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MATERIALS TO THE VASCULAR FLORA OF THE NEGLECTED EVANGELICAL CEMETERIES OF THE WESTERN PART OF THE DRAWSKO LANDSCAPE PARK (POLAND)

Anna Sigiel-Dopierała, Andrzej M. Jagodziński

A. Sigiel-Dopierała, Regional Directorate of Environmental Protection in Szczecin, Department in Złocieniec, Dworcowa 13, 78-520 Złocieniec, Poland
A.M. Jagodziński, corresponding author, Department of Forest Protection, Poznań University of Life Sciences, Wojska Polskiego 71 C, 60-625 Poznań, Poland; Institute of Dendrology, Polish Academy of Sciences, Parkowa 5, 62-035 Kórnik, Poland, e-mail: amj@man.poznan.pl

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ABSTRACT. Old cemeteries link historical, architectural and natural values and are considered to be some of the most interesting elements of Polish rural landscape. In the Drawsko Landscape Park area, which is situated in the north-western part of Poland, there exist ca. 80 neglected Evangelical cemeteries and they are very suitable habitats for vascular plants. We inventoried five abandoned Evangelical cemeteries of the western part of the Drawsko Landscape Park, i.e. in Lipno, Toporzyk, Śmidzięcino, Cieminko and Uraz. The survey showed relatively poor flora with the total number of 116 taxa of vascular plants derived from 44 families. The richest in species were the following families: *Rosaceae* (12), *Liliaceae* (10), *Ranunculaceae* (7), *Asteraceae* (6), *Carypohyllaceae* (5), *Lamiaceae* (5) and *Poaceae* (5). The number of species occurring in individual families ranged from 1 to 12 and the number of species per cemetery ranged from 31 in Lipno to 59 in Cieminko, with an average of 51 species per cemetery. The native flora is represented by 88% of total taxa with apophytes outnumbering spontaneophytes. The examined flora is dominated by hemicryptophytes (42%) with significant proportion of phanerophytes (32%). The cemeteries are habitats for relatively numerous plant species which are protected in Poland, i.e. *Convallaria majalis*, *Frangula alnus*, *Galanthus nivalis*, *Galium odoratum*, *Hedera helix*, *Hepatica nobilis*, *Leucoium vernum*, *Lilium bulbiferum*, *Lilium martagon*, *Lonicera periclymenum*, *Polypodium vulgare*, *Primula veris*, *Ribes nigrum*, *Viburnum opulus,* and *Vinca minor*, however most of these species were most likely planted by local inhabitants.

KEY WORDS: vascular flora, dendroflora, cemetery, nature protection

INTRODUCTION

Old cemeteries are some of the most significant elements of the Polish rural landscape and are also integral parts of architecture and green areas in cities, linking historical, architectural, cultural and natural values. Old cemeteries provide with some of the earliest written local history (Uslu 2010). The arrangement, architecture and flora diversity of cemeteries are the result of many factors – both geographical (i.e. the geographical region, topographic features, climate conditions) and historical and social factors (i.e. the date of the establishment, the time the cemetery was used, religious practices and customs of inhabitants, management practices, etc.) (Czarna et al. 2007 b). Old cemeteries may contain a surprising number of plant species – both native and exotic, that includes a high proportion of generally 'infrequent' species in rural areas (McBarron et al. 1988). However, research of the vegetation of cemeteries is very uncommon (Šilc 2009), most of floristical studies on cemeteries generally pertain to inventories of woody species (trees and shrubs), while herbaceous studies are less frequent (Stypiński 1978, Dorda 1995, Antkowiak and Heine 2005). In general, the herbaceous flora of cemeteries is not extensively researched. Moreover, publications concerning other groups of organisms, such as lichens, growing on the territories of cemeteries, are very rare (e.g. Kiszka and Lipnicki 1994, Grochowski 2002, Jastrzębska 2005, Matwiejuk 2008, 2009).

Most of the cemeteries are planted with trees and generally are highly shaded. They are also subjected to long lasting human impact on the environment, especially when situated in cities (Sudnik-Wójcikowska and Galera 2005). Trees in old cemeteries are particularly valuable because they perform many important functions, especially in deforested rural areas where they modify the local climate and diversify the landscape. They are generally of great importance not only for local population (Antkowiak and Heine 2005). Cemeteries were recognized as an important centre for alien plant invasions (Gudžinskas 2005). The occurrence of some species within the areas of cemeteries might be related to their symbolism, aesthetic reasons and practical roles (Kolbuszewski 1996, Antkowiak and Heine 2005). Moreover, the design form of a particular cemetery may

be also determined by the surface features of the surrounding area (Czarna et al. 2007 a). According to Czarna (2001) cemeteries may also play an important role as refuge for native plant species.

There are 10-15 thousand cemeteries (both municipal and religious) in Poland and they cover from 40 to 80 thousands ha of land (Siciński 1986). After the Second World War some old Evangelical cemeteries, especially in the cities, were taken over by Catholics and converted into their own needs; however, some of them were destroyed and converted into green areas and parks. The cemeteries situated in small towns and villages or in their vicinities were often plundered for valuable objects. Moreover, elements of gravestones were sometimes used by local inhabitants as building material on farms. However, the old cemeteries, even when destroyed, are still very interesting from many points of view.

In the Drawsko Landscape Park area, which is situated in the north-western part of Poland (West Pomeranian Voivodeship), there exist ca. 80 abandoned cemeteries and most of them are Evangelical cemeteries. They have never been studied as habitats for vascular plants. Thus, the aim of our study was to determine the list of vascular plant species in the most valuable and well preserved, abandoned Evangelical cemeteries in the western part of Drawsko Landscape Park.

MATERIALS AND METHODS

The inventory was conducted in five abandoned Evangelical cemeteries. The cemeteries are situated in the following locations: Lipno and Toporzyk – Połczyn Zdrój District, Śmidzięcino and Cieminko – Ostrowice District and Uraz – Czaplinek District.

The investigations were conducted between March and October in two consecutive growing seasons of 2008 and 2009. The cemeteries are not fenced (except Toporzyk cemetery), but their borders are clearly marked by stones and the area of the cemeteries may be more or less precisely determined by the line of old trees growing around cemetery. Thus, since the borders were clearly visible, we listed all vascular plant species growing in the area of each cemetery, excluding species growing outside the borders. Plant species growing outside the cemeteries were not included in the list of taxa. Nomenclature of species was based on Mirek et al. (2002). Diameters at breast height (1.3 m above ground) of trees were measured with caliper with 1 cm accuracy (two perpendicular measurements).

The analysis of geographical-historical groups was presented according to Chmiel (1993) with a few modifications; the spectrum of life forms according to Raunkiaer's system was based on Rutkowski (1998). We determined that the 'special care' species are these which are under legal protection in Poland (Rozporządzenie... 2004) or listed as threatened in Poland (Zarzycki et al. 1992) and in the West Pomerania region (Żukowski and Jackowiak 1995).

We characterised the studied cemeteries using the unpublished data from the Drawsko Landscape Park Protection Plan (Cmentarze... 1994, Drawsko... 1997):

1. The Evangelical Cemetery in Lipno (53°42' 03.38"N, 16°05'42.82"E): it was established in the second half of the XIX century and it covers 0.40 ha. It belongs to the Agricultural Property Agency (previously: the Agricultural Property Stock of the State Treasury). It is located in the forest, on a small hill in the south-eastern direction from buildings of Lipno, ca. 200 m east from Nowe Worowo – Połczyn Zdrój road. The cemetery is adjacent to a field road (western and northern boarder), and a forest (southern and eastern boarder). The cemetery is surrounded by fieldstones. In the unpublished records from Połczyn Zdrój District (dated on 1985), it was stated that old trees were present in the cemetery, i.e. six oaks, seven spruces and one pine. Moreover, it was mentioned in that record that there exists an iron churchyard cross from 1879. Based on the current investigation, the churchyard cross was not found, but the old pine-spruce-oak stand still exists. The graves were razed to the ground; the arrangement of paths and sections is invisible at present.

2. The Evangelical Cemetery in Toporzyk (53°41' 50.04"N, 16°03'24.73"E): it was established in the first half of the XIX century and it covers 0.65 ha. At present, it is the northern part of a municipal cemetery. The cemetery is situated in the north-eastern direction ca. 250 m from Toporzyk village. The arrangement and borders (an avenue of spruce trees) of the Evangelical Cemetery are well preserved. There are many gravestones, graves and iron churchyards dated both to the first and the second half of the XIX century and the first half of the XX century. The oldest churchyard is dated back to 1833.

3. The Evangelical Cemetery in Śmidzięcino (53°40'24.81"N, 16°08'33.03"E): the area of the cemetery is 0.18 ha. It is situated on a small hill behind the pond in the abandoned Śmidzięcino village, on the right side of the road from Bolegorzyn. The cemetery is surrounded by wastelands (meadows). The borders of the cemetery, made of fieldstones, are still visible. The gravestones and graves are devastated and plundered.

4. The Evangelical Cemetery in Cieminko (53°39' 52.17"N, 16°03'28.56"E): the area of the cemetery is 0.37 ha. It is situated ca. 200 m east from Cieminko village, on a small hill. It is surrounded by arable lands (north, east and west) and a mixed forest (south). Gravestones and churchyards are not very numerous. The cemetery is not fenced.

5. The Evangelical Cemetery in Uraz (53°38' 13.97"N, 16°09'21.87"E): the area of the cemetery is 0.11 ha, it is located ca. 400 m north-east from Uraz village, on the steep Drawsko lake shore. Form east, west and north it is adjacent to agricultural wastelands (meadows). Only concrete fence elements, 24 completely destroyed gravestones and 1 gravestone with a plate from 1946 still remain today. Shortly after the World War II, the cemetery was used by local inhabitants (five Poles were buried there).

RESULTS

The general characteristics of the flora

The survey showed relatively poor flora with a total number of 116 taxa of vascular plants derived from 44 families (Table 1). *Rosaceae* (12 species), *Liliaceae* (10),

Table 1. List of vascular plant species found in the cemeteries studied

Species	Cemetery				
	Lipno	Toporzyk	Śmidzięcino	Cieminko	Uraz
1	2	3	4	5	6
Abies alba Mill.	.	+	.	.	.
Acer platanoides L.	+	+	.	+	+
Acer pseudoplatanus L.	.	+	+	.	.
Adoxa moschatellina L.	.	+	+	.	+
Aegopodium podagraria L.	+	+	+	+	+
Alliaria petiolata (M. Bieb.) Cavara & Grande	.	.	.	.	+
Allium vineale L.	.	.	.	+	+
Anemone nemorosa L.	+	+	+	+	+
Anemone ranunculoides L.	.	+	+	.	+
Anthriscus sylvestris (L.) Hoffm.	.	+	.	+	+
Aquilegia vulgaris L.	+	+	.	+	+
Artemisia vulgaris L.	.	.	+	+	+
Betula pendula Roth	+	+	+	+	.
Calamagrostis arundinacea (L.) Roth	.	+	.	.	.
Campanula rapunculoides L.	.	.	.	+	.
Campanula trachelium L.	.	.	.	+	.
Carpinus betulus L.	+	+	+	+	+
Cerastium arvense L. s. s.	.	.	.	+	.
Cerasus avium (L.) Moench	+	+	.	.	.
Chamaecyparis lawsoniana Parl.	.	+	.	.	.
Chamaecyparis pisifera (Siebold & Zucc.) Endl.	.	+	.	.	.
Chelidonium majus L.	.	+	+	.	.
Cirsium arvense (L.) Scop.	.	+	.	.	.
Convallaria majalis L.	+	+	+	+	+
Corylus avellana L.	+	.	+	.	.
Crataegus monogyna Jacq.	+	.	+	+	.
Crataegus rhipidophylla Gand.	.	.	.	.	+
Dactylis glomerata L.	.	.	.	+	.
Deschampsia flexuosa (L.) Trin.	.	+	.	.	+
Dianthus barbatus L. s. s.	.	+	.	+	.
Dryopteris cartusiana (Vill.) H.P. Fuchs	+	.	.	.	.
Dryopteris filix-mas (L.) Schott	+	.	+	+	.
Equisetum arvense L.	.	+	.	.	.
Euonymus europaeus L.	.	+	+	+	+
Fagus sylvatica L.	+	+	+	+	+
Festuca gigantea (L.) Vill.	.	.	+	.	.
Ficaria verna Huds.	.	.	.	+	.
Fragaria × *ananassa* Duchesne	.	+	.	+	.

Table 1 – cont.

1	2	3	4	5	6
Fragaria vesca L.	.	.	.	.	+
Frangula alnus Mill.	.	.	+	+	+
Fraxinus excelsior L.	+	+	+	+	+
Gagea lutea (L.) Ker Gawl.	.	.	+	.	+
Gagea spathacea (Hayne) Salisb.	.	.	.	.	+
Galanthus nivalis L.	+	+	+	+	.
Galeobdolon luteum Huds.	+	.	.	.	.
Galeopsis pubescens Besser	.	.	+	.	.
Galium aparine L.	.	+	+	.	+
Galium odoratum (L.) Scop.	+	+	.	.	+
Geranium robertianum L.	.	.	.	.	+
Geum rivale L.	.	.	+	.	.
Geum urbanum L.	.	+	+	+	.
Glechoma hederacea L.	.	.	.	.	+
Hedera helix L.	+	+	+	+	+
Hemerocallis fulva L.	.	+	.	.	+
Hepatica nobilis Schreb.	.	.	+	+	+
Hieracium murorum L.	.	.	.	.	+
Humulus lupulus L.	.	.	+	.	.
Hypericum perforatum L.	.	.	.	+	.
Leucoium vernum L.	.	.	+	.	.
Ligustrum vulgare L.	.	+	.	+	.
Lilium bulbiferum L.	.	+	+	.	.
Lilium martagon L.	+	.	.	+	.
Lonicera periclymenum L.	.	.	.	+	.
Maianthemum bifolium (L.) F.W. Schmidt	+	.	.	+	+
Malus sylvestris Mill.	.	.	.	+	.
Melampyrum pratense L.	.	.	.	+	.
Moehringia trinervia (L.) Clairv.	.	+	+	.	+
Muscari botryoides (L.) Mill.	.	.	+	+	+
Mycelis muralis (L.) Dumort.	.	.	+	.	+
Myosotis sylvatica Ehrh. ex Hoffm.	.	+	+	+	+
Narcissus poëticus L.	.	+	+	+	.
Narcissus pseudonarcissus L.	+	.	.	.	.
Omphalodes verna Moench	.	.	.	+	.
Oxalis acetosella L.	.	.	+	.	.
Paeonia officinalis L.	.	+	.	.	.
Phyteuma spicatum L.	.	.	.	+	.
Picea abies (L.) H. Karst.	+	+	+	.	.

Table 1 – cont.

1	2	3	4	5	6
Pinus sylvestris L.	+	.	.	.	.
Poa nemoralis L.	.	+	.	+	.
Polypodium vulgare L.	+	.	.	.	.
Populus tremula L.	+	+	+	.	+
Primula veris L.	.	+	.	+	+
Padus avium Mill.	.	.	.	+	+
Pulmonaria obscura Dumort.	.	+	.	.	.
Pyrus pyraster (L.) Burgsd.	.	.	.	+	.
Quercus robur L.	+	+	+	+	+
Ranunculus auricomus L. s. l.	.	+	+	.	+
Ranunculus repens L.	.	.	.	+	.
Ribes nigrum L.	.	.	+	.	.
Ribes uva-crispa L.	.	+	+	+	+
Rubus idaeus L.	.	+	.	.	.
Salix caprea L.	.	.	.	+	.
Sambucus nigra L.	.	+	+	.	.
Saponaria officinalis L.	.	+	.	+	.
Scilla sibirica Haw.	.	+	.	.	+
Sorbus aucuparia L. em. Hedl.	+	+	.	.	.
Stachys officinalis (L.) Trev.	.	.	.	+	.
Stachys sylvatica L.	.	.	.	.	+
Stellaria holostea L.	+	.	+	+	.
Symphoricarpos albus (L.) S.F. Blake	.	+	+	.	.
Syringa vulgaris L.	.	+	+	+	.
Tanacetum vulgare L.	.	.	.	.	+
Taraxacum officinale F.H. Wigg.	.	+	+	+	+
Thuja occidentalis L.	.	+	.	+	.
Tilia cordata Mill.	.	+	+	.	+
Ulmus glabra Huds.	.	.	.	.	+
Ulmus laevis Pall.	.	.	.	.	+
Urtica dioica L.	.	+	+	+	+
Veronica chamaedrys L.	.	.	+	.	+
Viburnum opulus L.	+	.	.	+	.
Vicia sepium L.	.	.	.	+	.
Vinca minor L.	+	+	+	+	+
Viola hirta L.	+	.	+	+	+
Viola odorata L.	.	.	.	+	.
Viola reichenbachiana Jord. ex Boreau	.	+	+	.	+
Viscum album L.	.	.	+	.	.

Ranunculaceae (7), *Asteraceae* (6), *Carypohyllaceae* (5), *Lamiaceae* (5) and *Poaceae* (5) were the families richest in species. 44 species derive from these seven families, which constitutes 37.6% of all vascular plants of the examined area. The number of species occurring in individual families ranges from 1 to 12. The majority, i.e. 40 families, is represented by 1 to 5 species, with 19 families being represented by only one species. The number of species per cemetery ranged from 31 in Lipno to 59 in Cieminko, with an average of 51 species per cemetery.

The native flora is represented by 88% of total taxa with apophytes outnumbering spontaneophytes. The alien species constitute 12% of the total flora. The examined flora is dominated by hemicryptophytes (42%) with significant proportion of phanerophytes (32%). In phanerophytes, tree forms predominated over shrub-like ones.

Some of the species found in the area of the cemeteries studied, are considered as threatened on natural sites in the West Pomerania region and in Poland. For example *Gagea spathacea*, *Leucoium vernum* and *Lilium bulbiferum* are listed as vulnerable in Poland. In the West Pomerania region, *Gagea spathacea* is considered endangered, *Lilium martagon* and *Stachys officinalis* as vulnerable, whereas *Crataegus rhipidophylla* as rare species. However, these species were most likely planted and cultivated in the cemeteries studied by local inhabitants.

The detailed characteristics of the cemeteries flora

In the area of the Evangelical Cemetery in Lipno, we found 31 vascular plant species and of that, 16 woody species. The stand is composed of *Quercus robur* (DBH range: 10-88 cm), *Fagus sylvatica* (10-60 cm), *Picea abies* (37-72 cm), *Carpinus betulus* (8-62 cm), *Populus tremula* (23-36 cm), *Betula pendula* (8-54), *Fraxinus excelsior* (10-33 cm), *Acer platanoides* (7-17 cm), *Cerasus avium* (11-26 cm) and *Pinus sylvestris* (53 cm). The shrub layer is composed of *Carpinus betulus*, *Corylus avellana*, *Fagus sylvatica*, *Crataegus monogyna*, *Acer platanoides* and *Sorbus aucuparia*, and it is the thickest in the northern part of the cemetery. Woody species cover is rather dense, thus the herbaceous cover is generally shaded and more or less evenly distributed. In the places where light conditions are better, thick natural regeneration of *Fraxinus excelsior* and *Acer platanoides* develops. The flora of the cemetery is dominated by native plant species; only one alien plant species occurs there (i.e. *Narcisus pseudonarcissus*). There are three species strictly protected (i.e. *Galanthus nivalis*, *Lilium martagon*, and *Polypodium vulgare*) and five partially protected (i.e. *Convallaria majalis*, *Galium odoratum*, *Hedera helix*, *Viburnum opulus,* and *Vinca minor*), however it might be suspected that there is an anthropogenic site for most of the species listed above.

In the area of the Evangelical Cemetery in Toporzyk, we found 58 vascular plant species and of that, 25 woody plant species. The stand is composed of *Picea abies* (25-60 cm), *Acer pseudoplatanus* (16-61 cm), *Populus tremula* (22-39 cm), *Betula pendula* (31-49 cm), *Fagus sylvatica* (24-38 cm), *Carpinus betulus* (24-29 cm), *Acer platanoides* (13-46 cm), *Quercus robur* (13-66 cm), *Tilia cordata* (22-24 cm), *Thuja occidentalis* (13-42 cm), *Chamaecyparis pisifera* (45 cm; monument of nature) and *Chamaecyparis lawsoniana* (25 cm). The shrub layer is very sparse and composited mainly by *Euonymus europaeus*, *Syringa vulgaris* and *Sambucus nigra*. In the western part of the cemetery, a clump of *Symphoricarpos albus* grows. On one gravestone we found seedling of *Abies alba* that was 0.5 m of height. There are many *Hedera helix* climbing up the trees. The tree layer is very dense and the light conditions are not favorable for herbaceous plant species. In the summer time the predominant species is *Aegopodium podagraria* which covers ca. 90% of the cemetery. The flora of the cemetery is dominated by native plant species, however numerous alien plant species occur there (i.e. *Chamaecyparis lawsoniana*, *Chamaecyparis pisifera*, *Dianthus barbatus*, *Hemerocallis fulva*, *Narcissus poëticus*, *Paeonia officinalis*, *Scilla sibirica*, *Symphoricarpos albus*, *Syringa vulgaris*, and *Thuja occidentalis*). In the cemetery, there are two species strictly protected in Poland (i.e. *Galanthus nivalis* and *Lilium bulbiferum*) and four partially protected (i.e. *Convallaria majalis*, *Galium odoratum*, *Hedera helix* and *Primula veris*), however it is probably anthropogenic site of these species.

In the area of the Evangelical Cemetery in Śmidzięcino, we found 53 vascular plant species and of that, 21 woody plant species. The stand is composed of *Quercus robur* (16-98 cm), *Populus tremula* (21-75 cm), *Fraxinus excelsior* (16-54 cm), *Picea abies* (17-48 cm), *Acer pseudoplatanus* (8-85 cm), *Fagus sylvatica* (11-55 cm), *Carpinus betulus* (15-25 cm) and *Betula pendula* (16 cm). We found two monuments of nature – *Quercus robur* in the north-eastern part of the cemetery and *Acer pseudoplatanus* in the south-western part of the cemetery. The dense shrub layer is composed of *Crataegus monogyna*, *Euonymus europaeus*, *Fagus sylvatica*, *Acer pseudoplatanus*, *Sambucus nigra*, *Frangula alnus* and *Corylus avellana*. In the northern part of the cemetery, a clump of *Symphoricarpos albus* grows which covers ca. one third of the cemetery area. In the eastern part, *Viscum album* was found growing on *Populus tremula* tree. There are many *Hedera helix* climbing up the trees. The natural regeneration of woody species is very numerous and composed of *Populus tremula*, *Fraxinus excelsior*, *Acer pseudoplatanus*, *Corylus avellana*, *Quercus robur*, *Frangula alnus*, *Sambucus nigra* and *Euonymus europaeus*. The tree layer is very dense and the herbaceous layer is deeply shaded. In the summer, the predominant species in the herbaceous cover is *Aegopodium podagraria*. The flora of the cemetery is dominated by native plant species, however a few alien plant species occur there (e.g. *Narcissus poëticus*, *Symphoricarpos albus*, and *Syringa vulgaris*). In the cemetery, there are four species strictly protected in Poland (i.e. *Galanthus nivalis*, *Hepatica nobilis*, *Leucoium vernum*, *Lilium bulbiferum*) and five partially protected (i.e. *Convallaria majalis*, *Frangula alnus*, *Hedera helix*, *Ribes nigrum* and *Vinca minor*). Most likely, these plants were planted and cultivated here by local inhabitants.

In the area of the Evangelical Cemetery in Cieminko 59 vascular plant species were found (of that 21 woody plant species). The stand layer is composed of *Quercus robur* (12-81 cm), *Carpinus betulus* (7-28 cm), *Betula pendula* (11-32 cm), *Fagus sylvatica* (7-28 cm), *Fraxinus*

excelsior (9-52 cm), *Padus avium* (8-10 cm), *Acer platanoides* (28 cm), and *Pyrus pyraster* (16 cm). The shrub layer is composed of *Frangula alnus*, *Euonymus europaeus*, *Fraxinus excelsior*, *Viburnum opulus*, *Acer platanoides*, *Fagus sylvatica*, *Thuja occidentalis* and *Carpinus betulus*. There are *Hedera helix* climbing up the trees. The flora of the cemetery is also dominated by native plant species, however a few alien species occur there (i.e. *Dianthus barbatus*, *Narcissus poëticus*, *Omphalodes verna*, *Syringa vulgaris*, *Thuja occidentalis*, and *Viola odorata*). In the cemetery, there are four species strictly protected in Poland (i.e. *Galanthus nivalis*, *Hepatica nobilis*, *Lonicera periclymenum*, *Lilium martagon*) and six partially protected (i.e. *Convallaria majalis*, *Frangula alnus*, *Hedera helix*, *Primula veris*, *Viburnum opulus*, and *Vinca minor*). It also might be assumed that most of these species were planted and cultivated here in the distant past.

In the area of the Evangelical Cemetery in Uraz, 52 vascular plant species were found and of that 16 woody plant species. The stand is composed of *Quercus robur* (11-78 cm), *Fagus sylvatica* (10-46 cm), *Carpinus betulus* (7-49 cm), *Populus tremula* (11-27 cm), *Fraxinus excelsior* (25 cm), *Acer platanoides* (8-27 cm), *Ulmus laevis* (10-43 cm) and *Ulmus glabra* (67 cm). The shrub layer is not very dense; it is composed of *Carpinus betulus*, *Crataegus rhipidophylla*, *Tilia cordata*, *Padus avium*, *Frangula alnus* and *Euonymus europaeus*. The flora of the cemetery is also dominated by native plant species, however two alien plant species occur there (i.e. *Hemerocallis fulva* and *Scilla sibirica*). The herbaceous plant cover is rather shaded and more or less evenly distributed. In the cemetery, there is one species strictly protected in Poland (*Hepatica nobilis*) and six partially protected (i.e. *Convallaria majalis*, *Frangula alnus*, *Galium odoratum*, *Hedera helix*, *Primula veris* and *Vinca minor*). Some of these species (e.g. *Convallaria majalis*, *Hedera helix*, *Primula veris* and *Vinca minor*) were probably cultivated here in the distant past.

SUMMARY

All the cemeteries studied are abandoned and neglected, and they are no longer used for burying. The cemeteries are not fenced (except Toporzyk cemetery), but their borders are clearly marked by stones. Moreover, the area of the cemeteries may be more or less precisely determined by the line of old trees growing around cemetery. All the cemeteries are covered by dense vegetation, sometimes very expansive shrubs, and thus, they are difficult to explore, especially during the growing season. Trees and shrubs are not pruned and dying or dead trees are not removed from the cemetery.

Our study has shown a relatively low number of vascular plant species growing in the cemeteries, and it might be an effect of relatively small area of each cemetery studied. There were 116 plant species in total and of that, 40 woody plant species. For example, in the study conducted in historic cemeteries of the Koło District (Central Poland), Antkowiak and Heine (2005) have found 47 tree taxa and 28 shrub species of 26 families. Among the trees, the most dominant were broadleaved species, such as: *Robinia pseudoaccacia*, *Quercus robur*, *Fraxinus excelsior* and *Tilia cordata*. In another study, Stypiński (1978) have found 105 taxa of trees and shrubs in 11 municipal cemeteries in Olsztyn, and the most frequent were broadleaved tree species such as: *Acer pseudoplatanus*, *Tilia cordata*, *Acer negundo* and *Quercus robur*. Our data has revealed that woody species are not very numerous in the flora of the cemeteries, however play a dominant role in their vegetation structure. The number and total area of cemeteries studied by Antkowiak and Heine (2005) and Stypiński (1978) were higher than in the present study, and it might be a reason of more numerous woody plant species found in the cited papers.

Old cemeteries may contain an unexpected number of plant species – both native and alien. For example Czarna et al. (2006) studied vascular flora of seven Catholic cemeteries in Jelenia Góra and its surroundings, and described 406 spontaneously occurring and cultivated plant species. Czarna and Piskorz (2005) have found 171 species of wild and naturalized vascular plants in the two cemeteries in Zakopane. It is worth mentioning, that Czarna (2001) studied flora diversity of two Evangelical cemeteries in Koźmin and Koźminiec (Wielkopolska Lowland) and found 154 species of vascular flora in both cemeteries (54 taxa were present in both cemeteries). It was also found that hardly any plant species cultivated within the cemetery spread outside, however many plant species were considered as expansive plant species, i.e. *Allium scorodoprasum*, *Hesperis matronalis*, *Campanula rapunculoides*, *Lamium maculatum*, *Galanthus nivalis*, *Viola odorata* and *Ornithogalum umbellatum*. Czarna and Nowińska (2010) have found 160 species of vascular plants in four Jewish cemeteries of Western Carpathians. In all cemeteries, the highest cover displayed: *Aegopodium podagraria*, *Arrhenatherum elatius*, *Chaerophyllum aromaticum*, *Geranium palustre* and *Geranium pratense*. The analysis of the geographical-historical status of the species inventoried in the cited study has shown that native vascular plant species, i.e. apophytes and spontaneophytes, form the most numerous group while the alien species were generally rare. Our study gave similar results – although we have found some alien plant species, the predominating species were native.

The neglected Evangelical cemeteries described in our study need extensive restoration. The protection, restoration and preservation of gravestones and other structural elements in the cemeteries are significant from historical, architectural and aesthetic point of view. The stands of cemeteries we studied should be sanitary thinned (trees and shrubs) to remove dead and weak trees and to preserve their unique character – the woody plants cover should not be removed completely. It is of great importance, to protect the remaining gravestones and crosses against further degradation and devastation. As shown above, and in many other research papers, cemeteries are significant places for native vegetation. The remnants of the native vegetation in rural cemeteries can support threatened plant species that may have disappeared in adjacent areas as land usage has changed. In our opinion these cemeteries deserve to be included in educational and cultural programs.

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