



# Bryophlora of Old Tree Plantation - Former Managed Forest in Stradch Arboretum

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## Abstract

In this work we screened for the diversity of bryophytes on the protected tree plantation (14 years ago it was used as managed forest) in Stradch Arboretum. It was shown that the majority of all bryophyte taxa identified were mosses (28 taxa), only 6 species belonged to liverworts. Terricolous moss coverage was about 0,07%. It confirms relatively low anthropogenic pressure on the plot. The number of noted taxa, which clearly preferred epixylic habitat and their mats surface were considerably lesser than such quantities for other taxa occurring on dead wood. Such a poverty of all identified liverworts and epixylic bryophytes, which is peculiar for managed forests points on low recovering rate of these bryophyte groups.

**Keywords:** Mosses; Liverworts; Epiphytes; Epixyles; Epigeics; Generalists

## Introduction

Bryophytes are unusually sensitive components of phytocenosis. They perfectly diagnose even scarcely changes of physical and chemical parameters of the natural environment [1, 2]. Therefore, bryophytes are often used as effective indicators of differencing ecological conditions. It concerns anthropogenic pressure [3, 4], climate [5], and also peculiarities of vessel plant biodiversity [6]. Recently researches of the recovering of managed forests became especially actual [7]. Thus, the investigations of bryophlora of now protected former managed forests are very important. From our point of view the old tree plantation in Stradch Arboretum matches quite for such researches because more than 100 years it was being used as managed forest and since 2006 it has been belonging to the Botanical Garden of Ukrainian National Forestry University (UNFU) and used only with scientific interests. The number of visitors on the plantation is minimal. Therefore, the goal of our research was the investigation of bryophlora of such a plantation.

## The study area

The study area, Arboretum of Botanical Garden of UNFU, is located in Yavoriv district of Lviv region, West-Ukraine. It is situated in the south-eastern part of Ukrainian Roztochia in 20 km to the west of Lviv city. Apart the collection part of the Arboretum (of 5,7

ha) there is 140 years old hornbeam-beech-pine-oak forest of 9,8 ha attached to the Arboretum territory (former part of the Educational Managed Forest of the UNFU (EMF of UNFU)). In the forest there grew about 9800 trees, average age of which was about 140 years. There the undergrowth consisted of regionally widespread species *Fagus sylvatica* L., *Carpinus betulus* L., *Sambucus nigra* L., *Swida alba* (L.) Opiz., *Euonymus europaea* L. The forest part of Stradch Arboretum borders with the EMF of UNFU. Several kilometers further to the west there located the Roztochia Nature Reserve of 2084,5 ha, which serves as considerable pool of bryophyte species, which usually don't occur in managed forests [3, 8]. Therefore, the investigation of the plantation bryophlora may become also as the first step of the studying of managed forests recovering.

## Sampling Methods

Although bryophlora of Ukrainian Roztochia was good investigated [4, 9-11], on the territory of Stradch Arboretum there was studied only epiphytic bryophlora growing on the undergrowth [12]. The investigation presented here was carried out in 2016 – 2018 years. For such a goal it was chosen flat forestry plot (the altitude difference was not more than 1,5 m) of 2 ha, which didn't contain big paths and was located within the Arboretum

forest part in about 100 m from the Arboretum collection part. The bryophlora was surveyed on 1) ground; 2) trees of the first and the second floor; 3) logs and stumps beginning since the second level of their decomposition according to [13]. There were surveyed 64 logs, 96 stumps and 360 living trees, among which there were 116 pines, 112 beeches, 104 oaks and 28 hornbeams. Epiphytic bryophlora investigations were carried out up to the altitude 2,5 m (on a trunk). All collected specimens were identified [10, 14] after their macroscopic (under 5x, 10x, 16x magnification) and microscopic evaluation (under 200x magnification). Surface area (S) of bryophyte mats was measured. Each bryophyte species was classified according to one of 4 ecological groups: epiphytes – clearly preferring living trees bark; epixiles – species usually occurring on decomposing wood; epigeic species are prevailly terrestrial; generalists – without clear substrate preference [8].

## Results and Discussion

On the investigated plot there were identified 33 bryophyte taxa, among them 27 taxa belonged to mosses (Bryophyta) and only 6 were liverworts (Marchantiophyta). Although near the investigated plot there is located managed forest, where many liverwort species are usually suppressed [3, 8], several kilometers further there located the Roztochia Nature Reserve of 2084,5 ha, which is considerable shelter for such taxa. Thus, such liverworts poverty of the plot exists thanks to low recovering rate of bryophlora determined by considerable distantion to the Nature Park. Among noted taxa there were 5 epigeits: *Atrichum undulatum* (Hedw.) P. Beauv., *Dicranella heteromalla* (Hedw.) Schimp., *Eurhynchium striatum* (Hedw.) Schimp., *Fissidens bryoides* Hedw., *Plagiomnium*

affine (Blandow ex Funck) T.J.Kop.; 5 epixilic taxa: *Cephalozia bicuspidata*\* (L.) Dumort., *Herzogiella seligeri* (Brid.) Z. Iwats, *Lophocolea bidentata*\* (L.) Dumort., *Lophocolea heterophylla*\* (Schrad.) Dumort., *Tetraphis pellucida* Hedw.; 14 epiphytic taxa: *Frullania dilatata*\* (L.) Dumort., *Homalia trichomanoides* Hedw., *Hypnum cupressiforme* var. *filiforme* Brid., *Leskea polycarpa* Ehrh. ex Hedw., *Metzgeria furcata*\* (L.) Corda, *Orthodicranum montanum* (Hedw.) Loeske, *Orthotrichum pumilum* Sw., *Orthotrichum stramineum* Hornsch. ex Brid., *Platygyrium repens* (Brid.) Schimp., *Pylaisia polyantha* (Hedw.) Schimp., *Radula complanata*\* (L.) Dumort., *Syntrichia viréscens* (De Not.) Ochyra, *Ulota crispa* (Hedw.) Brid., *Ulota bruchii* Hornsch. ex Brid.; 9 species of generalists: *Amblystegium serpens* (Hedw.) Schimp., *Brachytecium salebrosum* (Web. et Mohr) B., S. et G., *Hygroamblystegium váruium* (Hedw.) Mönk., *Hypnum cupressiforme* Hedw., *Mnium hornum* Hedw., *Plagiomnium cuspidatum* (Hedw.) T.J. Kop., *Plagiomnium rostratum* (Schrad.) T.J.Kop., *Plagiothecium curvifolium* Limpr., *Plagiothecium denticulatum* (Hedw.) Schimp. Liverworts are indicated by sign\*.

Substrate distribution of bryophytes is shown in Table 1. The generalist's taxa number and the surface area of the epigeics were bigger than analogical values of other bryophytes occurring on soil. Terricolous moss coverage was about 0,07%. According to [4], it indicates relatively low anthropogenic pressure on the plot. The taxa number and the surface area of the epixiles were considerably lesser than analogical values of other species growing on dead wood without preference to such a substrate. It may be the consequence of not fully recovering of bryophlora of the plot during last 14 years from the anthropogenic pressure of managed forestry.

**Table 1:** Substrate distribution of bryophytes.

Substrate	Taxa clearly preferring the substrate		All taxa occurring on the substrate	
	Taxa number	Mats surface S, m <sup>2</sup>	Taxa number	Mats surface S, m <sup>2</sup>
Soil	5	6,1±0,2	15	7,1±0,3
Dead wood	5	60,8±1,0	17	141,4±1,9
Living trees	14	133,4±3,9	27	224,9±4,8
All substrates	24	200,3±5,1	33	373,4±5,3

From our point of view the bryophytes recovering is so low partially thanks to wide strip of the neighboring managed forest dividing the plot from the Roztochia Nature Reserve. For this reason, the planned leaving of dead trees (especially of big diameter) for the conservation of bryophytes biodiversity may have not only local, but also regional character [8].

## References

1. Frego K (2007) Bryophytes as potential indicators of forest integrity. *Forest Ecology & Management* 242(1): 65-75.
2. Haeussler S, Macdonald S, Gachet S, Bergeron Y (2007) Understory and epiphytic vegetation as indicators of the ecological integrity of managed forests. *Forest Ecology & Management* 242(1): 83-91.
3. Andersson L, Hytteborn H (1991) Bryophytes and decaying wood - a comparison between managed and natural forest. *Holarct Ecol* 14: 121-130.
4. Rahulina M (2010) Terricolous mosses (Bryophyta) as indicators of recreation impacts on forest ecosystems (in Yavoriv National Nature Park). *Scientific basises of the biodiversity preservation* 8: 117-124.
5. Kushnevskaia H, Mirin D, Shorohova E (2007) Patterns of epixylic vegetation on spruce logs in late-successional boreal forests. *For Ecol Manage* 250: 25-33.
6. Nowińska R, Urbański P, Szewczyk W (2009) Species diversity of plants and fungi on logs of fallen trees of different species in oak-hornbeam forests. *Botanika-Steciana* 13: 109-124.
7. Keddy P A, Drummond CG (1996) *Ecological Properties for the Evaluation, Management, and Restoration of Temperate Deciduous Forest Ecosystems*. - *Ecological Applications* 6(3): 748-762.

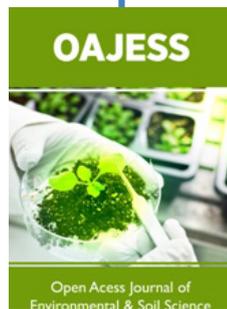
8. Wierzgoń M, Fojcik B (2014) Dead wood as a mainstay of bryophytes diversity in managed forest. - *Studia i Materiały CEPL w Rogowie* 41: 212-222.
9. Danylkiv I, Soroka M (1991) Bryophytes of the Roztochia Nature Reserve. UNFU, Lviv p. 78.
10. Danylkiv I, Lobachevska O, Mamchur Z, Soroka M, (2002) Bryophytes of Ukrainian Roztochia. - Institute of Ecology of the Carpathians, Lviv, pp. 320.
11. Rabyk I (2006) Liverworts (Hepaticophytina) in Ukrainian Roztochya. *Scientific basises of the biodiversity preservation* 7: 104-110.
12. Pundiak O (2019) The Investigation of Epiphytic Bryophlora on The Undergrowth in Stradch Arboretum. *Open Access Journal of Environmental and Soil Sciences* 2(4): 217-218.
13. Pyle C, Brown M (1998) A rapid system of decay classification for hardwood logs of the eastern deciduous forest floor. *J Torrey Bot Soc* 125(3): 237-245.
14. Atherton I et al. (2010) Mosses and Liverworts of Britain and Ireland: A Field Guide. Plymouth: Latimer Trend & Co. Ltd.



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