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## LIVERWORTS OF THE “DĘBOWIEC” NATURE RESERVE (CENTRAL POLAND)

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**ABSTRACT.** A list of liverworts in the “Dębowiec” reserve is presented. Altogether, 18 species were catalogued, among them epiphytic liverworts such as *Frullania dilatata*, *Porella platyphylla* and *Radula complanata*. The preliminary description of the bryophyte communities of the reserve was done, i.e. *Anomodonto-Leucodontetum*, *Mnietum cuspidati*, *Scopario-Hypnetum filiformis*, *Dicranetum taurici*, *Lophocoleo-Dolichothecetum seligeri*, *Lepidozio-Tetraphidetum pellucidiae*, *Aulacomnietum androgynae*, comm. with *Hypnum cupressiforme* and comm. with *Dicranella heteromalla*.

**Key words:** liverworts, bryophyte communities, “Dębowiec” nature reserve

### Introduction

“Dębowiec” nature reserve has been founded to protect and preserve ecosystems of deciduous forests, i.e. mixed lime-oak-hornbeam forests with large-leaved lime (on its northern limit of European range) and elm-ash forests. Since its foundation in 1965, the reserve has been arousing interest as a subject of geobotanical studies (**Mowszowicz** 1964, **Mowszowicz et al.** 1967, **Czyżewska** 1972, **Olaczek and Sowa** 1972, 1981, **Olaczek** 1998, **Nowakowska** 2000 a, b). Bryological studies have been carried out by **Urbanek** (1965, 1966 a, b, c, d, 1969), **Klama et al.** (1999), **Górski** (2004), and **Urbański** (2004).

The article presents the current state of hepaticoflora of the reserve and a preliminary characteristics of epiphytic, epixylic and epigeic bryophyte communities that have not been studied so far. It is worth noting that despite the presence of natural vascular plant communities, the value of the reserve is actually determined by mosses related with various substrates of the forest ecosystems. Mosses and epiphytic liverworts

clearly determine the appearance of the forest interior. They occur in large number, indicating favourable microhabitat conditions in the reserve forests (mainly constant, high humidity) and high degree of their preservation. This is of particular interest because in forests epiphytic bryophytes disappear, especially in lowlands (e.g. Klama 2003, 2004, Żarnowiec 2003, Żarnowiec et al. 2004, Górski and Urbański 2005). It is also important to take notice of these plants during formulating protection tasks in future preservation plans for the reserve. At present, it is a matter of urgency to protect the reserve against operations that decrease humidity inside the forest, mainly due to forest management in the nearby areas.

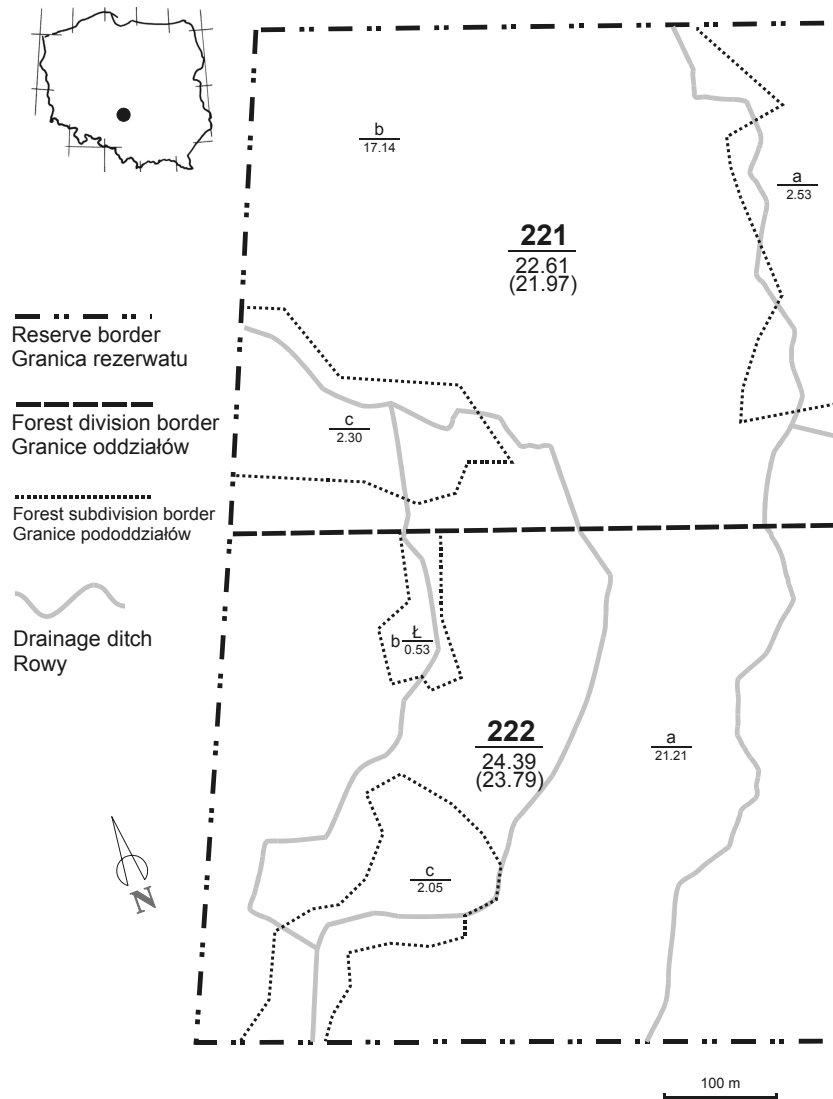


Fig. 1. Survey map of the "Dębowiec" nature reserve  
Ryc. 1. Mapa przeglądowa rezerwatu przyrody „Dębowiec”

## Profile of the reserve

"Dębowiec" nature reserve was founded on 20 October 1965 by regulation of Ministry of Forestry and Timber Industry (Monitor Polski, 1965 No. 63, pos. 352) and kept according to Łódzki Voivod Announcement no. 2/2001 Wojewody Łódzkiego, dated 2 October 2001, about the line-up of the Łódzkie Voivodship nature reserves established till 31 December 1998 (Dziennik Urzędowy Województwa Łódzkiego, no. 206, pos. 2976).

The object is located in the Żytno Community, Radomsko County, Łódzkie Voivodship. It encompasses forest units 221 and 222 entirely (221 a, b, c and 222 a, b, c; Fig. 1). The area is entirely the property of the Treasury under management of State Forests, Forest Inspectorate Gidle.

According to **Kondracki** (1998), the reserve is located in the Małopolska Highland, in the Włoszczowska Syncline. In geobotanical division of Poland (**Szafer** 1977), the object is situated in the Euro-Siberian Region, Central European Lowland-Upland Province, Baltic Division, Central Upland Belt Subdivision, Świętokrzyska Region and Przejściowy District. According to nature-forest regionalization (**Trampler** 1990), the reserve belongs to the Małopolska Land and the Świętokrzyskie Mountains District.

## Current actual vegetation of the reserve

In formation depiction, the predominant types of vegetation are forest communities. The greatest area is covered by lime-hornbeam forests *Tilio-Carpinetum* Tracz. 1962, then elm-ash forests (*Ficario-Ulmetum minoris* Knapp 1942 em. J. Mat. 1976), alder-ash forests (*Fraxino-Alnetum* W. Mat. 1952), and alder forests (*Carici elongatae-Alnetum* W. Koch 1926 ex R. Tx. 1931). The most diverse are lime-hornbeam forests that can be divided into two subassociations: *T.-C. stachyetosum sylvaticae*, *T.-C. typicum*, and a series of physiognomic forms (**Mowszowicz et al.** 1967, **Olaczek** and **Sowa** 1972). Apart from the compact forest area, in the reserve there is also a clearing with semi-natural communities, mainly herbaceous ones with *Filipendula ulmaria* – *Filipendulo-Geraniatum* W. Koch 1926, furthermore *Scirpetum sylvatici* Ralski 1931, and *Angelico-Cirsietum oleracei* R. Tx. 1937 (**Górski** and **Brzeg** 2004).

## Materials and methods

Field studies were carried out in 1990 and 2004. A list of liverworts was put together with respect to literature data (**Mowszowicz et al.** 1967, **Klama et al.** 1999, **Urbanek** 1965, 1966 a, b, c, d, 1969). Identification and depiction of moss and liverwort communities on live and rotten wood, and on ground were done according to **v. Hübschmann** (1986). Phytosociological relevés were done by using the classic method of Braun-Blanquet (**Pawłowski** 1966, **Dierschke** 1994). A modified quantitative scale of **Barkman et al.** (1964) was used for evaluating species cover. Plant nomenclature was used according to **Grolle** and **Long** (2000), **Szweykowski et al.** (2005), **Ochyra et al.** (2003) and **Mirek et al.** (2002).

Herbarium specimens were deposited in the herbarium of Henryk Klama and in the herbarium of Department of Botany, the August Cieszkowski Agricultural University of Poznań (POZNB).

## Results

### List of species

18 liverwort species were recorded in the reserve:

- Blepharostoma trichophyllum*** (L.) Dumort. – two localities; unit 221b, NW part on a rotten stump, in *Carici elongatae-Alnetum*; unit. 221b, central part, on a root-soil clod under a birch, in *Carici elongatae-Alnetum*.
- Calypogeia integristipula*** Steph. – one locality; unit 221b, N part, on soily slope of a trough adjacent to 221, on the borderline of units 221 and 220, *Tilio-Carpinetum stachyetosum*.
- Calypogeia muelleriana*** (Schiffn.) Müll. Frib. – one locality; unit 221b, NW part, on soil at the base of a birch, a cluster in *Carici elongatae-Alnetum*.
- Chiloscyphus polyanthos*** (L.) Corda – relatively frequent on soil in patches of *Fraxino-Alnetum* and *Carici elongatae-Alnetum*; units 221, 222.
- Conocephalum salebrosum*** Szweykowski, Buczkowska & Odrzykoski – relatively frequent in the investigated area; four localities in units 222a and 221b; on moisture soil along watercourses; *Fraxino-Alnetum* and *Tilio-Carpinetum stachyetosum*.
- Frullania dilatata*** (L.) Dumort. – relatively frequent in the investigated area, mainly in unit 221; on bark of live trees: *Quercus* sp., *Acer platanoides*, *A. pseudoplatanus*, *Alnus glutinosa*; *Fraxino-Alnetum* and *Tilio-Carpinetum typicum et stachyetosum*.
- Lepidozia reptans*** (L.) Dumort. – five localities; unit 221a, N part, rotting stamp, *Tilio-Carpinetum typicum*, unit 221b, N and central part, rotting stamp, *Carici elongatae-Alnetum*; 221b, W part, on soil, *Tilio-Carpinetum stachyetosum*; 221a, rotting stamp, *Tilio-Carpinetum stachyetosum*.
- Lophocolea bidentata*** (L.) Dumort. – one locality; unit 221b, N part; on soily slope of a trough adjacent to 221, on the borderline of units 221 and 220, *Tilio-Carpinetum stachyetosum*.
- Lophocolea heterophylla*** (Schrad.) Dumort. – common in the entire area, on live and rotting wood, less frequent on soil; any type of forest phytocoenoses.
- Marchantia polymorpha*** L. subsp. *polymorpha* – very rare on soil in a patch of *Filipendulo-Geranium*; unit 221.
- Metzgeria furcata*** (L.) Dumort. – common in the entire area, on bark of live trees; any type of forest phytocoenoses.
- Pellia endiviifolia*** (Dicks.) Dumort. – relatively frequent; six localities in units 222a and 221b; on moisture soil along watercourses; *Fraxino-Alnetum* and *Tilio-Carpinetum stachyetosum*.
- Pellia epiphylla*** (L.) Corda – relatively frequent on soil in patches of *Tilio-Carpinetum* and *Fraxino-Alnetum*; units 221, 222.
- Plagiochila asplenioides*** (L. emend. Taylor) Dumort. – common in the entire area; species related mainly to *Tilio-Carpinetum stachyetosum*, *Carici elongatae-Alnetum* and *Fraxino-Alnetum*.

***Porella platyphylla*** (L.) Pfeiff. – one locality in unit 221c, on bark of *Fraxinus excelsior* (295 cm in circumference), *Tilio-Carpinetum stachyetosum* in patches of epiphytic association *Anomodonto-Leucodontetum* (compare the description of epiphytic communities).

***Ptilidium pulcherrimum*** (G. Weber) Vanio – three localities; unit 222a, SE part, on bark of a struck oak in *Tilio-Carpinetum stachyetosum*; unit 221b, N and NW part, on bark of live trees, *Tilio-Carpinetum stachyetosum*.

***Radula complanata*** (L.) Dumort. – common in the entire reserve; on bark of live trees.

***Riccia fluitans*** L. – rare, in patches of *Filipendulo-Geraniumetum*; unit 222b.

### Preliminary characteristics of moss communities

The most valuable and rare components of moss vegetation in the reserve are epiphytes. An especially interesting community is *Anomodonto-Leucodontetum* Wiśniewski 1930. It is formed by more and more rare epiphytic liverworts like *Frullania dilatata* or *Porella platyphylla*, the latter species being endangered in Poland (status E, comp. Szweykowski 1992), and by mosses: *Anomodon viticulosus*, *Neckera complanata* and *Leucodon sciuroides*. Phytocoenoses *Anomodonto-Leucodontetum* usually occur on old trees: mostly on sycamore maples, and less frequent on oaks and ashes. Below there are two phytosociological relevés showing floristic composition of the community in the "Dębowiec" reserve.

Note: relevé headers are given below separately, floristic lists of both relevés are combined together, species participation in both relevés is separated with a slash (/), the first value refers to rél. 27, the second to rél. 28; lack of a species is marked with a dot

Rél. 27; 22 October 2004; moss cover layer d – 85%; patch area – 2 m<sup>2</sup>; location: unit 221c; base: ash trunk, 295 cm in circumference; forest phytocoenosis: *Tilio-Carpinetum stachyetosum sylvaticae*

Rél. 28; 21 October 2004; moss cover layer d – 50%; patch dimensions – 30 × 60 cm; location: unit 221b, N part; base: live elm trunk; forest phytocoenosis: *Carici elongatae-Alnetum*

ChAll. *Anomodontion*: *Anomodon viticulosus* 3.3/2.2, *Neckera complanata* 3.3/1.2, *Leucodon sciuroides* +/.

ChCl. *Hypnetea cupressiformis* et ChO. *Leucodontetalia*: *Radula complanata* 1.1/2a.1, *Frullania dilatata* +/+, *Metzgeria furcata* r/1.1, *Porella platyphylla* r/., *Plagiomnium cuspidatum*./r

Other: *Homalothecium sericeum* 2.2/.

Other components of epiphytic vegetation are:

***Mnietum cuspidati*** Felföldy 1941 – phytocoenoses with predomination of *Plagiomnium cuspidatum* and a slight addition of other epiphytes; they grow on bark of live trees at the base of the trunk

Rél. 13; 22 October 2004; moss cover layer d – 100%; patch area – 0.5 m<sup>2</sup>; location: unit 221b, SE part; base: at the base of a live oak trunk; forest phytocoenosis: *Tilio-Carpinetum typicum*

ChAss. *Plagiomnium cuspidatum* 5.5

ChCl. *Hypnetea* et ChO. *Leucodontetalia*: *Hypnum cupressiforme* +, *Homalia trichomanoides* +

Other: *Brachythecium rutabulum* 2a.3

***Scopario-Hypnetum filiformis*** Barkman 1958 *orthodicranetosum montani* – *Scopario-Hypnetum* phytocoenoses establish themselves on bark of live trees (ash, birch) in patches of lime-hornbeam

forests, alder forests, and alder-ash forests. In plant cover, the dominant species was *Orthodicranum montanum*, and, with lesser participation, various forms of *Hypnum cupressiforme*.

***Dicranetum taurici*** Neu 1963 – phytocoenoses with predomination of *Orthodicranum tauricum* were observed on the bark of live trees, although usually they grow on rotting wood (v. Hübschmann 1986). They are almost one-species aggregations with slight addition of *Hypnum cupressiforme*.

The second group of communities was vegetation growing on dead and rotting wood. Preliminary, the following phytocoenoses were identified in the reserve:

***Lophocoleo-Dolichothecetum seligeri*** Philippi 1965 – the most common community related to rotting wood at the bottom of the forest. Most often found on rotten logs and stumps. In the investigated area usually three forms of *Lophocoleo-Dolichothecetum seligeri* are established; they can be distinguished upon participation of structural species. They are: a form with predomination of *Lophocolea heterophylla* (the most frequent), a form with *Herzogiella seligeri*, and phytocoenoses with co-dominance of the aforementioned species. The floristic composition of a *Lophocoleo-Dolichothecetum seligeri* patch is given below.

Rél. 1; 21 October 2004; moss cover layer d – 90%; patch dimensions 30 × 60 cm; location: unit 221a, NE part; base: rotten log; forest phytocoenosis: *Tilio-Carpinetum typicum*, degenerated form with *Betula pendula*

ChAss. *Lophocolea heterophylla* 2b.3, *Herzogiella seligeri* 3.3

Other: *Hypnum cupressiforme* 2b.2, *Platygyrium repens* 1.2

***Lepidozio-Tetraphidetum pellucidae*** (Barkman 1958) Maurer 1961 – phytocoenoses with predomination of *Tetraphis pellucida*. The patches usually grow on deeply rotten stumps or are related (especially in alder forests) with vertical sides of soil-root clods. Apart from the aforementioned species, a liverwort *Lepidozia reptans* is often found in the patches. The floristic composition of a *Lepidozio-Tetraphidetum pellucidae* patch is given below.

Rél. 25; 21 October 2004; moss cover layer d – 90%; patch dimensions – 80 × 20 cm; location: unit 221b; base: birch base, in alder forest; forest phytocoenosis: alder forest *Carici elongatae-Alnetum*

ChAss. *Tetraphis pellucida* 3.3, *Lepidozia reptans* 3.4

ChCl. *Lepidozio-Lophocoletea* et ChO. *Lophocoletalia heterophyllae*: *Herzogiella seligeri* 2b.3, *Orthodicranum montanum* +, *Leucobryum glaucum* +

Other: *Plagiochila asplenioides* 1.2, *Rhizomnium punctatum* 1.2, *Hypnum cupressiforme* r

***Aulacomnietum androgynae*** v. Krusenstjerna 1945 – phytocoenoses related with rotting wood of high decay degree. Most frequently observed on stumps. The floristic composition of an *Aulacomnietum androgynae* patch is given below.

Rél. 26; 22 October 2004; moss cover layer d – 95%; patch area – 0.5 m<sup>2</sup>; location: unit 221c; base: rotten birch stump; forest phytocoenosis: *Tilio-Carpinetum stachyetosum sylvaticae*

*Aulacomnium androgynum* 5.5

*Dicranoweisia cirrata* 1.1, *Dicranum scoparium* +, *Plagiothecium* sp. 1.1, *Cladonia* sp. r

Community with ***Hypnum cupressiforme*** – phytocoenoses with predomination of *Hypnum cupressiforme* are one of the most common moss communities in the reserve. They grow on dead wood of various decay degrees, and on base parts of live trees. Floristic composition of the patches is unstable. Particular phytocoenoses are poor floristically, with predomination of *H. cupressiforme*, accompanied with low participation by typical epiphytes and epixyles. The com-

munity is a constant and predominant component of epiphytic and epixylic vegetation in the reserve. The floristic composition of a patch is given below.

Rél. 32; 22 October 2004; moss cover layer d – 100%; patch area – 1 m<sup>2</sup>; location: unit 221b, NE part; base: oak log with bark; forest phytocoenosis: *Tilio-Carpinetum stachyetosum sylvaticae*

ChCl. *Hypnetaea: Hypnum cupressiforme* 5.5, *Orthodicranum montanum* 1.2

Other: *Platygyrium repens* 1.2

The last group of communities are ground bryophytes. They are an integral part of undergrowth or are related to specific locations, i.e. slopes or ruts. Phytocoenoses with predominance of *Dicranella heteromalla* grow on eroded slopes, ruts, and pit slopes. They can have a tinge of sparse mosses, depending on trophic conditions and humidity of the soil. *Dicranella heteromalla* has a wide ecological range; hence it forms communities of unstable floristic composition. For this reason, communities with *D. heteromalla* are difficult to depict typologically. However, they have a very important ecological context: they are an indicator of natural erosion. In some cases, they indicate anthropogenic destabilization of soil base (ruts, furrows made by transported logs etc.). The floristic composition of a patch established in a deep rut is given below.

Rél. 33; 22 October 2004; moss cover layer d – 40%; herbal cover c – 2%; patch dimensions – 100 × 20 cm; location: unit 221b, central part; forest phytocoenosis: *Tilio-Carpinetum typicum*

ChCl. *Pogonato-Dicranelletea heteromallae: Dicranella heteromalla* 3.4

Other: *Oxyrrhynchium hians* r, *Plagiomnium affine* r, *Pohlia nutans* r, *Carex remota* r, *Moehringia trinervia* r

A drawing of the diversity of moss vegetation of the "Dębowiec" nature reserve given in this article does not scoop out the issue. Vegetation of each of the described communities needs further studies. Special focus should be put on communities with *Homalia trichomanoides*, aggregative formations with *Mnium hornum* or *Thuidium tamariscinum*. Furthermore, descriptions of formations related with watercourses (with *Fontinalis antipyretica* etc.) need to be completed.

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## WĄTROBOWCE REZERWATU PRZYRODY „DĘBOWIEC” (POLSKA ŚRODKOWA)

### S t r e s z c z e n i e

Rezerwat przyrody „Dębowiec” został utworzony w 1965 roku dla ochrony i zachowania ekosystemów lasów liściastych, tj. grądów z lipą szerokolistną (na jej północnym kresie europejskiego zasięgu) oraz łągów wiązowo-jesionowych. Poza zbiorowiskami roślin naczyniowych rezerwatu, posiadających w dużym stopniu naturalny charakter, o walorach przyrodniczych obiektu decyduje roślinność mszysta związana z różnymi typami substratów w obrębie ekosystemów leśnych. Wyraźny rys fizjonomii wnętrza lasu nadają mchy i wątrobowce epifityczne. Ich obfite występowanie wskazuje na korzystne warunki mikrosiedliskowe w obrębie lasów rezerwatu (głównie dużą i stałą wilgotność), a tym samym podkreśla ich wysoki stopień zachowania. W artykule przedstawiono aktualny stan hepatikoflory rezerwatu wraz z wstępną charakterystyką epifitycznych, epiksylicznych i epigeicznych zbiorowisk mszaków.

Na terenie rezerwatu udokumentowano występowanie 19 gatunków wątrobowców. W grupie tej do rzadszych należą epifity, tj. *Porella platyphylla* i *Frullania dilatata*. Najcenniejszym komponentem roślinności mszystej rezerwatu jest zbiorowisko *Anomodonto-Leucodontetum* Wiśniewski 1930. Wstępnie zidentyfikowano dziewięć typów fitocenoz mszaków porastających glebę oraz żywe lub martwe drewno.

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