

VASCULAR PLANTS OF THE “UROCZYSKO WIELKIE ŁUNAWY” (CHEŁMNO REGION)

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Abstract. “Uroczysko Wielkie Łunawy” belongs to objects which can be distinguished for their considerable floristic values. Varied and slightly deformed flora of this small object comprises 192 species of vascular plants derived from 60 families, including 41 taxa of arborescent plants. Sites of 13 species under legal protection were identified. Valuable fragments of oak-hornbeam and riparian forest communities as well as stands close to natural ones were also found. It seems that, bearing in mind the relatively rare and well-preserved communities of the oak-hornbeam and riparian forests occurring in this region, the entire “Uroczysko Wielkie Łunawy” should be protected.

Key words: flora, Wielkie Łunawy, Chełmno Region, Jamy Forest District

INTRODUCTION

“Uroczysko Wielkie Łunawy” is situated within the area of a very valuable Lower Vistula Valley Landscape Park which was established in 1999 as a result of merging two existing parks: Chełmiński and Nadwiślański [Rozporządzenie... 1999]. This situation lasted until 21st of May 2003 when the name “Lower Vistula Valley Landscape Park” was replaced by another one, namely “Complex of Chełmiński and Nadwiślański Landscape Parks” [Rozporządzenie... 1999, Zarządzenie... 2003]. At the present time, both the right-hand and left-hand bank sides of the Vistula River from Bydgoszcz to Nowe have been placed under protection [Przyroda... 1992, Parki... 2000, <http://www.dolnawisla.pl>].

The above-mentioned complex of Parks occupies the area of over 55 thousand hectares. Their unique natural values, considerable variability of the surface features, soil, climate as well as waters find their reflection in the exceptional wealth of flora and fauna. The total of 48 strictly protected species and 13 partially protected species derive

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from the former Chełmiński Landscape Park [Dokumentacja... 1997], whereas in the entire complex of Parks, 14 nature reserves and 101 nature monuments can be identified. In addition, there are valuable historical objects in Chełmno, Świecie and Nowe [http://www.dolnawisla.pl].

Forests cover a relatively small part of the complex of Parks and are distributed rather unevenly. Broadleaved forest communities, for example rather rare in the region *Acer platanoides-Tilia cordata* Jutr.-Trzeb. 1993 and *Tilio cordatae-Carpinetum betuli* Tracz. 1962, with sites of rare and protected plant species, occur in the neighbourhood of Wielkie Łunawy, near water heads as well as along small water courses [Rejewski 1971, Dokumentacja... 1997, Osobliwości... 1998, http://www.dolnawisla.pl]. The examined object is situated in the close vicinity of the proposed nature reserve in Wielkie Łunawy [Rejewski 1996]. Despite the fact that the forest communities of the planned reserve had been considered as degenerated to a smaller or greater extent, nevertheless numerous rare and protected species of vascular plants were recorded here. The rarest of them, i.e. *Allium ursinum*, *Corydalis solida*, *Galanthus nivalis*, can only be found in two or three natural sites in the Toruń Region and their sites in Wielkie Łunawy are considered to be the most numerous in the mentioned region. Additionally, apart from the above-mentioned species, *Aquilegia vulgaris*, *Hierochloa australis*, *Ispopyrum thalicroides*, *Lilium martagon*, *Listera ovata*, *Melica uniflora*, *Pulsatilla patens*, *P. pratensis*, were also reported to occur in the area of the planned reserve [Ceynowa-Giedon 1971].

STUDY AREA

“Uroczysko Wielkie Łunawy” is situated within the boundaries of the Kujawsko-Pomorskie Voivodeship, approximately 13 km north-east from Chełmno and about 200 m from the village of Wielkie Łunawy (53°23'9''N, 18°37'23''E). It comprises almost whole 117a and b sub-compartments of the Łunawy Forest Range (Jamy Forest District, Regional Directorate of the State Forest in Toruń). Floristic investigations were carried out on the area of about 7.7 ha (Fig. 1).

According to the physico-geographic regionalization of Poland [Kondracki 2000], the discussed object is situated in the Lower Vistula Valley, on the border between the Grudziądz Basin and Chełmińsko-Dobrzyńskie Lake District [Zobolewicz et al. 1996]. On the north-west, the “Uroczysko Wielkie Łunawy” borders with arable land of the village of Wielkie Łunawy, whereas in the remaining directions it is surrounded by the forests of the Łunawy Forest Range.

In accordance with the Forest Management Plan of the Jamy Forest District, the 117a sub-compartment occupies 7.12 ha. The investigated object is characterized by a considerable geomorphological diversity. A small stream flows along compartment 117a and forms a flood waters in compartment 117b (0.60 ha). Slightly above the small valley of the stream, steep slopes covered with broadleaved forests extend on its both sides.

The stand is made up, primarily, of *Quercus robur* and *Q. petraea* (80%), *Carpinus betulus* (10%) and *Alnus glutinosa* (10%). The mean age of oaks is 130 years and of the remaining two species – 100 years. Apart from the above-mentioned tree species, *Betula pendula* and *Tilia cordata* can also be found in the stand sporadically. The most common species of the stand undergrowth is *Corylus avellana*, *Q. robur* and *C. betulus*.

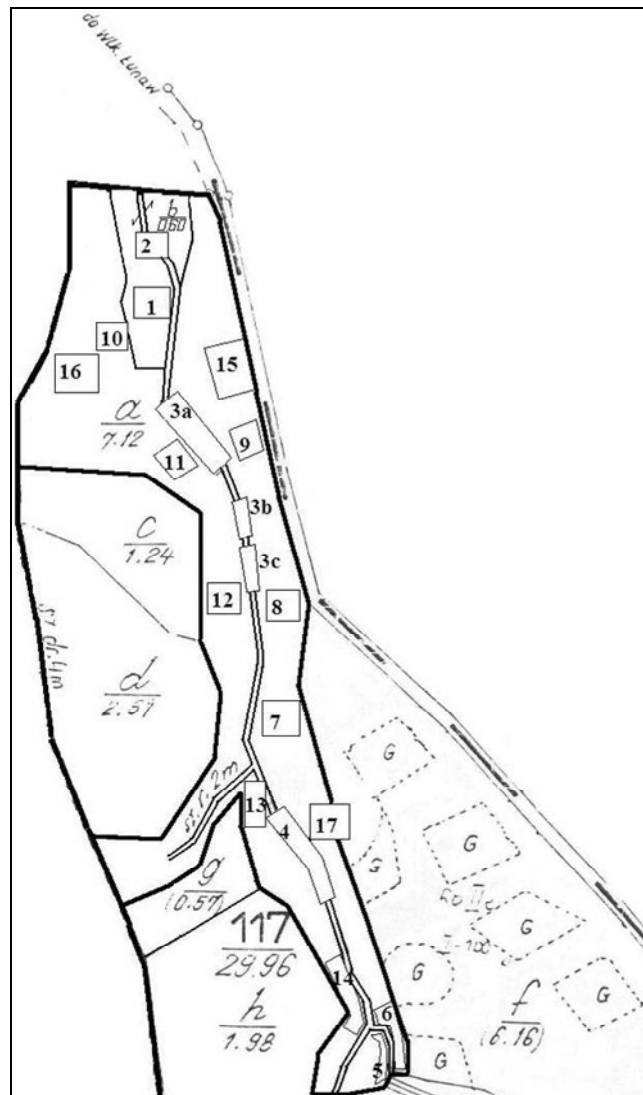


Fig. 1. Study site borders and location of sites where DBHs and heights of trees and shrubs were measured and stands structure were described

Rys. 1. Granice terenu badań oraz lokalizacja powierzchni, gdzie wykonano pomiary pierśnic i wysokości drzew i krzewów oraz określono strukturę pionową drzewostanów

The stand of the 117b sub-compartment is made up, primarily, of *A. glutinosa* (90%), *Fraxinus excelsior* (10%) and, occasionally, *Salix* sp. Most of the *A. glutinosa* and *F. excelsior* trees are about 60 years of age. The undergrowth layer consists mainly of *C. avellana* and *T. cordata* [Szczegółowe... 1997].

METHODS

Flora inventory was carried out from March to October 2005 and 2006. The names of plant species were given after Mirek et al. [2003] and Seneta and Dolatowski [2004], whereas the statistical analysis of the examined flora was carried out on the basis of Jackowiak [1993] and Żukowski et al. [1995]. The classification of socio-ecological groups was given as follows: 1) *Fagetalia, Prunetalia*, 2) *Quercion, Epilobion, Narde-talia*, 3) *Sambuco-Salicion, Alliarion*, 4) *Trifolio-Geranietea, Festuco-Brometea*, 5) *Corynephoretea, Sedo-Scleranthetea*, 6) *Alnion, Magnocaricion, Caricetalia fuscae, Sphagnion fusci*, 7) *Salicion, Phragmition, Glycerio-Sparganion, Potametea, Lemnetea, Utricularietea*, 8) *Molinietalia*, 9) *Molinio-Arrhenatheretea*, 10) *Plantaginetea*, 11) *Bidentetea, Nanocyperion*, 12) *Arction, Convolvulion*, 13) *Onopordion*, 14) *Sisymbriion, Eragrostion*, 15) *Polygono-Chenopodietalia*, 16) *Aperetalia*, 17) *Asplenietae*, 18) species with undefined phytosociological affiliation.

The “special care” species comprised those which are under legal protection [Rozporządzenie... 2004], mentioned on ‘red lists’, both country [Lista... 1992] and regional [Żukowski and Jackowiak 1995, Rutkowski 1997].

Measurements of breast height diameters as well as heights of trees and bushes growing in the examined site were conducted in August 2006. Breast height diameters of all trees and bushes grown on the sub-plots were measured with 1 mm accuracy (two perpendicular measurements), while their heights – with 10 cm accuracy (several dozen measurements for each thickness class). The structure of breast height diameters of trees and bushes were analysed in five centimetre thickness classes.

The inventory of the thickest trees involved belt-wise inspections of stands along transects 50 m wide in the north-south direction in all sub-compartments of the entire object. The examined trees were classified into one of the following three groups: trees with monumental circumference, close to monumental circumference: *Alnus glutinosa* – from 202-219 cm and splendid trees [Instrukcja... 1996, Ruciński 1998]. The health condition of the examined trees was determined on the basis of Kamiński and Czerniak [2000].

RESULTS

The general characteristics of the flora

The total of 192 taxons of vascular plants from 60 families, including 6 species of pteridophytes, 3 conifers as well as 183 species of mono- and dicotyledons (Table 1). The number of species in individual families ranged from 1 to 16. *Asteraceae, Poaceae, Ranunculaceae* as well as *Liliaceae, Rosaceae* and *Scrophulariaceae* belong to families richest in species. The total of 69 species, i.e. 35.9% of all vascular plants of the examined object, derives from these six families. Particular families are usually represented by a small number of species; the size of 52 families ranges from 1 to 5 species, while 23 families are represented by only one species (Table 2).

The most numerous species are those which occur in a few to several sites, i.e. rare and very rare species, while plants found in a greater number of places (frequent, very frequent and common species) constitute a much lower share. As to vascular plants, native species are prevalent and are represented by 177 species (92.2% of all taxons).

Table 1. The list of taxa of vascular plants in the "Uroczysko Wielkie Łunawy"

Tabela 1. Wykaz taksonów roślin naczyniowych stwierdzonych na terenie „Uroczyska Wielkie Łunawy”

No. Lp.	Species name Nazwa gatunkowa	Raunkiaer's group Grupa Raunkiaera	Geographical- -historical group Grupa his- toryczno- -geograficzna	Socio- -ecological group Grupa socjo- logiczno- -ekologiczna
1	2	3	4	5
1.	<i>Abies alba</i> L.	M	Kn	2
2.	<i>Acer platanoides</i> L.	M	Ap	1
3.	<i>Acer pseudoplatanus</i> L.	M	Ap	1
4.	<i>Achillea millefolium</i> L.	H	Ap	9
5.	<i>Actea spicata</i> L.	H	Sp	1
6.	<i>Adoxa moschatelina</i> L.	G	Sp	7
7.	<i>Aegopodium podagraria</i> L.	H	Ap	1
8.	<i>Aesculus hippocastanum</i> L.	M	Kn	3
9.	<i>Alliaria petiolata</i> (M. BIEB.) CAVARA & GRANDE	H	Ap	7
10.	<i>Allium ursinum</i> L.	G	Sp	1
11.	<i>Alnus glutinosa</i> (L.) GAERTN.	M	Ap	6
12.	<i>Anemone nemorosa</i> L.	G	Sp	1
13.	<i>Anemone ranunculoides</i> L.	G	Sp	1
14.	<i>Angelica sylvestris</i> L.	H	Ap	1
15.	<i>Anthriscus sylvestris</i> (L.) HOFFM	H	Ap	3
16.	<i>Aposeris foetida</i> (L.) LESS.	H	Ap	2
17.	<i>Arctium tomentosum</i> MILL.	H	Ap	12
18.	<i>Arrhenatherum elatius</i> (L.) P. BEAUV. ex J. PRESL & C. PRESL	H	Ap	9
19.	<i>Artemisia vulgaris</i> L.	Ch	Sp	12
20.	<i>Asarum europaeum</i> L.	H	Sp	1
21.	<i>Astragalus glycyphyllos</i> L.	H	Ap	4
22.	<i>Athyrium filix-femina</i> (L.) ROTH	H	Sp	1
23.	<i>Betula pendula</i> ROTH	M	Ap	2
24.	<i>Brachypodium sylvaticum</i> (HUDS.) P. BEAUV.	H	Sp	1
25.	<i>Caltha palustris</i> L.	H	Sp	8
26.	<i>Calystegia sepium</i> (L.) R. BR.	G, H, li	Ap	12
27.	<i>Campanula persicifolia</i> L.	H	Sp	4
28.	<i>Campanula rapunculoides</i> L.	H	Ap	4
29.	<i>Campanula trachelium</i> L.	H	Sp	1
30.	<i>Cannabis sativa</i> L.	T	Kn	13
31.	<i>Cardamine amara</i> L.	H	Sp	1
32.	<i>Carex digitata</i> L.	H	Sp	1
33.	<i>Carex remota</i> L.	H	Sp	1
34.	<i>Carex sylvatica</i> HUDS.	H	Sp	1

Table 1 – cont.

1	2	3	4	5
35.	<i>Carpinus betulus</i> L.	M	Sp	1
36.	<i>Chaerophyllum temulentum</i> L.	T, H	Ap	3
37.	<i>Epilobium angustifolium</i> L.	H	Ap	2
38.	<i>Chelidonium majus</i> L.	H	Ap	3
39.	<i>Chenopodium album</i> L.	T	Ap	15
40.	<i>Chrysosplenium alternifolium</i> L.	H	Sp	6
41.	<i>Circea lutetiana</i> L.	G	Sp	1
42.	<i>Cirsium arvense</i> (L.) SCOP.	G	Ap	12
43.	<i>Cirsium oleraceum</i> (L.) SCOP.	H	Ap	8
44.	<i>Convallaria majalis</i> L.	G	Sp	2
45.	<i>Cornus sanguinea</i> L.	N	Sp	1
46.	<i>Corydalis cava</i> SCHWEIGG. & KOERTE	G	Sp	1
47.	<i>Corydalis solida</i> (L.) CLAIRV.	G	Sp	1
48.	<i>Corylus avellana</i> L.	N	Ap	1
49.	<i>Crataegus monogyna</i> JACQ.	N, M	Ap	1
50.	<i>Dactylis polygama</i> HORV.	H	Sp	1
51.	<i>Dactylis glomerata</i> L.	H	Ap	9
52.	<i>Daphne mezereum</i> L.	N	Sp	6
53.	<i>Daucus carota</i> L.	H	Ap	9
54.	<i>Deschampsia caespitosa</i> (L.) P. BEAUV.	H	Ap	8
55.	<i>Dryopteris carthusiana</i> (VILL.) H. P. FUCHS	H	Ap	1
56.	<i>Dryopteris dilatata</i> (HOFFM.) A. GRAY	H	Ap	1
57.	<i>Dryopteris filix-mas</i> (L.) SCHOTT	H	Ap	1
58.	<i>Epilobium roseum</i> SCHREBER	H	Sp	7
59.	<i>Epipactis helleborine</i> (L.) CRANTZ	G	Ap	1
60.	<i>Equisetum arvense</i> L.	G	Ap	15
61.	<i>Equisetum fluviatile</i> L.	Hy	Sp	7
62.	<i>Equisetum hyemale</i> L.	C	Ap	1
63.	<i>Equisetum pratense</i> EHRH.	G	Sp	1
64.	<i>Equisetum sylvaticum</i> L.	G	Sp	1
65.	<i>Euonymus europaeus</i> L.	N	Sp	1
66.	<i>Euonymus verrucosus</i> SCOP.	N	Sp	1
67.	<i>Fagus sylvatica</i> L.	M	Kn	1
68.	<i>Festuca gigantea</i> (L.) VILL.	H	Sp	1
69.	<i>Festuca heterophylla</i> LAM.	H	Sp	1
70.	<i>Festuca ovina</i> L.	H	Sp	1
71.	<i>Ficaria verna</i> HUDS.	H	Ap	5
72.	<i>Fragaria vesca</i> L.	H	Ap	2
73.	<i>Frangula alnus</i> MILL.	N	Sp	6
74.	<i>Fraxinus excelsior</i> L.	M	Ap	1

Table 1 – cont.

1	2	3	4	5
75.	<i>Gagea lutea</i> (L.) KER-GAWLER	G	Sp	1
76.	<i>Galanthus nivalis</i> L.	G	Ef	18
77.	<i>Galeobdolon luteum</i> HUDS	C	Sp	1
78.	<i>Galeopsis pubescens</i> BESSER	T	Ap	1
79.	<i>Galeopsis speciosa</i> MILL.	T	Sp	2
80.	<i>Galeopsis tetrahit</i> L.	T	Ap	2
81.	<i>Galium aparine</i> L.	T	Ap	3
82.	<i>Galium mollugo</i> L.	H	Ap	9
83.	<i>Galium odoratum</i> (L.) SCOP.	H	Sp	1
84.	<i>Galium palustre</i> L.	H	Sp	6
85.	<i>Geranium robertianum</i> L.	T, H	Ap	3
86.	<i>Geum urbanum</i> L.	H	Ap	3
87.	<i>Hedera helix</i> L.	Ch, N	Ap	1
88.	<i>Hepatica nobilis</i> MILLER	H	Sp	1
89.	<i>Hieracium lachenalii</i> C. C. GMEL.	H	Sp	2
90.	<i>Hieracium laevigatum</i> WILLD.	H	Sp	2
91.	<i>Hieracium murorum</i> L.	H	Sp	2
92.	<i>Hypericum perforatum</i> L.	H	Ap	4
93.	<i>Impatiens noli-tangere</i> L.	T	Sp	1
94.	<i>Impatiens parviflora</i> DC.	T	Kn	3
95.	<i>Isopyrum thalictroides</i> L.	H	Sp	1
96.	<i>Juncus conglomeratus</i> L. em. LEERS	H	Ap	8
97.	<i>Juncus effusus</i> L.	H	Ap	8
98.	<i>Lamium album</i> L.	H	Arch	3
99.	<i>Lamium maculatum</i> L.	H	Sp	1
100.	<i>Lapsana communis</i> L.	H, T	Ap	1
101.	<i>Lathraea squamaria</i> L.	Gp	Sp	1
102.	<i>Lathyrus niger</i> (L.) BERNH.	G	Sp	2
103.	<i>Lathyrus vernus</i> (L.) BERNH.	G	Sp	2
104.	<i>Lilium martagon</i> L.	G	Sp	1
105.	<i>Lolium perenne</i> L.	H	Ap	10
106.	<i>Lonicera xylosteum</i> L.	N	Sp	1
107.	<i>Luzula multiflora</i> (RETZ.) LEJ.	H	Sp	2
108.	<i>Luzula pilosa</i> (L.) WILLD.	H	Sp	2
109.	<i>Lysymachia nummularia</i> L.	C	Sp	6
110.	<i>Lysymachia vulgaris</i> L.	H	Sp	8
111.	<i>Maianthemum bifolium</i> (L.) F. W. SCHMIDT	C	Sp	1
112.	<i>Malus domestica</i> BORKH.	M	Kn	18
113.	<i>Melampyrum nemorosum</i> L.	Tpp	Sp	1
114.	<i>Melampyrum pratense</i> L.	Tpp	Sp	2

Table 1 – cont.

1	2	3	4	5
115.	<i>Melandrium album</i> (MILL.) GARCKE	T	Ap	13
116.	<i>Melandrium rubrum</i> (WEIGEL) GARCKE	H	Sp	1
117.	<i>Melica nutans</i> L.	G, H	Sp	1
118.	<i>Mercurialis perennis</i> L.	G, H	Sp	1
119.	<i>Milium effusum</i> L.	H	Sp	1
120.	<i>Moehringia trinervia</i> (L.) CLAIRV.	T, H	Sp	1
121.	<i>Mycelis muralis</i> (L.) DUMORT.	H	Sp	1
122.	<i>Myosotis palustris</i> (L.) L. em. RCHB.	H	Sp	6
123.	<i>Myosoton aquaticum</i> (L.) MOENCH	G, H	Ap	7
124.	<i>Oxalis acetosella</i> L.	G, H	Sp	1
125.	<i>Oxalis stricta</i> L.	G	Kn	15
126.	<i>Paris quadrifolia</i> L.	G	Sp	1
127.	<i>Parthenocissus inserata</i> (A. KERN.) FRITSCH	N	Ef	18
128.	<i>Petasites hybridus</i> (L.) GAERTN., B. MEY. & SCHERB.	H	Sp	8
129.	<i>Phyteuma spicatum</i> L.	H	Sp	1
130.	<i>Picea abies</i> (L.) KARSTEN	M	Kn	2
131.	<i>Pinus sylvestris</i> L.	M	Sp	2
132.	<i>Plantago major</i> L.	H	Ap	10
133.	<i>Plantago media</i> L.	H	Ap	9
134.	<i>Poa annua</i> L.	T, H	Ap	10
135.	<i>Poa nemoralis</i> L.	H	Ap	1
136.	<i>Poa pratensis</i> L.	H	Ap	9
137.	<i>Polygonatum multiflorum</i> (L.) ALL.	G	Sp	1
138.	<i>Polygonatum odoratum</i> (MILL.) DRUCE	G	Sp	2
139.	<i>Polypodium vulgare</i> L.	H	Sp	2
140.	<i>Populus tremula</i> L.	M	Ap	2
141.	<i>Prunus padus</i> L.	M	Sp	1
142.	<i>Prunus serotina</i> EHRH.	M	Kn	2
143.	<i>Pteridium aquilinum</i> (L.) KUHN	G	Sp	1
144.	<i>Pulmonaria obscura</i> DUMORT.	H	Sp	1
145.	<i>Quercus petraea</i> (MATT.) LIEBL.	M	Sp	2
146.	<i>Quercus robur</i> L.	M	Ap	1
147.	<i>Ranunculus acris</i> L.	H	Ap	9
148.	<i>Ranunculus auricomus</i> L. S. L.	H	Sp	1
149.	<i>Ranunculus lanuginosus</i> L.	H	Sp	1
150.	<i>Ranunculus repens</i> L.	H	Ap	10
151.	<i>Rhamnus catharticus</i> L.	N	Sp	1
152.	<i>Ribes nigrum</i> L.	N	Sp	6
153.	<i>Ribes spicatum</i> ROBSON	N	Sp	1

Table 1 – cont.

1	2	3	4	5
154.	<i>Ribes uva-crispa</i> L.	N	Sp	1
155.	<i>Rubus caesius</i> L.	Ch, N	Ap	12
156.	<i>Rubus idaeus</i> L.	N	Ap	1
157.	<i>Salix caprea</i> L.	N, M	Ap	1
158.	<i>Salix purpurea</i> L.	N	Ap	7
159.	<i>Sambucus nigra</i> L.	N	Ap	3
160.	<i>Scirpus silvaticus</i> L.	G	Sp	8
161.	<i>Scrophularia nodosa</i> L.	H	Sp	1
162.	<i>Scrophularia umbrosa</i> DUMORT.	H, Hy	Sp	7
163.	<i>Scutellaria galericulata</i> L.	H	Sp	6
164.	<i>Sedum maximum</i> (L.) HOFFM.	H, G	Ap	5
165.	<i>Solidago gigantea</i> AITON	H, G	Kn	12
166.	<i>Solidago virgaurea</i> L.	H	Sp	2
167.	<i>Sorbus aucuparia</i> L. em. HEDL.	N, M	Ap	2
168.	<i>Stachys sylvatica</i> L.	H	Sp	1
169.	<i>Stellaria media</i> (L.) VILL.	T	Ap	15
170.	<i>Stellaria nemorum</i> L.	H	Sp	1
171.	<i>Symphoricarpos albus</i> (L.) BLAKE	N	Kn	1
172.	<i>Symphytum officinale</i> L.	G	Ap	9
173.	<i>Taraxacum</i> sp.	H	Ap	9
174.	<i>Thalictrum minus</i> L.	H	Sp	4
175.	<i>Tilia cordata</i> MILL.	M	Ap	1
176.	<i>Tilia platyphyllos</i> SCOP.	M	Kn	1
177.	<i>Trientalis europaeus</i> L.	G	Sp	1
178.	<i>Trifolium alpestre</i> L.	H	Sp	2
179.	<i>Tussilago farfara</i> L.	G	Ap	13
180.	<i>Ulmus glabra</i> HUDS.	M	Ap	1
181.	<i>Ulmus laevis</i> PALL.	M	Ap	1
182.	<i>Urtica dioica</i> L.	H	Ap	12
183.	<i>Vaccinium myrthillus</i> L.	Ch, N	Sp	2
184.	<i>Veronica anagalis-aquatica</i> L.	H	Sp	7
185.	<i>Veronica beccabunga</i> L.	C, Hy	Sp	7
186.	<i>Veronica chamaedrys</i> L.	C	Ap	9
187.	<i>Viburnum opulus</i> L.	N	Sp	1
188.	<i>Vicia sepium</i> L.	H	Sp	1
189.	<i>Vincetoxicum hirundinaria</i> MEDIK.	H	Sp	4
190.	<i>Viola canina</i> L.	H	Sp	2
191.	<i>Viola reichenbachiana</i> JORD. ex BOREAU	H	Sp	1
192.	<i>Viola riviniana</i> RCHB.	H	Sp	2

Table 2. The list and the participation of the families of vascular plants
 Tabela 2. Wykaz i udział rodzin we florze roślin naczyniowych

No. Lp.	Family Rodzina	Number of species Liczba gatunków	Participation, % Udział, %
1	2	3	4
1.	<i>Asteraceae</i>	16	8.3
2.	<i>Poaceae</i>	14	7.3
3.	<i>Ranunculaceae</i>	13	6.8
4.	<i>Liliaceae</i>	9	4.7
5.	<i>Rosaceae</i>	9	4.7
6.	<i>Scrophulariaceae</i>	8	4.2
7.	<i>Lamiaceae</i>	7	3.6
8.	<i>Caryophyllaceae</i>	6	3.1
9.	<i>Apiaceae</i>	5	2.6
10.	<i>Equisetaceae</i>	5	2.6
11.	<i>Fabaceae</i>	5	2.6
12.	<i>Campanulaceae</i>	4	2.1
13.	<i>Caprifoliaceae</i>	4	2.1
14.	<i>Cyperaceae</i>	4	2.1
15.	<i>Juncaceae</i>	4	2.1
16.	<i>Rubiaceae</i>	4	2.1
17.	<i>Aspidiaceae</i>	3	1.6
18.	<i>Boraginaceae</i>	3	1.6
19.	<i>Fagaceae</i>	3	1.6
20.	<i>Grossulariaceae</i>	3	1.6
21.	<i>Onagraceae</i>	3	1.6
22.	<i>Papaveraceae</i>	3	1.6
23.	<i>Pinaceae</i>	3	1.6
24.	<i>Primulaceae</i>	3	1.6
25.	<i>Salicaceae</i>	3	1.6
26.	<i>Violaceae</i>	3	1.6
27.	<i>Aceraceae</i>	2	1.0
28.	<i>Balsaminaceae</i>	2	1.0
29.	<i>Betulaceae</i>	2	1.0
30.	<i>Brassicaceae</i>	2	1.0
31.	<i>Celastraceae</i>	2	1.0
32.	<i>Corylaceae</i>	2	1.0
33.	<i>Oxalidaceae</i>	2	1.0
34.	<i>Plantaginaceae</i>	2	1.0
35.	<i>Rhamnaceae</i>	2	1.0
36.	<i>Tiliaceae</i>	2	1.0

Table 2 – cont.

1	2	3	4
37.	<i>Ulmaceae</i>	2	1.0
38.	<i>Adoxaceae</i>	1	0.5
39.	<i>Araliaceae</i>	1	0.5
40.	<i>Aristolochiaceae</i>	1	0.5
41.	<i>Asclepiadaceae</i>	1	0.5
42.	<i>Athyriaceae</i>	1	0.5
43.	<i>Cannabaceae</i>	1	0.5
44.	<i>Chenopodiaceae</i>	1	0.5
45.	<i>Clusiaceae</i>	1	0.5
46.	<i>Convolvulaceae</i>	1	0.5
47.	<i>Cornaceae</i>	1	0.5
48.	<i>Crassulaceae</i>	1	0.5
49.	<i>Ericaceae</i>	1	0.5
50.	<i>Euphorbiaceae</i>	1	0.5
51.	<i>Geraniaceae</i>	1	0.5
52.	<i>Hippocastanaceae</i>	1	0.5
53.	<i>Hypolepidaceae</i>	1	0.5
54.	<i>Oleaceae</i>	1	0.5
55.	<i>Orchidaceae</i>	1	0.5
56.	<i>Polypodiaceae</i>	1	0.5
57.	<i>Saxifragaceae</i>	1	0.5
58.	<i>Thymelaeaceae</i>	1	0.5
59.	<i>Urticaceae</i>	1	0.5
60.	<i>Vitaceae</i>	1	0.5

Out of these 177 species, 103 species are semi-synanthropic spontaneophytes, while 74 species belong to apophytes. Fifteen alien taxons were found to grow in the examined area, constituting 7.8% of all flora identified here. Thirteen species were introduced here and are now treated as established archaeophytes and kenophytes, while the remaining two species belong to ephemerophytes (Fig. 1).

From among Raunkiaer's groups, hemicryptophytes are represented most numerously (93 species) with phanerophytes (41 species) and cryptophytes (34 species) occurring slightly less frequently. Therophytes were represented by 16 species, while chamaephytes were found to occur even less often 10 species (Fig. 2).

The examined species belong to 14 socio-ecological groups with 3 to 87 species belonging to individual groups. The majority of them are associated with 2 socio-ecological groups whose total share exceeds 60%. These groups are represented by 87 and 29 species, whereas the remaining 12 groups are represented by from 3 to 11 species. Forest species from five syntaxons, i.e. *Fagetalia*, *Prunetalia*, *Quercion*, *Epilobion* and *Nardetalia* are found on the floristic list of the examined area (Fig. 3).

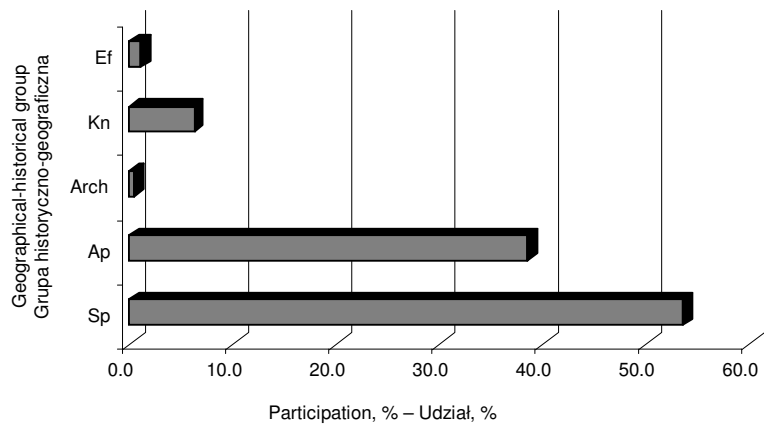


Fig. 2. The percentage participation of species in the geographical-historical groups: Sp – spontaneophytes, Ap – apophytes, Arch – archaeophytes, Kn – kenophytes, Ef – ephemeroxytes

Rys. 2. Procentowy udział gatunków w grupach geograficzno-historycznych: Sp – spontaneofity, Ap – apofity, Arch – archeofity, Kn – kenofity, Ef – efemerofity

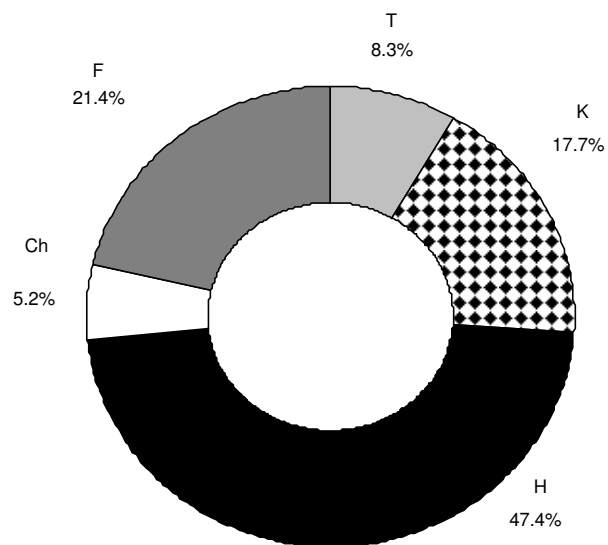


Fig. 3. The percentage participation of species according to Raunkiaer's groups

Rys. 3. Procentowy udział gatunków według grup Raunkiaera

Rare and endangered species

Fourteen out of the 192 taxons of vascular plants identified in the examined region were classified as "species of special concern". Thirteen of them are under legal protection of which five are strictly protected and the remaining plant species are partially protected. Moreover, four taxons are treated as threatened in the area of Western Pomerania, while one taxon occurs here rarely [Rozporządzenie... 2004, Żukowski and Jackowiak 1995, Lista... 1992; Table 3].

Table 3. The list of rare and endangered species (according to Żukowski and Jackowiak 1995)
Tabela 3. Lista gatunków rzadkich i zagrożonych (według Żukowskiego i Jackowiaka 1995)

No. Lp.	Species name Nazwa gatunkowa	Category of threat Kategoria zagrożenia	
		Poland Polska	West Pomerania Pomorze Zachodnie
1.	<i>Allium ursinum</i>	–	V
2.	<i>Asarum europaeum</i>	–	V
3.	<i>Convallaria majalis</i>	–	–
4.	<i>Daphne mezereum</i>	–	R
5.	<i>Epipactis helleborine</i>	–	–
6.	<i>Frangula alnus</i>	–	–
7.	<i>Galium odoratum</i>	–	–
8.	<i>Hedera helix</i>	–	–
9.	<i>Hepatica nobilis</i>	–	–
10.	<i>Lilium martagon</i>	–	V
11.	<i>Polypodium vulgare</i>	–	–
12.	<i>Ribes nigrum</i>	–	–
13.	<i>Viburnum opulus</i>	–	–
14.	<i>Actea spicata</i>	–	V

Highlighted – legally protected species, bold font – strict protection, V – endangered, R – rare, – unthreatened.

Wypelnienie – gatunki chronione, pogrubienie – ochrona ścisła, V – zagrożone, R – rzadkie, – niezagrożone.

Generally speaking, the described plants are found only in few sites, *Asarum europaeum*, *Convallaria majalis* and *Galium odoratum* are most numerous, while *Hepatica nobilis* and *Frangula alnus* – can be classified as numerous. They flower and fruit profusely and are in good health condition.

Galanthus nivalis was not included in the list of protected species, although in natural sites it is under legal protection but it was found in the neighbourhood of a rural garden and its site was considered as unnatural.

Dendroflora

The total of 41 species of trees and bushes was identified in the examined area, which constitutes about one fifth of all vascular plants of which 21 were trees, 14 – bushes and 3 – could occur as either trees or bushes (Table 1).

Stand structure is characterised by considerable variability. *Alnus glutinosa* was found dominant in the 117b sub-compartment where it forms the first floor (Table 4). The second floor is rather poor and is formed by *A. glutinosa*, *Corylus avellana*, *Ulmus laevis* and occasionally by *U. glabra*. In the case of the bush layer, quite abundant in places, *Sambucus nigra*, *C. avellana*, *Prunus padus*, *U. laevis*, *A. glutinosa*, *Cornus sanguinea*, *Tilia cordata*, *Quercus robur*, *Carpinus betulus* and *Ribes nigrum* are found growing; however, most of the above-mentioned species occur singly. *Alnus glutinosa* grows up to 30 m in height and reaches the breast height diameter of 50 cm.

Table 4. Stand layer structure of selected sites on the examined area. For each of the layer we described the total percentage cover of trees and shrubs, and among the layer we identified all the woody species presented there

Tabela 4. Struktura drzewostanów w wybranych miejscach terenu badań. Dla każdej z warstw określono procentowe pokrycie drzew i krzewów oraz skład gatunkowy

Site number and area Numer powierzchni i wielkość powierzchni	Percentage cover of trees and shrubs in particular stand layers Procentowy udział drzew i krzewów w poszczególnych warstwach				
	A1	A2	B	C1	C2
1	2	3	4	5	6
1	40%	1%	5%	5%	
20 × 20 m	<i>A. glutinosa</i>	<i>A. glutinosa</i> <i>U. glabra</i>	<i>P. padus</i> <i>A. glutinosa</i> <i>S. nigra</i>	<i>R. nigrum</i>	--
2	40%	5%	10%	10%	r
20 × 20 m	<i>A. glutinosa</i>	<i>C. avellana</i> <i>U. laevis</i>	<i>S. nigra</i> (7) <i>C. avellana</i> <i>P. padus</i>	<i>U. laevis</i> <i>A. glutinosa</i> <i>P. padus</i> <i>S. nigra</i> <i>C. sanguinea</i> <i>T. cordata</i>	<i>Q. robur</i> <i>C. avellana</i> <i>A. glutinosa</i> <i>C. betulus</i> <i>C. sanguinea</i>
3a	10%	5%	10%	5%	5%
64 × 15 m	<i>A. glutinosa</i>	<i>T. cordata</i> <i>U. glabra</i>	<i>U. glabra</i> (5) <i>A. glutinosa</i> (3) <i>F. excelsior</i> <i>T. cordata</i> <i>A. platanoides</i> <i>C. avellana</i>	<i>U. glabra</i> <i>T. cordata</i> <i>C. betulus</i>	<i>U. glabra</i> <i>T. cordata</i> <i>C. betulus</i> <i>Q. robur</i> <i>A. platanoides</i>
3b	65%	5%	20%	10%	10%
50 × 2 m	<i>A. glutinosa</i>	<i>A. glutinosa</i> <i>U. glabra</i>	<i>U. glabra</i> (15) <i>T. cordata</i> <i>A. glutinosa</i>	<i>T. cordata</i> <i>U. glabra</i> <i>C. betulus</i>	<i>T. cordata</i> <i>A. platanoides</i> <i>C. betulus</i>

Table 4 – cont.

	1	2	3	4	5	6
				<i>C. avellana</i>		<i>U. glabra</i>
						<i>Q. robur</i>
3c	--	--	--	--	+	+
50 × 2 m					<i>U. glabra</i>	<i>Q. robur</i>
					<i>F. excelsior</i>	<i>T. cordata</i>
						<i>A. platanoides</i>
4	70%	40%	20%	10%	10%	20%
82 × 16 m	<i>A. glutinosa</i> (60)	<i>U. glabra</i> (20)	<i>U. glabra</i> (10)	<i>U. glabra</i>	<i>U. glabra</i>	<i>U. glabra</i>
	<i>F. excelsior</i>	<i>C. betulus</i> (15)	<i>A. glutinosa</i> (3)	<i>A. glutinosa</i>	<i>P. padus</i>	<i>P. padus</i>
		<i>C. avellana</i>	<i>C. betulus</i> (3)	<i>C. betulus</i>	<i>F. excelsior</i>	<i>F. excelsior</i>
			<i>T. cordata</i> (3)	<i>T. cordata</i>	<i>A. glutinosa</i>	<i>A. glutinosa</i>
			<i>S. nigra</i>	<i>F. excelsior</i>	<i>E. europaeus</i>	<i>E. europaeus</i>
			<i>F. alnus</i>	<i>P. padus</i>	<i>S. caprea</i>	<i>S. caprea</i>
			<i>S. aucuparia</i>	<i>E. europaeus</i>	<i>S. purpurea</i>	<i>S. purpurea</i>
			<i>Q. robur</i>		<i>S. aucuparia</i>	<i>S. aucuparia</i>
5	20%	10%	--	--	--	5%
32 × 2 m	<i>A. glutinosa</i>	<i>C. betulus</i>				<i>C. betulus</i>
						<i>U. glabra</i>
						<i>Q. robur</i>
						<i>P. tremula</i>
6	60%	70%	5%	5%	5%	5%
40 × 10 m	<i>F. excelsior</i> (40)	<i>C. avellana</i> (40)	<i>P. abies</i>	<i>T. cordata</i>	<i>C. avellana</i>	<i>C. avellana</i>
	<i>Q. robur</i> (10)	<i>C. betulus</i> (30)	<i>C. avellana</i>	<i>C. betulus</i>	<i>C. betulus</i>	<i>C. betulus</i>
	<i>A. glutinosa</i> (10)		<i>U. glabra</i>		<i>S. aucuparia</i>	<i>S. aucuparia</i>
			<i>C. betulus</i>		<i>F. excelsior</i>	<i>F. excelsior</i>
					<i>A. platanoides</i>	<i>A. platanoides</i>
					<i>F. alnus</i>	<i>F. alnus</i>
7	40%	70%	5%	10%	30%	30%
20 × 20 m	<i>Q. robur</i>	<i>C. betulus</i>	<i>C. betulus</i>	<i>T. cordata</i>	<i>C. betulus</i>	<i>C. betulus</i>
	<i>Q. petraea</i>	<i>U. glabra</i>	<i>T. cordata</i>	<i>C. betulus</i>	<i>T. cordata</i>	<i>T. cordata</i>
	<i>P. sylvestris</i>		<i>A. platanoides</i>	<i>A. platanoides</i>	<i>A. platanoides</i>	<i>A. platanoides</i>
				<i>U. glabra</i>	<i>Q. robur</i>	<i>Q. robur</i>
				<i>L. xylosteum</i>	<i>F. excelsior</i>	<i>F. excelsior</i>
					<i>U. glabra</i>	<i>U. glabra</i>
					<i>F. sylvatica</i>	<i>F. sylvatica</i>
8	30%	50%	5%	45%	20%	20%
20 × 20 m	<i>Q. robur</i> (20)	<i>C. betulus</i> (40)	<i>T. cordata</i>	<i>C. betulus</i> (40)	<i>C. betulus</i> (10)	<i>C. betulus</i> (10)
	<i>C. betulus</i>	<i>T. cordata</i>	<i>A. glutinosa</i>	<i>A. platanoides</i>	<i>A. platanoides</i> (5)	<i>A. platanoides</i> (5)
		<i>Q. robur</i>	<i>U. glabra</i>	<i>T. cordata</i>	<i>T. cordata</i>	<i>T. cordata</i>
			<i>C. betulus</i>	<i>U. glabra</i>	<i>U. glabra</i>	<i>U. glabra</i>
				<i>Q. robur</i>	<i>Q. robur</i>	<i>Q. robur</i>
				<i>S. aucuparia</i>	<i>E. verrucosus</i>	<i>E. verrucosus</i>

Table 4 – cont.

	1	2	3	4	5	6
9		60%	20%	5%	5%	10%
20 × 20 m		<i>Q. robur</i> (45) <i>T. cordata</i> (10) <i>A. platanoides</i>	<i>C. betulus</i> (15) <i>A. platanoides</i>	<i>T. cordata</i> <i>U. glabra</i> <i>C. betulus</i>	<i>T. cordata</i> <i>F. sylvatica</i> <i>F. alnus</i>	<i>C. betulus</i> (7) <i>A. platanoides</i> <i>T. cordata</i> <i>P. serotina</i> <i>Q. robur</i>
10		60%	30%	5%	5%	15%
20 × 20 m		<i>Q. robur</i> (20) <i>T. cordata</i> (20) <i>C. betulus</i> (20) <i>B. pendula</i>	<i>C. betulus</i> <i>T. cordata</i> (r)	<i>C. betulus</i> <i>A. platanoides</i> <i>U. glabra</i> <i>T. cordata</i>	<i>C. betulus</i> <i>T. cordata</i> <i>T. platyphyllos</i> <i>S. nigra</i> <i>E. verrucosus</i> <i>A. platanoides</i> <i>U. glabra</i>	<i>A. platanoides</i> (5) <i>Q. robur</i> (5) <i>F. excelsior</i> <i>L. xylosteum</i> <i>E. verrucosus</i> <i>A. pseudoplatanus</i> <i>S. nigra</i> <i>C. betulus</i> <i>U. glabra</i> <i>T. cordata</i> <i>T. platyphyllos</i>
11		15%	50%	15%	5%	20%
20 × 20 m		<i>T. cordata</i> (10) <i>A. platanoides</i> <i>Q. petraea</i>	<i>A. platanoides</i> (15) <i>T. cordata</i> (15) <i>C. betulus</i> (10) <i>U. glabra</i>	<i>U. glabra</i> (10) <i>T. cordata</i> <i>S. nigra</i>	<i>T. cordata</i> <i>U. glabra</i> <i>C. avellana</i> <i>E. verrucosus</i> <i>F. excelsior</i> <i>Q. robur</i>	<i>T. cordata</i> <i>U. glabra</i> <i>C. betulus</i> <i>E. verrucosus</i> <i>A. platanoides</i>
12		55%	35%	5%	5%	10%
20 × 20 m		<i>Q. robur</i> (20) <i>A. platanoides</i> (15) <i>T. cordata</i> (15) <i>Q. petraea</i>	<i>C. betulus</i> (20) <i>A. platanoides</i> (10) <i>T. cordata</i>	<i>T. cordata</i> <i>U. glabra</i>	<i>T. cordata</i> <i>U. glabra</i>	<i>A. platanoides</i> <i>Q. robur</i> <i>Q. petraea</i> <i>T. cordata</i> <i>U. glabra</i> <i>C. betulus</i> <i>F. sylvatica</i> <i>F. excelsior</i>
13		40%	60%	5%	r	5%
15 × 27 m		<i>C. betulus</i> (15) <i>T. cordata</i> (10) <i>Q. robur</i> (8) <i>Q. petraea</i>	<i>T. cordata</i> (30) <i>C. betulus</i> (15) <i>C. avellana</i>	<i>U. glabra</i> <i>T. cordata</i> <i>A. platanoides</i>	<i>C. betulus</i> <i>T. cordata</i>	<i>A. platanoides</i> <i>T. cordata</i> <i>Q. robur</i> <i>Q. petraea</i> <i>F. excelsior</i> <i>U. glabra</i>
14		70%	45%	5%	15%	25%
10 × 40 m		<i>Q. robur</i>	<i>C. betulus</i> (30) <i>T. cordata</i> (5) <i>A. platanoides</i> (5)	<i>C. betulus</i> <i>T. cordata</i>	<i>C. betulus</i> <i>T. cordata</i> <i>B. pendula</i>	<i>C. betulus</i> <i>A. platanoides</i> <i>E. verrucosus</i>

Table 4 – cont.

1	2	3	4	5	6
		<i>S. aucuparia</i>		<i>S. aucuparia</i>	<i>T. cordata</i>
				<i>Q. robur</i>	<i>S. aucuparia</i>
				<i>F. alnus</i>	<i>B. pendula</i>
					<i>F. excelsior</i>
					<i>Q. robur</i>
					<i>F. sylvatica</i>
					<i>P. serotina</i>
					<i>P. sylvestris</i>
15	70%	45%	5%	15%	25%
50 × 50 m	<i>Q. robur</i> (50)	<i>C. betulus</i> (30)	<i>C. betulus</i>	<i>C. betulus</i>	<i>C. betulus</i>
	<i>Q. petraea</i>	<i>T. cordata</i> (5)	<i>T. cordata</i>	<i>T. cordata</i>	<i>T. cordata</i>
		<i>A. platanoides</i> (5)		<i>B. pendula</i>	<i>B. pendula</i>
		<i>S. aucuparia</i>		<i>S. aucuparia</i>	<i>S. aucuparia</i>
				<i>F. alnus</i>	<i>A. platanoides</i>
				<i>Q. petraea</i>	<i>Q. petraea</i>
					<i>F. excelsior</i>
					<i>P. sylvestris</i>
					<i>P. serotina</i>
					<i>E. verrucosus</i>
					<i>F. sylvatica</i>
16	70%	30%	5%	15%	20%
50 × 50 m	<i>Q. petraea</i>	<i>C. betulus</i> (25)	<i>T. cordata</i>	<i>T. cordata</i> (10)	<i>T. cordata</i> (7)
	<i>T. cordata</i> (r)	<i>T. cordata</i> (5)		<i>S. aucuparia</i>	<i>C. betulus</i> (7)
		<i>Q. petraea</i>		<i>A. platanoides</i>	<i>U. glabra</i>
				<i>C. betulus</i>	<i>A. platanoides</i>
				<i>F. excelsior</i>	<i>Q. petraea</i>
				<i>P. padus</i>	<i>F. excelsior</i>
				<i>F. alnus</i>	<i>P. padus</i>
				<i>S. nigra</i>	<i>F. alnus</i>
				<i>A. pseudoplatanus</i>	<i>S. nigra</i>
				<i>P. serotina</i>	<i>A. pseudoplatanus</i>
				<i>U. glabra</i>	<i>E. verrucosus</i>
					<i>E. europaeus</i>
					<i>C. sanguinea</i>
17	60%	60%	10%	5%	10%
50 × 50 m	<i>Q. petraea</i> (50)	<i>C. betulus</i> (55)	<i>C. betulus</i>	<i>C. betulus</i>	<i>C. betulus</i>
	<i>P. sylvestris</i> (5)	<i>Q. petraea</i>	<i>F. sylvatica</i>	<i>F. excelsior</i>	<i>A. platanoides</i>
	<i>B. pendula</i> (5)		<i>C. avellana</i> (+)	<i>T. cordata</i>	<i>F. excelsior</i>
	<i>T. cordata</i> (r)			<i>Q. petraea</i>	<i>U. glabra</i>
				<i>S. aucuparia</i>	<i>Q. petraea</i>
				<i>B. pendula</i>	<i>S. aucuparia</i>
				<i>F. sylvatica</i>	<i>B. pendula</i>
					<i>F. alnus</i>

The first floor of the stand growing along the stream (117a) is dominated by *Alnus glutinosa* and *Fraxinus excelsior* (Table 4), which reach the height of 30 to 35 m and the breast height diameter of 50-60 cm. The second floor, when it occurs, is formed by *A. glutinosa*, *Ulmus glabra*, *Tilia cordata*, *Carpinus betulus* and *Corylus avellana*. The bush floor is poor, dispersed and covers from 10 to 20% of the area of the stream valley. Although the bush layer is formed by many species, the dominant one is *U. glabra*, *A. glutinosa*, *F. excelsior* and *T. cordata*. The majority of bush species growing here, i.e. *Acer platanoides*, *Sorbus aucuparia*, *Prunus padus*, *Euonymus europaeus*, *Salix caprea*, *S. purpurea*, *Populus tremula* occur singly. The youngest generation of seedlings of arborescent plants is very numerous.

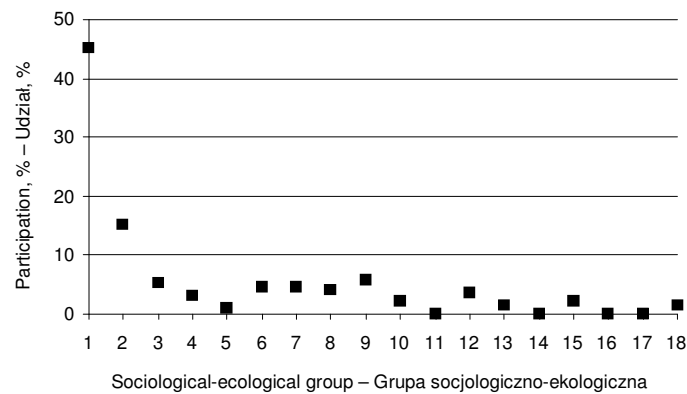


Fig. 4. The percentage participation of species in the sociological-ecological groups (according to Jackowiak 1993)

Rys. 4. Procentowy udział gatunków w grupach socjologiczno-ekologicznych (według Jackowiaka 1993)

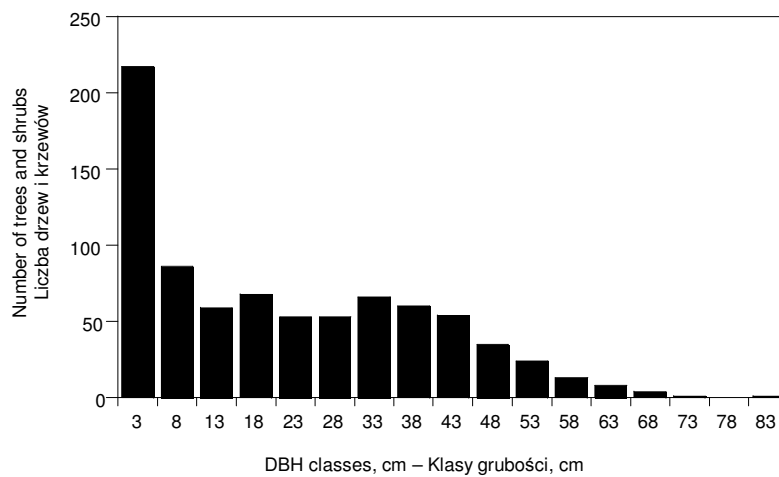


Fig. 5. The DBH structure of trees and shrubs

Rys. 5. Struktura grubości drzew i krzewów

The stand covering both sides of the steep slope along the stream is made up, primarily, of *Quercus robur* (first floor), although many other species such as *Fraxinus excelsior*, *Alnus glutinosa*, *Carpinus betulus*, *T. cordata* and *Acer platanoides*, play a co-dominant role (Table 4). The second floor is formed by a number of species. There are numerous trees with impressive breast height diameters growing on the slopes along the stream, e.g. *Q. robur* (81 cm), *T. cordata* (64 cm), *A. platanoides* (55 cm), *A. glutinosa* (46 cm), *C. betulus* (45 cm), *F. excelsior* (42 cm). The bush layer covers, on average, 10-15% of the stand area and it is made up, mainly, of young *Q. robur*, *C. betulus*, *A. platanoides*, *A. glutinosa*, *F. sylvatica*, *T. cordata*, *T. platyphyllos*, *U. glabra* trees and bushes (*C. avellana*, *S. nigra*, *L. xylosteum*, *S. aucuparia*, *F. alnus*, *E. verrucosus* and *E. europaeus*). The youngest generation of trees and bushes is very numerous with regard to the number of species but it occupies a relatively small area (about 10%). Seedlings of *C. betulus*, *T. cordata* and *Q. robur* are most numerous in this layer.

The dominant role in the stand situated between the right-hand side slope of the stream valley and the road: Wielkie Łunawy – Paparzyn is played by oak trees *Quercus robur* and *Q. petraea* (Table 4), with *Tilia cordata*, *Pinus sylvestris* and *Betula pendula* also occurring sporadically. The second floor is formed by hornbeam and lime. *T. cordata*, *C. betulus* and *Corylus avellana*, can be found in the relatively poor underbrush which forms quite dense brushwood in places. The number of bush species which form the underbrush increases distinctly in the neighbourhood of the road.

Figure 4 shows the structure of tree and bush thickness determined on the basis of 17 places representing the entire examined object. From among 922 measured trees and bushes, 13% failed to reach the height of 1.3 m, while 33% – failed to exceed the breast height diameter of 10 cm. Among the thickest trees with breast height diameters exceeding 50 cm, 16 trees of *Quercus robur*, 14 of *Alnus glutinosa*, 13 of *Quercus petraea*, 5 of *Tilia cordata* and one of *Acer platanoides*, *Pinus sylvestris* and *Ulmus glabra* were recorded.

The total of six trees with monumental, close-to-monumental and magnificent circumferences was identified in the examined region. Three of them, with monumental and close-to-monumental circumferences in good or very good health condition were proposed to be covered by protection in the form of nature monuments (Table 5).

Table 5. The list of the widest trees
Tabela 5. Wykaz najokazalszych drzew

No. Lp.	Species name Nazwa gatunkowa	Circumference, cm Obwód, cm	Monumental circumference, cm Obwód pomnikowy, cm	Height, m Wysokość, m	Health condition Stan zdrowotny
1.	<i>Alnus glutinosa</i> *	215	225	31	5
2.	<i>Quercus robur</i>	230	380	33	4
3.	<i>Quercus robur</i>	300	380	24	2
4.	<i>Quercus robur</i>	255	380	31	5
5.	<i>Ulmus laevis</i> *	280	220	32	4
6.	<i>Ulmus laevis</i> *	315	220	38	5

*Trees selected as monumental. Highlighted and bold font – trees with monumental circumferences. Bold font – trees with circumference close to monumental. Remaining trees – trees with impressive circumferences.

*Drzewa wytypowane na pomniki przyrody. Pogrubienie i cieniowanie – obwód pomnikowy. Pogrubienie – obwód zbliżony do pomnikowego. Pozostałe – drzewa okazałe.

CONCLUSIONS

The flora of the examined object is relatively little degraded as evidenced by:

- very high proportion of native species (92.2%) with a distinct advantage of spontaneophytes (53.7%), which show no tendency to occupy strongly transformed sites, over apophytes (38.5%) which can be found on strongly transformed sites on which they can even achieve their developmental optimum,
- only small proportion of taxons of alien origin (7.8%) among which permanent, well-established species (archaeophytes, kenophytes) have advantage over plants occurring only periodically (ephemerophytes). The ongoing processes of floral species composition is confirmed by a greater proportion of young new-comers (kenophytes) over older ones (archaeophytes),
- relatively rich species composition of the tree and bush layer at only slight proportion of trees and bushes of alien origin,
- occurrence of 13 legally protected plant species.

The “Uroczysko Wielkie Łunawy” belongs to objects distinguished for their significant floristic value. This is shown not only by the number of the described species but also by a significant proportion among them of legally protected plants. The diverse and rich flora of this small object amounts to 192 taxons of vascular plants with fragments of valuable oak-hornbeam and riparian forest communities as well as stands close to natural ones. They frequently constitute one of the few sites found in this region of rare plant species. The authors found 14 species of “special care” of which 13 are covered by legal protection and one belongs to rare and threatened species occurring in this region. In addition, trees with monumental, close-to-monumental and magnificent circumferences can also be found here. That is why the described object deserves to be covered by protection in order to preserve the communities of oak-hornbeam and riparian forests rare in this region.

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ROŚLINY NACZYNIOWE „UROCZYSKA WIELKIE ŁUNAWY” NA ZIEMI CHEŁMIŃSKIEJ

Streszczenie. „Uroczysko Wielkie Łunawy” należy do obiektów wyróżniających się znacznymi walorami florystycznymi. Urozmaicona i mało zdegenerowana flora tego obiektu liczy 192 taksony roślin naczyniowych z 60 rodzin, w tym 41 taksonów roślin drzewiastych. Odnaleziono stanowiska 13 gatunków podlegających ochronie prawnej. Zachowały się tu cenne fragmenty zbiorowisk łąk i łąk oraz drzewostany zbliżone do naturalnych. „Uroczysko Wielkie Łunawy” należałoby objąć ochroną ze względu na występujące tu, a dość rzadkie w regionie, dobrze zachowane zbiorowiska lasów łąkowych i łąkowych.

Słowa kluczowe: flora, Wielkie Łunawy, ziemia chełmińska, Nadleśnictwo Jamy

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