultz) R.H.Zander – 10: soil with gravel
Pseudoscleropodium purum (Hedw.) M.Fleisch. – 1, 4, 8, 10: wet soil
Pylaisia polyantha (Hedw.) Schimp. – 1: bark of *Padus cerasus*; 4: bark of *Prunus serrulata* and *Berberis vulgaris*; 7: bark of *Alnus glutinosa*; 8: bark of *Liriodendron tulipifera*; 10: bark of *Hibiscus syriacus*
Rhytidiadelphus squarrosus (Hedw.) Warnst. – 3, 8, 9, 10: wet soil
Schistidium crassipilum H.H.Blom 1: artificial rock
Syntrichia ruralis (Hedw.) F.Weber & D.Mohr – 1: bark of *Padus cerasus*; 4: bark of *Berberis vulgaris*; 11: artificial rock
Syntrichia papillosa (Wilson) Jur. – 1: bark of old *Quercus robur* and *Padus cerasus*; 4: bark of *Celtis occidentalis* and *Lonicera maackii* 12: bark of *Acer pseudoplatanus*
Syntrichia virescens (De Not.) Ochyra – 1: tar paper, bark of old *Quercus robur* and *Padus cerasus*; 4: bark of *Celtis occidentalis*, *Fraxinus excelsior*, and *Lonicera maackii*; 7: bark of *Alnus glutinosa*; 12: bark of *Acer pseudoplatanus*
Thuidium assimile (Mitt.) A.Jaeger – 3, 4, 5, 9, 10: soil
Tortula lanceola R.H.Zander – 12: disturbed and bare soil
Tortula muralis Hedw. – 1: artificial rock; 5: plaster and brick; 7: concrete

Acknowledgement – The authors would like to express their gratitude to Andrea Sass-Gyarmati and Tamás Pócs for their useful comments. The first author’s research was supported by the grant EFOP-3.6.1-16-2016-00001 (“Complex improvement of research capacities and services at Eszterházy Károly University”). Special thanks to András Schmotzer and Jana Táborská for their help in literatures and preparing the map, and Gergely Baranyi for his help in field works. The authors are grateful to Tamás Zöllei (director of Arborétum of Erdőtelek) for permission the sample collection possible.

REFERENCES

- DÖVÉNYI, Z. (ed.) (2010). *Magyarország kistájainak katasztere*. MTA Földrajztudományi Kutatóintézet, Budapest, 824 pp.
- FINTHA, G., SZÚCS, P. & ERZBERGER, P. (in press). A gödi Huzella Kert mohafldrája. (The bryophyte flora of Huzella garden in Göd town (Pest county, Hungary)). *Botanikai Közlemények* **107**.
- GALAMBOS, I. (1992). A Zirci Arborétum mohafldrája. *Folia Musei historico-naturalis Bakonyiensis* **11**: 29–35.
- GODOVIČOVÁ, K. (2017). Bryophytes of the Botanical Garden of the Comenius University in Bratislava. *Acta Botanica Universitatis Comenianae* **52**: 29–34.
- HILL, M.O., BELL, N., BRUGGEMAN-NANNAENGA, M.A., BRUGUES, M., CANO, M.J., ENROTH, J., FLATBERG, K.I., FRAHM, J.-P., GALLEGRO, M.T., GARILLETI, R., GUERRA, J., HEDENÁS, L., HOLYOAK, D.T., HYVÖNEN, J., IGNATOV, M.S., LARA, F., MAZIMPAKA, V., MUNOZ, J. & SÖDERSTRÖM, L. (2006). An annotated checklist of the mosses of Europe and Macaronesia. *Journal of Bryology* **28**: 198–267.
<https://doi.org/10.1179/174328206X119998>
- HRADÍLEK, Z. (2012). *Mechorosty: mechorosty Botanické zahrady Přírodovědecké fakulty Univerzity Palackého v Olomouci*. 1. vyd. Olomouc: Univerzita Palackého v Olomouci.
- KIRÁLY, G., BALOGH, L., BARINA, Z., BARTHA, D., BAUER, N., BODONCZI, L., DANCZA, I., FARKAS, S., GALAMBOS, I., GULYÁS, G., MOLNÁR, V. A., NAGY, J., PIFKÓ, D., SCHMOTZER, A., SOMLYAI, L., SZMORAD, F., VIDÉKI, R., VOJTKÓ, A., & ZÓLYOMI, SZ. (2003). A magyarországi flóratérképezés módszertani alapjai. *Flora Pannonica* **1**: 3–20.
- MAMCHUR, Z., DRACH, Y. & DANYLKIV, I. (2018). Bryoflora of the “Pohulyanka” forest park (Lviv city) I. Changes in taxonomic composition under anthropogenic transformation. *Studia Biologica* **12**(1): 99–112.
<https://doi.org/10.30970/sbi.1201.542>
- NAGY, Z., MAJLÁTH, I., MOLNÁR, M. & ERZBERGER, P. (2016). A Martonvásári Kastélypark mohafldrája. (Bryofloristical study in the Brunszvik manor park in Martonvásár, Hungary). *Kitaibelia* **21**(2): 198–206.
<https://doi.org/10.17542/kit.21.198>
- NÉMETH, CS. & PAPP, B. (2016). Mohák a Soroksári Botanikus Kertben. In: HÖHN, M., PAPP, V. (szerk): Biodiverzitás a Soroksári Botanikus Kertben. Magyar Biodiverzitás-kutató Társaság and SZIE Kertészettudományi Kar, Soroksári Botanikus Kert, Budapest, pp. 111–149.
- PAPP, B., ERZBERGER, P., ÓDOR, P., HOCK, ZS., SZÖVÉNYI, P., SZURDOKI, E. & TÓTH, Z. (2010). Updated checklist and Red List of Hungarian Bryophytes. *Studia Botanica Hungarica* **41**: 31–59.

- PLĂMADĂ, E. (1963). Briofite din gradina Botanica din Cluj. *Studii si Cercetări de Biologie* **14**(2): 177–194.
- RIGÓ, A., KOVÁCS, A. & NÉMETH, CS. (2019). A Budai Arborétum mohafldrája. (Bryophyte flora of the Buda Arboretum (Budapest, Hungary)). *Botanikai Közlemények* **106**(2): 217–235.
<https://doi.org/10.17716/BotKozlem.2019.106.2.217>
- SOLDÁN, Z. (1999). The bryophyte flora of the Charles University Botanical Garden in Prague. *Novitates Botanicae ex Universitate Carolinae* **13**: 27–33.
- SØRENSEN, T. (1948). A method of establishing groups of equal amplitude in plant sociology based on similarity of species content. Kongelige Dansk e Videnskabernes Selskab. *Biologiske Skrifter* **4**: 1–34.
- SÖDERSTRÖM, L., HAGBORG, A., VON KONRAT, M., BARTHOLOMEW-BEGAN, S., BELL, D., BRISCOE, L., BROWN, E., CARGILL, D.C., COSTA, D.P., CRANDALL-STOTLER, B.J., COOPER, E.D., DAUPHIN, G., ENGEL, J.J., FELDBERG, K., GLENNY, D., GRADSTEIN, S.R., HE, X., HEINRICHS, J., HENTSCHEL, J., ILKIU-BORGES, A.L., KATAGIRI, T., KONSTANTINOVA, N.A., LARRAÍN, J., LONG, D.G., NEBEL, M., PÓCS, T., PUCHE, F., REINER-DREHWALD, E., RENNER, M.A.M., SASS-GYARMATI, A., SCHÄFER-VERWIMP, A., MORAGUES, J.G.S., STOTLER, R.E., SUKKHARAK, P., THIERS, B.M., URIBE, J., VÁÑA, J., VILLARREAL, J.C., WIGGINTON, M., ZHANG, L. & ZHU, R.-L. (2016). World checklist of hornworts and liverworts. *PhytoKeys* **59**: 1–828. <https://doi.org/10.3897/phytokeys.59.6261>
- ȘTEFUREAC, T.I. & LUNGU, L. (1961). Bryofite din Gradina Botanica din Bucuresti. *Acta Botanica Horti Bucarestiensis* **273**–280.
- SZÜCS, P. (2009). Mohaadatok az Agostyáni Arborétumból. (Data to the bryophyte flora of Agostyáni Arboreum, Tata, NW Hungary). *Komárom-Esztergom Megyei Múzeumok Közleményei* **15**: 159–164.
- SZÜCS, P. (2013). Kiegészítések a Zirci Arborétum mohafldrájához. (Contribution to the bryophyte flora of Arboretum Zirc (NW-Hungary)). *Folia Musei Historico-Naturalis Bakonyiensis* **30**: 47–54.
- SZÜCS, P. (2017). Bryophyte flora of the Botanic Garden of the University of Sopron (W Hungary). *Studia botanica hungarica* **48**: 77–88.
<https://doi.org/10.171110/StudBot.2017.48.1.77>
- SZÜCS, P., TÁBORSKÁ, J., BARANYI, G. & PÉNZESNÉ-KÓNYA, E. (2017). Short-term changes in the bryophyte int he botanical garden of Eszterházy Károly University (Eger, NE Hungary). *Acta Biologica Plantarium Argiensis* **5**(2): 52–60.
<https://doi.org/10.21406/abpa.2017.5.2.52>
- SZÜCS, P., BARANYI, G. & FINTHA, G. (2018). The Bryophyte flora of the park of Mátrai Gyógyintézet Sanatorium (NE Hungary). *Acta Biologica Plantarum Agriensis* **6**: 123–132. <https://doi.org/10.21406/abpa.2018.6.123>
- VAJDA, L. (1954). A Vácrátóti Botanikai Kutató Intézet Természetvédelmi Parkjának mohái. (Die Moose im Naturschutzparke des Botanischen Forschungsinstitutes von Vácrátót.) *Botanikai Közlemények* **45**: 63–66.
- VAJDA, L. (1968). A Szigligeti Arborétum mohái (The bryophytes of Arboretum Szigliget). *A Veszprém Megyei Múzeumok Közleményei* **7**: 237–239.
- WALLNEROVÁ, D. (2015). *Mechorosty v botanické zahradě Přírodovědecké fakulty Masarykovy univerzity v Brne*. Stredoškolská odborná činnost, Brno.
- WOLSKI, G.J., STEFANIAK, A. & KOWALKIEWICZ, B. (2012). Bryophytes of the experimental and teaching garden of the faculty of biology and environmental

protection, University of Łódź (Poland). *Ukrainian Botanical Journal* **69**(4): 519–529.

ZSÓLYOM, D. & SZŰCS, P. (2018). Balaton település (Heves megye) mohafldrája. (The bryophyte flora of Balaton village (Heves county, Hungary)). *Botanikai Közlemények* **105**(2): 231–242.

<https://doi.org/10.17716/BotKozlem.2018.105.2.231>

APPENDIX

Site details

Collection of the specimens was carried out in Heves County, in the territory of the local administrative unit of Erdőtelek village. Each collection point belongs to 8387.2 quadrant.

1. dendrological collection, woody vegetation, roadside, pagoda, stone fence; N°47.688352, E°20.312575 (06.07.2016, 01.05.2019, 16.11.2019)
2. dendrological collection, woody vegetation, roadside, bare soil surface; N°47.688446, E°20.313391 (06.07.2016, 01.05.2019, 16.11.2019)
3. mown lawn, bare soil surface, abandoned building, N°47.688792, E°20.312468 (06.07.2016, 01.05.2019, 16.11.2019)
4. dendrological collection, woody vegetation, roadside, bare and shaded soil surface, mown lawn N°47.689319, E°20.312998 (06.07.2016, 01.05.2019, 16.11.2019)
5. dendrological collection, woody vegetation, roadside, lakeshore, mown lawn, bare soil; N°47.689316, E°20.314538 (06.07.2016, 01.05.2019, 16.11.2019)
6. island, mown lawn, concrete; N°47.689590, E°20.315104 (06.07.2016, 01.05.2019, 16.11.2019)
7. *Alnus glutinosa* vegetation, stone bridge, lakeshore, roadside; N°47.690168, E°20.314798 (01.05.2019, P., 16.11.2019)
8. dendrological collection, woody vegetation, roadside, mown lawn; N°47.689945, E°20.314516 (06.07.2016, 01.05.2019, 16.11.2019)
9. dendrological collection, woody vegetation, roadside, mown lawn; N°47.689994, E°20.313759 (06.07.2016, 01.05.2019, 16.11.2019)
10. dendrological collection, woody vegetation, roadside, mown lawn; N°47.689957, E°20.313290 (06.07.2016, 01.05.2019, 16.11.2019)
11. horticulture, outbuildings, roadside; N°47.689807, E°20.312183 (01.05.2019, 16.11.2019)
12. horticulture, foil tent, woody vegetation, roadside, bare soil; N°47.689599, E°20.312385 (06.07.2016, 01.05.2019, 16.11.2019)

(submitted: 11.12.2019, accepted: 30.12.2019)