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LIVERWORTS OF THE NATURE RESERVES IN WIELKOPOLSKA. 1. "LAS ŁĘGOWY W DOLINIE POMIANKI"

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ABSTRACT. A list of liverworts in the reserve "Las Łęgowy w Dolinie Pomianki" is presented. Altogether, 11 species were catalogued (*Cephalozia bicuspidata*, *Chiloscyphus pallescens*, *Frullania dilatata*, *Lepidozia reptans*, *Lophocolea bidentata*, *L. heterophylla*, *Metzgeria furcata*, *Plagiochila asplenioides*, *Ptilidium pulcherrimum*, *Radula complanata* and *Riccardia latifrons*). Their distribution in regard to diversity of forest plant communities in the reserve was shown.

Key words: liverworts, nature reserves, Las Łęgowy w Dolinie Pomianki, Wielkopolska region, Poland

Introduction

The article initiates a series of material studies on hepaticoflora of nature reserves in Wielkopolska. The results of cataloguing will be used to present a complete picture of the variability of hepaticoflora in most valuable areas in the region. In many cases, publications will coincide with implementation of new protection plans, and should enable monitoring changes in hepaticoflora with regards to protection, like in the situation of the reserve "Las Łęgowy w Dolinie Pomianki".

Field studies were carried out in 2005-2006. Liverworts nomenclature and depiction was applied according to **Szweykowski** (2006). Other groups of plants were depicted according to **Ochyra** et **al.** (2003), **Mirek** et **al.** (2002), and **Brzeg** and **Wojterska** (2001). The map of species distribution in the reserve was shown on the background of the diversity of forest communities. Herbary materials were deposited in the herbarium of Department of Botany of the August Cieszkowski Agricultural University of Poznań (POZNB).

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Profile of the reserve

General data

The "Las Łęgowy w Dolinie Pomianki" nature reserve functions under a regulation of Ministry of Forestry and Timber Industry from 10 December 1971 (Monitor Polski no. 5, pos. 33), kept by announcement of Wielkopolska Voivod from 4 October 2001, regarding the line up of nature reserves established by 31 December 1998 (Dz. Urz. woj. Wlkp. no. 123, pos. 2401). The reserve was founded to "preserve alder forest *Circaeo-Alnetum* with rare undergrowth plants, for scientific and educational purpose".

The reserve is situated in the Wielkopolskie voivodship, Kępno district, Łęka Opatowska commune (Fig. 1). In geobotanical classification of Poland (**Szafer** 1972), the reserve is localized in the Kaliski District.

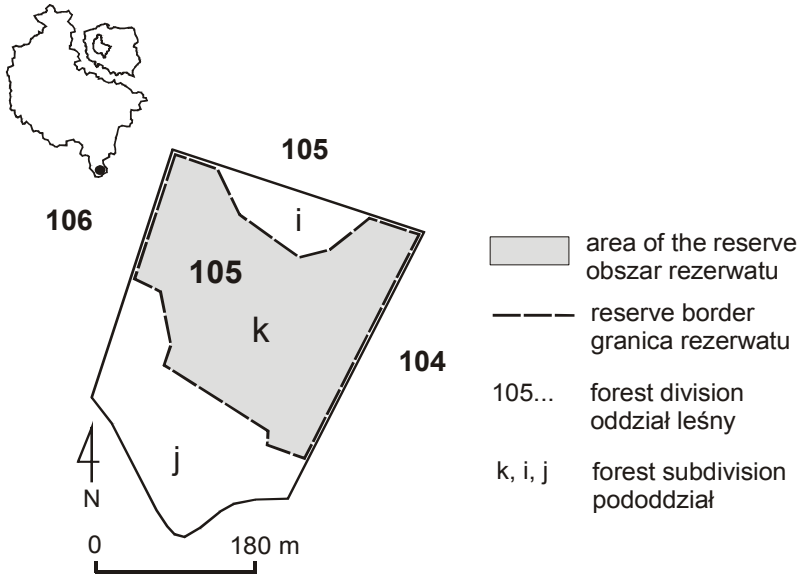

Fig. 1. Survey map of the "Las Łęgowy w Dolinie Pomianki" nature reserve
Ryc. 1. Mapa przeglądowa rezerwatu przyrody „Las Łęgowy w Dolinie Pomianki"

The area covers 6.03 hectares and is entirely the property of the Treasury under management of the Experimental Forest Station of August Cieszkowski Agricultural University of Poznań, located in Siemianice. The reserve encompasses unit 105 k, according to the management plan of the Forest Experimental Station in Siemianice (2004-2013).

Geological structure, soil and relief

The reserve is situated in the valley of the Pomianka river, on flat, slightly concave area with its outlet directed to the east. Parent rocks are made of river alluvial soils and

river sands. There are also peats and silted buggy soils (Plan urządzenia gospodarstwa rezerwatowego... 1975-1985). The soil cover comprises mineral buggy soils (46.9% of area), mucky black earths (27.5%) and peat-buggy soils (25.6% of area) (Plan urządzenia lasu... 2004-2013).

Previous studies on the reserve

High natural value of the forest near Siemianice was noticed before the World War II (**Mijakowski** 1930). Rare vascular (**Ferchmin** 1965, 1967) and spore plants (**Górski** 2005 b) have been reported from this area. **Ferchmin** (1967), who has made the first phytosociological documentation of the area, postulated protecting the most valuable areas of forest ecosystems, and conducted phytosociological studies after the reserve was founded (see **Ferchmin** 1966, 1980). In 2005, plant vegetation of the reserve has been catalogued (**Górski** 2005 a, **Urbański** 2005); moreover, a range of protection for the next 20 years has been defined (**Klimko** and **Górski** 2005).

Current state of vegetation in the reserve

Altogether, 137 species of vascular plants and two plant associations (ash-elm forest and alder forest) were found in the reserve (**Ferchmin** 1980, **Górski** 2005 a). A peculiarity is a rich population of *Senecio rivularis*, and occurence of *Ophioglossum vulgatum*, *Valeriana dioica*, *Listera ovata* and *Rubus siemianicensis* (confirmed also in 2005).

Most of the area of the reserve is covered by ash-elm forest *Fraxino-Alnetum*. The predominant species in this forest is *Alnus glutinosa*. *Fraxinus excelsior* has lower participation and *Betula pubescens* grows sporadically. Physiognomy of the forest interior is determined mostly by bushes. This layer, with cover reaching 75%, is predominated by bird cherry (*Padus avium*) creating lush thickets in places (comp. Table 1, rel. 6-7). The undergrowth is strictly compact. Predominating species are: *Galeobdolon luteum*, *Aegopodium podagraria*, and *Stellaria nemorum*. The cover of herbaceous layer amounts to 80-95%. Spore plants, which make the lowest plant layer, occur with variable cover (15-45%). The major species from this group is *Plagiomnium undulatum*. Depending on moisture of the habitat, particular patches more or less correspond to ash forest in their floristic composition. More moisture forms of the alder-ash forest (comp. Table 1, rel. 1-3) have more rushes species (*Carex acutiformis*, *C. paniculata*, *Galium palustre*) and meadows (mostly moisture meadows) species (*Cirsium oleraceum*, *Caltha palustris*). Forest species, especially those of *Querco-Fagetea* and *Alnion glutinosae*, have less participation. Forms of these forests are located mostly in southern part of the reserve. The second group of phytocoenoses (comp. Table 1, rel. 4-7), less corresponding to alder forests, has high participation of bird cherry in bush and more forest species. Moisturefilous meadows and rushes species are much rarer. These patches can be found in northern part of the reserve.

At present, some parts of the forest lack rush and alder forest species, which distinguish *Fraxino-Alnetum* from other ash forest communities of the alliance *Alnion incanae*. Withdrawing of moisturefilous plants of the classes *Phragmitetea* and *Alnetea glutinosae* may be caused by a decrease of the level of ground waters in the reserve. It also shows succession to elm-ash forest (*Querco-Ulmetum*). Dynamic tendencies of this community should be monitored in future.

Table 1

Phytocoenoses of *Fraxino-Alnetum* from the "Las Łęgowy w Dolinie Pomianki" nature reserve
Fitocenozy łęgu *Fraxino-Alnetum* z rezerwatu przyrody „Las Łęgowy w Dolinie Pomianki"

									Constancy – Stałość	Cover coefficient – Współczynnik pokrycia
Succesive number Numer kolejny zdjęcia		1	2	3	4	5	6	7		
Number of relevé in the field Numer zdjęcia w terenie		4	6	8	11	5	3	7		
Cover of tree layer (%) Zwarcie warstwy drzew (%)		45	65	50	60	65	60	70		
Cover of shrub layer (%) Zwarcie warstwy krzewów (%)		5	25	15	70	60	75	65		
Cover of herb layer (%) Pokrycie warstwy zielnej (%)		80	95	80	90	95	85	90		
Cover of moss layer (%) Pokrycie warstwy mszystej (%)		15	15	40	25	20	45	15		
Date Data		20	20	20	21	20	20	20		
		06	06	06	06	06	06	06		
		05	05	05	05	05	05	05		
Area of relevé (m^2) Powierzchnia zdjęcia (m^2)		400	400	300	400	350	300	400		
Number of species Liczba gatunków w zdjęciu		37	34	36	42	45	48	28		
Alnus glutinosa (Ch. III)	a	3.1	4.4	3.1	3.4	3.1	3.4	3.4	V	4107
Fraxinus excelsior (Ch. II)	a	.	1.1	+	2a.1	3.1	2b.1	2b.1	V	1329
Betula pendula (VI)	a	.	.	.	.	.	r	1.1	II	73
Padus avium (Ch. I)	b	1.1	2b.2	1.2	4.4	4.4	4.5	4.4	V	4000
Fraxinus excelsior (Ch. II)	b	+	+	1.2	1.2	1.1	.	.	IV	229
Fagus sylvatica (Ch. II)	b	.	.	1.2	.	+	.	.	II	79
Sorbus aucuparia (VI)	b	.	.	.	+	+	.	.	II	14
Frangula alnus (VI)	b	.	.	.	.	+	.	.	I	7
I. Ch. ***Alnion incanae***										
Plagiomnium undulatum		2a.2	2a.2	2b.2	2.2	2a.2	3.2	1.2	V	1571
Stellaria nemorum		+	2b.1	1.1	1.2	1.1	2.1	2.2	V	1007
Circaea lutetiana		1.1	2a.1	+	1.1	1.1	2a.1	1.1	V	579
Festuca gigantea		r	+	.	.	r	r	r	IV	13
Equisetum sylvaticum		1.3	2b.3	.	.	.	r	+	III	366
Eurhynchium angustirete		.	.	.	+.2	+.2	r	1.1	III	87

Table 1 – cont.

Succesive number Numer kolejny zdjęcia		1	2	3	4	5	6	7		
Ribes spicatum	b/c	.	.	.	./r	+/.	+/.	+/.	III/I	21/1
Padus avium	c	.	.	.	1.1	+	+	+	III	93
Stachys sylvatica		.	.	.	.	1.1	.	2b.2	II	357
Carex remota		r	r	.	r	.	.	.	III	4
Viburnum opulus	c	r	.	.	.	.	.	.	I	1
Impatiens noli-tangere		.	+	.	.	+	.	.	II	14
Chrysosplenium alternifolium		.	.	r	.	.	r	.	II	3
II. Ch. ***Querco-Fagetea***										
Galeobdolon luteum		2a.1	3.4	2.3	3.4	4.4	3.4	3.4	V	3429
Aegopodium podagraria		2a.1	2a.1	1.1	2.1	2b.2	2.1	2.1	V	1393
Ranunculus lanuginosus		+	1.1	.	+	1.1	1.1	+	V	236
Paris quadrifolia		.	1.1	r	+	1.1	+	.	IV	159
Carex sylvatica		r	.	.	+	+	+	r	IV	24
Brachypodium sylvaticum		r	+.2	.	+	+	r	.	IV	24
Milium effusum		r	+	r	+	+	+	+	V	39
Anemone nemorosa		o	o	.	o	o	o	o	V	0
Fraxinus excelsior	c	+	.	+	r	.	+	+	IV	30
Atrichum undulatum		r	.	.	.	.	r	+	III	10
Euonymus europaeus	c	.	.	.	+	+	r	r	III	17
Polygonatum multiflorum		.	.	.	.	+	r	+	III	16
Stellaria holostea		.	.	.	.	.	+	2.3	II	257
Asarum europaeum		.	.	.	2b.1	+	.	.	II	293
Hepatica nobilis		.	.	.	1.1	1.1	.	.	II	143
Ajuga reptans		.	.	.	.	1.3	.	.	I	71
Acer pseudoplatanus		.	.	r	.	.	.	+	II	9
Scrophularia nodosa		.	.	r	.	.	.	.	I	1
Viola reichenbachiana		.	.	.	+	.	.	.	I	7
Fagus sylvatica	c	.	.	.	r	+	r	.	III	10
Carpinus betulus	c	.	.	.	.	+	.	.	I	7
III. Ch. ***Alnetea glutinosae***										
Lycopus europaeus		+	.	1.1	r	+.2	r	.	IV	89
Solanum dulcamara		.	r	1.2	.	.	.	.	II	73
IV. Ch. ***Molinio-Arrhenatheretea***										
Cirsium oleraceum		2a.1	1.1	+	+	+	.	.	IV	236
Lysimachia vulgaris		1.1	+	.	r	+	+	.	IV	94

Table 1 – cont.

Succesive number Numer kolejny zdjęcia		1	2	3	4	5	6	7		
Poa trivialis		+	+	1.1	+	.	r	.	IV	94
Crepis paludosa		1.1	+	+	.	+.2	.	.	III	93
Equisetum palustre		.	+	+	+	+	r	.	IV	30
Ranunculus repens		r	.	1.2	.	.	+	.	III	80
Caltha palustris		.	+	2.3	.	.	+	.	III	264
Deschampsia caespitosa		.	.	+	r	.	r	.	III	10
Climacium dendroides		.	.	.	.	r	r	.	II	3
Filipendula ulmaria		r	.	.	.	.	.	.	I	1
Juncus effusus		r	.	.	.	.	.	.	I	1
V. Ch. ***Phragmitetea***										
Carex acutiformis		3.4	1.1	.	.	.	.	.	II	607
Phalaris arundinacea		r	.	+.2	.	.	.	.	II	9
Galium palustre		.	.	1.2	r	r	.	.	III	74
Carex paniculata		.	.	1.1	.	.	r	.	II	73
Galium uliginosum		.	.	.	.	.	+	.	I	7
VI. **Others – Inne**										
Impatiens parviflora		2a.3	2a.1	1.1	r	+	1.1	2a.1	V	580
Oxalis acetosella		+	+	1.2	+	2b.3	+.2	2a.1	V	529
Plagiomnium rostratum		+	.	+	1.2	1.2	2a.2	1.1	V	371
Rubus idaeus		+.2	+	.	1.1	1.1	r	1.1	V	230
Dryopteris carthusiana		.	+	+	+	+	1.1	+	V	107
Geum rivale		+	+	+	1.1	r	r	.	V	96
Urtica dioica		.	+	1.1	+	+	+	.	IV	100
Athyrium filix-femina		1.1	1.2	+	.	.	r	.	III	151
Brachythecium rutabulum		1.2	1.2	.	.	.	+	.	III	150
Calliergonella cuspidata		.	.	2b.2	.	.	2a.2	.	II	429
Maianthemum bifolium		.	r	.	r	1.1	r	.	III	76
Oxyrhynchium hians		+	.	.	1.2	.	.	.	II	79
Brachythecium curtum		.	.	.	1.2	.	.	.	I	71
Chiloscyphus pallescens		r	.	.	.	.	.	.	I	1
Eupatorium cannabinum		.	.	r	.	.	r	.	II	3
Cardamine amara		.	.	+	.	.	.	.	I	7
Humulus lupulus		.	.	.	r	.	.	.	I	1
Geranium robertianum		.	.	.	+	+	.	.	II	14
Rhamnus catharticus	c	.	.	.	.	r	.	.	I	1
Mnium hornum		.	.	.	.	.	+	.	I	7

Carici elongatae-Alnetum covers little area. The community occurs in north-eastern and south-western parts of the reserve. Poorly compact woods are composed of alder (*Alnus glutinosa*), with slight tinge of ash (*Fraxinus excelsior*). Bushes are poor. They consist of glossy buckthorn, alder, and ash. The undergrowth has usually high cover and is composed of rushes and alder forest species, i.e. *Carex acutiformis*, *Glyceria fluitans*, *Solanum dulcamara*, and *Lycopus europaeus*. The alder forests of the reserve correspond floristically to predominant alder-ash forests; their tuft-hollow structure is not developed clearly. The floristic composition of a patch is given below.

Rel. 1, 19 June 2005 r., cover: trees (a) – 25%, bushes (b) – 5%, herbaceous plants (c) – 85%, mosses (d) – 5%, reserve "Las Łęgowy w Dolinie Pomianki", unit 105k, p. SW.

a *Alnus glutinosa* 2b.1, *Fraxinus excelsior* r

b *Fraxinus excelsior* 1.1, *Frangula alnus* +, *Alnus glutinosa* +

c *Solanum dulcamara* 3.4, *Glyceria fluitans* 3.3, *Carex acutiformis* 3.3, *Myosotis palustris* 2a.3, *Scirpus sylvaticus* 2a.3, *Galium uliginosum* 2a.3, *Peucedanum palustre* 1.2, *Lycopus europaeus* 1.1, *Galium palustre* 1.1, *Scutellaria galericulata* 1.1, *Carex paniculata* 1.1, *Ranunculus repens* 1.2, *Dryopteris carthusiana* 1.2, *Athyrium filix-femina* 1.2, *Hottonia palustris* +, *Poa trivialis* +, *Carex vesicaria* +, *Crepis paludosa* r, *Lythrum salicaria* r, *Impatiens parviflora* r, *Juncus effusus* r, *Urtica dioica* r, *Sorbus aucuparia* r

d *Calliergonella cuspidata* 1.2, *Plagiomnium rostratum* +

Results

Liverwort flora

Eleven species of liverworts were found in the reserve "Las Łęgowy w Dolinie Pomianki". The poorest group are epiphytes. *Frullania dilatata*, a rarer and rarer species (**Klama** et **al.** 1999) was found at one locality. Epiphytes are also represented by *Metzgeria furcata* and *Radula complanata*, which, while common in Poland, in the reserve were found at one locality only. The richest are epixylic liverworts, especially *Cephalozia bicuspidata*. It grows on rotting logs in the central part of the reserve. *Plagiochila asplenioides* was often found at the bottom of the forest. It also has been recorded earlier (**Ferchmin** 1980). It is worth to note that *P. asplenioides* is an indicator species for forests of high naturalness, and is regarded as the so-called original relict of primeval forests (**Cieśliński** et **al.** 1996). It is also partially protected by law.

List of species

Abbreviations:
CA – *Carici elongatae-Alnetum*, FA – *Fraxino-Alnetum*, FA/QU – patches *Fraxino-Alnetum* corresponding to *Querco-Ulmetum*

Cephalozia bicuspidata (L.) Dumort. – frequent (CA, FA), on rotten logs in central part of the reserve,

Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort. – one locality (FA), on soil in eastern part of the reserve,

Frullania dilatata (L.) Dumort. – one locality (FA/QU), on withered trunk, in northern part,

Lepidozia reptans (L.) Dumort. – one locality (FA), rotting wood, in eastern part of the reserve,

Lophocolea bidentata (L.) Dumort. – one locality (FA) in south-western part [also given by Ferchmin (1980) in table *Fraxino-Alnetum*, Table 6, rel. 1, 4, 5],

Lophocolea heterophylla (Schrad.) Dumort. – common (CA, FA, FA/QU), rotting wood, less common on the ground; whole area of the reserve,

Metzgeria furcata (L.) Dumort. – one locality (FA/QU), on withered trunk, in northern part,

Plagiochila asplenioides (L. emend. Taylor) Dumort. – two localities (FA), on soil in eastern part of the reserve [also given by Ferchmin (1980) in table *Fraxino-Alnetum*, Table 6, rel. 5, 6],

Ptilidium pulcherrimum (Weber) Vain. – three localities (CA, FA), on bark of birch and alder,

Radula complanata (L.) Dumort. – one locality (FA), on bark of alder, in eastern part of the reserve,

Riccardia latifrons (Lindb.) Lindb. – one locality (FA), rotten log, in eastern part of the reserve.

Menace to liverworts

A potential menace to liverwort flora, especially epiphytes, is caused by actions lowering moisture inside the forest ecosystems of the reserve (**Klama** 2003, 2004, **Górski** and **Urbański** 2005). Especially dangerous could be complete tree falling in the forest stand with hemlock spruce in the unit 105j adjacent to reserve on the south and further bordering on arable fields. It is the only plant strip buffering the drying effect of wind blowing from the field. Drainage in the area around the reserve can also be unfavourable for the microclimate of the forests. A tendency to transformation of fragments of *Fraxino-Alnetum* to *Querco-Ulmetum* can already be noticed. Another reason of concern can be a deep ditch situated south to the reserve. A forest edge at the border of the unit 105j and the field should be allowed to grow naturally, as it will decrease penetration of wind into the reserve.

Naturalness of the reserve and perspectives of preservance of hepaticoflora

The reserve "Las Łęgowy w Dolinie Pomianki" is a unique object which shows how in a relatively short time consequent strict protection can lead to formation of an ecosystem of "primeval forest" physiognomy. Since the beginning of protection (1971), the reserve has been excluded from any sort of forestry, particularly, dead wood has been left in the forest. At present, the amount of dead wood in various stages of decay is significant. Considering the structure and the floristic composition, the ash forests are highly natural. Unfortunately, one should expect invasion of *Impatiens parviflora*, already present in the undergrowth.

Within the next few years, the state of liverwort flora should not change substantially. The new protection plan (in preparation) guarantees undisturbed course of ecological processes in the reserve. It is worth to note that primeval character of the forests in the reserve, defined by **Cieśliński** et **al.** (1996), apart from *Plagiochila aspleniodes*, is also emphasized by relict mosses, i.e. *Homalia trichomanoides* and *Neckera complanata* (**Urbański** 2005).

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WĄTROBOWCE REZERWATÓW PRZYRODY WIELKOPOLSKI. 1. „LAS ŁĘGOWY W DOLINIE POMIANKI"

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

Rezerwat przyrody „Las Łęgowy w Dolinie Pomianki" został utworzony w 1971 roku dla ochrony fitocenoz łęgu jesionowo-olszowego (*Fraxino-Alnetum*). Od objęcia tego obszaru ochroną obiekt całkowicie wyłączono z jakichkolwiek form gospodarowania, w tym w szczególności pozostawiano martwe drewno. Na badanym obszarze stwierdzono występowanie 11 gatunków wątrobowców (*Cephalozia bicuspidata*, *Chiloscyphus pallescens*, *Frullania dilatata*, *Lepidozia reptans*, *Lophocolea bidentata*, *L. heterophylla*, *Metzgeria furcata*, *Plagiochila asplenioides*, *Ptilidium pulcherrimum*, *Radula complanata* i *Riccardia latifrons*). Zagrożeniem dla flory wątrobowców, zwłaszcza epifitycznych, są wszelkie działania zmieniające poziom wilgotności powietrza we wnętrzu ekosystemów leśnych rezerwatu. Szczególnie niebezpieczny byłby zrąb zupełny w drzewostanie z daglezją w wydzieleniu 105 j, przylegającym od południa do rezerwatu i dalej graniczącym z polami uprawnymi. Jest to bowiem jedyny pas roślinności buforujący osuszające działanie wiatru od strony pola. Niekorzystny wpływ na mikroklimat lasów może mieć melioro-wanie terenu wokół rezerwatu. Już teraz zaznacza się tendencja przechodzenia fragmentów *Fraxino-Alnetum* w kierunku *Querco-Ulmetum*. Duży niepokój budzi obecność głębokiego rowu poza rezerwatem, od strony południowej.

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