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Epiphytic and epixylic bryophyte communities of Hosiivskiy National Nature Park

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Abstract. The article presents 80 relevés of bryophyte communities on living trees and dead wood sampled within Hosiivskiy National Nature Park (Kyiv, Ukraine). They are referred to 16 associations of 5 classes (*Frullanio dilatatae-Leucodontetea sciuroidis*, *Cladonio digitatae-Lepidozietea reptantis*, *Neckeretea complanatae*, *Hylocomietea splendentis*, *Platyhypnidio-Fontinalietea antipyreticae*). Most frequent are communities dominated by *Hypnum cupressiforme* and *H. pallescens* of the class *Frullanio dilatatae-Leucodontetea sciuroidis* (on bark of living trees) and *Brachythecium rutabulum* of the class *Cladonio digitatae-Lepidozietea reptantis* (on dead wood). In mesic forests, trees are usually not inhabited by bryophyte communities. Much more often, they occur in wet forests, near water, and in mesic forests in ravines. Four associations are reported in Ukraine for the first time: *Callicladietum haldaniani* LeBlanc 1963, *Brachythecio rutabuli-Plagiomnietum cuspidati* (Felföldy 1941) Plamada 1982, *Brachythecio rivularis-Hygrohypnetum luridi* Philipp 1965, and *Leptodictyo riparii-Hygroamblystegietum varii* Hugonnot et Celle 2013.

Keywords: bryophyte communities, classification, syntaxonomy, Ukraine

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Реферат. У статті наведено 80 описів угруповань мохоподібних на корі живих дерев і мертвій деревині, виконаних у Києві (Україна). Всі угруповання зараховано до 16 асоціацій п'яти класів (*Frullanio dilatatae-Leucodontetea sciuroidis*, *Cladonio digitatae-Lepidozietea reptantis*, *Neckeretea complanatae*, *Hylocomietea splendentis*, *Platyhypnidio-Fontinalietea antipyreticae*). Найчастіше трапляються угруповання з домінуванням *Hypnum cupressiforme* і *H. pallescens* класу *Frullanio dilatatae-Leucodontetea sciuroidis* (на корі живих дерев) і домінуванням *Brachythecium rutabulum* класу *Cladonio digitatae-Lepidozietea reptantis* (на мертвій деревині). У мезофільних лісах, зазвичай на деревах немає угруповань бріофітів. Набагато частіше вони трапляються в сирих лісах, поблизу води та в ярах. Чотири асоціації наводяться для України вперше: *Callicladietum haldaniani* LeBlanc 1963, *Brachythecio rutabuli-Plagiomnietum cuspidati* (Felföldy 1941) Plamada 1982, *Brachythecio rivularis-Hygrohypnetum luridi* Philipp 1965, *Leptodictyo riparii-Hygroamblystegietum varii* Hugonnot & Celle 2013.

Ключові слова: класифікація, синтаксономія, угруповання мохоподібних, Україна

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Information about bryophyte vegetation in Ukraine, or more precisely in its Forest-Steppe zone, is presented in publications by S. Gapon (2009, 2012, 2014, 2017), Yu. Gapon (2015, 2017), S. Gapon and Yu. Gapon (2018). Brief descriptions of bryophyte communities in one of the parks of Kyiv city is provided by Virchenko and S. Gapon (2009). In our article, we report new material on this issue and its interpretation. The data were sampled in Hosiivskyi National Nature Park (Kyiv, Ukraine). Vegetation of the park is represented mainly by continental forests of *Pinus sylvestris* L. (*Pyrolo-Pinetea* Korneck 1974), deciduous forests dominated by *Quercus robur* L., *Carpinus betulus* L., *Acer campestre* L., *Fraxinus excelsior* L., *Alnus glutinosa* (L.) Gaertn. (*Carpino-Fagetea sylvaticae* Jakucs ex Passarge 1968, *Alno-Fraxinetalia excelsioris* Passarge 1968, *Quercetia pubescentis* Doing-Kraft ex Scamoni et Passarge 1959), and *Alnus glutinosa* swamps (*Alnetalia glutinosae* Tx. 1937). Bryophyte communities were studied on living and dead trees in 2017–2018. Totally 80 relevés have been sampled in different parts of the national park: Horikhuvatka and Hosiiv valleys in Hosiivskyi Wood, floodplain of the Vita River (Lisnyky Reserve), Teremky Wood, Dachne forestry, Sviatoshynske forestry. Each plot area was 4 dm². A total number of bryophyte species in the relevés is 41. Data were included in the second version (2018) of the database "Vegetation Database of Ukraine and Adjacent Parts of Russia" (GIVD index EU-UA-006).

Most relevés were assigned to associations using taxonomic arrangement of bryophyte communities by Marstaller (2006). Higher syntaxa are given according to *Vegetation of Europe...* by Mucina et al. (2016). Names of bryophyte species follow Boiko (2008).

The relevés were referred to 16 associations of 5 classes (constancies of species in higher syntaxa are shown in Table 1):

Frullanio dilatatae-Leucodontetea sciuroidis Mohan 1978

- Orthotrichetalia* Hadač in Klika & Hadač 1944
- Leskeion polycarpae* Barkman 1958
- Leskeetum polycarpae* Horvat 1932
- Ulotion crispae* Ochsner 1928
- Pylaisietum polyanthae* Gams ex Felföldy 1941
- Syntrichion laevipilae* Ochsner 1928
- Orthotrichetum fallacis* von Krusenstjerna 1945
- Dicranetalia scoparii* Barkman 1958
- Dicrano scoparii-Hypnion filiformis* Barkman 1958
- Platygyrietum reptantis* LeBlank ex Marstaller 1986

Callicladietum haldaniani LeBlanc 1963

Ptilidio pulcherrimi-Hypnetum pallescentis Herzog 1943 (*Ptilidio pulcherrimi-Hypnetum reptile* Gapon 2010)

Dicrano montani-Hypnetum cupressiformis Wiśniewski 1930

Dicrano scoparii-Hypnetum filiformis Barkman 1949

comm. *Dicranum tauricum* – [*Frullanio-Leucodontetea*]

Cladonio digitatae-Lepidozietea reptantis Ježek & Vondráček 1962

Brachythecietalia rutabulo-salebrosi Marstaller 1987

Bryo capillaris-Brachythecion rutabuli Lecointe 1975

Brachythecio salebrosi-Amblystegietum juratzkani (Sjögren ex Marstaller 1987) Marstaller 1987

Brachythecio rutabuli-Hypnetum cupressiformis Nörr 1969

Neckeretea complanatae Marstaller 1986

Neckeretalia complanatae Ježek & Vondráček 1962

Neckerion complanatae Šmarda & Hadač ex Klika 1946

Anomodontetum attenuati (Barkman 1958) Peciar 1965

Anomodontetum longifolii Waldheim 1944

Plagiomnio cuspidati-Homalietum trichomanoidis (Peciar 1965) Marstaller 1993

Hylocomietea splendentis Gillet ex Marstaller 1992

Hylocomietalia splendentis Gillet ex Vadam 1990

Eurhynchion striati Waldheim 1944

Brachythecio rutabuli-Plagiomnietum cuspidati (Felföldy 1941) Plamada 1982 (*Mnietum cuspidati* Felföldy 1941)

Climacion dendroidis Ștefureac 1941

Platyhypnidio-Fontinalietea antipyreticae Philippi 1956

Leptodictyetalia riparii Philippi 1956

Brachythecion rivularis Hertel 1974

Brachythecio rivularis-Hygrohypnetum luridi Philippi 1965 (*Brachythecietum rivularis* Herzog 1943)

Leptodictyo riparii-Hygroamblystegietum varii Hugonnot & Celle 2013

The class ***Frullanio dilatatae-Leucodontetea sciuroidis*** includes predominantly bryophyte communities on the bark of living trees. Order *Orthotrichetalia* (relevés are presented in Table 2) comprises vegetation of light-demanding mesophilous species on trees with

Table 1. Synoptic table of epiphytic and epixylic bryophyte communities of Holosiivskyi National Nature Park at the level of order

Class	FRU		CLE	NEC	HYL	PLA
	Ort	Dic	Bra	Nec	Hyl	Lep
Order	13	32	11	14	4	6
Number of plots	13	32	11	14	4	6
<i>Leskea polycarpa</i>	85	.	.	.	.	.
<i>Orthotrichum pumilum</i>	46	.	.	.	.	.
<i>Orthotrichum speciosum</i>	23	3	.	.	.	.
<i>Pylaisiella polyantha</i>	62	3	.	.	.	.
<i>Hypnum cupressiforme</i>	.	38	9	7	.	.
<i>Hypnum pallescens</i>	.	53	.	.	.	.
<i>Orthodicranum montanum</i>	.	37	.	.	.	.
<i>Platygyrium repens</i>	.	38	.	.	.	.
<i>Amblystegium serpens</i>	.	.	27	.	.	.
<i>Brachythecium rutabulum</i>	.	.	91	.	25	.
<i>Amblystegium subtile</i>	.	.	.	21	.	.
<i>Anomodon attenuatus</i>	.	.	.	62	.	.
<i>Anomodon longifolius</i>	.	.	.	14	.	.
<i>Anomodon viticulosus</i>	8	.	.	43	.	.
<i>Homalia trichomanoides</i>	.	.	.	29	.	.
<i>Climacium dendroides</i>	.	.	.	.	25	.
<i>Plagiomnium cuspidatum</i>	.	.	55	.	75	.
<i>Plagiomnium undulatum</i>	.	.	.	.	25	.
<i>Brachythecium rivulare</i>	.	.	.	.	.	17
<i>Leptodictyum riparium</i>	.	.	.	.	.	83
<i>Amblystegium serpens</i>	8	.	.	.	.	.
<i>Brachythecium reflexum</i>	.	.	9	.	.	.
<i>Brachythecium salebrosum</i>	23	3	27	21	.	.
<i>Bryum moravicum</i>	8	3	.	.	.	.
<i>Callicladium haldanianum</i>	.	6	.	.	.	.
<i>Climacium dendroides</i>	.	3	.	.	.	.
<i>Dicranum flagellare</i>	.	3	.	.	.	.
<i>Dicranum scoparium</i>	.	3	.	.	.	.
<i>Dicranum tauricum</i>	.	13	.	.	.	.
<i>Dicranum viride</i>	.	3	.	.	.	.
<i>Drepanocladus aduncus</i>	.	.	.	.	.	17
<i>Leskeella nervosa</i>	8	10	9	.	.	.
<i>Leucodon sciuroides</i>	.	.	.	7	.	.
<i>Lophocolea heterophylla</i>	.	10	27	.	.	.
<i>Orthotrichum obtusifolium</i>	8	.	.	.	.	.
<i>Plagiothecium succulentum</i>	.	.	18	.	25	.
<i>Pohlia nutans</i>	.	.	.	.	25	.
<i>Ptilidium pulcherrimum</i>	.	6	.	.	.	.
<i>Radula complanata</i>	31	13	9	7	.	.
<i>Rhizomnium punctatum</i>	.	.	9	.	.	.

Classes: FRU – *Frullania dilatatae-Leucodontetea sciuroidis*, CLE – *Cladonia digitatae-Lepidozietea reptantis*, NEC – *Neckeretea complanatae*, HYL – *Hylocomietea splendentis*, PLA – *Platyhypnidio-Fontinalietea antipyreticae*.

Orders: Ort – *Orthotrichetalia*, Dic – *Dicranetalia scoparii*, Bra – *Brachythecieta rutabulo-salebrosi*, Nec – *Neckeretalia complanatae*, Hyl – *Hylocomieta splendentis*, Lep – *Leptodictyeta riparii*

non-acid bark. Character species and dominants of three associations are, respectively, *Leskea polycarpa* Hedw., *Pylaisia polyantha* (Hedw.) Schimp., and *Orthotrichum pumilum* Sw. Available relevés were sampled on living trees of *Salix alba* L., *Salix babylonica* L., *Populus canescens* (Aiton) Sm., and *Fraxinus excelsior*.

Communities of the *Dicranetalia scoparii* (Tables 3, 4) occur mainly in mesic conditions on trees with acid bark (in our dataset, on living and dead trunks of *Alnus glutinosa*, *Betula pendula* Roth, *Carpinus betulus*, *Quercus robur*, *Robinia pseudoacacia* L.). In the park, the order is represented by 5 associations. Character species and typical dominants of four associations are, respectively, *Callicladium haldanianum* (Grev.) H.A.Crum, *Hypnum pallescens* (Hedw.) P.Beauv., *Platygyrium repens* (Brid.) Schimp., and *Orthodicranum montanum* (Hedw.) Loeske. The association *Dicrano scoparii-Hypnetum filiformis* is considered to be a basal association of *Dicrano scoparii-Hypnion filiformis* without character and positive differential species (Marstaller, 2006). Besides 5 associations, the comm. *Dicranum tauricum* – [*Frullanio-Leucodontetea*] was included in the *Dicranetalia scoparii*. *Dicranum tauricum* Sapjegin is a character species of the predominantly epixylic class *Cladonio digitatae-Lepidozietea reptantis*. In the park, bryophyte communities predominated by *Dicranum tauricum* were found on living trees of *Betula pendula* and *Alnus glutinosa* together with the species of the class *Frullanio dilatatae-Leucodontetea sciuroidis*.

The *Cladonio digitatae-Lepidozietea reptantis* (Table 5) is represented by one order, *Brachythecietalia rutabulo-salebrosi*, with one alliance and two associations. It includes predominantly epixylic communities of sub-hygrophilous pleurocarpous mosses. In the park, they were sampled on dead trees of *Alnus glutinosa* and *Quercus robur*. One relevé was made on a living tree of *Alnus glutinosa*. The most frequent dominant is *Brachythecium rutabulum* (Hedw.) Schimp. One association is distinguished by the presence of *Brachythecium salebrosum* (Hoffm. ex F.Weber & D.Mohr) Schimp. and *Amblystegium serpens* (Hedw.) Schimp.

The *Neckeretea complanatae* (Table 6) comprises some communities of large mat-forming sciophytic bryophytes preferring base-rich substrates. In Hosiivskyi National Nature Park, they were described on living trees of *Fraxinus excelsior* (most plots), *Acer platanoides* L., *Salix alba*, *Quercus robur*, and *Tilia cordata* Mill. Three identified in the park associations are characterised respectively by *Anomodon attenuatus*

(Hedw.) Huebener, *A. longifolius* (Schleich. ex Brid.) Hartm., and *Homalia trichomanoides* (Hedw.) Schimp. In addition, an unidentified community with dominance of *Anomodon viticulosus* (Hedw.) Hook. & Taylor was found. Communities of this class are rarer in the park than those of the classes *Frullanio dilatatae-Leucodontetea sciuroidis* and *Cladonio digitatae-Lepidozietea reptantis*.

The *Platyhypnidio-Fontinalietea antipyreticae* (Table 7) is a class of hydrophilous bryophyte vegetation occurring in and near fresh waters. Relevés of this class were sampled on dead trunks and branches of *Alnus glutinosa* lying in floodplains of rivulets. Height above the ground was from 10 to 45 cm. The class is represented by two associations; both contain only species-poor variants. Their character and main dominant species are respectively *Leptodictyum riparium* (Hedw.) Warnst. and *Brachythecium rivulare* Schimp. Relevés with *Leptodictyum riparium* were identified as the association *Leptodictyo riparii-Hygroamblystegietum varii* (Hugonnot, Celle, 2013). Our relevés of this association do not include the second character species *Hygroamblystegium varium* (Hedw.) Monk.; however, this species occurs in the park in the same habitats. The authors of the association placed it in the *Cladonio digitatae-Lepidozietea reptantis*. Taking into account that the association is confined to wet habitats and *Leptodictyum riparium* is a character species of the class *Platyhypnidio-Fontinalietea antipyreticae* (Marstaller, 2006), the association may belong to this class.

The *Hylcomietea splendentis* (Table 7) is a class of predominantly epigeic bryophyte communities. In the park, they are described on dead logs of *Alnus glutinosa* and *Quercus robur* at the late decay stage.

In Hosiivskyi National Nature Park, most frequent dominants of bryophyte communities are *Hypnum cupressiforme* and *H. pallescens* on living trees and *Brachythecium rutabulum* on dead wood. Trees in mesic oak-hornbeam forests usually do not have bryophyte communities. Much more often, they occur in wet forests, near water, and in mesic forests in ravines.

Associations *Callicladietum haldaniani* LeBlanc 1963, *Brachythecio rutabuli-Plagiomnietum cuspidati* (Felföldy 1941) Plamada 1982, *Brachythecio rivularis-Hygrohypnetum luridi* Philipp 1965, and *Leptodictyo riparii-Hygroamblystegietum varii* Hugonnot et Celle 2013 are reported from Ukraine for the first time. The latter two associations are represented by the impoverished variants without a part of their diagnostic species.

Table 2. Relevés of the order *Orthotrichetalia* Hadač in Klika et Hadač 1944

Number in table	1	2	3	4	5	6	7	8	9	10	11	12	13
Number in database of Holosiivskiyi NNP	1517	1513	1514	1567	1502	1580	1576	1515	1579	1504	1537	1583	1503
Number in database EU-UA-006	3878	3874	3875	3928	3863	3941	3937	3876	3940	3865	3898	3944	3864
Area (dm ²)	4	4	4	4	4	4	4	4	4	4	4	4	4
Aspect	NWW	SW	NE	SWW	S	W	NEE	NNW	W	SW	SSE	W	SW
Inclination (°)	70	80	80	70	75	75	75	80	72	75	75	80	75
Cover of bryophytes (%)	85	65	75	77	50	90	90	55	55	40	60	90	40
Number of bryophyte species	1	2	2	2	2	5	6	2	5	3	5	2	4
Living tree	*	*	*	*	*	*	*	*	*	*	*	*	*
Tree species	Cb	Pca	Pca	Fex	Sba	Pca	Cavi	Apl	?	Sba	Cb	Sa	Sba
Height above the ground (cm)	25	170	170	50	140	180	140	60	160	190	110	220	180
Association	1									2			3
Ch <i>Frullanio-Leucodontetea</i>													
<i>Leskea polycarpa</i>	85	63	74	75	49	80	60	37	80	10	.	.	10
<i>Pylaisiella polyantha</i>	.	.	.	.	.	3	10	18	3	37	48	70	10
<i>Orthotrichum pumilum</i>	.	.	.	.	1	5	8	.	5	3	.	.	20
<i>Orthotrichum speciosum</i>	.	.	.	.	.	.	7	.	.	.	+	20	.
<i>Orthotrichum obtusifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	+
Ch <i>Cladonio-Lepidozietea</i>													
<i>Amblystegium serpens</i>	.	.	.	.	.	.	5	.	.	.	.	.	.
<i>Brachythecium salebrosum</i>	.	.	1	.	.	2	.	.	2	.	.	.	.
<i>Radula complanata</i>	.	.	.	2	.	+	.	.	+	.	1	.	.
Ch <i>Neckeretea</i>													
<i>Anomodon viticulosus</i>	.	2	.	.	.	.	.	.	.	.	.	.	.
<i>Leskeela nervosa</i>	.	.	.	.	.	.	.	.	.	.	10	.	.
Other species													
<i>Bryum moravicum</i>	.	.	.	.	.	.	.	.	.	.	+	.	.
<i>Orthotrichum</i> sp.	.	.	.	.	.	.	+	.	.	.	.	.	.

Associations: 1 – *Leskeetum polycarpae*; 2 – *Pylaisietum polyanthae*; 3 – *Orthotrichetum pumili*.

Abbreviations of tree names: Agl – *Alnus glutinosa*, Cavi – *Cerasus avium*, Cb – *Carpinus betulus*, Fex – *Fraxinus excelsior*, Pca – *Populus × canescens*, Qr – *Quercus robur*, Sa – *Salix alba*, Sba – *Salix babylonica*.

Dates and locations:

1517 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.38911°, longitude 30.50541°, accuracy 5 m;

1513 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39222°, longitude 30.51064°, accuracy 8 m;

1514 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39222°, longitude 30.51064°, accuracy 8 m;

1567 – 2017.05.02, Lisnyky reserve, latitude 50.29599°, longitude 30.53662°, accuracy 5 m;

1502 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39361°, longitude 30.51118°, accuracy 9 m;

1580 – 2018.04.26, Teremky, latitude 50.36022°, longitude 30.44494°, accuracy 6 m;

1576 – 2018.04.26, Teremky, latitude 50.36013°, longitude 30.44732°, accuracy 6 m;

1515 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39110°, longitude 30.51017°, accuracy 8 m;

1579 – 2018.04.26, Teremky, latitude 50.35863°, longitude 30.44836°, accuracy 6 m;

1504 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39361°, longitude 30.51118°, accuracy 9 m;

1537 – 2017.04.30, Holosiivskiyi Wood, latitude 50.37232°, longitude 30.49988°, accuracy 8 m;

1583 – 2018.05.05, Sviatoshynske forestry, latitude 50.49061°, longitude 30.31212°, accuracy 6 m;

1503 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39361°, longitude 30.51118°, accuracy 9 m.

Table 3. Relevés of the order *Dicranetalia scopariae* Barkman 1958 (associations *Platygyrietum repentis* Leblanc 1963, *Callicladietum haldaniani* Leblanc 1963), com. *Dicranum tauricum* - [*Frullanio-Leucodonteteta*]

Number in table	1	2	3	4	5	6	7	8	9	10	11	12	13
Number in database of Holosiivskiyi NNP	1505	1506	1511	1547	1520	1550	1561	1590	1563	1512	1573	1574	1584
Number in database EU-UA-006	3866	3867	3872	3908	3881	3911	3922	3951	3924	3873	3934	3935	3945
Area (dm ²)	4	4	4	4	4	4	4	4	4	4	4	4	4
Aspect	SWW	SW	SE	W	SWW	-	NEE	NW	SEE	NWW	NW	NW	SW
Inclination (°)	60	70	60	80	80	0	78	77	70	80	70	70	70
Cover of bryophytes (%)	60	40	80	60	50	70	65	45	70	75	90	95	35
Number of bryophyte species	1	2	4	3	1	5	3	2	2	1	5	5	2
Living tree	*	*	-	*	*	-	*	*	-	-	*	*	*
Tree species	Qr	Agl	Agl	Qr	Qr	Fex	Bp	Agl	Qr	Agl	Bp	Bp	Agl
Height above the ground (cm)	15	130	60	100	10	60	170	130	50	35	60	90	160
Association	1						2			3			
Ch <i>Frullanio-Leucodonteteta</i>													
<i>Platygyrium repens</i>	60	40	70	55	50	10	60	40	.	.	.	1	.
<i>Callicladium haldanianum</i>	.	.	.	.	.	.	.	.	70	75	.	.	.
<i>Radula complanata</i>	.	.	.	5	.	5	.	.	.	.	.	.	.
<i>Hypnum cupressiforme</i>	.	.	+	.	.	40	.	.	.	.	.	.	.
<i>Hypnum pallescens</i>	.	+	+	.	.	.	5	.	.	.	.	1	5
<i>Lophocolea heterophylla</i>	.	.	.	.	.	.	.	.	.	.	3	.	.
<i>Orthodicranum montanum</i>	.	.	+	.	.	.	+	5	.	.	1	3	.
<i>Pylaisiella polyantha</i>	.	.	.	.	.	10	.	.	.	.	.	.	.
Other species													
<i>Climacium dendroides</i>	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Dicranum tauricum</i>	.	.	.	.	.	.	.	.	.	.	80	80	30
<i>Dicranum scoparium</i>	.	.	.	.	.	.	.	.	.	.	1	.	.
<i>Leskeella nervosa</i>	.	.	.	+	.	.	.	.	.	.	.	.	.
<i>Orthotrichum speciosum</i>	.	.	.	.	.	5	.	.	.	.	.	.	.
<i>Ptilidium pulcherrimum</i>	.	.	.	.	.	.	.	.	.	.	5	5	.

Associations: 1 – *Platygyrietum repentis*; 2 – *Callicladietum haldaniani*; 3 – com. *Dicranum tauricum* – [*Frullanio-Leucodonteteta*]. Abbreviations of tree names: Agl – *Alnus glutinosa*, Bp – *Betula pendula*, Fex – *Fraxinus excelsior*, Qr – *Quercus robur*.

Dates and locations:

1505 – 2017.04.28, Maksym Rylskiy Holosiivskiy Park, latitude 50.39382°, longitude 30.51229°, accuracy 8 m;
 1506 – 2017.04.28, Maksym Rylskiy Holosiivskiy Park, latitude 50.39316°, longitude 30.51200°, accuracy 8 m;
 1511 – 2017.04.28, Maksym Rylskiy Holosiivskiy Park, latitude 50.39244°, longitude 30.51063°, accuracy 8 m;
 1547 – 2017.04.30, Lisnyky reserve, latitude 50.29635°, longitude 30.53629°, accuracy 5 m;
 1520 – 2017.04.28, Maksym Rylskiy Holosiivskiy Park, latitude 50.39020°, longitude 30.50330°, accuracy 5 m;
 1550 – 2017.05.02, Lisnyky reserve, latitude 50.29620°, longitude 30.53612°, accuracy 4 m;
 1561 – 2017.05.02, Lisnyky reserve, latitude 50.29702°, longitude 30.54237°, accuracy 6 m;
 1590 – 2018.05.05, Sviatoshynske forestry, latitude 50.49115°, longitude 30.31044°, accuracy 6 m;
 1565 – 2017.05.02, Lisnyky reserve, latitude 50.29658°, longitude 30.54676°, accuracy 7 m;
 1512 – 2017.04.28, Maksym Rylskiy Holosiivskiy Park, latitude 50.39244°, longitude 30.51063°, accuracy 8 m;
 1573 – 2018.04.25, Dachne forestry, latitude 50.25709°, longitude 30.60036°, accuracy 6 m;
 1574 – 2018.04.25, Dachne forestry, latitude 50.25709°, longitude 30.60036°, accuracy 6 m;
 1584 – 2018.05.05, Sviatoshynske forestry, latitude 50.490585°, longitude 30.31132°, accuracy 6 m.

Table 4. Relevés of the order *Dicranetalia scopariae* Barkman 1958 (associations *Ptilidio pulcherrimi-Hypnetum pallescentis* Herzog 1943, *Dicrano montani-Hypnetum cupressiformis* Wiśniewski 1930, *Dicrano scoparii-Hypnetum filiformis* Barkman 1949)

Number in table	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Number in database of Holosiivskiyi NNP	1575	1587	1510	1578	1572	1560	1519	1589	1581	1588	1530	1584	1541	1529	1531	1501	1507	1509	1518	
Number in database EU-UA-006	3936	3948	3871	3939	3933	3921	3880	3950	3942	3949	3891	3945	3902	3890	3892	3862	3868	3870	3879	
Area (dm ²)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Aspect	W	W	SE	NWW	?	E	NNW	NNW	NNW	NW	N	SW	W	W	S	NWW	NWW	.	NWW	
Inclination (°)	65	80	45	75	75	65	50	65	70	70	65	70	80	22	45	75	55	0	85	
Cover of bryophytes (%)	70	90	80	90	55	85	90	70	80	55	85	35	90	85	85	65	50	90	90	
Number of bryophyte species	4	2	1	3	2	2	3	3	2	2	4	2	2	3	3	2	1	1	1	
Living tree	*	*	-	*	*	*	*	*	*	*	-	*	*	-	-	*	*	-	*	
Tree species	Bp	Agl	Agl	Bp	Bp	Bp	Qr	Agl	Qr	Agl	Qr	Agl	Bp	Qr	Qr	Rps	Agl	Agl	Cb	
Height above the ground (cm)	140	40	60	25	110	120	10	120	40	120	20	150	100	?	110	130	110	60	30	
Association	1									2					3					
Ch <i>Frullania dilatatae</i>-<i>Leucodontetea sciuroidis</i>																				
<i>Hypnum pallescens</i>	60	90	80	68	54	80	30	60	70	5	.	5	5	.	.	.	.	.	.
<i>Orthodicranum montanum</i>	2	.	.	.	.	.	.	5	10	50	55	30	85	.	.	.	.	.	.
<i>Hypnum cupressiforme</i>	.	.	.	.	.	5	60	5	.	.	28	.	.	70	60	60	50	90	90
<i>Dicranum tauricum</i>	.	.	.	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leskeella nervosa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	15	20	.	.	.	.
<i>Platygyrium repens</i>	5	+	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.
<i>Radula complanata</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Ch <i>Cladonio-Lepidozietea</i>																				
<i>Brachythecium salebrosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Dicranum flagellare</i>	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dicranum viride</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
<i>Lophocolea heterophylla</i>	.	.	.	2	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Other species																				
<i>Bryum moravicum</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.

Associations: 1 – *Ptilidio pulcherrimi-Hypnetum pallescentis*; 2 – *Dicrano montani-Hypnetum cupressiformi*; 3 – *Dicrano scoparii-Hypnetum filiformis*.

Abbreviations of tree names: Agl – *Alnus glutinosa*, Bp – *Betula pendula*, Cb – *Carpinus betulus*, Qr – *Quercus robur*, Rps – *Robinia pseudoacacia*.

Dates and locations:

- 1575 – 2018.04.25, Dachne forestry, latitude 50.25323°, longitude 30.60261°, accuracy 6 m;
- 1587 – 2018.05.05, Sviatoshynske forestry, latitude 50.49108°, longitude 30.31033°, accuracy 6 m;
- 1510 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39258°, longitude 30.51060°, accuracy 11 m;
- 1578 – 2018.04.26, Teremky, latitude 50.35712°, longitude 30.44472°, accuracy 6 m;
- 1573 – 2018.04.25, Dachne forestry, latitude 50.25709°, longitude 30.60036°, accuracy 6 m;
- 1560 – 2017.05.02, Lisnyky reserve, latitude 50.29702°, longitude 30.54237°, accuracy 6 m;
- 1519 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.38839°, longitude 30.50451°, accuracy 8 m;
- 1589 – 2018.05.05, Sviatoshynske forestry, latitude 50.49108°, longitude 30.31033°, accuracy 10 m;
- 1581 – 2018.05.05, Sviatoshynske forestry, latitude 50.48955°, longitude 30.31427°, accuracy 6 m;
- 1574 – 2018.04.25, Dachne forestry, latitude 50.25709°, longitude 30.60036°, accuracy 6 m;
- 1588 – 2018.05.05, Sviatoshynske forestry, latitude 50.49108°, longitude 30.310328°, accuracy 6 m;
- 1530 – 2017.04.30, Holosiivskiyi Wood, latitude 50.37303°, longitude 30.50025°, accuracy 8 m;
- 1584 – 2018.05.05, Sviatoshynske forestry, latitude 50.490585°, longitude 30.31132°, accuracy 6 m;
- 1541 – 2017.04.30, Holosiivskiyi Wood, latitude 50.37177°, longitude 30.49885°, accuracy 6 m;
- 1529 – 2017.04.30, Holosiivskiyi Wood, latitude 50.37335°, longitude 30.499780°, accuracy 9 m;
- 1531 – 2017.04.30, Holosiivskiyi Wood, latitude 50.37309°, longitude 30.50000°, accuracy 7 m;
- 1501 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39351°, longitude 30.51041°, accuracy 8 m;
- 1507 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.39316°, longitude 30.51200°, accuracy 8 m;
- 1509 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.37275°, longitude 30.51092°, accuracy 8 m;
- 1518 – 2017.04.28, Maksym Rylskiyi Holosiivskiyi Park, latitude 50.38853°, longitude 30.50478°, accuracy 6 m.

Table 5. Relevés of the order *Brachythecietalia rutabulo-salebrosi* Marstaller 1987

Number in table	1	2	3	4	5	6	7	8	9	10	11
Number in database of Hološivskyi NNP	1521	1508	1524	1523	1527	1528	1534	1533	1525	1585	1577
Number in database EU-UA-006	3882	3869	3885	3884	3888	3889	3895	3894	3886	3946	3938
Area (dm ²)	4	4	4	4	4	4	4	4	4	4	4
Aspect	NE	N	NNW	N	NW	NW	NW	-	-	NE	NW
Inclination (°)	50	45	75	60	60	75	85	0	0	50	75
Cover of bryophytes (%)	95	80	50	80	85	80	95	90	90	90	95
Number of bryophyte species	5	1	3	3	6	3	3	1	2	3	2
Living tree	-	*	-	-	-	-	-	-	-	-	-
Tree species	Qr	Agl	Agl	Agl	Qr	Qr	Agl	Agl	Agl	Agl	Qr
Height above the ground (cm)	25	60	25	25	110	100	20	20	10	15	40
Syntaxon	1	2								3	
Ch Cladonio-Lepidozietea											
<i>Brachythecium salebrosum</i>	20	.	.	.	1	.	.	.	.	.	10
<i>Amblystegium serpens</i>	15	.	.	5	.	5	.	.	.	.	.
<i>Brachythecium rutabulum</i>	40	80	17	65	50	70	60	90	60	10	.
<i>Brachythecium reflexum</i>	.	.	.	.	.	.	.	.	.	.	85
<i>Lophocolea heterophylla</i>	5	.	3	.	.	.	.	.	.	+	.
<i>Plagiothecium succulentum</i>	.	.	30	.	.	.	15	.	.	.	.
Ch Frullanio-Leucodontetea											
<i>Leskeella nervosa</i>	.	.	.	.	30	.	.	.	.	.	.
<i>Hypnum cupressiforme</i>	.	.	.	.	1	.	.	.	.	.	.
<i>Radula complanata</i>	.	.	.	.	3	.	.	.	.	.	.
Other species											
<i>Plagiomnium cuspidatum</i>	5	.	.	10	+	5	20	.	30	.	.
<i>Rhizomnium punctatum</i>	.	.	.	.	.	.	.	.	.	80	.

Syntaxa: 1 – *Brachythecio salebrosi-Amblystegietum juratzkani*; 2 – *Brachythecio rutabuli-Hypnetum cupressiformis*; 3 – *Bryo capillaris-Brachythecion rutabuli*, association is not identified.

Abbreviations of tree names: Agl – *Alnus glutinosa*, Qr – *Quercus robur*.

Dates and locations:

1521 – 2017.04.30, Hološivskyi Wood, latitude 50.37441°, longitude 30.50001°, accuracy 6 m;

1508 – 2017.04.28, Maksym Rylskyi Hološivskyi Park, latitude 50.39275°, longitude 30.51092°, accuracy 8 m;

1524 – 2017.04.30, Hološivskyi Wood, latitude 50.37315°, longitude 30.49993°, accuracy 11 m;

1523 – 2017.04.30, Hološivskyi Wood, latitude 50.37343°, longitude 30.49963°, accuracy 10 m;

1527 – 2017.04.30, Hološivskyi Wood, latitude 50.37335°, longitude 30.49978°, accuracy 9 m;

1528 – 2017.04.30, Hološivskyi Wood, latitude 50.37335°, longitude 30.49978°, accuracy 9 m;

1534 – 2017.04.30, Hološivskyi Wood, latitude 50.37282°, longitude 30.49983°, accuracy 9 m;

1533 – 2017.04.30, Hološivskyi Wood, latitude 50.37282°, longitude 30.49993°, accuracy 9 m;

1525 – 2017.04.30, Hološivskyi Wood, latitude 50.37361°, longitude 30.49975°, accuracy 10 m;

1585 – 2017.05.05, Sviatoshynske forestry, latitude 50.37315°, longitude 30.31111°, accuracy 6 m;

1577 – 2017.04.26, Teremky, latitude 50.35773°, longitude 30.44586°, accuracy 6 m.

Table 6. Relevés of the class *Neckeretea complanatae* Marstaller 1986

Number in table	1	2	3	5	6	7	8	9	10	11	12	13	14
Number in database of Holosiivskyi NNP	1549	1566	1571	1570	1565	1538	1539	1552	1564	1551	1546	1548	1553
Number in database EU-UA-006	3910	3927	3932	3931	3926	3899	3900	3913	3925	3912	3907	3909	3914
Area (dm ²)	4	4	4	4	4	4	4	4	4	4	4	4	4
Aspect	SW	SWW	-	W	NE	E	SSW	NNW	SE	NNW	NNE	NE	NWW
Inclination (°)	70	75	0	55	75	70	80	70	60	70	70	70	70
Cover of bryophytes (%)	95	100	100	100	60	95	70	80	90	95	95	95	50
Number of bryophyte species	3	2	3	2	1	2	2	4	2	3	1	2	3
Living tree	*	*	*	*	*	*	*	*	*	*	*	*	*
Tree species	Fex	Fex	Fex	Fex	Tco	Apl	Apl	Sal	Fex	Fex	Qr	Fex	Sal
Height above the ground (cm)	20	110	60	40	170	100	40	40	35	20	10	20	70
Syntaxon	1						2		3		4		5
Ch <i>Neckeretea complanatae</i>													
<i>Anomodon attenuatus</i>	65	20	60	95	60	85	.	5	50	40	.	.	.
<i>Anomodon longifolius</i>	.	.	.	.	.	.	65	70	.	.	.	.	.
<i>Homalia trichomanoides</i>	.	.	.	.	.	.	.	.	40	50	95	90	.
<i>Anomodon viticulosus</i>	.	80	15	5	.	10	5	.	.	.	.	.	40
<i>Amblystegium subtile</i>	3	.	.	.	.	.	.	.	.	5	.	5	.
Ch <i>Frullanio-Leucodontetea</i>													
<i>Leucodon sciuroides</i>	.	.	25	.	.	.	.	.	.	.	.	.	.
<i>Hypnum cupressiforme</i>	.	.	.	.	.	.	.	.	.	.	.	.	5
<i>Radula complanata</i>	.	.	.	.	.	.	.	+	.	.	.	.	.
Ch <i>Cladonio-Lepidozietea</i>													
<i>Brachythecium salebrosum</i>	2	.	.	.	.	.	.	.	5	.	.	.	5

Syntaxa: 1 – *Anomodontetum attenuati*; 2 – *Anomodontetum longifolii*; 3 – transition *Anomodontetum longifolii* × *Plagiomnio cuspidati-Homaliatum trichomanoidis*; 4 – *Plagiomnio cuspidati-Homaliatum trichomanoidis*; 5 – *Neckerion complanatae*, association is not identified.

Abbreviations of tree names: Apl – *Acer platanoides*, Fex – *Fraxinus excelsior*, Qr – *Quercus robur*, Sal – *Salix alba*, Tco – *Tilia cordata*

Dates and locations:

1549 – 2017.05.02, Lisnyky, latitude 50.29638°, longitude 30.53635°, accuracy 7 m;
 1566 – 2017.05.02, Lisnyky, latitude 50.29618°, longitude 30.54686°, accuracy 13 m;
 1571 – 2017.05.02, Lisnyky, latitude 50.29502°, longitude 30.55236°, accuracy 7 m;
 1570 – 2017.05.02, Lisnyky, latitude 50.29608°, longitude 30.54687°, accuracy 7 m;
 1568 – 2017.05.02, Lisnyky, latitude 50.29618°, longitude 30.54686°, accuracy 13 m;
 1565 – 2017.05.02, Lisnyky, latitude 50.29658°, longitude 30.54678°, accuracy 7 m;
 1538 – 2017.04.30, Holosiyivskyi Wood, latitude 50.37228°, longitude 30.49991°, accuracy 6 m;
 1539 – 2017.04.30, Holosiyivskyi Wood, latitude 50.37228°, longitude 30.49991°, accuracy 6 m;
 1552 – 2017.05.02, Lisnyky, latitude 50.29575°, longitude 30.53789°, accuracy 7 m;
 1564 – 2017.05.02, Lisnyky, latitude 50.29660°, longitude 30.54680°, accuracy 6 m;
 1551 – 2017.05.02, Lisnyky, latitude 50.29576°, longitude 30.53750°, accuracy 6 m;
 1546 – 2017.05.02, Lisnyky, latitude 50.29635°, longitude 30.53629°, accuracy 5 m;
 1548 – 2017.05.02, Lisnyky, latitude 50.29638°, longitude 30.53632°, accuracy 5 m;
 1553 – 2017.05.02, Lisnyky, latitude 50.29575°, longitude 30.53789°, accuracy 6 m.

Table 7. Relevés of the classes *Platyhypnidio-Fontinalietea antipyreticae* and *Hylocomietea splendentis*

Number in table	1	2	3	4	5	6	7	8	9	10
Number in database of Holosiivskiyi NNP	1526	1522	1536	1562	1555	1559	1558	1556	1586	1532
Number in database EU-UA-006	3887	3883	3897	3923	3916	3920	3919	3917	3947	3893
Area (dm ²)	4	4	4	4	4	4	4	4	4	4
Aspect	-	-	E	NW	-	-	-	-	W	-
Inclination	0	0	40	40	0	0	0	0	10	0
Cover of bryophytes (%)	100	100	80	80	90	100	90	90	-	90
Number of bryophyte species	2	1	3	2	3	1	2	1	1	1
Living tree	-	-	-	-	-	-	-	-	-	-
Tree species	Agl	?	Agl	Qr	Agl	Agl	Agl	Agl	Agl	Agl
Height above the ground (cm)	25	10	30	50	15	15	25	20	45	10
Height above the water (cm)	-	-	-	-	-	7	10	10	25	7
Syntaxon	1		2		3				4	
Ch <i>Hylocomietea splendentis</i>										
<i>Plagiomnium cuspidatum</i>	85	100	15	.	5	.	.	.	.	.
<i>Plagiomnium undulatum</i>	.	.	60	.	.	.	.	.	.	.
<i>Climacium dendroides</i>	.	.	.	50	.	.	.	.	.	.
Ch <i>Platyhypnidio-Fontinalietea</i>										
<i>Leptodictyum riparium</i>	.	.	.	.	80	100	15	95	95	.
<i>Brachythecium rivulare</i>	.	.	.	.	.	.	.	.	.	90
Ch <i>Cladonio-Lepidozietea</i>										
<i>Brachythecium rutabulum</i>	15	.	.	.	5	.	.	.	.	.
<i>Pohlia nutans</i>	.	.	.	30	.	.	.	.	.	.
<i>Plagiothecium succulentum</i>	.	.	5	.	.	.	.	.	.	.
Other species										
<i>Drepanocladus aduncus</i>	.	.	.	.	.	.	75	.	.	.

Syntaxa: 1 – *Brachythecio rutabuli-Plagiomnietum cuspidati*; 2 – *Climacion dendroidis*, association is not identified; 3 – *Leptodictyo riparii-Hydroamblystegietum varii*; 4 – *Brachythecio rivularis-Hygrohypnetum luridi*.

Abbreviations of tree names: Agl – *Alnus glutinosa*, Qr – *Quercus robur*.

Dates and locations:

1549 – 2017.05.02, Lisnyky, latitude 50.29638°, longitude 30.53635°, accuracy 7 m;
 1522 – 2017.04.30, Holosiivskiyi wood, latitude 50.37330°, longitude 30.49960°, accuracy 14 m;
 1536 – 2017. 04.30, Holosiivskiyi wood, latitude 50.37263°, longitude 30.49964°, accuracy 7 m;
 1562 – 2017.05.02, Lisnyky, latitude 50.29778°, longitude 30.54402°, accuracy 6 m;
 1555 – 2017.05.02, Lisnyky, latitude 50.29575°, longitude 30.53792°, accuracy 4 m;
 1559 – 2017.05.02, Lisnyky, latitude 50.29609°, longitude 30.53963°, accuracy 4 m;
 1558 – 2017.05.02, Lisnyky, latitude 50.29611°, longitude 30.53952°, accuracy 4 m;
 1556 – 2017.05.02, Lisnyky, latitude 50.29610°, longitude 30.53956°, accuracy 5 m;
 1586 – 2018.05.05, Sviatoshynske forestry, latitude 50.49111°, longitude 30.31022°, accuracy 6 m;
 1532 – 2017.04.30, Holosiivskiyi wood, latitude 50.37271°, longitude 30.49991°, accuracy 5 m.

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