

## THE VASCULAR PLANTS OF THE EARLY MEDIEVAL SETTLEMENT “POGANKA” NEAR WABCZ IN THE CHEŁMNO REGION

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**Abstract.** The total of 155 taxa of vascular plants derived from 51 families, including 32 woody plants, were inventoried in the area of the settlement. The modern flora of the explored settlement does not show traces of the human activity which had taken place here centuries ago. Native species clearly predominate over foreign ones and nearly 70% constitute meso- and oligohemerobic species indicating a low level of human pressure to the environment. The most common plants found here are those associated with thermophilic oak forests and mesophilic broad-leaved forests, nitrophilic thickets and meadow vegetation. Sites of 7 species under legal protection were identified. Stands are dominated by young trees but more than 100-year-old specimens can also be found. The authors believe that the examined area should be allowed to follow natural succession processes and long-term, periodical floristic and phytosociological investigations should be undertaken to monitor changes in its flora. The “Poganka” is a regional tourist attraction and should be made available to visitors by marking out special tourist paths close to the old site.

**Key words:** vascular plants, Chełmno Region, settlement “Poganka”

### INTRODUCTION

In the area of the Chełmno Region, 36 early medieval settlements were discovered. Excellent geographic conditions of the region as well as a considerable area of fertile soils created favourable conditions for the development of settlements [Grzeškowiak 1968, Niewiarowski 1968, 1987].

One of the Chełmno Region settlements is “Poganka”. This area is subject to protection as an archaeological monument [Decyzja... 1965]. It is a single-segment settlement with the shape resembling an ellipsis and area of 0.55-0.57 ha (including the rampart). Two stages of settlement of the site during the early Middle Ages were distinguished in the course of archaeological excavations. The first phase of settlement

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occurred from the second half of the 10<sup>th</sup> century to the end of the 10<sup>th</sup> and beginning of the 11<sup>th</sup> centuries, whereas the second phase occurred from the end of the 11<sup>th</sup> to the beginning of the 12<sup>th</sup> centuries [Chudziakowa 1994]. The site is preserved in good condition, although modern excavations were observed in the central part of the settlement, probably of plunderous character [Chudziakowa 1994, Protokół... 2003].

In the Prussian cartographic sources dating to the 19<sup>th</sup> and 20<sup>th</sup> centuries this area is referred to as “Schanze” or “Burgwall” [Bielski et al. 1998]. At the present time, the area is known to the local community as “Poganka” and is associated with a bloody legend of a courageous castellan Mścibój, his daughter Danka and an unfaithful knight Wojśław [Legenda..., Mroczko 1976].

Phytosociological investigations in the neighbourhood of the research site were carried out by Rejewski [1971] and Krawczyk [1977]. According to the first author, the Chełmno Region oak-hornbeam forests are situated within the intermediate belt, between two associations *Tilio-Carpinetum* Tracz. 1962 and *Galio sylvatici-Carpinetum* Oberd. 1957. Because of a closer floristic connection of the local oak-hornbeam forests with *Tilio-Carpinetum*, they were classified in this association, stressing their transitional character. It should be mentioned that Krawczyk [1977] identified four sub-associations of *Tilio-Carpinetum* in the close vicinity of the settlement, i.e.: *T.-C. typicum*, *corydaletosum*, *stachyetosum* and *calamagrostietosum*.

The objective of the authors was to inventory vascular plants of the settlement and then, on the basis of the obtained data, to assess its floristic value.

## STUDY AREA

The “Poganka” old settlement (53°21'05”N, 18°33'16”E; 52 m above sea level) is situated in the Kujavian-Pomeranian Region, about 900 m north-west of the village of Wabcz (Stolno Commune) and occupies part of the 171 b compartment of the Chełmno Forest Range (Jamy Forest District). The investigations were carried out in a 1 ha area, which comprised the entire old settlement and areas in its direct neighbourhood (Fig. 1).

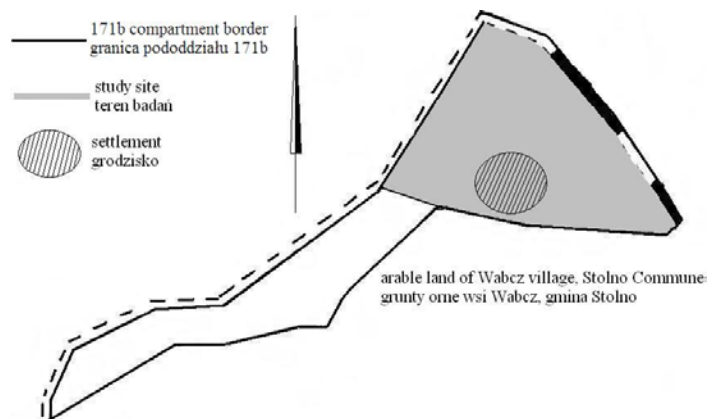


Fig. 1. The borders of the study area  
Rys. 1. Granice terenu badań

According to the physico-geographical regionalization [Kondracki 2000], the area under investigation is situated in the Lower Vistula Valley, at the border of the Grudziądz Basin and the Chełmińsko-Dobrzyńskie Lake District. It lies at the junction of arable land and forested ravine Struga Żaki (Cybulana) in the highland region of a historic Lower Vistula Valley Landscape Park [Zobolewicz et al. 1996, Dokumentacja... 1997]. To the south, "Poganka" borders with arable land, to the east and west it is adjacent to the forests of the Chełmno Forest Range, whereas to the north-west it adjoins with fish ponds and a former Żaki Mill.

## METHODS

The inventory of the flora was conducted between March and October 2004 and 2005. Species names of plants were given after Mirek et al. [2003] and Seneta and Dolatowski [2004]. The flora statistical characterization was carried out on the basis of Jackowiak [1993] and Celka [1999]. In comparison with the latter study, the authors modified frequency classes of species occurrence. Therefore, the number of sites on the examined area for the individual classes is as follows: I – very rare species (1-5), II – rare (6-10), III – frequent (11-20), IV – very frequent (21-40), V – common (> 40).

The classification of socio-ecological groups was given after Celka [1999]. Plants from the following syntaxonomic groups were found to occur in the "Poganka" settlement: 4 – *Phragmitetea*, 5 – *Molinio-Arrhenatheretea*, *Agropyro-Rumicion crispi*, 6 – *Sedo-Scleranthetea*, *Festuco-Brometea*, 7 – *Trifolio-Geranietea sanguinei*, *Rhamno-Prunetea*, 8 – *Nardo-Callunetea*, *Epilobion angustifolii*, *Fragarion vescae*, 9 – *Vaccinio-Piceetea*, *Quercetea robori-petraeae*, 10 – *Salicetea purpureae*, *Convolvuletalia sepium*, 11 – *Alnetea glutinosae*, *Alno-Padion*, 12 – *Quercion*, *Carpinion*, *Fagion*, *Alliarion*, *Sambuco-Salicion*, 13 – *Polygono-Chenopodietalia*, *Secalietea*, 14 – *Eragrostietalia*, *Sisymbrietalia*, *Onopordion*, *Eu-Arction*, *Polygonion avicularis*, 16 – species with undefined phytosociological affiliation.

The following plant species were classified as "special care" species: plant species under legal protection [Rozporządzenie... 2004], as well as those placed on "red lists" – both national [Lista roślin... 1992] and regional [Rutkowski 1997].

Measurements of breast height diameters and height of trees and shrubs growing on the examined area were carried out in August 2004. Breast height diameters of all trees and shrubs were measured with the accuracy of 1 mm (two perpendicular measurements) and their height – with the accuracy of 10 cm (several measurements for each thickness class). The breast height diameter structure for trees and shrubs was elaborated for 2 cm thickness classes.

## RESULTS

### The general characteristics of the flora

From the floristic and phytosociological point of view, the examined area can be divided into several fragments. The rampart and the ward of the settlement as well as the east and west slopes are covered with different species of fertile broad-leaved forests,

mainly oak-hornbeam forests. The plant association found here is *Tilio-Carpinetum*, however the classification is difficult because of the lack of characteristic and differential species. The *Carpinion betuli* alliance is represented by *Carpinus betulus*, *Dactylis polygama*, *Tilia cordata* and *Stellaria holostea*, while *Aegopodium podagraria*, *Anemone nemorosa*, *A. ranunculoides*, *Asarum europaeum*, *Dryopteris filix-mas*, *Epipactis helleborine*, *Galeobdolon luteum*, *Hepatica nobilis*, *Melica nutans*, *Milium effusum*, *Paris quadrifolia*, *Poa nemoralis*, *Polygonatum multiflorum*, *Pulmonaria obscura*, *Ranunculus lanuginosus*, *Stachys sylvatica* and *Viola reichenbachiana* represents the *Fagetalia* order and *Quercio-Fagetea* class.

The steep, north-western slope of the settlement is covered by a meadow with *Poa trivialis* on which *Chaerophyllum temulum*, *Urtica dioica* and *Veronica chamaedrys* are frequent or very frequent species. Many species from the *Molinio-Arrhenatheretea* class can also be found here.

The southern slope, neighbouring arable land, is covered by brushwood phytocoenosis from the *Rhamno-Prunetea* class. *Prunus spinosa* was found to be the dominating species with *Cornus sanguinea*, *Euonymus europaeus* occurring quite frequently and *E. verrucosus*, *Crataegus monogyna* and *C. rhipidophylla* found from time to time. The most important role in the forest vegetation cover is played by the nitrophilic plants from the *Artemisietea vulgaris* class such as: *Geum urbanum*, *Urtica dioica*, *Alliaria petiolata*, *Rubus caesius*, *Chelidonium majus*, *Glechoma hederacea* or *Galium aparine*.

The total number of 155 taxa of vascular plants derived from 51 families was found to occur in the area of the examined old settlement including: 2 species of ferns, 1 conifer and 152 mono- and dicotyledons. *Poaceae*, *Rosaceae*, *Asteraceae*, *Lamiaceae*, also *Ranunculaceae*, *Caryophyllaceae*, *Scrophulariaceae*, *Fabaceae* and *Liliaceae* were the families richest in species. 81 species derive from these 9 families, which constitutes a little more than 52.3% of all vascular plants of the examined area. The number of species occurring in individual families ranges from 1 to 15. The majority, i.e. 44 families, is represented by 1 to 5 species, with 21 families being represented by only 1 species, whereas 4 families were represented by more than 10 species.

The native flora is represented by 92.2% of total taxa with apophytes predominating spontaneophytes. The alien species constitute 7.8% of the total flora (Fig. 2). Rare and very rare species (91%) predominate in the flora found in "Poganka", while frequent species constitute only 7.1%. Very frequent and common species are the least numerous (1.9%) (Fig. 3). The examined flora is dominated by hemicryptophytes (45.8%) with significant proportion of phanerophytes (20.6%) and cryptophytes (16.1%) as well as therophytes (12.3%), while chamaephytes (5.2%) are less frequent. In phanerophytes, tree forms predominate over shrub-like ones, while in cryptophytes geophytes dominate over hydro- and helophytes.

The "Poganka" settlement is almost completely covered by an oak-hornbeam forest and, therefore, the floristic list is dominated by the thermophilic species of oak forests and mesophytic broad-leaved forests as well as nitrophilic brushwood. Also meadow plants occur abundantly. Species associated with thermophilic brushwood communities, coniferous forests and acidophilic broad-leaved forests, ruderal communities, sandy and xerothermic grasslands, marshy and boggy forests as well as alder brushwood and segetal plant communities are less numerous. The least frequent are species associated with proper and sedge rushes as well as those of undetermined phytosociological membership (Fig. 4).

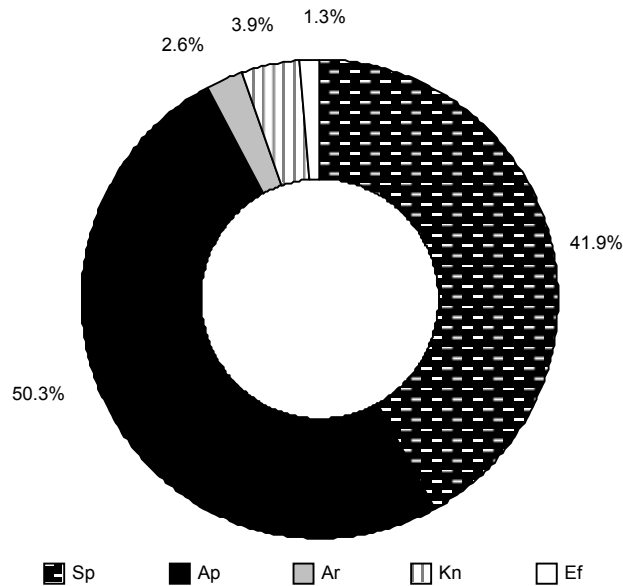


Fig. 2. The percentage participation of species in the geographical-historical groups. Sp – spontaneophytes, Ap – apophytes, Ar – archeophytes, Kn – kenophytes, Ef – ephemerophytes

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

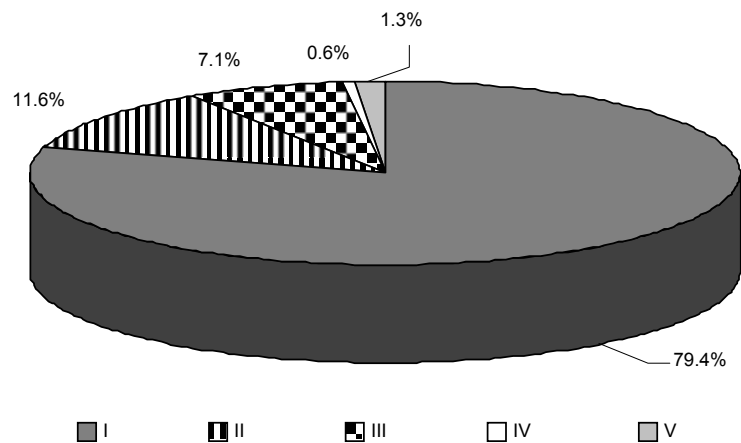


Fig. 3. The percentage of species in frequency classes. I – very rare (1-5 localities), II – rare (6-20), III – frequent (21-40), IV – very frequent (41-60), V – common (> 60)

Rys. 3. Procentowy udział gatunków w stopniach częstości. I – bardzo rzadki (1-5 stanowisk), II – rzadki (6-20), III – częsty (21-40), IV – bardzo częsty (41-60), V – pospolity (> 60)

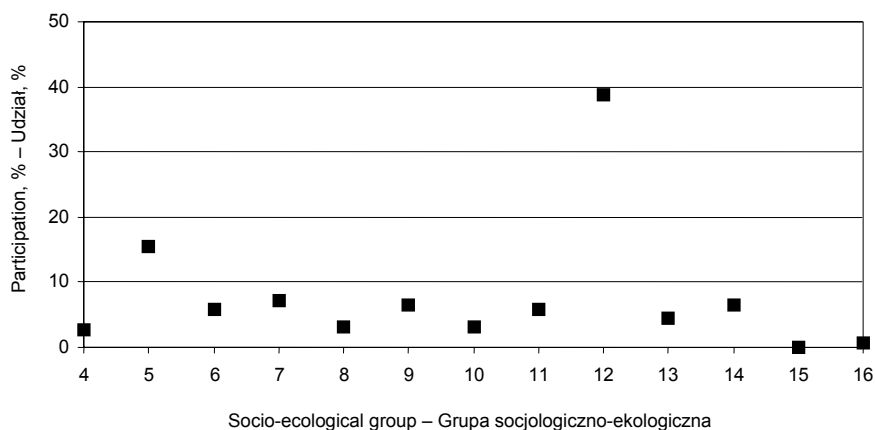


Fig. 4. The percentage of species in the socio-ecological groups [according to Celka 1999]  
Rys. 4. Procentowy udział gatunków w grupach socjologiczno-ekologicznych [według Celki 1999]

Almost all identified species find their optimum in mesohemerobic sites and only one taxon is euhemerobic (Table 1). Nearly half of the species are mesohemerobic plants (45.4%), with eu- and oligohemerobic (28.1 and 23.3%, respectively) taxa also fairly frequent. Polyhemerobic species (3.3%) are the least common.

Table 1. The list of taxa of vascular plants in the “Poganka” settlement  
Tabela 1. Wykaz taksonów roślin naczyniowych grodziska „Poganka”

No. Lp.	Species name Nazwa gatunkowa	Raunkiaer's group Grupa Raunkiaera	Frequency Częstość	Hemerobic degrees Stopnie hemerobii	Geographical-historical group Grupa historyczno-geograficzna	Socio-ecological group Grupa socjologiczno-ekologiczna
1	2	3	4	5	6	7
1	<i>Acer campestre</i> L.	M	I	ome	Ap	12
2	<i>Acer negundo</i> L.	M	I	me	Ef	10
3	<i>Acer platanoides</i> L.	M	II	omep	Ap	12
4	<i>Acer pseudoplatanus</i> L.	M	I	omep	Ap	12
5	<i>Achillea millefolium</i> L.	H	I	mep	Ap	5
6	<i>Acinos arvensis</i> (LAM.) DANDY	T, H	I	mp	Ap	6
7	<i>Adoxa moschatelina</i> L.	G	I	om	Sp	12

Table 1 – cont.

1	2	3	4	5	6	7
8	<i>Aegopodium podagraria</i> L.	H	II	<u>om</u>	Ap	11
9	<i>Aesculus hippocastanum</i> L.	M	I	<u>me</u>	Ef	16
10	<i>Agrimonia eupatoria</i> L.	H	I	<u>me</u>	Ap	7
11	<i>Agrostemma githago</i> L.	T	I	<u>me</u>	Ar	13
12	<i>Agrostis stolonifera</i> L.	H	I	<u>me</u>	Ap	5
13	<i>Alliaria petiolata</i> (M. BIEB.) CAVARA & GRANDE	H	I	<u>ome</u>	Ap	12
14	<i>Alopecurus geniculatus</i> L.	H	I	<u>me</u>	Ap	5
15	<i>Anchusa officinalis</i> L.	H	II	<u>mep</u>	Ap	14
16	<i>Anemone nemorosa</i> L.	G	I	<u>om</u>	Sp	12
17	<i>Anemone ranunculoides</i> L.	G	II	<u>om</u>	Sp	12
18	<i>Anthoxanthum odoratum</i> L.	H	I	<u>ome</u>	Ap	5
19	<i>Anthriscus sylvestris</i> (L.) HOFFM	H	I	<u>ome</u>	Ap	12
20	<i>Arctium tomentosum</i> MILL.	H	I	<u>me</u>	Ap	14
21	<i>Artemisia vulgaris</i> L.	Ch	I	<u>me</u>	Ap	14
22	<b><i>Asarum europaeum</i> L.</b>	<b>H</b>	<b>III</b>	<b><u>om</u></b>	<b>Sp</b>	<b>11</b>
23	<i>Astragalus glycyphyllos</i> L.	H	I	<u>ome</u>	Ap	7
24	<i>Betula pendula</i> ROTH	M	I	<u>omep</u>	Ap	9
25	<i>Calamagrostis epigeios</i> (L.) ROTH	G	I	<u>me</u>	Ap	8
26	<i>Calystegia sepium</i> (L.) R. BR.	G, H, li	I	<u>me</u>	Ap	10
27	<i>Campanula patula</i> L. subsp. <i>patula</i>	H	I	<u>me</u>	Sp	5
28	<i>Carex hirta</i> L.	G	I	<u>ome</u>	Ap	14
29	<i>Carex sylvatica</i> HUDS.	H	I	<u>m</u>	Sp	12
30	<i>Carpinus betulus</i> L.	M	V	<u>om</u>	Sp	12
31	<i>Cerastium arvense</i> L.	C	I	<u>me</u>	Ap	6
32	<i>Chaerophyllum aromaticum</i> L.	H	II	<u>m</u>	Sp	12
33	<i>Chaerophyllum temulum</i> L.	T, H	IV	<u>ome</u>	Ap	12
34	<i>Chelidonium majus</i> L.	H	II	<u>ome</u>	Ap	12
35	<i>Chenopodium album</i> L.	T	I	<u>mep</u>	Ap	14
36	<i>Cirsium arvense</i> (L.) SCOP.	G	I	<u>me</u>	Ap	14
37	<i>Consolida regalis</i> GRAY	T	I	<u>me</u>	Ar	13
38	<b><i>Convallaria majalis</i> L.</b>	<b>G</b>	<b>II</b>	<b><u>om</u></b>	<b>Sp</b>	<b>9</b>
39	<i>Conyza canadensis</i> (L.) CRONQUIST	T, H	I	<u>mep</u>	Kn	14
40	<i>Cornus sanguinea</i> L.	N	III	<u>ome</u>	Sp	7
41	<i>Corydalis cava</i> SCHWEIGG. & KÖRTE	G	I	<u>om</u>	Sp	12
42	<i>Corylus avellana</i> L.	N	II	<u>om</u>	Ap	12
43	<i>Crataegus monogyna</i> JACQ.	N, M	I	<u>ome</u>	Ap	7
44	<i>Crataegus rhipidophylla</i> GAND.	N	I	<u>m</u>	Sp	7

Table 1 – cont.

1	2	3	4	5	6	7
45	<i>Cuscuta europaea</i> L.	Tp	I	<u>m</u>	Sp	10
46	<i>Dactylis glomerata</i> L.	H	I	<u>ome</u>	Ap	5
47	<i>Dactylis polygama</i> HORV.	H	I	<u>m</u>	Sp	12
48	<i>Dryopteris carthusiana</i> (VILL.) H.P. FUCHS	H	I	<u>om</u>	Sp	12
49	<i>Dryopteris filix-mas</i> (L.) SCHOTT	H	II	<u>ome</u>	Sp	12
50	<i>Elymus repens</i> (L.) GOULD	G	I	<u>me</u>	Ap	14
51	<i>Epilobium angustifolium</i> L.	H	I	<u>me</u>	Ap	8
52	<b><i>Epipactis helleborine</i> (L.) CRANTZ</b>	<b>G</b>	<b>I</b>	<b><u>m</u></b>	<b>Sp</b>	<b>12</b>
53	<i>Equisetum arvense</i> L.	G	I	<u>me</u>	Ap	13
54	<i>Equisetum pratense</i> EHRH.	G	I	me	Sp	12
55	<i>Equisetum sylvaticum</i>	G	I	m	Sp	12
56	<i>Euonymus europaeus</i> L.	N	III	<u>ome</u>	Ap	12
57	<i>Euonymus verrucosus</i> SCOP.	N	I	<u>ome</u>	Sp	12
58	<i>Eupatorium cannabinum</i> L.	H	I	<u>m</u>	Sp	5
59	<i>Fagus sylvatica</i> L.	M	I	<u>om</u>	Kn	12
60	<i>Fallopia convolvulus</i> (L.) Á. LÖVE	T	I	<u>me</u>	Ar	13
61	<i>Festuca gigantea</i> (L.) VILL.	H	I	<u>om</u>	Sp	12
62	<i>Ficaria verna</i> HUDS.	H	I	<u>ome</u>	Ap	11
63	<i>Filipendula ulmaria</i> (L.) MAXIM.	H	I	<u>m</u>	Sp	5
64	<i>Fragaria vesca</i> L.	H	I	<u>me</u>	Ap	8
65	<b><i>Frangula alnus</i> MILL.</b>	<b>N</b>	<b>I</b>	<b><u>om</u></b>	<b>Sp</b>	<b>11</b>
66	<i>Fraxinus excelsior</i> L.	M	I	<u>ome</u>	Ap	11
67	<i>Galeobdolon luteum</i> HUDS	C	III	<u>om</u>	Sp	12
68	<i>Galeopsis pubescens</i> BESSER	T	I	<u>om</u>	Ap	12
69	<i>Galeopsis tetrahit</i> L.	T	I	<u>me</u>	Ap	8
70	<i>Galium aparine</i> L.	T	III	<u>ome</u>	Ap	12
71	<i>Galium verum</i> L.	H	I	<u>me</u>	Ap	6
72	<i>Geranium palustre</i>	H	I		Sp	4
73	<i>Geranium robertianum</i> L.	T, H	I	<u>ome</u>	Ap	12
74	<i>Geum rivale</i> L.	H	I	<u>m</u>	Sp	5
75	<i>Geum urbanum</i> L.	H	I	<u>ome</u>	Ap	12
76	<i>Glechoma hederacea</i> L.	G, H	II	<u>ome</u>	Ap	12
77	<b><i>Hepatica nobilis</i> MILLER</b>	<b>H</b>	<b>I</b>	<b><u>om</u></b>	<b>Sp</b>	<b>12</b>
78	<i>Holcus lanatus</i> L.	H	I	<u>me</u>	Ap	5
79	<i>Humulus lupulus</i> L.	H, li	I	<u>ome</u>	Ap	10
80	<i>Hypericum perforatum</i> L.	H	I	<u>mep</u>	Ap	6



Table 1 – cont.

1	2	3	4	5	6	7
81	<i>Impatiens noli-tangere</i> L.	T	I	<u>om</u>	Sp	12
82	<i>Impatiens parviflora</i> DC.	T	II	<u>ome</u>	Kn	12
83	<i>Juncus conglomeratus</i> L. em. LEERS	H	I	<u>me</u>	Ap	5
84	<i>Juncus effusus</i> L.	H	I	<u>me</u>	Ap	5
85	<i>Lamium maculatum</i> L.	H	III	<u>om</u>	Sp	12
86	<i>Lapsana communis</i> L.	H, T	I	<u>ome</u>	Ap	12
87	<i>Lathyrus vernus</i>	G	I	<u>om</u>	Sp	12
88	<i>Lonicera xylosteum</i> L.	N	I	<u>om</u>	Sp	12
89	<i>Lotus corniculatus</i> L.	H	I	<u>me</u>	Ap	5
90	<i>Luzula pilosa</i> (L.) WILLD.	H	I	<u>m</u>	Sp	9
91	<i>Lycopus europaeus</i> L.	H, Hy	I	<u>me</u>	Ap	11
92	<i>Lysymachia nummularia</i> L.	C	I	<u>om</u>	Sp	4
93	<i>Maianthemum bifolium</i> (L.) F.W. SCHMIDT	C	I	<u>om</u>	Sp	9
94	<i>Malus domestica</i> BORKH.	M	I	<u>me</u>	Kn	12
95	<i>Medicago falcata</i> L.	H	I	<u>me</u>	Ap	6
96	<i>Melandrium rubrum</i> (WEIGEL) GARCKE	H	I	<u>m</u>	Sp	12
97	<i>Melica nutans</i> L.	G, H	I	<u>om</u>	Sp	12
98	<i>Mentha aquatica</i> L.	H, Hy	I	<u>m</u>	Sp	4
99	<i>Milium effusum</i> L.	H	I	<u>om</u>	Sp	12
100	<i>Moehringia trinervia</i> (L.) CLAIRV.	T, H	II	<u>om</u>	Sp	12
101	<i>Mycelis muralis</i> (L.) DUMORT.	H	I	<u>om</u>	Sp	9
102	<i>Myosotis arvensis</i> (L.) HILL	T, H	I	<u>me</u>	Ar	13
103	<i>Myosoton aquaticum</i> (L.) MOENCH	G, H	I	<u>me</u>	Ap	11
104	<i>Oxalis acetosella</i> L.	G, H	I	<u>om</u>	Sp	12
105	<i>Oxalis fontana</i> BUNGE	G	I	<u>me</u>	Kn	13
106	<i>Paris quadrifolia</i> L.	G	I	<u>om</u>	Sp	11
107	<i>Pinus sylvestris</i> L.	M	I	<u>ome</u>	Sp	9
108	<i>Plantago major</i> L.	H	I	<u>mep</u>	Ap	5
109	<i>Poa annua</i> L.	T, H	I	<u>me</u>	Ap	5
110	<i>Poa nemoralis</i> L.	H	II	<u>ome</u>	Ap	12
111	<i>Poa pratensis</i> L.	H	I	<u>me</u>	Ap	5
112	<i>Poa trivialis</i> L.	H	I	<u>me</u>	Ap	5
113	<i>Polygonatum multiflorum</i> (L.) ALL.	G	I	<u>om</u>	Sp	12
114	<i>Polygonatum odoratum</i> (MILL.) DRUCE	G	I	<u>om</u>	Sp	9
115	<b><i>Primula veris</i> L.</b>	<b>H</b>	<b>I</b>	<b><u>om</u></b>	<b>Sp</b>	<b>7</b>

Table 1 – cont.

1	2	3	4	5	6	7
116	<i>Prunella vulgaris</i> L.	H	I	<u>me</u>	Ap	5
117	<i>Prunus padus</i> L.	M	III	<u>m</u>	Sp	7
118	<i>Prunus serotina</i> EHRH.	M	I	<u>me</u>	Kn	9
119	<i>Prunus spinosa</i> L.	N	II	<u>ome</u>	Ap	7
120	<i>Pulmonaria obscura</i> DUMORT.	H	III	<u>om</u>	Sp	12
121	<i>Pyrus communis</i> L.	M	I	<u>me</u>	Sp	7
122	<i>Quercus robur</i> L.	M	V	<u>om</u>	Sp	12
123	<i>Ranunculus lanuginosus</i> L.	H	II	<u>ome</u>	Sp	12
124	<i>Ranunculus repens</i> L.	H	II	<u>me</u>	Ap	5
125	<i>Rhamnus catharticus</i> L.	N	I	<u>m</u>	Sp	7
126	<i>Ribes alpinum</i> L.	N	I	<u>ome</u>	Ap	12
127	<i>Rubus caesius</i> L.	Ch, N	II	<u>ome</u>	Ap	12
128	<i>Rumex acetosa</i> L.	H	I	<u>ome</u>	Ap	5
129	<i>Rumex conglomeratus</i> MURRAY	H	I	<u>e</u>	Ap	14
130	<i>Salix fragilis</i> L.	M	I	<u>me</u>	Ap	10
131	<i>Sambucus nigra</i> L.	N	III	<u>ome</u>	Ap	12
132	<i>Scirpus silvaticus</i> L.	G	I	<u>m</u>	Sp	5
133	<i>Scrophularia nodosa</i> L.	H	I	<u>om</u>	Sp	12
134	<i>Sedum maximum</i> (L.) HOFFM.	H, G	I	<u>me</u>	Ap	6
135	<i>Solidago virgaurea</i> L.	H	I	<u>om</u>	Sp	9
136	<i>Sorbus aucuparia</i> L. em. HEDL.	N, M	I	<u>ome</u>	Ap	9
137	<i>Stachys sylvatica</i> L.	H	I	<u>om</u>	Sp	12
138	<i>Stellaria holostea</i> L.	C	I	<u>om</u>	Sp	12
139	<i>Stellaria media</i> (L.) VILL.	T	II	<u>ome</u>	Ap	13
140	<i>Tanacetum vulgare</i> L.	H	I	<u>ome</u>	Ap	14
141	<i>Taraxacum</i> section <i>Vulgaria</i>	H	I	<u>omep</u>	Ap	5
142	<i>Thalictrum minus</i> L.	H	I	<u>m</u>	Sp	6
143	<i>Tilia cordata</i> MILL.	M	I	<u>ome</u>	Ap	12
144	<i>Trifolium pratense</i> L.	H	I	<u>me</u>	Ap	5
145	<i>Ulmus glabra</i> HUDS.	M	I	<u>ome</u>	Ap	11
146	<i>Urtica dioica</i> L.	H	III	<u>ome</u>	Ap	12
147	<i>Verbascum thapsus</i> L.	H, T	I	<u>m</u>	Ap	6
148	<i>Veronica beccabunga</i> L.	Hy, C	I	<u>m</u>	Sp	4
149	<i>Veronica chamaedrys</i> L.	C	III	<u>me</u>	Ap	5
150	<i>Veronica hederifolia</i> L.	T	I	<u>ome</u>	Ap	12
151	<i>Veronica spicata</i> L.	H, C	I	<u>me</u>	Sp	6

Table 1 – cont.

1	2	3	4	5	6	7
152	<b><i>Viburnum opulus</i> L.</b>	N	I	<u>m</u>	Sp	7
153	<i>Viola canina</i> L.	H	I	<u>m</u>	Sp	8
154	<i>Viola reichenbachiana</i> JORD. ex BOREAU	H	I	<u>m</u>	Sp	12
155	<i>Viola riviniana</i> RCHB.	H	I	<u>om</u>	Sp	12

Bold fonts denote legally protected species.  
Pogrubienie – gatunki objęte ochroną prawną.

No rare and threatened species (nationally and regionally) are found in the "Poganka" old settlement [Lista roślin... 1992, Rutkowski 1997]. Seven of the identified species are under legal protection – *Asarum europaeum* and *Epipactis helleborine* are under strict protection and the remaining 5 species – *Convallaria majalis*, *Frangula alnus*, *Hepatica nobilis*, *Primula veris* and *Viburnum opulus* – are under partial protection. The majority of the above-mentioned species comprises very rare plants, only *Convallaria majalis* belongs to the category of rare plants, while *Asarum europaeum* is a frequent species in the examined area (Table 1).

### Dendroflora

The identified dendroflora comprises 32 taxa, which constitutes 20.6% of all vascular plants found in the examined area, of which 18 species are trees, 12 are shrubs and 2 have both forms of growth. It is evident from the information found in Szczegółowe... [1997] that the stand from the 171 b compartment (1.40 ha), partially growing in the examined settlement, is made up of *Quercus robur* (40%), *Carpinus betulus* (30%) and *Pinus sylvestris* (30%). Oaks growing here are now 103, hornbeams are 83 and pine trees are 48 years old. In 1997 late thinning was carried out in this stand within the framework of tending operations and in 1999 beech underplantings were performed in a 0.5 ha area. Results obtained in this study confirm this information.

*Quercus robur* and *Carpinus betulus* trees play a dominant role in the examined stand and they form its first storey, with *Betula pendula* and *Tilia cordata* appearing sporadically. *Carpinus betulus*, *Quercus robur*, *Prunus padus*, *Acer platanoides* trees, with *Pyrus communis* and *Tilia cordata* appearing singly, grow in the second storey. Species forming the underbrush, very thick sometimes, include: *Acer campestre*, *A. negundo*, *A. platanoides*, *Sambucus nigra*, *Fagus sylvatica*, *Prunus padus* and *P. serotina*, *Cornus sanguinea*, *Carpinus betulus*, *Pyrus communis*, *Crataegus monogyna*, *C. rhipidophylla*, *Sorbus aucuparia*, *Corylus avellana*, *Tilia cordata*, *Rhamnus catharticus*, *Frangula alnus*, *Prunus spinosa*, *Euonymus europaeus*, *E. verrucosus*, *Lonicera xylosteum*, *Ulmus glabra*, *Ribes alpinum* and *Viburnum opulus*.

The ward together with ramparts is covered, primarily, by shrubs of which *Prunus padus*, *P. spinosa*, *Euonymus europaeus*, *E. verrucosus*, *Sambucus nigra*, *Coryllus avellana*, are dominant and *Acer platanoides*, *Sorbus aucuparia*, *Crataegus monogyna*, *C. rhipidophylla*, *Rhamnus catharticus* and *Lonicera xylosteum* found only singly. The stand is made up of *Quercus robur*.

The forest which covers the slope from the side of the Żaki Mill is made up of *Quercus robur* (first storey) and *Carpinus betulus* (second storey). The underbrush is fairly poor and dominated by *Carpinus betulus*, *Prunus padus* and *Euonymus europaeus*, *E. verrucosus*, *Cornus sanguinea*, *Rhamnus catharticus*, *Sambucus nigra*, *Corylus avellana* and *Tilia cordata* growing individually.

In the small, single-storey *Pinus sylvestris* stand (43 trees) adjacent to the old settlement on the south-eastern side, some *Betula pendula* and *Quercus robur* were also found. The underbrush comprises *Prunus padus*, *Corylus avellana*, *Cornus sanguinea*, *Sambucus nigra*, *Carpinus betulus*, *Acer platanooides*, *Aesculus hippocastanum*, *Crataegus monogyna*, *Tilia cordata*, *Lonicera xylosteum*, *Prunus spinosa* and *Ribes alpinum*.

The “Poganka” settlement is separated from the arable land of the Wabcz village by a narrow belt of bushy brushwood consisting mainly of *Prunus spinosa*, *Cornus sanguinea* and *Euonymus europaeus*.

In 1997, a plantation of *Fagus sylvatica* was established on the north-western slope of the “Poganka”.

The structure of breast height diameter and height of trees and shrubs growing in the “Poganka” area is shown in Figure 5. From among 792 trees and shrubs measured in the course of field inventory, 49% have breast height diameter not exceeding 10 cm. The majority of these (74%) is found in the central part of the old settlement (mainly shrubs). The thickest trees of breast height diameter exceeding 50 cm include 28 specimens of *Quercus robur* and one *Betula pendula*. The majority of them grow in the central part of the settlement (ward) and in the narrow belt separating the arable fields from the beech plantation. The highest trees include *Betula pendula*, *Pinus sylvestris*, *Quercus robur* and *Carpinus betulus*. Results of the measurements of breast height diameters and heights of trees and shrubs growing in the settlement are shown in Table 2.

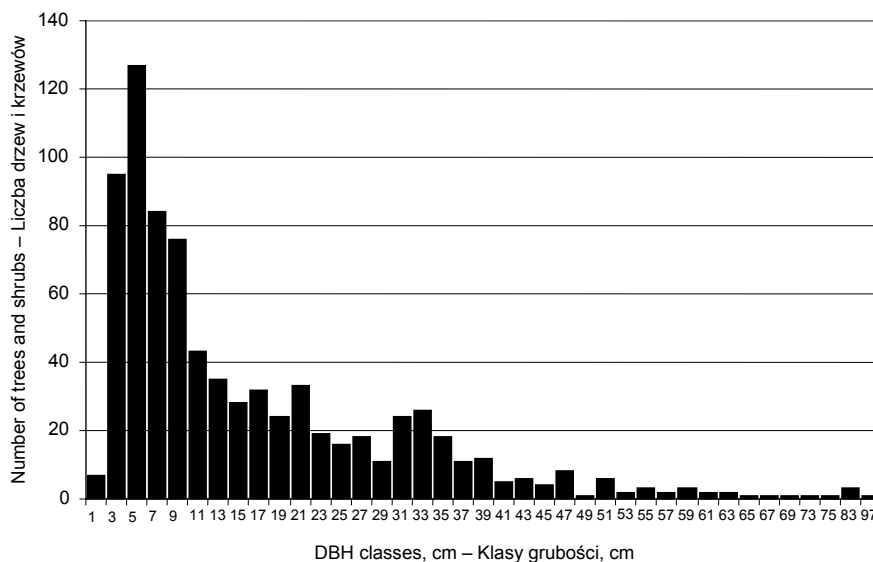


Fig. 5. The DBH structure of trees and shrubs

Rys. 5. Struktura pierśnic drzew i krzewów

Table 2. The results of the dendroflora inventory  
Tabela 2. Wyniki inwentaryzacji roślin drzewiastych

Species name Nazwa gatunkowa	Number of trees and/or shrubs Liczba drzew i/lub krzewów	Mean DBH Średnia pierśnica cm	Minimum DBH Minimalna pierśnica cm	Maximum DBH Maksymalna pierśnica cm	Mean height Średnia wysokość m	Total basal area Sumaryczne pole powierzchni przekroju pierśnicowe go m <sup>2</sup>	Total basal area Udział w sumarycznej powierzchni przekroju pierśnicowe go %
<i>Acer platanoides</i>	14	14.29	2.75	30.15	6.9	0.3031	1.029
<i>Aesculus hippocastanum</i>	4	9.65	6.75	17.45	6.5	0.0356	0.121
<i>Betula pendula</i>	9	34.04	16.50	57.00	22.3	0.9192	3.121
<i>Carpinus betulus</i>	78	13.93	2.35	42.00	14.8	1.5965	5.420
<i>Cornus sanguinea</i>	40	6.14	2.00	11.75	4.4	0.1378	0.468
<i>Corylus avellana</i>	23	7.89	3.30	13.00	7.5	0.1212	0.411
<i>Crataegus monogyna</i> et <i>C. rhipidophylla</i>	7	9.06	3.00	13.00	4.3	0.0524	0.178
<i>Euonymus europaeus</i> et <i>E. verrucosus</i>	98	6.73	2.00	17.40	4.0	0.4121	1.399
<i>Fagus sylvatica</i>	1	8.20	8.20	8.20	6.3	0.0053	0.018
<i>Fraxinus excelsior</i>	1	14.00	14.00	14.00	8.4	0.0154	0.052
<i>Lonicera xylosteum</i>	4	1.35	1.00	2.20	1.6	0.0006	0.002
<i>Pinus sylvestris</i>	43	26.32	11.55	43.80	21.0	2.5729	8.735
<i>Prunus padus</i>	107	9.50	2.10	28.00	8.5	0.9814	3.332
<i>Prunus spinosa</i>	68	3.64	1.00	11.45	3.8	0.0822	0.279
<i>Pyrus communis</i>	4	16.49	9.55	22.20	7.5	0.0930	0.316
<i>Quercus robur</i>	207	33.23	9.00	97.10	20.3	21.6506	73.503
<i>Rhamnus catharticus</i>	9	8.83	2.10	21.00	4.9	0.0755	0.256
<i>Sambucus nigra</i>	65	4.63	1.00	10.75	3.8	0.1279	0.434
<i>Sorbus aucuparia</i>	2	6.43	5.60	7.25	3.4	0.0066	0.022
<i>Tilia cordata</i>	7	20.82	14.00	32.75	8.0	0.2570	0.872
<i>Ulmus glabra</i>	1	11.00	11.00	11.00	6.7	0.0095	0.032

## DISCUSSION AND CONCLUSIONS

No rare and threatened and few protected species were found in the flora of the "Poganka". Also no trees and shrubs with monumental circumferences were found to occur. However, the special structure of the old settlement contributes to a significant site diversification and, consequently, species variability. 155 taxa of vascular plants derived

from 51 families, including 7 legally protected species, occur in the area of the settlement. In the case of more than 90%, they are species of a very small number of sites – very rare and rare in the area investigated. This data is similar to that obtained by Celka [1999].

The modern flora of the examined settlement bears no traces of human activities which thrived here ages ago. Native species clearly predominate (92.2%) over alien ones (7.8%). For comparison, Celka [1999] gives 77.6% and 22.4%, respectively, for settlements from the Wielkopolska Region. Nearly 70% of plants growing here belong to species of ecosystems characterised by a low level of human pressure (meso- and oligohemerobic degree) and this can be attributed to the fact that the experimental area is situated among forests and meadows, far from busy roads and large cities.

The most numerous plants are forest and brushwood species usually associated with thermophilic oak and mesophylic broad-leaved forests as well as nitrophilic brushwoods. Therefore, it is not surprising that the “Poganka” flora, which is situated among forests, has a 10% higher proportion of trees and shrubs than the settlements of the Wielkopolska Region, which is associated most frequently with the farming landscape. The dendroflora comprises 32 taxa. The stands growing in the area of the old settlement are dominated by species of fertile, broad-leaved forests, most frequently oak-hornbeam forests. The most outstanding specimens are about 100 years old, although it is young trees that are dominant as the breast height diameter of over 49% of trees and shrubs found in the old settlement does not exceed 10 cm. The thickest trees with the breast height diameter of over 50 cm include 28 specimens of *Quercus robur* and one of *Betula pendula*.

Summing up, the examined area should be left to natural succession processes and periodical, long-term floristic and phytosociological investigations should be carried out to monitor changes of its flora and vegetation. Possible activities should be confined to refraining from the introduction of alien species and the supporting the “special care” species by the protection of communities which already occur here. When carrying out silvicultural works in the close neighbourhood of the “Poganka”, special attention should be paid to their possible impact on the plants growing in this settlement and which are under species protection. The “Poganka” is undoubtedly a regional tourist attraction and its historical, landscape and floristic values, which have been confirmed by its protection status, fully justify the need to make it available to visitors as an interesting area by marking out special tourist paths close to the old site leading from the nearby village of Wabcz.

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**ROŚLINY NACZYNIOWE WCZESNOŚREDNIOWIECZNEGO GRODZISKA „POGANKA” KOŁO WABCZA NA ZIEMI CHEŁMIŃSKIEJ**

**Streszczenie.** Na terenie grodziska „Poganka” zinwentaryzowano 155 taksonów roślin naczyniowych pochodzących z 51 rodzin, w tym 32 taksony roślin drzewiastych. Współczesna flora badanego grodziska nie wykazuje śladów mającej tu miejsce przed wiekami działalności człowieka. Gatunki rodzime zdecydowanie przeważają nad obcymi, niemal 70% stanowią gatunki mezo- i oligohemerobne, wskazujące na słaby stopień antropopresji. Najliczniej występują tu rośliny związane z ciepłolubnymi dąbrowami i mezofilnymi lasami liściastymi, zaroślami nitrofilnymi oraz roślinnością łąkową. Odnaleziono stanowiska 7 gatunków podlegających ochronie prawnej. W drzewostanach przeważają młode drzewa, jednak są też okazy ponadstuletnie. Zdaniem autorów, należałoby pozostawić badany obiekt naturalnym procesom sukcesji i prowadzić tu cyklicznie wieloletnie badania florystyczne i fitosocjologiczne, w celu obserwacji przemian jego flory i roślinności. „Poganka” jest regionalną atrakcją turystyczną i powinna być udostępniona zwiedzającym, poprzez wytyczenie w pobliżu grodziska szlaku turystycznego.

**Słowa kluczowe:** rośliny naczyniowe, ziemia chełmińska, grodzisko „Poganka”

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