Arctoa (2023) **32:** *10–25*
doi: 10.15298/arctoa.32.02

BRYOPHYTE VEGETATION OF NIZHNY NOVGOROD PROVINCE (EUROPEAN RUSSIA)

РАСТИТЕЛЬНОСТЬ МОХООБРАЗНЫХ НИЖЕГОРОДСКОЙ ОБЛАСТИ (ЕВРОПЕЙСКАЯ ЧАСТЬ РОССИИ)

Anna A. Shestakova[1] & Olga V. Biryukova[1]

Анна А. Шестакова[1], Ольга В. Бирюкова[1]

Abstract

Bryophyte communities were studied in different types of forests in Nizhny Novgorod Province using Braun-Blanquet approach. The presented system of bryophyte vegetation includes 6 classes, 9 orders, 11 alliances and 3 suballiances. A total of 23 associations, 13 subassociations and one community were described. 6 associations were described as new and the position in the system of high syntaxa has been critically revised for 1 subassociation. The peculiarities of floristic composition and ecological characteristics of revealed bryophyte communities are discussed.

Резюме

Сообщества мохообразных исследовались в различных лесных сообществах Нижегородской области по методике Браун-Бланке. Изученные сообщества отнесены к 6 классам, 9 порядкам, 11 союзам и 3 подсоюзам. Всего было описано 23 ассоциации, 13 субассоциаций и одно сообщество, из них 6 ассоциаций описаны впервые, и для 1 субассоциации критически пересмотрено положение в системе высших синтаксонов. По своему видовому составу и экологическим характеристикам выделенные сообщества имеют ряд особенностей, которые обсуждаются в статье.

KEYWORDS: bryophytes, bryophyte communities, syntaxonomy, European Russia

Introduction

In Russia, research of bryophyte vegetation using the Braun-Blanquet approach was carried out by several authors (Baisheva *& al.,* 1994; Baisheva, 1995, 2000; Pisarenko, 1999; Anishchenko, 2001). This paper presents the results of research using the same approach in Nizhny Novgorod Province.

Material and Methods

Nizhny Novgorod Province is situated in the Volga region of the Middle part of European Russia, in the center of the Russian Plain, between latitudes of 56°06'–54°27'N and longitudes of 41°48'–47°46'E (Kharitonychev, 1974). The territory of Nizhny Novgorod Province is located at the border of two landscape zones: taiga and forest-steppe (Milkov & Gvozdetsky, 1976). The climate of the study area is temperate continental. The mean annual precipitation is 450–600 mm. The mean annual sum of temperature is 2300–2650°C, the mean annual temperature ranges between 2.0–3.7°C. The frostless period is about 120–140 days (Agafonova, 1974, Yaroshevskaya, 1967). The general characteristics of vegetation in the province are presented by Alyokhin (1935), Averkiev (1954), Poluyakhtov (1973). The present investigations were carried out in several types of forests from the classes ***Vaccinio-Piceetea*** Br.-Bl. in Br.-Bl. & al. 1939 (alliances ***Piceion excelsae*** Pawłowski & al. 1928, ***Dicrano-Pinion sylvestris*** (Libbert 1933) W. Matuszkiewicz 1962 and ***Cladonio stellaris-Pinion sylvestris*** Kielland-Lund ex Ermakov et Morozova 2011), ***Pyrolo-Pinetea sylvestris*** Korneck 1974 (alliance ***Festuco-Pinion sylvestris*** Passarge 1968), ***Carpino-Fagetea sylvaticae*** Jakucs ex Passarge 1968 (alliance ***Querco roboris-Tilion cordatae*** Solomeshch et Laivins ex Bulokhov et Solomeshch in Bulokhov et Semenishchenkov 2015), ***Alno glutinosae-Populetea albae*** P. Fukarek et Fabijanić 1968 (alliance ***Poa angustifoliae-Ulmion laevis*** Golub in Golub et Kuzmina 1997), ***Alnetea glutinosae*** Br.-Bl. et Tx. ex Westhoff & al. 1946 (alliances ***Alnion glutinosae*** Malcuit 1929 and ***Betulion pubescentis*** Lohmeyer et Tx. ex Oberd. 1957).

About 650 geobotanical relevés were carried out in 1997–2003, several observations were conducted in 2022. Locations of relevés are given in Appendix 1. The most typical, often repeated sites of bryophytic cover on the tree trunks, decaying wood and soil were selected. The particular attention was paid to ecological homogeneity of sample plots (moisture, illumination, exposition). The area of sample plots ranged from 4 dm^2 to 1 m^2. The abundance of species was evaluated according to the Braun-Blanquet cover abundance scale: r – extremely rare; + –

[1] – Institute of Biology and Biomedicine, Lobachevsky State University of Nizhny Novgorod, Gagarin ave., Nizhny Novgorod, 23, 603950, Russia. E-mail: f_s_c@mail.ru; ORCID (AS): 0000-0001-9366-716X, (OB): 0000-0002-9626-5016

cover not more than 1%; 1 – 1–5%; 2 – 5–25%; 3 – 25–50%; 4 – 50–75%; 5 – 75–100%. Nomenclature of mosses is after Hodgetts & al. (2020). The names and position of high syntaxa (classes, orders and alliances) follow Mucina & all. (2016); the names of associations and suballiances are according to Marstaller (2006). The abbreviations of substrate used in the tables are as follow: TC – *Tilia cordata*, QR – *Quercus robur*, PA – *Picea abies*, AS – *Abies sibirica*, UG – *Ulmus glabra*, UL – *Ulmus laevis*, AP – *Acer platanoides*, PT – *Populus tremula*, PN – *Populus nigra*, BP – *Betula pubescens/pendula*, FE – *Fraxinus excelsior*, PS – *Pinus silvestris*, AG – *Alnus glutinosa*, SC – *Salix caprea*, SA – *Salix alba*; R – rotten wood, S – soil, L – limestone covered with thon layer of soil. The numbers of nomenclature type relevés are marked with "!".

Syntaxa of the bryophyte vegetation of Nizhny Novgorod Province, Russia

Cl. ***Ceratodonto-Polytrichetea piliferi*** Mohan 1978
Ord. ***Polytrichetalia piliferi*** von Hübschmann 1975
All. ***Polytrichion piliferi*** Šmarda 1947

1. Ass. ***Racomitrio-Polytrichetum piliferi*** von Hübschmann 1967
2. Ass. ***Brachythecietum albicantis*** Gams ex Neumayr 1971
   subass. ***typicum*** von Hübschmann ex Marstaller 1989
   subass. ***tortuletosum ruralis*** Neumayr 1971

Cl. ***Hylocomietea splendentis*** Gillet ex Marstaller 1992
Ord. ***Hylocomietalia splendentis*** Gillet ex Vadam 1990
All. ***Pleurozion schreberi*** von Krusenstjerna 1945

3. Ass. ***Pleurozietum schreberi*** Wiśniewski 1930

All. ***Fissidention taxifolii*** Marstaller 2006

4. Ass. ***Eurhynchietum swartzii*** Waldheim 1944

Cl. ***Platyhypnidio-Fontinalietea antipyreticae*** Philippi 1956
Ord. ***Leptodictyetalia riparii*** Philippi 1956
All. ***Brachythecion rivularis*** Hertel 1974

5. Ass. ***Calliergonello lindbergii-Rhizomnietum punctatis*** **ass. nov**.

Cl. ***Neckeretea complanatae*** Marstaller 1986
Ord. ***Neckeretalia complanatae*** Ježek et Vondráček 1962
All. ***Neckerion complanatae*** Šmarda et Hadač ex Klika 1948
Suball. ***Brachythecio populei-Homalienion trichomanoidis*** Marstaller 1992

6. Ass. ***Anomodontetum longifolii*** Waldheim 1944
7. Ass. ***Plagiomnio cuspidati-Homalietum trichomanoidis*** (Peciar 1965) Marstaller 1993

Cl. ***Frullanio dilatatae-Leucodontetea sciuroidis*** Mohan 1978
Ord. ***Orthotrichetalia*** Hadač in Klika et Hadač 1944
All. ***Ulotion crispae*** Barkman 1958

8. Ass. ***Orthotrichetum speciosi*** Barkman 1958
9. Ass. ***Pylaisietum polyanthae*** Felföldy 1941
10. Ass. ***Pylaisielleto polyanthae-Leskeelletum nervosae*** Baisheva & al. 1994
11. Ass. ***Pylaisio polyanthae-Neckeretum pennatis*** **ass. nov**.

All. ***Leskeion polycarpae*** Barkman 1958

12. Ass. ***Syntrichio latifoliae-Leskeetum polycarpae*** von Hübschmann 1952
    subass. ***typicum***
    subass. ***pylaisielletosum polyanthae*** Baisheva & al. 1994
    subass. ***leptodictyetosum riparii*** Philippi 1972

Ord. ***Dicranetalia scoparii*** Barkman 1958
All. ***Dicrano scoparii-Hypnion filiformis*** Barkman 1958

13. Ass. ***Platygyrietum repentis*** Le Blanc ex Marstaller 1986
    subass. ***typicum***
    subass. ***dicranetosum montani*** Marstaller 1986
14. Ass. ***Ptilidio pulcherrimi-Hypnetum pallescentis*** Barkman ex Wilmanns 1962
    subass. ***typicum***
    subass. ***callicladietosum haldanianae*** Baisheva 1995
15. Ass. ***Orthodicrano-Plagiothecietum laeti*** Baisheva & al. 1994
    subass. ***typicum***
    subass. ***eurhynchietosum pulchelli*** (Anishchenko 2001 prov.) comb. nov.

Cl. ***Cladonio digitatae-Lepidozietea reptantis*** Ježek et Vondráček 1962
Ord. ***Diplophylletalia albicantis*** Philippi 1963
All. ***Dicranellion heteromallae*** Philippi 1963
Suball. ***Brachythecienion velutini*** Marstaller 1984

16. Ass. ***Plagiothecietum cavifolii*** Marstaller 1984

Suball. ***Pogonatenion urnigeri*** (von Krusenstjerna 1945) Philippi 1956

17. Ass. ***Pohlietum nutantis*** **ass. nov.**
18. Ass. ***Atricheto undulati-Dicranelletum heteromalli*** **ass. nov.**
19. Ass. ***Atrichetum flaviseto-undulati*** **ass. nov.**

Ord. ***Lophocoleetalia heterophyllae*** Barkman 1958
All. ***Tetraphidion pellucidae*** von Krusenstjerna 1945
Tetraphis pellucida – community

Ord. ***Brachythecietalia rutabulo-salebrosi*** Marstaller 1987
All. ***Bryo capillaris-Brachythecion rutabili*** Lecointe 1975

20. Ass. ***Brachythecio salebrosi-Amblystegietum juratzkani*** (Sjogren ex Marstaller 1987) Marstaller 1989
21. Ass. ***Brachythecio salebrosi-Drepanocladetum uncinati*** Marstaller 1989
22. Ass. ***Brachythecietum salebroso-curti*** **ass. nov.**
23. Ass. ***Brachythecietum salebrosi-reflexi*** Pisarenko 1999
    subass. ***plagiomnietosum cuspidati*** Pisarenko 1999
    subass. ***brachythecietosum reflexi*** (Baisheva & al. 1994) Pisarenko 1999

DESCRIPRION OF SYNTAXA

Relevé tables in printed version are given only for newly described syntaxa and synthetic tables; all tables are available in on-line Supplementary materials (SM: https://kmkjournals.com/upload/PDF/Arctoa/32/Arctoa_32_010_025_SM.pdf). For table numbers of print version the corresponding numbers in SM are added.

1. Association ***Racomitrio-Polytrichetum piliferi*** von Hübschmann 1967 (Table 1 in SM).

Diagnostic species: *Polytrichum piliferum* (dom.), *Niphotrichum elongatum.*

This association was described in Western Europe (Marstaller, 1993; Hübschmann, 1986) for drained acid sandy soils of pine forests. In Nizhny Novgorod Province, communities of this association are recorded in similar habitats, e.g. in dry pine forests of alliances ***Cladonio stellaris-Pinion sylvestris*** and ***Festuco-Pinion sylvestris****,* open spaces, and disturbed areas, e.g. along the edge of fields, meadows (mainly on sandy soils), in settlements, e.g. on old asphalt, stones, concrete, etc. Unlike typical association, it is characterized by the absence of diagnostic species *Niphotrichum elongatum* (Marstaller, 1993), low cover and small number of species per relevé as well. The average number of species is 6. The average cover is 75%.

2. Association ***Brachythecietum albicantis*** Gams ex Neumayr 1971 (Table 2 in SM).

subass. ***typicum*** von Hübschmann ex Marstaller 1989 (rel. 7–20)

subass. ***tortuletosum ruralis*** Neumayr 1971 (rel. 1–6)

Diagnostic species: *Brachythecium albicans*.

These communities are similar to the type association described in Western Europe (Hübschmann, 1986; Marstaller, 1993) and characterized by high constancy of other diagnostic species of the class ***Ceratodonto-Polytrichetea piliferi*** (*Ceratodon purpureus, Polytrichum juniperinum* and *Polytrichum piliferum*). The association occurs in similar habitats as the previous one, but in less dry areas and on richer soils. In addition, it is quite often revealed on rotten wood. In communities of the subass. ***tortuletosum ruralis***, *Tortula ruralis* is the additional diagnostic species. In other parameters, the subassociations do not differ significantly from each other. The average number of species in relevé is 5. The average cover is 86 %.

3. Association ***Pleurozietum schreberi*** Wiśniewski 1930 (Table 3 in SM**).**

Diagnostic species: *Pleurozium schreberi, Hylocomium splendens, Ptilium crista-castrensis*.

This association unites the most common bryophyte communities of the ground cover and also occurs on rotten wood, at base and on roots of trees (in wet floodplain forests it is noted at a height up to 60 cm above the ground) in forests belonging to the alliances ***Piceion excelsae****,* ***Dicrano-Pinion sylvestris*** and ***Querco roboris-Tilion cordatae*** (in the latter case only on the rotten wood and at bases of trees). The most common species in the communities are always *Pleurozium schreberi, Hylocomium splendens, Hylocomiadelphus triquetrus* and somewhat less frequently *Ptilium crista-castrensis*. The main codominants are *Dicranum polysetum* (in the communities occurring on the forest floor, especially in pine forests) and *D. scoparium* (in the communities on the rotten wood). In general, in contrast to communities described in Europe (Mastaller, 1986a), the association of the study area is characterized by a poorer floristic composition, low constancy of *Ptilium crista-castrensis* and presence of *Brachythecium salebrosum*. From the communities described in the South Urals (Baisheva *et al.*, 1994) our communities also differ in the low constancy of *Ptilium crista-castrensis*. The average species number in relevé is 5. The average cover is 94%.

4. Association ***Eurhynchietum swartzii*** Waldheim 1944 (Table 4 in SM).

Diagnostic species: *Oxyrrhynchium hians* (dom.), *Fissidens taxifolius*.

The type association is described for the floor in broad-leaved forests of Western Europe (Hübschmann, 1986; Marstaller, 1993, 2006). In Nizhny Novgorod Province, this association occurs in similar habitats, i.e. in the ground cover in broad-leaved, rarely mixed forests from the alliance ***Querco roboris-Tilion cordatae***. The communities of this association are most common in oak forests located on forest terraces on slopes of the Oka and Volga Rivers. These mesophytic communities grow in rather shaded habitats on slightly acid or neutral substrates. The average species number in relevé is 5. The average cover is 66%.

5. Association ***Calliergonello lindbergii-Rhizomnietum punctatis*** ass. nov. (Table 1 / = Table 5 in SM).

Diagnostic species: *Calliergonella lindbergii, Rhizomnium punctatum, Leptodictyum riparium*. Type relevé of association is 7 in Table 1.

These hygrophyte communities are rather common in the floodplain forests belonging to the alliances ***Piceion excelsae****,* ***Querco roboris-Tilion cordatae*** and the class ***Alno glutinosae-Populetea albae.*** They were found both in shaded and open areas in periodically flooded, wet habitats: directly along the banks of water bodies (especially often along the banks of forest streams) or in on slightly acidic and neutral substrates small depressions (soil, rotten wood, on roots of *Alnus glutinosa* and *Salix alba* trees), rarely reaching up the trunk to a height of 10 cm (up to the level of flooding).

The communities of this association are close to mesohygrophilous and sciophilous ass. ***Rhizomnio punctati-Fissidentetum taxifolii*** (Gil & Martinez 1985) Garcia-Zamora & al. 2000 (alliance ***Fissidention taxifolii****,* class ***Hylocomietea splendentis***, diagnostic species *Brachythecium rivulare, Rhizomnium punctatum, Ptychostomum pseudotriquetrum, Chiloscyphus polyanthos, Amphidi-*

Table 1. Association *Calliergonello lindbergii–Rhizomnietum punctatis* ass. nov.

Number of relevé	9	19	19	19	13	25	25	9	7	3	7	16	19	1	19	19	7	**C**
Localization of relevé	1	2	3	4	5	6	7!	8	9	10	11	12	13	14	15	16	17	**O**
Substrate	R	SA	S	S	S	AG	S	S	R	R	R	S	S	R	S	S	R	**N**
Width of the plot, cm	20	30	50	30	30	40	50	20	20	20	20	30	20	30	30	40	20	**S**
Length of the plot, cm	20	10	40	50	50	10	100	80	20	30	20	100	60	40	50	40	20	**T**
Cover, %	80	90	60	70	60	70	100	90	60	80	90	100	90	80	100	90	90	
Number of species in relevé	5	9	8	11	6	6	6	10	7	7	9	5	6	5	6	4	5	
Height above the ground, cm	–	10	–	–	–	10	–	–	–	–	–	–	–	–	–	–	–	
Diagnostic species of association																		
Calliergonella lindbergii		2	2	2	2	2	2	1	1	3	3	4	4					**IV**
Rhizomnium punctatum	3	+	+	+	1	2	1	3	2	1	3	2	2	3	4	4	4	**V**
Leptodictyum riparium	2	3	3	2	2	2	+	+	1	+								**III**
Diagnostic species of alliance, order and class																		
Brachythecium rivulare	+			2				2			+					1		**II**
Chiloscyphus polyanthos		r			1							r			r			**II**
Fontinalis anthipyretica		1	r			+												**I**
Other species																		
Amblystegium serpens			1	1	+				+	+				+				**II**
Aulacomnium palustre									1		r		+					**I**
Brachythecium salebrosum		+	r	r						+				+	1			**II**
Ptychostomum pseudotriquetrum			+	+														**I**
Calliergon cordifolium	+	r			1	+	1		1			+	+					**III**
Campylophyllopsis sommerfeltii											1				2	2		**I**
Climacium dendroides				+			1			+								**I**
Lophocolea heterophylla											r				r	r		**I**
Oxyrrhynchium hians				+				+										**I**
Plagiochila porelloides											+						1	**I**
Plagiomnium cuspidatum	1													+				**I**
Pleurozium schreberi								2				1						**I**
Riccia fluitans			+	+											1			**I**
Sanionia uncinata		+					2	+		2				2				**II**

Low constancy species: *Atrichum undulatum* (13–+);*Blepharostoma trichophyllum* (17–+); *Dicranum scoparium* (11–+); *Herzogiella turphacea* (11–r); *Leskea polycarpa* (2–+; 6–r); *Marchantia polymorpha* (13–+); *Plagiomnium medium* (4–+); *Plagiothecium denticulatum* (8–r; 17–+); *Polytrichum formosum* (8–+); *Pseudobryum cinclidioides* (9–1); *Tetraphis pellucida* (17–1).

um mougeotii and *Eurhynchium praelongum*), described in Spain on slopes close to running water (Garcia-Zamora *et al*., 2000). Our communities differ in floristic composition by the absence of *Fissidens taxifolius* and the high constancy of *Calliergonella lindbergii*, *Leptodictyum riparium* and *Calliergon cordifolium*, but their habitats seem to be the same. However, the high constancy of the diagnostic species of the order ***Leptodictyetalia*** and absence or insignificant partisipation of the diagnostic block of the order ***Hylocomietalia*** allows us to place these communities within ***Leptodictyetalia***. This decision also may be confirmed by the intermediate position of their habitats between hygrophytic and terrestrial, which is more specific for the communities of the alliance ***Brachythecion rivularis*** (Marstaller, 2006). The average number of species in relevé is 7. The average cover is 82%.

6. Association ***Anomodontetum longifolii*** Waldheim 1944 (Table 6 in SM).

Diagnostic species: *Anomodon longifolius* (dom.).

The sciophilous and basiphilous association occurs in old-growth mesophytic and floodplain broad-leaved and coniferous–broad-leaved forests belonging to the alliance ***Querco roboris-Tilion cordatae***. The communities were described on trunks of old deciduous trees (of age 80 years and over) on the bark of *Populus tremula, Tilia cordata, Quercus robur* at a height of 20 to 150 cm (averaging to 50 cm in mesophytic deciduous and mixed forests and up to 1–1.2 m in the moist southern taiga and floodplain oak forests), rarely on deadfalls and on limestone outcrops.

This association was described as epiphytic for broad-leaved forests of Western Europe (Marstaller, 1993) and in the Central European part of Russia (Anishchenko, 2001), where *Neckera pennata* is indicated as diagnostic species. Our association differs by the absence of *Neckera pennata* on the background of the rather high constancy of *Pylaisia polyantha, Pseudoleskeella nervosa, Radula complanata, Sciuro-hypnum reflexum,* and *Brachythecium salebrosum*. The average species number in relevé is 4. The average cover is 96%.

7. Association ***Plagiomnio cuspidati-Homalietum trichomanoidis*** (Peciar 1965) Marstaller 1993 (Table 7 in SM).

Diagnostic species: *Homalia trichomanoides* (dom.), *Plagiomnium cuspidatum*.

This association is one of the most characteristic for floodplain forests of alliances ***Querco roboris-Tilion cordatae*** and rarely ***Piceion excelsae***. The communities were revealed mainly on deciduous (*Tilia cordata, Populus tremula, Betula pubescens, Ulmus glabra*) and somewhat less often on coniferous trees (*Picea abies, Abies sibirica*), at tree bases up to a height of 1m (averaging up to 50 cm) above the ground. These communities differ from the type association described in Germany (Marstaller, 1993) by the extremely low presence of *Plagiomnium cuspidatum* and the absence of other diagnostic species of the order ***Neckeretalia complanatae***, excepting *Pseudoamblystegium subtile*. At the same time, it is characterized by the high constancy of *Neckera pennata, Pylaisia polyantha, Pseudoleskeella nervosa,* and *Eurhynchiastrum pulchellum*. The average species number in relevé is 5. The average cover is 95 %.

8. Association ***Orthotrichetum speciosi*** Barkman 1958 (Table 8 in SM).

Diagnostic species: *Lewinskya speciosa, Nyholmiella obtusifolia.*

On the territory of Nizhny Novgorod Province, these communities are rather rare and occur mainly in the south of the region in broad-leaved and aspen forests of the alliance ***Querco-Tilion*** on the bark of *Quercus robur, Tilia cordata, Populus tremula, Acer platanoides* and *Ulmus glabra* at a height of 0.8 to 3 m, less often higher (up to 5 m) above the ground, generally on inclined trunks and in the forks of large branches. Marstaller (2006) synonymized this association with ass. ***Orthotrichetum striati*** Gams 1927 whose diagnostic species *Lewinskya striata* is absent in our study area, and therefore, we cannot place our communities within this association. The syntaxonomic position of these communities needs a further research.

The communities also differ from the those described in Western Europe (Marstaller, 1993) by the poorer floristic composition that is expressed in the absence of *Leucodon sciuroides, Frullania dilatata, Hypnum cupressiforme, Ulota crispa, Tortula papillosa* and a number of *Orthotrichaceae* species. The average species number in relevé is 4. The average cover is 60%.

9. Association ***Pylaisietum polyanthae*** Felföldy 1941 (Table 9 in SM).

Diagnostic species: *Pylaisia polyantha* (dom.).

This association is one of the most widespread epiphytic communities of the study area; it occurs mainly in southern taiga, mixed and aspen forests, rarely in broad-leaved (most frequently linden) forests of the alliance ***Querco-Tilion***. The communities were described on the tree trunks of *Tilia cordata, Populus tremula, Fraxinus excelsior, Quercus robur, Alnus glutinosa* and *Salix caprea* at a height of 0.4–2 m (up to 3–5 m, sometimes it was at a height of up to 15 m in the forks of large branches) above the ground. The habitats are rather xerophytic and well lit. The communities of the study area differ significantly from European (Marstaller, 1993) and Bashkirian ones (Baisheva *et al.*, 1994) by the absence of *Leucodon sciuroides, Ulota crispa, Hypnum cupressiforme* and the high constancy of *Lewinskia speciosa* and *Radula complanata*. In the southern taiga zone, *Ptilidium pulscherrimum* may also have high constancy in the communities of this association. A poor floristic composition is also specific: the average species number in relevé is 5. The average cover is 96%.

10. Association ***Pylaisielleto polyanthae-Leskeelletum nervosae*** Baisheva & al. 1994 (Table 10 in SM).

Diagnostic species: *Pseudoleskeella nervosa* (dom.), *Pylaisia polyantha*.

On the territory of Nizhny Novgorod Province this epiphytic basophilous association occurs mainly in the forests of the alliance ***Querco-Tilion*** on the bark of deciduous trees at a height of 0.2–1.2 m above the ground in southern districts of the study area and 0.8–2.2 m in the northern districts, preferring more shaded conditions than communities of association ***Pylaisietum polyanthae***. In the study area, the distribution of these communities is directly related to broad-leaved trees, in particular linden and oak. In the southern parts of province, these epiphytic communities are quite common, whereas in the northern districts they occur only in floodplain forests on linden, oak, aspen and elm. Our communities differ from typical ones described in Bashkortostan (Baisheva *et al.*, 1994) by the high constancy of *Radula complanata* and poor floristic composition: the average species number in relevé is 4. The average cover is 97%.

11. Association ***Pylaisio polyanthae-Neckeretum pennatis*** ass. nov. (Table 2 / = Table 11 in SM).

Diagnostic species: *Neckera pennata* (dom.), *Pylaisia polyantha.* Type relevé of association is 13 in Table 2.

This epiphytic association is common in southern taiga and secondary aspen forests (alliance ***Querco-Tilion***), replacing southern taiga communities after felling, and extremely rare in other forest types (mainly in floodplain oak forests). It occurs on trunks of deciduous trees (*Tilia cordata, Populus tremula, Quercus robur, Acer platanoides, Ulmus glabra*) at a height of 30 cm (more often 60–80 cm) to 2 m above the ground, and rarely may be found on the deadfalls. These communities are hygropilous and develop in rather shaded habitats. They are characterized by the high constancy of diagnostic species of the orders ***Dicranetalia*** and ***Brachythecietalia rutabulo-salebrosi***: *Ptilidium pulcherrimum*, *Sciurohypnum reflexum*. Diagnostic species of this association *Neckera pennata* is included in the diagnostic block of the class ***Neckeretea complanatae***. However, the absence of other diagnostic species of this class against the high constancy of diagnostic species of order ***Orthotricheta-***

Table 2. Association *Pylaisio polyanthae–Neckeretum pennatis* ass.nov.

Number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13!	14	15	16	17	18	19	20	21	22	23	**C**
Localization of relevé	13	24	13	13	2	13	6	13	1	1	1	21	2	2	1	1	8	8	9	9	5	5	5	**O**
Substratum	PT	AP	TC	TC	R	PT	QR	PT	TC	TC	UG	AP	PT	PT	PT	PT	PT	PT	PT	PT	PT	PT	TC	**N**
Width of the plot, cm	30	20	30	30	20	20	30	20	30	30	30	30	20	20	30	20	30	20	20	30	30	20	30	**S**
Length of the plot, cm	60	40	100	140	60	30	120	30	40	120	150	120	40	40	90	40	90	60	20	90	140	20	120	**T**
Cover, %	90	80	70	80	70	80	90	100	100	90	80	90	70	100	90	90	70	80	100	80	80	100	70	
Number of species in relevé	5	5	4	5	5	4	5	5	5	4	6	4	7	4	7	5	5	7	6	6	6	5	5	
Above the ground. from, cm	40	20	40	20		30	60	30	80	60	90	30	60	30	60	60	60	40	40	60	60	80	80	
Above the ground. up to, cm	100	60	140	160		60	180	60	120	200	240	150	100	70	150	100	150	100	60	150	200	100	200	
Diagnostic species of association																								
Neckera pennata	4	4	5	5	4	4	4	4	4	5	4	4	4	4	4	4	3	3	3	3	4	5	5	**V**
Diagnostic species of order *Orthotrichetalia*																								
Pylaisia polyantha			+	+	+	1	1	1	2	1	1	2	2	2	1	1	3	3	3	2				**IV**
Lewinskya speciosa										r	+	+	+	r	r	r	+	1	r	1	1	1	r	**IV**
Radula complanata										+	+	+												**I**
Diagnostic species of order *Dicranetalia*																								
Ptilidium pulcherrimum	r		1	r			1	+	1				+	+	r	r	+	1	+	1	r	1	+	**IV**
Dicranum montanum		1											+		r					+				**I**
Dicranum scoparium													+									+		**I**
Diagnostic species of order *Brachythecietalia*																								
Sciuro-hypnum reflexum		1	r	+	+		+		r				+	1	1				+		1	+	+	**III**
Amblystegium serpens	+			+	+	+		1											2					**II**
Other species																								
Homalia trichomanoides	2			+					r									r			+			**II**
Anomodon longifolius											1													**I**
Pseudoleskeella nervosa	1	1																						**I**
Sanionia uncinata						1		+			r				+	2	1	+		+	+			**II**

Low constancy species: *Nyholmiella obtusifolia* (18–+); *N. gymnostoma* (2–r); *Leucodon sciuroides* (7–1).

lia and class ***Frullanio dilatatae-Leucodontetea sciuroidis*** (*Lewinskya speciosa*, *Pylaisia polyantha, Radula complanata*) and the epiphytic position allows us to consider this association within ***Orthotrichetalia***. The average species number in relevé is 5. The average cover is 85%.

12. Association ***Syntrichio latifoliae-Leskeetum polycarpae*** von Hübschmann 1952 (Table 12 in SM).

Diagnostic species: *Leskea polycarpa.* Other diagnostic species of the Central European communities of this association (Marstaller, 2006), *Syntrichia latifolia* and *Fissidens bryoides* var. *gymnandrus* are not registered in the communities in the study area.

subass. ***S.l.-L.p. typicum*.** Diagnostic species: *Leskea polycarpa* (dom.).

In Nizhny Novgorod Province, this subassociation (rel. 1–11) occurs in floodplain forests of the classes ***Carpino-Fagetea sylvaticae*** (alliance ***Querco-Tilion***) and ***Alno glutinosae-Populetea albae***. The communities were described on the bark of *Populus tremula, Tilia cordata, Acer platanoides, Fraxinus excelsior, Ulmus laevis, Populus nigra, Alnus glutinosa* and *Salix alba* (from the tree bases to the height up to 50 cm above the ground), as well as on rotten wood. The average species number in relevé is 5. The average cover is 92%.

subass. ***S.l.-L.p. pylaisielletosum polyanthae*** Baisheva & al. 1994.

Diagnostic species: *Pylaisia polyantha*.

The habitats of this subassociation (rel. 12–20) are similar to the previous ones. The communities of the study area differ from ones described in the broad-leaved forests of the Southern Urals (Baisheva *et al.*, 1994) by the high constancy of *Radula complanata*, which is more typical for Western European associations (Mihai, 1976; Philippi, 1974). The average species number in relevé is 6. The average cover is 94%.

subass. ***S.l.-L.p. leptodictyetosum riparii*** Philippi 1972 (Table 13 in SM).

Diagnostic species: *Leptodictyum riparium* (dom.), *Brachythecium rivulare.*

In Nizhny Novgorod Province, these hygrophilous and basiphilous communities were found in floodplain forests of the classes ***Carpino-Fagetea sylvaticae*** (alliance ***Querco-Tilion***) and ***Alno glutinosae-Populetea albae*** and forested mires (alliance ***Alnion glutinosae***) on bark of *Ulmus laevis*, *Populus nigra*, *Alnus glutinosa*, *Salix alba* and *Quercus robur* (from tree bases to the height up to 30 cm above the ground) and on rotten wood. In Western European communities of this subassociation (Marstaller, 1985), *Hygroamblystegium varium* is also noted as diagnostic species. Our communities differ in the absence of this species and low presence of *Brachythecium rivulare* against the rather high constancy of *Amblystegium serpens, Brachythecium salebrosum* and *Sanionia uncinata*. The average number of species in relevé is 7. The average cover is 96%.

13. Association ***Platygyrietum repentis*** Le Blanc ex Marstaller 1986 (Table 14 in SM).

subass. ***typicum*** (rel. 1-5)

subass. ***dicranetosum montani*** Marstaller 1986 (rel. 6-20)

Diagnostic species: *Platygyrium repens*.

These communities occur as epiphytic in old-aged mesophytic broad-leaved and mixed forests (***Querco-Tilion***) mainly in the south of the Province, on trunks of *Tilia cordata, Quercus robur, Acer platanoides* at a height of 60–180 cm (up to 3 m) and rarely on tree bases of *Picea abies* up to 30 cm above the ground. Besides, it is noted on deadfalls at the initial stages of wood destruction. *Dicranum montanum* is the additional diagnostic species in communities of the subass. ***dicranetosum montani***, which are more usual than subass. ***typicum.*** It differs from the association described in Germany (Marstaller, 1986a) by the high constancy of S*anionia uncinata, Pseudoleskeella nervosa* and *Radula complanata*. The low constancy of *Pylaisia polyantha* distinguishes described communities from Bashkirian ones (Baisheva, 1995). The average number of species in relevé is 5. The average cover is 93%.

14. Association ***Ptilidio pulcherrimi-Hypnetum pallescentis*** Barkman ex Wilmanns 1962.

subass. ***P.p.-H.p. typicum*** (Table 15 in SM).

Diagnostic species: *Jochenia pallescens* (dom.), *Ptilidium pulcherrimum*.

This subassociation is quite widespread in different types of woods and forested mires. The communities were described at the base of tree trunks of *Picea abies, Abies sibirica, Tilia cordata* and *Alnus glutinosa* up to a height of 50 cm (up to 80 cm and more in alder swamps) above the ground, rarely on rotten wood. The floristic composition is similar to the communities described in the forests of Central Europe (Barkman, 1958; Hübschmann, 1986; Marstaller, 1986b; 1989), South Urals (Baisheva *et al.*, 1994) and Salair (Pisarenko, 1999). The average species number in relevé is 6. The average cover is 93%.

subass. ***P.p.-H.p. callicladietosum haldanianae*** Baisheva 1995 (Table 16 in SM).

Diagnostic species: *Callicladium haldaneanum* (dom.).

In Nizhny Novgorod Province, these communities are common on rotten wood and at the base of deciduous trees in different types of mesophytic and wet forests. They occur on the bark of *Picea abies, Abies sibirica, Betula pubescens, Populus tremula* and *Tilia cordata* from the tree bases to the height up to 50 cm above the ground. The communities are similar to the type subassociation described in forests of the Southern Urals in the same habitats (Baisheva, 1995). The average species number in relevé is 7. The average cover is 97%.

15. Association ***Orthodicrano-Plagiothecietum laeti*** Baisheva & al. 1994

subass. ***O.-P.l. typicum*** (Table 17 in SM).

Diagnostic species: *Dicranum montanum, Plagiothecium laetum*.

The subassociation unites communities being common in coniferous and coniferous–broad-leaved and birch forests. They occur on *Picea abies, Abies sibirica, Pinus sylvestris, Betula pubescens, Populus tremula* and *Tilia cordata* at tree bases up to a height of 40 cm, very rare reaching 60 cm (on inclined birches). In contrast to the type association described in moist coniferous forests of the Southern Urals (Baisheva *et al.*, 1994), it differs by a higher constancy of diagnostic species of ***Dicranetalia*** (*Ptilidium pulcherrimum, Dicranum scoparium*). The average species number in relevé is 6. The average cover is 87%.

subass. ***eurhynchietosum pulchelli*** (Anishchenko 2001 prov.) comb. nov. (Table 3 / = Table 18 in SM).

Diagnostic species: *Eurhynchiastrum pulchellum* (dom.). Type relevé of association is 7 in Table 3.

In Nizhny Novgorod Province, this subassociation occurs in the mesophytic forests of the alliances ***Piceion excelsae*** and ***Querco roboris-Tilion cordatae*** mainly on the roots of conifers (fir, spruce, pine), birch and linden. Rarely these communities were found on trunks of aspen (where they may rise along the trunk up to 40 cm above the ground), on the forest floor and extremely rarely on rotten wood. The communities are similar to the association *Eurhynchietum pulchelli* Anishchenko 2001 prov. described in forests of the Central European part of Russia in similar habitats and placed into the alliance ***Anomodontion europaeum*** of the order ***Leucodontetalia sciuroides*** (Anishchenko, 2001). However, the absence of diagnostic species of these high syntaxa and the presence of diagnostic species of the order ***Dicranetalia*** (*Dicranum montanum, D. scoparium, Ptilidium pulcherrimum*) allows us to consider our communities as a subassociation within the association ***Orthodicrano-Plagiothecietum laeti*** Baisheva & al. 1994. The average species number in relevé is 5. The average cover is 95%.

16. Association ***Plagiothecietum cavifolii*** Marstaller 1984 **(**Table 19 in SM).

Diagnostic species: *Plagiothecium cavifolium* (dom.).

In Nizhny Novgorod Province, these communities were found on bare soil and at the base of *Picea abies* (up to 30 cm above the ground) in wet coniferous (mainly spruce), alder and birch forests of alliances ***Piceion excelsae, Alnion glutinosae*** and ***Betulion pubescentis***. The type association was described in broad-leaved forests of Western Europe (Marstaller, 1984, 1993, 2006; Hübschmann, 1986) in similar habitats. The communities of the study area differ from Western European ones by the absence of *Plagiothecium nemorale* and *P. schimperi,* and high constancy of *P. denticulatum, P. laetum* s.l. and *Lophocolea heterophylla*. Also, the diagnostic block of the suballiance ***Brachythecienion velutini*** (*Brachytheciastrum velutinum, Oxyrrhynchium hians,*

Table 3. Association *Orthodicrano–Plagiothecietum laeti* Baisheva & al. 1994 subass. *eurhynchietosum pulchelli* (Anishchenko 2001 prov.) comb. nov.

Number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	**C**
Localization of relevé	14	13	1	1	13	1	13	13	5	5	9	7	8	19	3	24	19	24	18	**O**
Substratum	PA	BP	AS	AS	BP	BP	AS	AS	PA	BP	TC	PA	R	PA	TC	TC	PS	PT	BP	**N**
Width of the plot, cm	30	20	30	40	30	30	40	30	20	20	30	30	20	20	20	20	30	20	20	**S**
Length of the plot, cm	30	40	20	20	40	20	20	40	35	40	40	40	40	30	20	20	30	20	40	**T**
Cover, %	90	80	100	100	90	100	100	80	90	90	100	90	100	100	100	100	100	100	90	
Number of species in relevé	6	6	7	7	5	5	4	5	7	6	6	7	5	3	7	3	7	5	4	
Height above the ground, cm	30	40	20	20	40	20	20	40	35	40	40	40	–	30	30	20	30	20	40	
Diagnostic species of association																				
Eurhynchiastrum pulchellum	4	4	3	4	4	5	5	5	2	4	3	5	5	5	5	4	4	4	3	**V**
Diagnostic species of order *Dicranetalia*																				
Dicranum montanum			r	2	1	+	+	+	3	+	r	+								**III**
Dicranum scoparium	1	1	r	+	1	+														**II**
Plagiothecium laetum			1	+	1	1	1	r	2											**II**
Ptilidium pulcherrimum		1		+	+	r	r							+						**II**
Diagnostic species of order *Brachythecietalia*																				
Amblystegium serpens									r						r		r	+		**II**
Sciuro-hypnum reflexum	2			r						1		+			r					**II**
Brachythecium salebrosum	+										+									**I**
Other species																				
Blepharostoma trichophyllum												+	+							**I**
Jochenia pallescens																2	1			**I**
Lophocolea heterophylla			+																+	**I**
Lophocolea minor												1	+							**I**
Tetraphis pellucida				+								+								**I**
Calliergon cordifolium																	1	+		**I**
Mnium stellare											3			1			1			**I**
Plagiochila porelloides								r	+		+									**I**
Plagiomnium cuspidatum								+	+	+					+				2	**II**
Pleurozium schreberi		+	+																	**I**
Pohlia nutans	r	1																	1	**I**
Rhodobryum roseum			+												+					**I**
Sanionia uncinata										+	+					+				**I**

Low constancy species: *Anomodon viticulosus* (17–+); *Callicladium haldaneanum* (18–1); *Pseudoleskeella nervosa* (17–+); *Lepidozia reptans* (12–+); *Plagiothecium denticulatum* (1–+, 15–+); *Pylaisia polyantha* (18–r); *Radula complanata* (9–+; 15–r); *Rhizomnium punctatum* (13–1); *Sciuro-hypnum oedipodium* (13–+).

Fissidens taxifolius, Plagiochila porelloides) were not revealed in our communities, while the presence of *Pleurozium shreberi, Dicranum scoparium, Pohlia nutans* and *Polytrichum juniperinum* is quite constant. Considering these facts, the syntaxonomic position of this association is doubtful and requires further surveys. The average species number in relevé is 6. The average cover is 91%.

17. Association ***Pohlietum nutantis*** ass. nov. (Table 4 / = Table 20 in SM).

Diagnostic species: *Pohlia nutans* (dom.), *Polytrichum juniperinum, Cephaloziella divaricata*. Type relevé of association is 15 in Table 4.

In the Nizhny Novgorod Province this community was described on acidic, nutrient-poor, bare soil and rotten wood at the last stage of decay in meso- and hygrophytic forests of alliances ***Piceion excelsae***, ***Querco roboris-Tilion cordatae***, ***Dicrano-Pinion sylvestris***, ***Alnion glutinosae*** and ***Betulion pubescentis***. These communities are closely related to ass. ***Plagiothecio laeti-Pohlietum nutantis*** Baisheva & al. 1994, described on rotten wood in pine forests of the Southern Urals (Baisheva *et al*., 1994), which Marstaller (2006) included to the alliance ***Nowellion curvifoliae*** Philippi 1965 of the order ***Lophocoleetalia heterophyllae*** due to the high constancy of liverwort *Lophocolea heterophylla*. In the study area, several relevés are similar to this association, but most of them differ significantly in the absence of *Plagiothecium laetum* s.l., as well as in the high constancy of *Cephaloziella divaricata* and *Polytrichum juniperinum.* At the same time, some releves show similarities with *Pohlia nutans–Plagiothecium denticulatum*–community Baisheva 2000. Probably, these communities in the study area and those described by Baisheva (Baisheva *et al.*, 1994; Baisheva, 2000) represent different variants of one syntaxon. We place these communities to the alliance ***Dicranellion heteromallae*** due to the presence of diagnostic species of this alliance (*Isopaches bicrenatus, Dicranella heteromalla*, etc.) and its suballiance ***Pogonatenion urnigeri*** (*Polytrichum juniperinum*), as well the low abundance of diagnostic species of the alliance

Table 4. Association *Pohlietum nutantis* ass. nov.

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15!	16	17	18	19	20	**C**
Localization of relevé	16	16	16	2	13	25	2	25	19	14	16	16	19	19	16	11	18	13	18	18	**O**
Substratum	R	R	R	R	BP	R	R	R	R	S	S	S	S	S	S	S	S	S	S	S	**N**
Width of the plot, cm	20	30	30	30	20	20	30	30	20	20	30	40	50	50	40	50	50	50	60	60	**S**
Length of the plot, cm	20	30	30	20	20	30	20	20	30	80	40	20	40	50	60	40	50	50	30	40	**T**
Cover, %	100	90	100	100	90	90	100	90	100	70	80	70	80	90	80	70	70	70	80	60	
Number of species in relevé	7	7	7	5	4	4	9	8	8	10	7	6	7	7	8	7	7	7	7	7	
Height above the ground, cm	30	30	–	–	20	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	
Diagnostic species of association																					
Pohlia nutans	3	4	4	4	5	5	3	3	3	4	4	3	2	2	3	3	3	4	4	5	**V**
Polytrichum juniperinum								+	+	2	2	3	4	4	3	3	3	1	1	1	**IV**
Cephaloziella divaricata	+									+	r	+	r	r	+	+	+	+	+	+	**IV**
Diagnostic species of suballiance, alliance, order and class *Cladonio-Lepidozietea reptantis*																					
Plagiothecium laetum			+	+	+	+	1	2	2	1	r	r	+								**III**
Lophocolea heterophylla	1	+	+	+			+		+	r	1				+	+			+	+	**III**
Atrichum undulatum										+				1	+			1			**II**
Isopaches bicrenatus										+					+		+				**I**
Plagiothecium denticulatum		+													+						**I**
Pogonatum urnigerum								+										+			**I**
Other species																					
Amblystegium serpens								+						+							**I**
Brachythecium salebrosum		+						r											r		**I**
Callicladium haldaneanum			r						1												**I**
Ceratodon purpureus		r							r		+	1				r				+	**II**
Dicranum montanum	3	r			1	+															**I**
Dicranum polysetum													+	+	+	+				1	**II**
Dicranum scoparium	+		+						+	1			+				+	+			**II**
Jochenia pallescens	r		1					r													**I**
Pleurozium schreberi										r			1	1			1		1	+	**II**
Ptilidium pulcherrimum	1	+						+	+	1							+		+		**II**
Tetraphis pellucida					+	1	1														**I**

Low constancy species: *Sciuro-hypnum curum* (3–1); *Brachytheciastrum velutinum* (7–+); *Campylophyllopsis sommerfeltii* (7–r); *Dicranella cerviculata* (11–+); *Dicranum flagellare* (18–2); *Leptobryum pyriforme* (4–+); *Mnium stellare* (7–1); *Oncophorus wahlenbergii* (7–r); *Ptilidium ciliare* (12–+); *Rhizomnium punctatum* (7–+).

Nowellion. The average species number in relevé is 7. The average cover is 84%.

18. Association ***Atricheto undulati-Dicranelletum heteromalli*** ass. nov. (Table 5 / = Table 21 in SM).

Diagnostic species: *Dicranella heteromala* (dom.), *Pohlia nutans, Atrichum undulatum*. Type releve of association is 7 in Table 5.

In Nizhny Novgorod Province, these acidophilus communities grow in shaded habitats on highly acidic and poor soils in mesophytic coniferous, mixed and broad-leaved forests of alliancs ***Piceion excelsae***, ***Dicrano-Pinion sylvestris*** and ***Querco roboris-Tilion cordatae***. These communities are close to *Dicranella heteromalla*–community Gesellschaft Nörr 1969, which was described on soil in broad-leaved oak and beech forests of Western Europe (Nörr, 1969; Philippi, 1983; Hübschmann, 1986). The high constancy of *Calypogeia muelleriana* and absence of *Isopterygium elegans, Pogonatum aloides* and *Diplophyllum albicans,* as well as typical habitats (another types of forests) differ our communities from the Central European ones. We include this association to the alliance ***Dicranellion heteromallae*** and suballiance ***Pogonatenion urnigeri*** due to the high constancy of *Polytrichum commune*, *P. juniperinum* and *Atrichum undulatum.* From other associations of this alliance, i.e. ***Pogonato urnigeri-Atrichetum undulati*** von Krusenstjerna 1945 (Marstaller, 2006) and ***Dicranello heteromallae-Atrichetum flaviseti*** Pisarenko 1999 (Pisarenko 1999) our communities are distinguished by the combination of dominant species. Taking the above into consideration, we recognize these communities as a new association. The average number of species in relevé is 6. The average cover is 83%.

19. Association ***Atrichetum flaviseto-undulati*** **ass. nov.** (Table 6 / = Table 22 in SM).

Diagnostic species: *Atrichum undulatum, A. flavisetum*. Type relevé of association is 10 in Table 6.

This mesophytic bryophyte communities were described on bare moderate acid soil in shaded and rather lighted habitats in coniferous and coniferous-deciduous, birch and aspen forests of the alliances ***Piceion***, ***Dicrano-Pinion*** and ***Querco-Tilion***: on the ravine slopes (rel. 1, 3, 14, 15), in ditches (7, 8), on roadsides (6, 10), on upturned roots of fallen trees. The floristic composition

Table 5. Association *Atricheto undulati–Dicranelletum heteromalli* ass. nov.

Number of relevé	1	2	3	4	5	6	7!	8	9	10	11	12	13	14	15	**C**
Localization of relevé	14	18	18	11	18	11	11	11	18	18	14	14	14	14	14	**O**
Localization of relevé	14	18	18	11	18	11	11	11	18	18	14	14	14	14	14	**N**
Substratum	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	**S**
Width of the plot, cm	50	50	50	50	50	30	30	50	50	50	20	50	20	30	50	**T**
Length of the plot, cm	100	60	50	50	40	40	40	50	60	50	40	20	40	40	60	
Cover, %	90	100	90	80	90	70	70	90	80	70	80	80	90	80	90	
Number of species in relevé	5	6	6	6	8	4	4	8	6	6	6	6	6	6	6	
Diagnostic species of association																
Dicranella heteromalla	4	4	4	5	5	5	4	3	3	2	3	4	4	3	5	**V**
Atrichum undulatum				+	+	1	1	+	+	2	1	1				**III**
Pohlia nutans	+	2	2	2	1	+	1	3								**III**
Diagnostic species of suballiance and alliance																
Calypogeia muelleriana	2			+					+	+	+		1	+	1	**III**
Cephalozia bicuspidata	r	r	+								+					**II**
Polytrichum commune			+		1				+	1			+	1		**II**
Polytrichum juniperinum					+			2				1			1	**II**
Polytrichum formosum				1		+						+				**I**
Isopaches bicrenatus			r					r								**I**
Diagnostic species of order and class																
Pohlia cruda											2		2	3	+	**II**
Cephloziella divaricata			+					+								**I**
Lophocolea heterophylla								+				+				**I**
Lepidozia reptans							r						r			**I**
Other species																
Atrichum flavisetum		1							1	+	1			+		**II**
Ceratodon purpureus	+	r								1				+	1	**II**
Hylocomium splendens		+		+					1							**I**
Ptychostomum capillare					+										+	**I**

Low constancy species: *Scapania scandica* (8–+); *Callicladium haldaneanum* (5–+); *Plagiochila porelloides* (12–+); *Plagiothecium laetum* (5–+); *Sphagnum girgensohnii* (13–+).

of these communities is close to ones of associations ***Pogonato urnigeri-Atrichetum undulati*** von Krusenstjerna 1945, ***Pellio-Atrichetum undulatae*** Herzog 1943, ***Dicranello heteromallae-Atrichetum flaviseti*** Pisarenko 1990. However, the first two Central European associations are characterized by the absence of *A. flavisetum* (Hübschmann, 1986), and latter one described in Siberia is distinguished by the high constancy of *Dicranella heteromalla* and the absence of *Atrichum undulatum* (Pisarenko, 1999). Comparing with association ***Atricheto undulati-Dicranelletum heteromalli*** it develops on less acidic substrates: pH=4–5 against 2.5–3.5, which is specific for the first. Taking the above into consideration, we consider these communities as a new association, belonging to suballiance ***Pogonatenion urnigeri*** and alliance ***Dicranellion heteromallae*** due to the composition of high-constancy species (*Polytrichum formosum, P. juniperinum, Dicranella heteromala*). The average species number in relevé is 7. The average cover is 83%.

20. ***Tetraphis pellucida*** – community (Table 23 in SM).

Diagnostic species: *Tetraphis pellucida* (dom.).

The mesophytic and acidophilous communities described on decaying, fully destructed wood in coniferous and mixed forests of Southern Urals (Baisheva, 1995) was observed in the Nizhny Novgorod Province in various forest communities in similar habitats. Also, these communities were occasionally noted on bare soil and on upturned roots of fallen trees and on the bases of living trees at the height up to 40cm above the ground. It was noted on *Picea abies* and *Abies sibirica*. The average species number in relevé is 6. The average cover is 81%.

21. Association ***Brachythecio salebrosi-Amblystegietum juratzkani*** Sjogren ex Marstaller 1987) Marstaller 1989 (Table 24 in SM).

Diagnostic species: *Amblystegium serpens* var. *juratzkanum* (dom.).

These communities occur in the forests belonging to the alliances ***Piceion excelsae*** and ***Querco roboris-Tilion cordatae*** on the bark of *Populus tremula, Ulmus glabra, Acer platanoides, Quercus robur, Tilia cordata, Abies sibirica.* They grow on tree bases reaching the height up to 30–50 cm above the ground, less often on the rotten wood. The high constancy and abundance of *Lophocolea heterophylla, Sanionia uncinata* and the diagnostic species of the alliance ***Bryo-Brachythecion*** (*Campylophyllopsis sommerfeltii* and *Sciuro-hypnum reflexum*), and the lower presence of *Leskea polycarpa* allows us to consider it as *Brachythecio salebrosi–Amblystegietum juratzkani,* but not as ass. ***Brachythecio salebrosi-Am-***

Table 6. Association *Atrichetum flaviseto–undulati* ass. nov.

Number of relevé	1	2	3!	4	5	6	7	8	9	10!	11	12	13	14	15	**C**
Localization of relevé	25	12	19	10	11	11	27	27	12	28	28	12	27	12	8	**O**
Substratum	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	**N**
Width of the plot, cm	30	50	40	30	30	50	40	20	30	50	30	20	40	40	50	**S**
Length of the plot, ńm	40	50	80	50	70	50	40	40	40	30	40	60	30	50	50	**T**
Cover, %	80	70	90	100	80	90	80	90	90	80	70	80	70	100	80	
Number of species in relevé	6	9	9	8	7	9	8	9	7	8	4	4	8	1	4	
Diagnostic species of association																
Atrichum flavisetum	2	2	3	3	2	3	3	3	3	4	4	4	4	5	3	**V**
Atrichum undulatum	3	2	3	3	2	3	2	1	2	1	+	+	+			**IV**
Diagnostic species of suballiance, alliance, order and class																
Polytrichum formosum				1	2	+	+	+	+							**II**
Polytrichum juniperinum		+	+	+	+	r	1	1								**II**
Dicranella heteromalla					1	1	1	1			+	+				**II**
Polytrichum commune	+	+	+													**I**
Pohlia cruda					1	+										**I**
Other species																
Ceratodon purpureus		+	+	1	r	r		+	3			r				**III**
Brachythecium salebrosum		1	+	+				1								**II**
Pohlia nutans	1	1				+	+	1			+					**II**
Sciuro-hypnum starkei		1		+									+		3	**II**
Eurhynchiuastrum pulchellum							1		+				1			**I**
Plagionium ellipticum										+			1			**I**
Plagiomnium cuspidatum	+		+	+												**I**
Plagiothecium laetum									r						+	**I**
Rhodobryum roseum			+										+			**I**
Sanionia uncinata			1						1							**I**

Low constancy species: *Calypogeia muelleriana* (6–+); *Cirriphyllum piliferum* (10–+); *Hygroamblustegium varium* (13–+); *Hylocomium splendens* (5–+); *Leptobryum pyriforme* (8–+); *Mnium stellare* (13–+); *Plagiochila porelloides* (15–+); *Pleurozium schreberi* (2–r); *Pogonatum urnigerum* (10–1); *Pohlia annotina* (10–+); *Pohlia bulbifera* (10–+); *Ptychostomum capillare* (10–+); *Ptychostomum moravicum* (7–+); *Sciuro-hypnum curtum* (1–+);

blystegietum serpentis Baischeva & al. 1993, described in the Bashkirian forests on rotten wood and tree bases as well. However, typical epiphytic associations described in Central Europe were distinguished by the predominance of *Amblystegium serpens* (Marstaller, 2006), and our communities are characterized by both the predominance of *Amblystegium serpens* and *Brachythecium salebrosum*. Thus, two variants can be distinguished: var. *typica* (rel. 13–23) and var. *Brachythecium salebrosum* (rel. 1–12). The average species number in relevé is 6. The average cover is 91%.

22. Association ***Brachythecio salebrosi-Drepanocladetum uncinati*** Marstaller 1989 (Table 25 in SM).

Diagnostic species: *Sanionia uncinata* (dom.), *Brachythecium salebrosum*.

In Nizhny Novgorod Province, these communities were described on the tree bases up to a height of 40 cm in broad-leaved forests in the southern part of the province, on tree trunks at a height of 20 to 60 cm in the mesophytic coniferous-deciduous forests belonging to the alliance ***Querco-Tilion***, and on tree trunks at a height of 0.5 to 2 m in the secondary aspen forests and southern taiga in the northern part of the province. The host trees are *Populus temula, Tilia cordata, Quercus robur, Acer platanoides, Picea abies* and *Abies sibirica*.

The abundance of *Brachythecium salebrosum*, as well as the predominantly epiphytic position of communities allow us to consider them as association ***Brachythecio salebrosi-Drepanocladetum uncinati*** Marstaller 1989. At the same time, the high constancy of diagnostic species of the order ***Dicranetalia*** differs our communities from the European ones. The average number of species in relevé is 5. The average cover is 90%.

23. Association ***Brachythecietum salebrosi-curti*** ass. nov. (Table 7 / = Table 26 in SM).

Diagnostic species: *Sciuro-hypnum curtum* (dom.), *Brachythecium salebrosum*. Type relevé of association is 7 in Table 7.

These mesophytic communities occur on the forest floor, developing on rather acid sandy soil in shaded habitats within mesophytic forests belonging to the alliances ***Piceion excelsae***, ***Querco-Tilion*** and ***Dicrano-Pinion***. Also, these communities occur on the roots of trees (mainly spruce) spreading to knolls at the tree trunks, covered with coniferous litter (rev. 1, 7, 11, 14, 15). Habitats of these communities possess an intermediate position between characteristic ones for the alliances ***Bryo-Brachythecion*** (bases of trees and rotten wood) and ***Pleurozion schreberi*** (forest soil and litter). The communities are characterized by the high constancy of diagnos-

Table 7. Association *Brachythecietum salebrosi–curti* ass. nov.

Number of relevé	1	2	3	4	5	6	7!	8	9	10	11	12	13	14	15	**C**
Localization of relevé	19	19	19	14	16	14	14	19	11	15	14	19	15	15	13	**O**
Substratum	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	**N**
Width of the plot, cm	20	50	40	40	50	50	50	50	20	30	40	40	30	20	20	**S**
Length of the plot, cm	20	50	60	80	50	50	50	50	20	40	50	40	50	20	20	**T**
Cover, %	100	90	100	90	80	80	80	90	100	90	100	90	90	100	90	
Number of species in relevé	5	4	5	3	4	5	6	4	3	5	7	6	5	7	5	
Diagnostic species of association																
Sciuro-hypnum curtum	5	5	5	4	4	4	4	4	3	3	2	2	1	1	1	**V**
Brachyhtecium salebrosum	+				+	+	+	1	1	2	2	2	2	2	2	**V**
Diagnostic species of alliance and order																
Amblystegium serpens	r					+						r	r	r		**III**
Brachytheciastrum velutinum		1	+	+	r			1		+	+			2	3	**III**
Brachyhtecium rutabulum						+										**I**
Campylophyllopsis sommerfeltii	+															**I**
Diagnostic species of class																
Lophocolea heterophylla			+			+	+			r	+			1	+	**III**
Plagiothecium denticulatum		+					+						+			**I**
Jochenia pallescens	1						2									**I**
Other species																
Eurhynchiastrum pulchellum			1	1												
Plagiochila porelloides											1	3				**I**
Plagiothecium cavifolium											+			1		**I**
Pleurozium schreberi									1			1				**I**
Rhodobryum roseum		+	1		2			+		1	1		2	+		**III**

Low constancy species: *Aulacomnium palustre* (12–r); *Plagiomnium cuspidatum* (15–+); *Pohlia nutans* (7–+).

tic species of the order ***Brachythecietalia rutabulo-salebrosi*** and the class ***Cladonio-Lepidozietea reptantis***, as well as *Rhodobryum roseum,* which is a co-dominant in several revelés (Table 7). This association is similar to ***Brachythecium starkei***-Gesellschaft Philippi 1983 (Philippi, 1983), but differs by absence of *Sciuro-hypnum reflexum, Herzogiella seligeri, Plagiothecium curvifolium* and *Rhizomnium punctatum*, presence of *Brachytheciastrum velutinum, Amblystegium serpens* and the higher constancy of *Brachythecium salebrosum*. Such floristic composition and specific habitats allow us to recognize these communities as a new association. The average species number in relevé is 5. The average cover is 91%.

24. Association ***Brachythecietum salebroso-reflexi*** Pisarenko 1999

subass. ***B. s.-r. brachythecietosum reflexi*** (Baisheva & al. 1994) Pisarenko 1999 (Table 27 in SM).

Diagnostic species: *Sciuro-hypnum reflexum* (dom.), *Brachythecium salebrosum*.

In Nizhny Novgorod Province, these communities occur in mixed coniferous-deciduous forests (alliance ***Piceion excelsae***) and forested mires (***Alnion glutinosae***) in the central and northern parts of the province (on roots, tree bases and tree trunks at the height up to 30 cm above the ground) and in broad-leaved forests of the alliance ***Querco-Tilion*** (at tree trunks at a height of 30 to 60–80 cm, less often reaching up to 160 cm above the ground) in the southern districts of province. It differs from typical communities, which were firstly described on the tree bases and on the deadfalls in the taiga of Salair (Pisarenko, 1999) by the high constancy and abundance of diagnostic species of the order ***Dicranetalia***. The average species number in relevé is 5. The average cover is 96 %.

subass. ***B. s.-r. plagiemnietosum cuspidati*** Pisarenko 1999 (Table 28 in SM).

Diagnostic species: *Plagiomnium cuspidatum* (dom.).

This subassociation is rather common in different forest communities and occurs in shaded well-moistened areas mainly on the tree bases and trunks (usually on deciduous and very rare on coniferous trees) at the height up to 40–60 cm, on roots, rotten wood and forest floor. This community is similar to typical one described in the same habitats in the Salair taiga (Pisarenko, 1999). The close syntaxon is ***Brachythecio salebrosi-Amblystegietum serpentis*** Baisheva & al. 1994 subass. ***plagiomnietosum cuspidati*** Baisheva 1995 described for the Bashkirian forests (Baisheva, 1995). The average species number in relevé is 5. The average cover is 89%.

Discussion

The syntaxonomical systems developed for European countries (Barkman, 1958; Hübschmann, 1986; Marstaller, 2006) and used for South Ural's (Baisheva *et al.*, 1994; Baisheva, 1995; 2000) and Siberian (Pisarenko, 1999) forests have been used for classification of bryophytic vegetation in the forests of Nizhny Novgorod Province. The present system of bryophytic vegetation contains 6 classes, 9 orders, 11 alliances and 3 suballiances (Tables 8 [= Table 29 in SM] and 9 [= Table 30 in SM]).

Table 8. Syntaxa of classes *Ceratodonto-Polytricheta piliferi*, *Hylocomietalia splendentis, Platyhypnidio-Fontinalietea antipyreticae, Neckeretea complanatae* and *Frullanio dilatatae-Leucodentetea sciuroidis* (Numbers of syntaxa: 1 – *Racomitrio-Polytrichetum piliferi; 2 – Brachythecietum albicantis;* 3 – *Pleurozietum schreberi;* 4 – *Eurhynchietum swartzii;* 5 – *Calliergonelleto lindbergii-Rhizomnietum punctatis;* 6 – *Anomodontetum longifolii;* 7 – *Plagiomnio cuspidati-Homalietum*; *trichomanoidis;* 8 – *Orthotrichetum speciosi;* 9 – *Pylaisielleto polyanthae-Leskeelletum nervosae;* 10 – *Pylaisietum polyanthae;* 11 – *Pylaisio polyanthae-Neckeretum pennatis*; 12 – *Syntrichio latifoliae-Leskeetum polycarpae* subass. *typicum;* 13 – *Syntrichio latifoliae-Leskeetum polycarpae* subass. *pylaisielletosum polyanthae*; 14 – *Syntrichio latifoliae-Leskeetum polycarpae* subass. *leptodictyetosum riparii;* 15 – *Platygyrietum repentis*; 16 – *Ptilidio pulcherrimi-Hypnetum pallescentis* subass. typicum; 17 – *Ptilidio pulcherrimi-Hypnetum pallescentis* subass. *callicladietosum haldanianae; 18 – Orthodicrano-Plagiothecietum laeti* subass. typicum; 19 – *Orthodicrano-Plagiothecietum laeti* subass. *eurhynchietosum pulchelli*.)

N of syntaxa	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
N of relevés in syntaxa	15	20	25	15	17	17	15	12	18	21	23	7	13	15	20	27	23	27	19
Mean cover, %	75	86	94	66	82	96	95	60	97	96	85	92	94	96	93	93	97	87	95
Total N of species	15	20	29	25	32	25	20	10	14	17	17	13	14	23	14	25	37	25	30
Mean N of species in relevé	6	5	5	5	7	4	5	4	4	5	5	5	6	7	5	6	7	6	5
Diagnostic species of associations																			
Polytrichum piliferum	V⁴	II⁺																	
Brachythecium albicans	III⁺	V⁴																	
Hylocomium splendens			III³																
Ptilium crista-castrensis			I														I		
Oxyrrhynchium hians				V⁴	I														
Fissidens taxifolius				II¹															
Rhizomnium punctatum				I	V³							I							
Calliergonella lindbergii				I	IV²							IIʳ		II¹					
Anomodon longifolius						V⁴	I		I	I	I	I	I						
Homalia trichomanoides			I			I	V⁴		I	I	II⁺								
Lewinskya speciosa						I		V³	II⁺	IV¹	IV⁺		III⁺	I	II⁺	I			
Pseudoleskeella nervosa						III¹	II¹		V⁴	I	I				III¹	I			I
Pylaisia polyantha						II¹	II⁺	III¹	V²	V⁴	IV²	I	V²	II⁺	I	I	I	I	I
Neckera pennata							II⁺		I	II⁺	V⁴				I	I			
Leskea polycarpa				I	I			III¹		II⁺		V⁵	V⁴	V²					
Platygyrium repens												I			V⁴	I			
Jochenia pallescens		I	I						I			II⁺	I		I	V⁴	III²	I	I
Ptilidium pulcherrimum			I				I	II⁺	I	IV¹	IV¹			I	I	III⁺	II⁺	IV¹	II⁺
Callicladium haldaneanum	I				I											II⁺	V³	I	I
Plagiothecium laetum			I				I									II¹	II⁺	V³	II¹
Dicranum montanum	I						I			I	I				IV¹	III¹	III¹	V³	III¹
Eurhynchiastrum pulchellum		I	I			I	II¹			I						II⁺	I	III¹	V⁴
Diagnostic species of *Ceratodonto-Polytrichetea piliferi*																			
Ceratodon purpureus	IV¹	IV²		I										II⁺					
Polytrichum juniperinum	III²	I																	
Syntrichia ruralis	IV²	II⁺																	
Diagnostic species of *Hylocomieta splendentis*																			
Pleurozium schreberi	II⁺	I	IV⁴		I														
Hylocomiadelphus triquetrus			I																
Diagnostic species of *Platyhypnidio-Fontinalietea antipyreticae*																			
Leptodictyum riparium				I	III²							IV¹	I	V³					
Brachythecium rivulare				I	II¹									I					
Fontinalis antipyretica					I									II⁺					
Diagnostic species of *Neckeretea complanatae*																			
Plagiomnium cuspidatum			II¹	I	I	II⁺	I		I			I		I		I			
Pseudoamblystegium subtile							III⁺				II⁺							I	
Diagnostic species of *Frullanio dilatatae-Leucodentetea sciuroidis*																			
Frullania bolanderi									I	I									
Nyholmiella obtusifolia								III²	I	II⁺	I		II¹						
Radula complanata						II⁺	I	II⁺	III⁺	III⁺	I		III⁺		III⁺	I		I	I
Leucodon sciuroides						I	I		I		I								
Dicranum scoparium	I	I	II⁺		I					I	I			I	I				

Other species																		
Amblystegium serpens	I	I	I	I	II^{+}	I	I	I	I		IV^{1}	III^{+}	II^{+}	I	I	II^{r}	I	II^{r}
Atrichum undulatum			I	I	I											I		
Brachythecium salebrosum			III^{+}	II^{+}	II^{+}	III^{1}	I	II^{+}			II^{+}		II^{+}	I	III^{+}	I	I	I
Brachythecium rutabulum				III^{1}														
Calliergon cordifolium			I		III^{+}								II^{+}					
Lophocolea heterophylla			I		I		I								I	II^{r}	II^{+}	I
Plagiothecium denticulatum	I	I	I		I	I									I	I	I	I
Pohlia nutans	III^{1}	II^{+}	I												I	I	I	I
Ptychostomum pseudotriquetrum		I		I	I						II^{r}	I	II^{r}					
Sanionia uncinata			I	I	II^{2}	I	I		I	I	II^{+}	II^{+}	III^{r}	II^{+}	III^{+}	III^{2}	I	I
Sciuro-hypnum reflexum			I	I		II^{+}	I	I	III^{+}	III^{+}				II^{+}	II^{+}	II^{+}	II^{+}	II^{r}
Pagiochila porelloides	I		I												I	I	I	I

Low constancy species: *Abietinella abietina* (1–II^{+}; 2–I); *Anomodon viticulosus* (10–I); *Brachytheciastrum velutinum* (8–I; 17–I; 18–I); *Bryum argenteum* (1–I; 2–II^{1}); *Aulacomnium palustre* (5–I); *Blepharostoma trichophyllum* (5–I); *Campyliadelphus chrysophyllum* (8–I); *Campylophyllopsis sommerfeltii* (4–I; 5–I; 9–I; 17–I); *Cephaloziella divaricata* (1–II); *Chiloscyphus pallescens* (3–I; 4–II); *C. polyanthos* (7–I); *Cirriphyllum piliferum* (8–I); *Climacium dendroides* (1–I; 4–I; 21–I); *Cratoneuron filicinum* (8–I); *Dichelima falcatum* (14–I); *Dicranum polysetum* (3–II^{2}); *D.viride* (6–I; 9–I; 16–I); *Ditrichum pusillum* (4–I); *Drepanocladus aduncus* (14–I); *Fissidens bryoides* (4–I); *F. exilis* (4–I); *Herzogiella turphacea* (2–I); *Hygroamblystegium varium* (6–I; 15–I); *Lepidozia reptans* (6–I; 19–I); *Leptobryum pyriforme* (1–I; 2–I; 4–I; 6–I); *Lophocolea minor* (3–I; 16–I; 19–I); *Marchantia polymorpha* (5–I); *Mnium stellare* (7–I); *Nyholmiella gymnostoma* (8–I; 11–I); *Oncophorus wahlenbergii* (17–I); *Plagiochila asplenioides* (3–I; 5–I); *Plagiothecium cavifolium* (7–I; 17–I); *Plagiomnium ellipticum* (4–I); *P. medium* (1–I; 3–I); *Pogonatum urnigerum* (1–I); *Pohlia annotina* (2–I); *Polytrichum commune* (3–I); *P. formosum* (5–I); *P. juniperinum* (17–I; 18–I; 19–I); *Pseudobryum cinclidioides* (5–I); *Ptychostomum capillare* (7–I); *P. crebberimum* (2–I; 12–I); *P. pallens* (2–I); *Rhizomnium pseudopunctatum* (18–I); *Rhodobryum roseum* (3–I); *Riccia fluitans* (5–I; 14–I); *Sciuro-hypnum curtum* (3–I; 17–I; 18–I); *S. starkei* (3–I); *Sphagnum girgensohnii* (3–I); *S. sqarrosum* (3–I); *Stereodon pratensis* (3–I). *Tetraphis pellucida* (5–I; 17–I; 18–I; 19–I).

A total of 23 different associations, 13 subassociations and one community were described for the forests of Nizhny Novgorod Province; 6 associations were described as new and the position in the system of high syntaxa has been critically revised for 1 subassociation. Compared to European data, the described communities have the poorer presence of diagnostic species of the high syntaxa, which was noted for Bashkirian bryophyte vegetation as well (Baisheva *et al.*, 1994; Baisheva, 1995; 2000). Considering occurrence of described associations, we should note the most of them being common. The rarest associations are ***Orthotrichetum speciosi***, ***Plagiothecietum cavifolii*** and ***Anomodontetum longifolii***. A number of associations are characteristic only for certain forests, where they are quite common, while in others they were not observed: Ass. ***Pylaisio polyanthae-Neckeretum pennatis*** is rare in the most types of forests, but the commonest in the south taiga, and ass. ***Eurhynchietum swartzii*** was recorded in the broad-leaved forests only. Analyzing habitats of bryophyte communities, we recorded 7 associations generally developing on the forest floor, 3 – on bare soil, 6 – on rotten wood of different stages of decay and tree bases and 8 – as epiphytic. Concluding, we should note that epiphytic bryophyte communities had been studied most fully, while the list of epixylic and epigeic associations should be added and clarified during further surveys.

Acknowledgements

The authors are grateful to E.Z. Baisheva for her help in selecting literature and great advice.

Literature Cited

[AGAFONOVA, S.M.] АГАФОНОВА С.М. 1974. Климат. – [Climate] *Природа Горьковской области (ред. Кузнецов, Н.В). Горький: Волго-Вятское кн. изд-во* [*In: Kuznetsov, V.N. (ed.) Nature of the Gorky region. Gorky: Volga-Vyatka Publishing House*], *106–125.*

[AVERKIEV, D.S.] АВЕРКИЕВ Д.С. 1954. История развития растительного покрова Горьковской области и ее ботанико-географическое деление. – [The history of the development of the vegetation cover of the Gorky region and its botanical and geographical division] *Ученые записки Горьковского университета* [*Scientific Notes of the Gorky State University*] **25**: *119–136*.

[ALYOKHIN, V.V.] АЛЕХИН В.В. 1935. Объяснительная записка к геоботаническим картам (современной и восстановленной) бывшей Нижегородской губернии (в масштабе 1:500000). – [Explanatory note to geobotanical maps (modern and restored) of the former Nizhny Novgorod province (on a scale of 1:500000)] *Л., Наука* [*Leningrad, Nauka*], *66 pp*.

[ANISHCHENKO, L.N.] АНИЩЕНКО Л.Н. 2001. Бриофлора и синтаксономия моховой растительности Юго-Запада Нечерноземья России. – [Bryoflora and syntaxonomy of moss vegetation of the South-West of the Non-Chernozem region of Russia] *Автореф. ...канд. биол. наук. Брянск, Брянский гос. ун-т* [*Ph.D Thesis Abstract, Bryansk, Bryansk State University*], *23 pp*.

BAISHEVA, E.Z. 1995. Bryophyte vegetation of Bashkiria (South Urals). II. Epiphytic and epixylic communities of North-Eastern Baskiria. – *Arctoa* **4**: *55–63*. https://doi.org/10.15298/arctoa.04.07

BAISHEVA, E.Z. 2000. Bryophyte vegetation of Bashkiria (South Urals). III. Epiphytic and epixylic communities of North-Eastern Baskiria. – *Arctoa* **9**: *101–104*. https://doi.org/10.15298/arctoa.09.08

BAISHEVA, E.Z., A.I. SOLOMETCH & E.A. IGNATOVA. 1994. Bryophyte vegetation of Bashkiria, South Urals. I. Epiphytic and epixylic communities. – *Arctoa* **3**: *139–152.* https://doi.org/10.15298/arctoa.03.09

GARCIA-ZAMORA, P., R.M. ROS, I. GUERRA. 2000. Vegetación briofítica de las sierras de Filabres, Cabrera, Alhamilla y Cabo de Gata (Almería, SE de España). – *Cryptogamie, Bryologie* **21**(1): *19–75*. https://doi.org/10.1016/S1290-0796(00)00102-4

Table 9. Syntaxa of class *Cladonio digitatae-Lepidozietea reptantis* (Numbers of syntaxa: 1 – *Plagiothecietum cavifolii;* 2 – *Pohlietum nutantis;* 3 – *Atricheto undulati–Dicranelletum heteromalli;* 4 – *Atrichetum flaviseto–undulati;* 5 – *Tetraphis pellucida* – community; 6 – *Brachythecio salebrosi–Amblystegietum juratzkani;* 7 – *Brachythecio salebrosi–Drepanocladetum uncinati;* 8 – *Brachythecietum salebrosi–curti;* 9 –*Brachythecietum salebrosi–reflexi subass.plagiomnietosum cuspidati;* 10 –*Brachythecietum salebrosi–reflexi subass. brachythecietosum reflexi.*)

N of syntaxa	4	2	1	3	5	6	7	8	9	10
N of relevees in syntaxa	15	19	15	15	17	22	22	15	27	23
Mean cover, %	91	84	83	83	81	91	90	91	89	96
Total number of species	17	30	22	32	27	31	33	17	37	33
Mean number of species in releve	6	7	6	7	6	6	5	5	5	5
Diagnostic species of associations										
Plagiothecium cavifolium	V 4							I		I
Cephaloziella divaricata	I	IV+	I							
Pohlia nutans	II	V3	III2	II+	I	I	I	I	I	I
Dicranella heteromalla	II1		V 4	II1						
Atrichum undulatum	II+	II	III1	IV2						
Atrichum flavisetum			II1	V3						
Tetraphis pellucida		I			V4		I		I	I
Amblystegium serpens	IIr	I			I	V4	I	IIIr	III1	I
Sanionia uncinata				I	I	II1	V4		II1	II+
Sciuro–hypnum curtum		I		I	I	I	I	V 3		
Plagiomnium cuspidatum				I	I	III+	I	I	V4	II
Sciuro–hypnum reflexum					I	II1	III1		II2	V4
Diagnostic species of *Cladonio–Lepidozietea reptantis*										
Plagiothecium denticulatum	V 2	II1			I	I	I	I	I	I
Lophocolea heterophylla	III+	III+	I		IIr	IIr	I	III+	I	I
Plagiothecium laetum	III+	III1	I	I	IV1	I				I
Pohlia cruda	I		II2	I	I					
Isopaches bicrenatus		I	I	I						
Lepidozia reptans			I		IIr					
Calypogeia muelleriana			III+	I						
Pagiochila porelloides			I	I	I	I	I	I	I	I
Polytrichum formosum			I	II+						
Polytrichum juniperinum	II+	IV3	II1	II+	I	I			I	
Blepharostoma trichophyllum					I					
Callicladium haldanianum		I	I		I	I			I	
Brachytheciastrum velutinum		I						III+		I
Brachythecium salebrosum	I	I		II+	I	V3	III1	V 2	III1	II+
Sciuro–hypnum starkei				II+	I		I			I
Other species										
Campylophyllopsis sommerfeltii		I				IIr	I	I	II+	I
Dicranum scoparium	III+	II+			II+	I	III+		I	II+
Ptilidium pulcherrimum		II1			II1	I	III1			II1
Dicranum montanum		I			IV1	I	II+		I	II1
Eurhynchiastrum pulchellum				I	I	I	I		II1	
Hylocomiadelphus triquetrus						I			I	I
Jochenia pallescens		I		I		I	I	I	I	I
Lewinskya speciosa							I			I
Leptodictyum riparium									I	
Lophocolea minor						I				
Mnium stellare		I		I					I	
Neckera pennata						I			I	II1
Platygyrium repens						I	I			
Pleurozium schreberi	III+	II1		I	IIr	II+	I	I	I	I
Pseudoleskeella nervosa						I			II+	II+
Pylaisia polyantha						II+	I		I	II+
Radula complanata						I	I			II+
Rhizomnium punctatum		I				I	I			
Rhodobryum roseum				I	I		I	III1		
Number of syntaxa	4	2	1	3	5	6	7	8	9	10

Low constancy species: *Aulacomnium palustre* (7–I; 8–I); *Cephalozia bicuspidata* (3–II+*); Cephaloziella rubella* (2–I); *Ceratodon purpureus* (11–III+); *Chiloscyphus polyanthos* (1–I); *Cirriphyllum piliferum* (4–I); *Climacium dendroides* (7–I;); *Dicranella cerviculata* (2–I); *Hygroamblustegium varium* (4–I); *Hylocomium splendens* (4–I); *Fissidens bryoides* (9–I); *Leptobryum piriforme* (2–I; 4–I); *Lophoziopsis longidens* (9–I); *Mnium stellare* (4–I); *Plagiomnium ellipticum* (4–I; 9–I); *P. rostratum* (9–I); *Pogonatum urnigerum* (4–I); *Pohlia annotina* (4–I); *P. bulbifera* (4–I); *P. wahlenbergii* (9–I); *Polytrichum commune* (3–II; 4–I); *P. longisetum* (5–I); *Ptilium crista–castrensis* (9–I); *Ptychostomum capillare* (4–I); *P. moravicum* (4–I); *Rhizomnium pseudopunctatum* (9–I;); *Scapania scandica* (2–I).

HODGETTS, N.G., L. SÖDERSTRÖM, T.L. BLOCKEEL, S. CASPARI, M.S. IGNATOV, N.A. KONSTANTINOVA, N. LOCKHART, B. PAPP, C. SCHRÖCK, M. SIM-SIM, D. BELL, N.E. BELL, H.H. BLOM, M.A. BRUGGEMAN-NANNENGA, M. BRUGUÉS, J. ENROTH, K.I. FLATBERG, R. GARILLETI, L. HEDENÄS, D.T. HOLYOAK, V. HUGONNOT, I. KARIYAWASAM, H. KÖCKINGER, J. KUCERA, F. LARA & R.D. PORLEY. 2020. An annotated checklist of bryophytes of Europe, Macaronesia and Cyprus. – *Journal of Bryology* **42**(1): *1–116*. https://doi.org/10.1080/03736687.2019.1694329.

HÜBSCHMANN, A. 1957. Zur Systematik Wassermoosgesellschaften. – *Mitteilungen der Floristisch-Soziologischen Arbeitsgemeinschaft* **6/7**: *147–151.*

HÜBSCHMANN, A. 1986. Prodromus der Moosgesellschaften Zentraeuropas. – *Bryophytorum Bibliotheca* **32**: *1–313.*

[KHARITONYCHEV, A.T.] ХАРИТОНЫЧЕВ А.Т. 1974. Природные зоны и ландшафты. – [Natural zones and landscapes] *Природа Горьковской области (ред. Кузнецов Н.В). Горький: Волго-Вятское кн. изд-во* [*In: Kuznetsov, V. N. (ed.) Nature of the Gorky region. Gorky: Volga-Vyatka Publishing House*]*, pp. 135–150.*

MARSTALLER, R. 1984. Die Moosgesellschaften des Verbandes Dicranellion heteromallae Philippi 1963. 12 Beitrag zur Moosvegetation Thuringens. – *Gleditschia* **11**: *199–247.*

MARSTALLER, R. 1985. Die Moosgesellschaftender Ordnun Orthotrichetalia Hadacin Klika et Hadač1944. 19. Beitragzur Moosvegetation Thuringens. – *Gleditschia* **13**(2): *311–355.*

MARSTALLER, R. 1986a. Die Moosdesellschaften der Verbande Dicrano-Hypnion filiformis Barkman 1958 und Antitrichion curtipendulae v. Krusenstjerna 1945. 20. Beitrag zur Moosvegetation Thuringens – *Gleditschia* **14**(1): *197–225.*

MARSTALLER, R. 1986b. Die Moosdesellschaften auf morschem Holz und Rohhumus. 25. Beitrag zur Moosvegetation Thuringens – *Gleditschia* **15**(2): *73–138.*

MARSTALLER, R. 1993. Synsystematische Übersicht über die Moosgesellschaften Zentraleuropas – *Herzogia* **9**: *513–541.*

MARSTALLER, R. 2006. Syntaxonomischer Konspekt der Moosgesellschaften Europas und angrenzender Gebiete – *Haussknechtia* suppl. **13**: *1–192.*

MIHAI, G. 1976. Microassociations muscinales de la Foret de Mizzest, Iasi (Roumanic). – *Feddes Repertorium* **87**(9–10): *659–669*.

[MILKOV, F.N. & N.A. GVOZDETSKY] МИЛЬКОВ Ф.Н., Н. А. ГВОЗДЕЦКИЙ. 1976. Физическая география СССР. – [Physiography of the USSR] *M.: Мысль* [*Moscow, Mysl*], *448 pp*.

MUCINA, L., H. BÜLTMANN, K. DIERÂEN, J.-P. THEURILLAT, T. RAUS, A. ČARNI, K. ŠUMBEROVÁ, W. WILLNER, J. DENGLER, R.G. GARSÍA, M. CHYTRÝ, M. HÁJEK, R. DI PIETRO, D. IAKUSHENKO, J. PALLAS, F. J. A. DANI¨LS, E. BERGMEIER, A.S. GUERRA, N. ERMAKOV, M. VALACHOVIČ, J.H.J. SCHAMINÉE, T. LYSENKO, YA.P. DIDUKH, S. PIGNATTI, J.S. RODWELL, J. CAPELO, H.E. WEBER, A. SOLOMESHCH, P. DIMOPOULOS, C. AGUIAR, S.M. HENNEKENS & L. TICHÝ. 2016. Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. – *Applied Vegetation Science* **19**(1): *3–264.* https://doi.org/10.1111/avsc.12257

NÖRR, M. 1969. Die Moosvegetation des Naturschutzgebites Bodetal. – *Hercynia* **6**(4): *345–435.*

PHILIPPI, G. 1974. Verbreitung, Ökologie und Soziologie des Laubmooses *Broterella lorenziana* (Mol.) Loeske in Südwestdeutschland und angrenzender Gebieten. – *Beiträge zur naturkundlichen Forschung in Südwestdeutschland* **33**: *41–53*.

PHILIPPI, G. 1983. Rote Liste der Mosse (Bryophyten). 2. Fassung, Stand April 1983. – *Naturschutz aktuelle. Hilda–Verl.Grefen* **1**: *148–153*.

PISARENKO, O.Yu. 1999. Bryophyte communities of Salair forests (South Siberia). – *Arctoa* **8**: *35–49.* https://doi.org/10.15298/arctoa.08.05

[POLUYAKHTOV, K.K.] ПОЛУЯХТОВ К.К. 1974. Лесорастительное районирование Горьковской области. – [Vegetation regions of the Gorky province] *Биологические основы повышения продуктивности, Горьк. гос. ун–т* [*Biological bases of productivity increase, Proceeding of the Gorky State University*] **2**: *4–20.*

[YAROSHEVSKAYA, S.F. (ed.)] ЯРОШЕВСКАЯ С.Ф. (ред.) 1967. Агроклиматические ресурсы Горьковской области. – [Agro-climatic resources of the Gorky region] *Горький* [*Gorky*]*, 228 pp*.

Appendix 1. Locations of relevés

1 – 14.VIII.1999. Vetluga distr., nr. Klenovik, fir–spruce forest with linden 58.0032°°N, 45.4686°N; 2 – 26.V.2000. Tonshaevo distr., nr. Burepolom, of fir–spruse forest along Pizhma River 57.97554° N, 47.1459E°; 3 – 28.V.2000. Tonshaevo distr., nr. Sherstky, Pizhemskiy nature reserve, floodplain of Pizhma River, fir–spruce forest, 57.9790°N, 47.3989°E. 08.V.1999. 4 – 23.VIII.1999. Varnavino distr., 2,5 km W from Ruseniha, fir–spruce forest, 57.4463°N, 44.8308°E; 5 – 21.VIII.2000. Varnavino distr., between Nepogodiha and Reshetiha, wet large–fern fir–spruce forest along Varvazh River, 57.7670°N, 45.0784°E; 6 – 19.VIII.1999. Vetluga distr., nr. Golubiha, floodplain of Vetluga River, fir–spruce with linden, 57.64595°N, 45.19882°E; 7 – 24.VIII.1999. Varnavino distr., nr. Severnyi, fir–spruce forest along Shada and Agrafenka Rivers, 57.5838°N, 44.7122°E; 8 – 23.VIII.2000. Uren distr., nr. Bolshoe Karpovo, fir–spruce forest with linden, 57.4368°N, 46.0222°E; 9 – 21.VIII.2000. Tonkino distr., Tonkinsky nature reserve, fir–spruce forest with linden, 57.3447°N, 46.4460°E; 10 – 23.VIII. 2000. Tonkino distr., nr. Ipatovo, spuce forest along Usta River, 57.2543°N, 46.2815°E; 11– 27.VIII.2000. Kovernino distr., nr. Neveyka, pine–spruce forest, 57.3984°N, 44.3154°E; 12 – 10.IX.2003. Krasnye Baki distr., nr. Dmitrievskoe, fir–spruce forest with linden along Vetluga River, 57.2048°N, 45.0933°E; 13 – 24.VIII.2000. Sharanga distr., Kilemarsky nature reserve, nr. Tanayka, fir–spruce forest along Shkleya River, 56.9841°N, 46.4197°E; 14 – 27.VIII.2003. Semyonov distr., nr. Moshna, birch and pine forests with predominance of ferns and *Vaccinium myrtillus*, 56.9301°N, 44.6993°E; 15 – 06.VI.2006. Bor distr. Kerzhents State Nature Reserve, spruce forest along Vishnya River 56.4879°N, 44.81477°E; 16 – 02.X.2004. nr. Dzerzhinsk, floodplain oak forest along Oka River, 56,2154°N, 43,4410°E; 17 – 04.V.2003. N. Novgorod, Sovetskiy distr. aspen forest with predominance of nemoral herbs, 56.24502°N, 43.94714°E; 18 – 08.IX.2002. Vorotynets distr., nr. Kamenka, wet spruce forest, 56.2248°N, 45.5143°E; 19 – 22.VII.2000. Arzamas distr., nr. Staraya Pustyn, NNSU Biostation, spruce–pine forest with linden, 55.6707°N, 43.5838°E; 20 – Buturlino distr., nr. Tartaley, oak–linden–ash forest with predominance of *Mercurialis perennis* 55.4538°N, 45.0986°E; 21 – 22.VIII.1998. Pervomaysk distr., nr. Neley, elm–oak–aspen forest with predominance of *Aegopodium podagraria* and *Carex pilosa*, 54.8189°N, 43.9906°E; 22 – 24.VIII.1998. Lukoyanov distr., broad–leaves forests in the upper streams of Ezhat River, oak–forest with predominance of *Aegopodium podagraria* and *Carex pilosa*, 54.9660°N, 44.5233°E; 23 – 09.V.1999. Sechenovo distr., nr. Torgovoe Talyzino, oak–linden forest with predominance of *Aegopodium podagraria* and *Carex pilosa,* 55.0575°N, 45.7652°E; 24 – 05.IX.1998. Lukoyanov distr., nr. Kurley, oak–linden–maple forest with predominance of *Aegopodium podagraria*, 54.7344°N, 44.37878°E; 25 – 27.VIII.2003. Pochinky distr., nr. Sadovka, linden–oak forest with predominance of *Aegopodium podagraria* and *Carex pilosa*, 54.5999°N, 44.3944°E; 26 – 23.VI. 2022. Bogorodsk distr. right side of Volga-river nr. Olenino, broad-leaved forest, 55.1985°N, 43.6608°E; 27 – 14.VIII.2022. Tonkino distr., Tonkinsky nature reserve, nr. Volkovo, fir–spruce forest with linden, 57,34405 °N, 46,43847°E, 28 – 18.VII. 2022. Arzamas distr., nr. Staraya Pustyn, NNSU Biostation, spruce–pine forest with linden, 55.6707°N, 43.5838°E.

Received 19 April 2023 *Accepted 20 June 2023*

SM: https://kmkjournals.com/upload/PDF/Arctoa/32/Arctoa_32_010_025_SM.pdf