

Rare and endangered plant communities of the Opole

Rzadkie i ginące zbiorowiska roślinne Opola

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ABSTRACT: This paper presents the environmental conditions, floristic structure and distribution of the 9 rare and endangered plant associations in the Opole (SW Poland).

KEY WORDS: phytosociology, plant associations, vascular plants, Opole Silesia, Poland

Introduction

The Opole city is located in the central part of the Opole voivodship. The city within its administrative boundaries covers 9621 ha. The area of Opole is one of physiographically most diverse areas of the lowland part of the entire Opole region. According to the physical and geographical classification of regions by Kondracki (1988), the city area is situated within the Wrocław Marginal Stream Valley, the Opole Plain and the Niemodlin Plain – mesoregions of the Silesia Lowland.

Administratively Opole is the capital of the voivodship and of the Opole city and land districts. The city is inhabited by ca 130 thousands people (ca 12 % of the voivodship population), which gives the density of inhabitancy ca 1350 persons/km².

In the area of Opole no systematic phytosociological studies were conducted, except for studies on selected segetal (Kącki et al. 1999) and aquatic communities (Nowak, Spalek 2003).

The aim of the study was to present the phytosociological characteristics and present distribution of rare and endangered plant communities of Opole.

Material and methods

Plant communities were characterised based on relevés done during vegetation seasons 1996-2000, by Braun-Blanquet method (Braun-Blanquet 1964, Pawłowski 1977). Homogenous fragments were selected for relevés, hence their areas in some cases were limited to few m². In total, 37 relevés were collected, and 19 of them were

used in the present paper. Detailed locations of the relevés are described by geographical coordinates and are available from the Phytosociology and Plant Geography Division of the Opole University.

Names of plant communities and their syntaxonomic classification were based on the paper of Matuszkiewicz (2001). Names of vascular plant species were adopted after Mirek et al. (2002) and names of bryophytes followed Ochyra and Szmajda (1978).

Some part of the described plant communities were included into the „Red List of Plant Communities of the Upper Silesia” (Celiński et al. 1997). Categories of threat were given in parentheses next to each community: E – endangered community, V – vulnerable community, I – community of indeterminate threat category.

List of communities

In the result of the conducted phytosociological studies, in the area of Opole occurrence of 9 rare and endangered plant communities was stated, including 4 communities from the class *Potametea*: *Potametum pectinati* (category **V**), *Nupharo-Nymphaeetum albae* (**V**), *Potametum obtusifolii* (**V**), *Ranunculo-Callitrichetum hamulatae*, 1 from the class *Phragmitetea*: *Scirpetum maritimi* (**I**), 2 from the class *Molinio-Arrhenatheretea*: *Molinietum medioeuropaeum* (**V**), *Cirsietum rivularis* (**I**), 1 from the class *Scheuchzerio-Caricetea nigrae*: *Caricetum davallianae* (**E**) and 1 from the class *Quercu-Fagetea*: *Potentillo albae-Quercetum petraeae* (**V**).

Potametum pectinati Carstensen 1955

Small fragments of *Potametum pectinati* were found in the abandoned quarry in Opole-Groszowice, filled with water. They developed in the littoral zone over the stone bottom in water of the depth 20-70 cm. This is a floristically poor, one-layer community predominated by *Potamogeton pectinatus*.

Phytosociological relations in this fragment are reflected by the relevé below, done on 25 July 2000.

Area - 10 m², coverage of layer c - 60 %. Ch. *Potametum pectinati*: *Potamogeton pectinatus* 3; Ch. *Potamion*: *Potamogeton pusillus* 1.

Phytocenoses from this association occur in scattered localities over the whole country. The majority of these localities known so far are situated in northern and central Poland (Tomaszewicz 1979). In the Opole voivodship it has been reported from few locations in the Opole Plain (Spalek 2005).

Nupharo-Nymphaeetum albae Tomasz. 1977

Small fragments of this association were found in the Ulga Channel and in the flooding of the stream south from Opole-Grotowice. This association is represented by one-layer, or more rare – two-layer phytocenoses of floating leaves, with different percentage of species entirely submerged and pleustonic. The dominating component of

these fragments is *Nuphar lutea*. The second species for this community - *Nymphaea alba*, has never been stated in these fragments.

Phytosociological relations in this fragment are reflected by the relevé below, done on 16 July 2000 in Opole-Grotowice.

Area - 10 m², coverage of layer c - 65 %. Ch. *Nupharo-Nymphaeetum albae*: *Nuphar lutea* 3; Ch. *Nymphaeion*: *Potamogeton natans* 1; Ch. *Potametea*, *Potametalia*: *Elodea canadensis* 1, *Callitriche verna* +; Accompanying species: *Lemna minor* +.

Potametum obtusifolii (Carst. 1954) Segal 1965

Small fragments of *Potametum obtusifolii* were revealed in abandoned quarries in Opole-Groszowice and at the 1 Maja Street. This association developed in shallow places with a thick layer of mineral sediments in water of the depth 20-60 cm. This community is composed mainly of submerged plants, predominated by *Potamogeton obtusifolius*. However, floristically poor fragments have been usually recorded in these locations.

Phytosociological relations in this fragment are reflected by the relevé below, done on 07 August 2000 in Opole-Groszowice.

Area - 10 m², coverage of layer c - 40 %. Ch. *Potametum obtusifolii*: *Potamogeton obtusifolius* 3; Ch. *Potamion*: *Potamogeton pusillus* +; Ch. *Potametea*, *Potametalia*: *Utricularia vulgaris* +.

Potametum obtusifolii belongs to communities rare in Poland. Its localities have been reported from regions of Piła, Morąg, Sejny (Podbielkowski, Tomaszewicz 1979) and from the basins of the Wisła and Odra rivers (Piórecki 1980, Macicka-Pawlik, Wilczyńska 1996). In the Opole voivodship it is known from several locations in the Opole Plain (Spalek 2005).

Ranunculo-Callitrichetum hamulatae Oberd. 1957 em. Müll. 1977

Phytocenoses *Ranunculo-Callitrichetum hamulatae* were revealed in the stream in Opole-Grotowice. They usually develop in water 10-40 cm deep forming small patches. In fragments of this association the dominant species is usually *Callitriche hamulata* with smaller or greater admixture of *Batrachium fluitans*.

Phytosociological relations in this fragment are reflected by the relevé below, done on 22 July 1997.

Area - 8 m², coverage of layer c - 20 %. Ch. *Ranunculo-Callitrichetum hamulatae*: *Callitriche hamulata* 2; D. *Ranunculo-Callitrichetum hamulatae*: *Veronica beccabunga* +; Ch. *Ranunculion fluitantis*: *Batrachium fluitans* 1; Ch. *Potametea*, *Potametalia*: *Callitriche verna* +.

The only phytosociologically evidenced locations of this association have been reported so far from the Mławka river near Mława, however it has been presumed that phytocenoses of this association can be more widespread in Poland (Tomaszewicz 1979, Matuszkiewicz 2001). This was the case in the Opole Silesia, as this association is known from several locations in the Opole Plain (Spalek 2005).

Scirpetum maritimi (Br.-Bl. 1931) R. Tx. 1937

A small fragment of *Scirpetum maritimi* was found in a small pond in Opole-Kolonia Gosławicka. It is a floristically poor community with domination of *Bulboschoenus maritimus*.

Phytosociological relations in this fragment are reflected by the relevé below, done on 12 August 1999.

Area - 10 m², coverage of layer c - 65 %. Ch. *Scirpetum maritimi*: *Bulboschoenus maritimus* 4; Ch. *Phragmition*: *Oenanthe aquatica* 1, *Phragmites australis* 1, *Glyceria maxima* +, *Typha latifolia* +; Accompanying species: *Bidens tripartita* +.

Phytocenoses formed by *Bulboschoenus maritimus* occur mainly in naturally or artificially salinised soils. The majority of their locations are known from the central Poland and Baltic coastal zone (Matuszkiewicz 2001). It has been recorded also on ruderal biotopes (Anioł-Kwiatkowska 1974).

Molinietum medioeuropaeum Koch 1926 (Tab. 1)

Phytocenoses *Molinietum medioeuropaeum* are among the most endangered plant communities, both in Poland and in Europe (Denisiuk et al. 1995). Small fragments were stated in Opole-Nowa Wieś Królewska. Most often only floristically poor fragments were recorded, with the domination of *Molinia caerulea* only. In one fragment additionally occurrence of *Dianthus superbus* (Nowak et al. 2002) was stated. These phytocenoses are formed mainly in wet places, where they usually neighbour *Cirsietum rivularis*, *Caricetum gracilis* and meadow communities from associations *Molinion* and *Calthion*.

Phytocenoses *Molinietum medioeuropaeum* in the studied area, similarly as in other parts of the country (Denisiuk 1967, Pender 1990, Oświt 1991, Kački et al. 1998), often present a distinct reduction of floristic richness, especially in typical species. This is probably caused by intensification of agriculture, regulation of the water regime and change in traditional use of these meadows.

Table 1. *Molinietum medioeuropaeum* Koch 1926.

Successive number	1	2	3	4
Date	21.07.2000			
Locality	Opole-Nowa Wieś Królewska			
Cover of c layer (%)	100	100	100	100
Cover of d layer (%)	-	5	.	+
Area of relevé (m ²)	20	20	20	25
Number of species	28	27	25	26
Ch. <i>Molinietum medioeuropaeum</i>				
<i>Molinia caerulea</i>	3	1	2	2
<i>Dianthus superbus</i>	+	.	+	.
<i>Silaum silaus</i>	.	+	.	+

Ch. Molinion				
<i>Lysimachia vulgaris</i>	2	2	+	1
<i>Succisa pratensis</i>	.	.	+	+
Ch. Molinietaalia				
<i>Deschampsia caespitosa</i>	+	2	2	2
<i>Lotus uliginosus</i>	+	+	1	1
<i>Lychnis flos-cuculi</i>	+	+	1	1
<i>Myosotis scorpioides</i>	1	+	+	+
<i>Juncus effusus</i>	+	.	1	1
<i>Galium uliginosum</i>	+	+	.	.
<i>Cirsium rivulare</i>	+	.	+	.
<i>Dactylorhiza majalis</i>	+	.	.	+
<i>Caltha palustris</i> subsp. <i>palustris</i>	.	+	+	.
<i>Sanguisorba officinalis</i>	.	+	+	.
Ch. Molinio-Arrhenatheretea				
<i>Poa pratensis</i>	1	2	1	1
<i>Ranunculus acris</i>	1	1	2	1
<i>Centaurea jacea</i>	+	2	+	+
<i>Holcus lanatus</i>	2	.	2	2
<i>Lathyrus pratensis</i>	2	1	.	1
<i>Rumex acetosa</i>	+	+	.	+
<i>Trifolium repens</i>	+	.	1	.
<i>Poa trivialis</i>	.	1	.	+
<i>Achillea millefolium</i>	+	+	.	.
<i>Alopecurus pratensis</i>	+	+	.	.
<i>Campanula patula</i>	+	+	.	.
<i>Plantago lanceolata</i>	+	.	.	+
<i>Dactylis glomerata</i>	.	+	.	+
<i>Trifolium pratense</i>	.	.	+	+
Others				
<i>Anthoxanthum odoratum</i>	+	1	1	+
<i>Briza media</i>	.	1	.	+
<i>Carex nigra</i>	.	.	2	+
<i>Potentilla erecta</i>	1	+	.	.
<i>Calliergonella cuspidata</i> d	.	1	.	+
<i>Carex hirta</i>	+	+	.	.
<i>Carex panicea</i>	.	.	+	+
Sporadic: <i>Aegopodium podagraria</i> 2; <i>Agrostis canina</i> 1; <i>Allium vineale</i> 2; <i>Carex flava</i> 3; <i>Carex leporina</i> 1; <i>Filipendula ulmaria</i> 4(1); <i>Glechoma hederacea</i> 2; <i>Hydrocotyle vulgaris</i> 3; <i>Lycopus europaeus</i> 3.				

***Cirsietum rivularis* Ralski 1931 (Tab. 2)**

Fragments of *Cirsietum rivularis* were revealed in Opole-Nowa Wieś Królewska. Most often it formed there small fragments in wet places. The dominant species in these fragments were *Caltha palustris* subsp. *palustris*, *Myosotis scorpioides* and *Filipendula ulmaria*. The characteristic physiognomy of this community, especially during flowering of *Cirsium rivulare*, makes it well-distinguishable among other meadow communities. In Poland *Cirsietum rivularis* presents features of a community of the boreal and mountain range and belongs to typical anthropogenic communities, growing on riverside or alder carrs (Denisiuk 1976).

In the Opole Silesia phytocenoses *Cirsietum rivularis* have been so far reported from the region of Staniszcze Małe, Dębska Kuźnia, Krasiejów, between Żędowice and Kielcza (Spalek 1995) and from the valley of Oziąbel (Kački et al. 1998).

Table 2. *Cirsietum rivularis* Ralski 1931.

Successive number	1	2	3	4	5
Date	08.06.2000				
Locality	Opole-Nowa Wieś Królewska				
Cover of c layer (%)	95	100	100	100	100
Cover of d layer (%)	+	+	-	-	-
Area of relevé (m ²)	20	20	20	15	20
Number of species	24	24	21	15	18
Ch. <i>Cirsietum rivularis</i>					
<i>Cirsium rivulare</i>	3	3	4	4	3
Ch. <i>Calthion</i>					
<i>Myosotis scorpioides</i>	1	1	1	2	2
<i>Crepis paludosa</i>	+	+	.	+	+
<i>Caltha palustris</i> subsp. <i>palustris</i>	1	1	+	.	.
<i>Scirpus sylvaticus</i>	.	.	.	+	+
Ch. <i>Molinietalia</i>					
<i>Filipendula ulmaria</i>	2	1	+	.	+
<i>Equisetum palustre</i>	+	.	1	1	+
<i>Deschampsia caespitosa</i>	+	1	+	.	.
<i>Lysimachia vulgaris</i>	.	+	1	1	.
<i>Lychnis flos-cuculi</i>	+	+	+	.	.
<i>Cirsium palustre</i>	+	.	.	+	.
<i>Lotus uliginosus</i>	+	.	.	.	+
<i>Juncus effusus</i>	.	+	+	.	.
<i>Dactylorhiza majalis</i>	.	+	.	.	+
<i>Galium uliginosum</i>	.	+	.	.	+

Ch. Molinio-Arrhenatheretea					
<i>Holcus lanatus</i>	2	2	1	+	+
<i>Ranunculus acris</i>	+	2	1	+	+
<i>Rumex acetosa</i>	+	+	+	+	+
<i>Lathyrus pratensis</i>	.	+	.	2	1
<i>Poa pratensis</i>	+	+	+	.	.
<i>Cardamine pratensis</i>	+	+	.	+	.
<i>Alopecurus pratensis</i>	+	+	.	.	.
<i>Poa trivialis</i>	+	+	.	.	.
<i>Centaurea jacea</i>	+	.	+	.	.
<i>Plantago lanceolata</i>	+	.	.	+	.
Others					
<i>Carex nigra</i>	1	+	+	+	1
<i>Ranunculus repens</i>	.	.	2	1	+
<i>Anthoxanthum odoratum</i>	+	+	+	.	.
<i>Briza media</i>	+	.	+	.	+
<i>Calliergonella cuspidata</i> d	+	+	.	.	.
<i>Potentilla erecta</i>	.	.	+	.	+
Sporadic: <i>Carex hirta</i> 2; <i>Carex leporina</i> 2; <i>Carex panicea</i> 4;					
<i>Carex paniculata</i> 1; <i>Cerastium vulgatum</i> 3; <i>Lysimachia nummularia</i> 5;					
<i>Stellaria graminea</i> 3.					

Caricetum davallianae Dutoit 1924 em. Görs 1963

In the area of Opole a small fragment of *Caricetum davallianae* was found in Nowa Wieś Królewska. It was formed in a local lowering with high level of ground waters and with water often stagnating over the soil surface. In this community *Carex davalliana* is a dominant, accompanied by other species from the class *Scheuchzerio-Caricetea nigrae*.

Phytosociological relations in this fragment are reflected by the relevé below, done on 12 June 2000.

Area - 8 m², coverage of layer c - 35 %, d - 60 %. Ch. *Caricetum davallianae*: *Carex davalliana* 3; Ch. *Caricion davallianae*, *Caricetalia davallianae*: *Carex flava* 1; *Scheuchzerio-Caricetea nigrae*: *Agrostis canina* 1, *Carex echinata* +, *Carex nigra* +, *Hydrocotyle vulgaris* +, *Juncus articulatus* +, *Viola palustris* +; Gatunki towarzyszące: *Calliergonella cuspidata* (d) 4, *Briza media* 1, *Phragmites australis* 1, *Galium palustre* +.

Until now, in the Opole voivodship fragments of this community were reported only from the region of Gogolin (Nowak et al. 2000, Spalek 2002).

Potentillo albae-Quercetum Libb.1933 (Tab. 3)

Small and fragmentarily developed phytocenoses *Potentillo albae-Quercetum* were found near Opole-Malina. Fragments of this interesting community form enclaves among phytocenoses of *Leucobryo-Pinetum* and pine monocultures. These fragments were formed on dry sandy soil. The tree stand consists of *Quercus petraea* with admixture of *Betula pendula* and *Pinus sylvestris*. In the undergrowth of a limited coverage there was no dominant species. In the poorly developed bryophyte layer *Eurhynchium striatum* predominated. In comparison with fragments of this phytocenosis in the Wielkopolska region (Wojterski 1960) and the Wrocław Marginal Stream Valley (Drozdowska, Macicka 1994), the described phytocenoses are characterised by undergrowth layer poorer in species and of the smaller coverage. *Potentillo albae-Quercetum* is a rare and disappearing forest community in Poland (Jakubowska-Gabara 1993). It has never been recorded before in Opole Silesia.

Table 3. *Potentillo albae-Quercetum* Libb. 1933.

Successive number		1	2	3	4
Date:		11. 07. 1996			
Locality		Opole - Malina			
Cover of a layer (%)	70	75	65	65	
Cover of b layer (%)		10	10	25	20
Cover of c layer (%)		20	15	30	25
Cover of d layer (%)	10	10	20	15	
Area of relevé (m ²)	100	150	200	150	
Number of species		37	25	29	25
Trees and shrubs					
<i>Quercus petraea</i>	a	4	5	4	4
	b	.	.	2	2
<i>Sorbus aucuparia</i>	b	1	1	1	1
	c	+	.	+	.
<i>Crataegus monogyna</i>	b	1	1	+	1
	c	.	.	+	.
<i>Betula pendula</i>	a	1	1	1	.
<i>Pinus sylvestris</i>	a	1	.	1	.
	b	.	1	.	.
<i>Populus tremula</i>	b	+	.	.	.
	c	+	.	+	.
<i>Ligustrum vulgare</i>	b	.	.	1	+
<i>Cornus sanguinea</i>	c	+	.	+	.
<i>Viburnum opulus</i>	c	+	.	+	.
Sporadic: <i>Frangula alnus</i> b 1; <i>Picea abies</i> b 1(1)					

Ch., D.* <i>Potentillo albae-Quercetum</i>				
<i>Pteridium aquilinum*</i>	1	+	1	2
<i>Vaccinium myrtillus*</i>		+	1	1
<i>Ranunculus polyanthemus</i>		.	.	+
Ch., D.* <i>Quercion pubescenti-petraeae, Quercetalia pubescenti-petraeae</i>				
<i>Cephalanthera longifolia</i>		+	+	.
<i>Campanula persicifolia</i>		+	.	.
<i>Vincetoxicum hirsutum*</i>		+	.	.
<i>Coronilla varia*</i>		.	+	.
Ch. <i>Quercus-Fagetum</i>				
<i>Eurhynchium striatum</i>	d	1	2	2
<i>Epipactis helleborine</i>		+	+	+
<i>Eurhynchium hians</i>	d	2	+	.
Sporadic: <i>Luzula pilosa</i> 1; <i>Poa nemoralis</i> 2				
Others				
<i>Maianthemum bifolium</i>		1	1	1
<i>Molinia caerulea</i>		1	1	+
<i>Mycelis muralis</i>		1	+	+
<i>Listera ovata</i>		+	+	+
<i>Pimpinella saxifraga</i>		+	+	+
<i>Fragaria vesca</i>		1	1	.
<i>Astragalus glycyphyllos</i>		1	+	+
<i>Lupinus polyphyllus</i>		+	+	.
<i>Mnium undulatum</i>	d	+	.	+
<i>Dactylis glomerata</i>		+	+	.
<i>Epipactis x schmalhauseni</i>		+	+	.
<i>Lathyrus pratensis</i>		+	+	.
<i>Potentilla erecta</i>		+	+	.
<i>Ranunculus acris</i>		+	.	+
<i>Ajuga reptans</i>		.	.	+
<i>Platanthera bifolia</i>		.	.	+
Sporadic: <i>Chaerophyllum temulum</i> 3; <i>Cirsium oleraceum</i> 1; <i>Convallaria majalis</i> 2; <i>Festuca ovina</i> 3; <i>Galium saxatile</i> 3(1); <i>Hypericum perforatum</i> 3; <i>Lotus corniculatus</i> 1; <i>Moehringia trinervia</i> 1; <i>Orthilia secunda</i> 1; <i>Trifolium pratense</i> 3; <i>Veronica officinalis</i> 3.				

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Streszczenie

Artykuł przedstawia charakterystykę fitosocjologiczną i aktualne rozmieszczenie rzadkich i ginących zbiorowisk roślinnych miasta Opola. W wyniku przeprowadzonych badań fitosocjologicznych na tym obszarze stwierdzono występowanie 9 rzadkich i ginących zespołów roślinnych, w tym 4 z klasy *Potametea*: *Potametum pectinati*, *Nupharo-Nymphaeetum albae*, *Potametum obtusifolii*, *Ranunculo-Callitrichetum hamulatae*, 1 z klasy *Phragmitetea*: *Scirpetum maritimi*, 2 z klasy *Molinio-Arrhenatheretea*: *Molinietum medioeuropaeum*, *Cirsietum rivularis*, 1 z klasy *Scheuchzerio-Caricetea nigrae*: *Caricetum davallianae* oraz 1 z klasy *Quercu-Fagetea*: *Potentillo albae-Quercetum petraeae*.

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