OROBANCHE PALLIDIFLORA WIMM. & GRAB. IN POLAND: DISTRIBUTION, HABITAT AND HOST PREFERENCES

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ABSTRACT

The paper presents ten new localities of *Orobanche pallidiflora* Wimm. & Grab. from Poland (Middle Roztocze, Równina Bełska plain, Wyżyna Malopolska upland, Góry Kaczawskie Mts and Western Bieszczady Mts). Information on hosts, abundance and habitat preferences at the new localities is given and a supplemented map of the distribution in Poland is included.

KEY WORDS: *Orobanche pallidiflora*, habitat, distribution, host, Poland.

INTRODUCTION

Orobanche pallidiflora Wimm. & Grab. belongs to the parasitic family Orobanchaceae L. and is one of the rarest elements of the Polish flora. It is considered to be rare (R) in Poland (Zarzycki and Szeląg 2006), endangered (EN) in Lower Silesia (Kącki et al. 2003), the Sudetes (Fabiszewski and Kwiatkowski 2002), Western Pomerania (E) (Żukowski and Jackowiak 1995) and critically endangered (CR) in Gdańskie Pomerania (Markowski and Buliński 2004). Its threat status is indeterminate (I) in the Kujawy and Pomerania region (Rutkowski 1997) and Upper Silesia (Parusel et al. 1996), and it is thought to be regionally extinct in the Opole province (RE) (Nowak et al. 2003; Nowak et al. 2008). *O. pallidiflora* is listed as a strictly protected species (Regulation of the Minister of Environment of 24th July 2004).

TAXONOMY

Syn.: *Orobanche pallidiflora* Wimmer et Grabowski 1829 – *Orobanche reticulata* Wallr. subsp. *pallidiflora* (Wimm. et Grab.) Hayek; *O. reticulata* var. *pallidiflora* (Wimm. et Grab.) G. Beck; *O. cirsii* Fries; *O. procera* Koch; *O. platystigma* Reichenb.

O. pallidiflora belongs to the section *Osproleon* Wallr., grex *Glandulosae* G. Beck (Beck 1890, 1930). Species belonging to the grex *Glandulosae* are mostly characterised by a cover of dark, usually purple or violet glandular hairs, sometimes sitting on small warts, on the upper corolla lip, which makes the corolla appear darkly spotted (Beck 1890, 1930). *Orobanche alba* Stephan ex Willd. also belongs to the grex in Poland. The species is differently treated in various studies: as a separate taxon or in the rank of subspecies or variety within *Orobanche reticulata* (*O. reticulata* Wallr. subsp. *pallidiflora* (Wimm. et Grab.) Hayek, *O. reticulata* var. *pallidiflora* (Wimm. et Grab.) G. Beck) (Beck

1890, 1930; Gilli 1966; Chater and Webb 1972; Kreutz 1995; Zázvorka 2000; Rothmaler et al. 2002).

O. reticulata and *O. pallidiflora* differ in morphology, habitat and altitudinal ranges as well as host preferences. The former is associated with southern Europe: high parts of the Alps, NE Spain and E France (the Pyrenees), Italy, Baltic states and Greece. It is known in Asia from the Caucasus and the Himalayas (Kreutz 1995; Meusel et al. 1978). It is a montane or subalpine species that occurs at altitudes between 1400 and 2500 in the Alps, 1550 and 2000 in the Apennines and up to 3660 m in the Himalayas (Uhlich et al. 1995). *O. pallidiflora* is mostly a lowland species and rarely a subalpine species. The most important traits distinguishing the two problematic species are given in Table 1 below following the keys by Beck (1890, 1930), Kreutz (1995), Rothmaler et al. (2002).

The altitudinal gradient can cause plastic differences in morphology of the species, especially in colour, glandulosity or biometric features, and may result in the selection of different hosts that are also related to specific altitudinal ranges and habitats. While they may be only ecological varieties of the same taxon, especially as regards different hosts, the altitudinal gradient and morphological characters, morphological and ecological characters seem to be important and conspicuous enough to separate the two species. However, further research into both taxa, including molecular studies, is recommended.

GENERAL DISTRIBUTION

Orobanche pallidiflora occurs as a rare or even sporadic species in flatland regions of Europe (less frequently in subalpine regions), ranging from France in the west, Central and Southern Europe, to the Ural Mts and the Caucasus, and from Asia Minor up to the Himalayas (Mądalski 1967; Foley 1993; Kreutz 1995). As approaches to the taxon are inconsistent, it is difficult to specify the exact distribution of *O. pallidiflora* in Europe. The species is often treated inclusively within *O. reticulata*. *O. pallidiflora* is widespread and its range is discontinuous; its localities, however, are rare. It is included into species with a European-Western Siberian range (Rothmaler et al. 2002). Its groups are usually quite numerous where it occurs (Kreutz 1995).

DISTRIBUTION IN POLAND

The species is known from only a few localities in Poland, mainly from Western and Eastern Pomerania, Lower Silesia and the Sudetes (Zając and Zając 2001) (Fig. 1). It has also been reported from the Wyżyna Lubelska upland, Opole and Roztocze (Szafer et al. 1924; Mądalski 1967).

It has been confirmed at only 41 localities situated in 14 ATPOL cartogram units of 10×10 km squares (Zając 1978) after 2000: 7 localities in the Western Sudetes (Kwiatkowski 2000, 2001, 2005; Bacieczko and Myśliwy 2008), 31 in Szczecin Pomerania (Bacieczko 2002; Bacieczko and Myśliwy 2005, 2008), 1 in the Lower Vistula valley (Rutkowski unpbl.; Zając and Zając 2001), 2 in the Puszcza Romincka Forest (Łachacz 2002) (Fig. 1).

HABITAT AND PHYTOCOENOTIC PREFERENCES

Orobanche pallidiflora grows mainly in xerothermic and semidry grasslands, on field edges, in different ruderal habitats, in waterlogged alkaline meadows (eutrophic and stony), in humid forest communities and scrub (Mądalski 1967; Tzvelev 1981; Kreutz 1995). According to Zarzycki et al. (2002), it requires moderately warm climatic and light conditions, and has a wide spectrum of soil selection from dry to fresh and moist soils, usually mesotrophic, alkaline, mostly sandy clays and silty formations, poor in organic matter.

The species is usually reported in Europe from communities of the class Artemisietea vulgaris, Mesobromion alliance and the order Molinietalia (Rothmaler et al. 2002).

It usually occurs in variously degraded meadow communities of the class Molinio-Arrhenatheretea, both in humid meadow forms belonging to Calthion palustris and fresh meadows of the Arrhenatherion elatioris alliance in Szczecin Pomerania in Poland. It also grows in typically anthropogenic habitats, especially nitrophilous and ruderal communities of the class Artemisietea vulgaris. It has been reported from roadsides, fallows, banks of water bodies, ecotonal zones between, for instance, water bodies or rushes and fields, fallows or trampled sites, rushes, i.e. Phragmitetum australis beds, rush and sedge beds, for instance Caricetum acutiformis (Bacieczko and Myśliwy 2005, 2008).

TABLE 1. A comparison of the most important diagnostic features of *Orobanche pallidiflora* and *Orobanche reticulata*.

Features	*O. pallidiflora*	*O. reticulata*
Height	10-70 (100) cm (usually taller than 30 cm)	10-20 cm (rarely 70 cm)
Inflorescence	With numerous flowers covering a larger part of the stem	With a few flowers usually on the upper part of the stem
Bract	About as long as the corolla	Usually longer than the corolla
Corolla	Whitish or yellowish, tinged with violet towards the margin, sparsely glandular-pubescent with dark hairs	More or less brightly violet or purple-violet, yellowish below, densely glandular pubescent with dark violet glandular hairs below
Host	*Cirsium* species (*C. arvense*, *C. eriophorum*, *C. vulgare*, *C. oleraceum*, *C. palustre*, *C. rivulare*) and *Carduus* species (*C. acanthoides*, *C. crispus*, *C. personata*)	*Cirsium erisithales*, *Carlina acaulis*, *Scabiosa lucida*, *Carduus defloratus*, *Knautia dipsacifolia*, *K. sylvatica*
Altitudinal range	From plains to submontane areas	Montane to subalpine

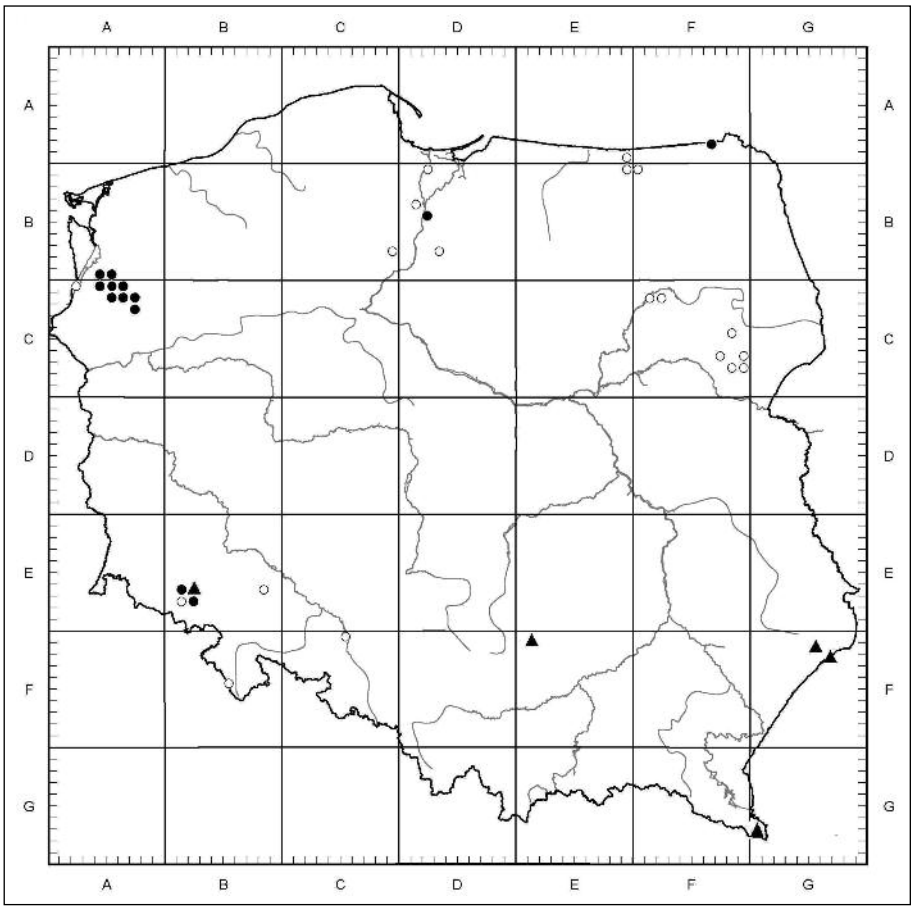

Fig. 1. Distribution of *Orobanche pallidiflora* Wimm. & Grab. in Poland (after Zając and Zając 2001, in ATPOL grid 10×10 km, modified and supplemented); ▲ – new localities, ● – presently existing localities, ○ – locality not confirmed at present, probably extinct.

It grows in a fertile and humid anthropogenic habitat in patches of Carduetum personatae Hadač et al. 1969, a montane nitrophilous community of herbaceous scrub, near Rudawy Janowickie in the Western Sudetes. A high percentage of nitrophilous species, especially of the Aegopodion podagrariae alliance, or meadow species of the order Molinietalia, is observed in this habitat (Kwiatkowski 2005).

The species occurs on low hills with closed quarries or excavation pits in the calcareous part of the Góry Kaczawskie Mts between Wojcieszów and Bolków. It forms a floristically rich xerothermic grassland of the order Brometalia erecti. It has been recorded in humid meadows (Molinietalia) or in carrs in the mountains less frequently (Kwiatkowski 2001).

In NE Poland in the Puszcza Romincka Forest, it occurs in a soligenic baltic mire of the class Scheuchzerio-Caricetea nigrae on the slopes of a copula surrounded by a fen overgrown with reed beds on peat-muck soils with a high iron oxide content and in drier parts of a sloping mire overgrown with a pinewood with a high share of *Betula pubescens* (Łachacz 2002).

METHODS

Ten new localities of the species were found in the Middle Roztocze, the Równina Bełska plain, the Wyżyna Małopolska upland, the Góry Kaczawskie Mts and the Western Bieszczady Mts during floristic studies conducted between 2005 and 2009 (Fig. 1). A list of localities was mapped in the network of ATPOL cartogram units of 1×1 km squares (Zając 1978). The nomenclature of the vascular plant species listed in the phytosociological table follows Mirek et al. (2002) and the nomenclature of syntaxa is used after Matuszkiewicz (2006).

The location of the sites, abundance of individuals within populations and preferred hosts are provided and habitat data are briefly discussed below. Plant communities with *Orobanche pallidiflora* are presented in Table 2.

Herbarium specimens are deposited in the Herbarium of the Department of Botany, Jan Kochanowski University in Kielce (KTC).

RESULTS

A LIST OF NEW LOCALITIES OF *OROBANCHE PALLIDIFLORA*

1. Góry Kaczawskie Mts, Nowe Rochowice

Location: on the left side of the road from the Nowe Rochowice village towards the E65 road, ca. 200 m from the junction (altitude 495 m, GPS: N 50 56 24/E 16 02 10).

Habitat: Humid usable and pastured hay meadow, ca. 500-700 m^2 and a ditch between the meadow and the road, tall-herb Filipendulo-Geranietum community with a high share of hygrophilous species of the Calthion alliance; high content of $CaCO_3$ in the substrate.

Abundance: 2005 – 60 shoots (in the entire area); 2006 – 5 shoots (in a ditch, meadow mown); 2007 – 19 shoots (in the entire area, meadow partly mown); 2008 – 35 shoots (in the entire area).

Host: *Cirsium oleraceum*.
ATPOL: BE 6242.
vid. B. Gierczyk, 2005-2008, det. B. Gierczyk & R. Piwowarczyk.

2. Western Bieszczady Mts, Wołosate
Location: the Bieszczady National Park, by the red tourist hiking trail from Wołosate towards the Przełęcz Bukowska pass (alt. 995 – 1205 m, GPS: N 49 03 22/E 22 45 40).
Habitat: stony roadside of a metalled road, felled site, tall-herb communities of the Adenostylion alliariae alliance with a high quantitative share of dicotyledonous perennials of the class Molinio-Arrhenatheretea. It was also recorded near the road in a meadow with an abundant share of *Carduus personata*. The species also enters further areas, strongly shaded sites, adjacent carrs with dominant *Alnus incana*, with an admixture of mostly *Picea abies* and *Acer pseudoplatanus*; the population occurs intermittently in a section of 1,5 km.
Abundance: 2005 – 19 shoots; 2006 – 27; 2007 – 25; 2008 – 223, 2009 – about 1000.
Host: *Carduus personata* and *Cirsium oleraceum*.
ATPOL: GG 7014.
vid. B. Gierczyk & J. Soboń, 2005-2008, leg. R. Piwowarczyk, 14.08.2009 (KTC).

3. Middle Roztocze, Przeorsk (1)
Location: a fallow descending to the bottom of a small dry valley entering the Sołokija river lying between calcareous hills, by the road from Przeorsk towards Jarczów (NE of the Przeorsk village), (alt. 275 m, GPS: N 50 25 27/E 23 30 59).
Habitat: degenerated, slightly humid meadow and fallow in the Sołokija river valley of the class Molinio-Arrhenatheretea bordering with arable fields and xerothermic grasslands, with a high share of segetal species of the class Stellarietea mediae and ruderal species of the classes Artemisietea vulgaris and Agropyretea intermedio-repentis, with a SW exposure, on argillaceous soil.
Abundance: 2007 – 30 shoots, 2008 – 2.
Host: *Cirsium arvense*.
ATPOL: GF 1550.
leg. P. Chmielewski & R. Piwowarczyk, 09.06.2007 (KTC).

4. Middle Roztocze, Przeorsk (2)
Location: ca. 400 m E of the buildings in the Przeorsk village on the SW slope of the Łysa Góra hill (alt. 265 m, GPS: N 50 25 14/E 23 30 59).
Habitat: arable fields, most probably previously used for cereal crops, with a share of segetal species of the class Stellarietea mediae and ruderal species of the class Artemisietea vulgaris.
Abudance: 2007 – four shoots, 2008 – one shoot.
Host: *Cirsium arvense*.
ATPOL: GF 1560.
leg. P. Chmielewski & R. Piwowarczyk, 09.06.2007 (KTC).

5. Równina Bełska plain, Wierzbica
Location: by a dirt road ca. 1 km SW of the Wierzbica village near Machnów Nowy (alt. 215 m, GPS: N 50 20 35/E 23 39 08).
Habitat: on the edge of a weed-grown field cultivation bordering on humid meadows and pastures in the Sołokija river valley, with a mosaic of meadow species of the class Molinio-Arrhenatheretea, ruderal species of the classes Artemisietea vulgaris and Agropyretea intermedio-repentis and segetal species of the class Stellarietea mediae.
Abundance: 2007 – three shoots (the locality was damaged by field works in spring 2008).
Host: *Cirsium arvense*.
ATPOL: GF 2631.
vid. P. Stachyra, 2007, leg. P. Chmielewski, 22.09.2007 (KTC), det. R. Piwowarczyk, 2008.

6. Równina Bełska plain, Kolonia Jarczów I (1)
Location: E part of the Kolonia Jarczów I village, in a 0.5 ha fallow lying by a field road towards N of the Wierszczyca village (alt. 235 m, GPS: N 50 26 13/E 23 34 43).
Habitat: edge of a fallow and a field road between cereal crops, S exposure. Ruderal and segetal species of the classes Artemisietea vulgaris, Agropyretea intermedio-repentis and Stellarietea mediae dominate the community.
Abundance: five specimens.
Host: *Cirsium arvense*.
ATPOL: GF 1535.
leg. P. Chmielewski & R. Piwowarczyk, 13.07.2008 (KTC).

7. Równina Bełska plain, Kolonia Jarczów I (2)
Location: ca. 750 m W of the previous location in Kolonia Jarczów I (1), near rural buildings in an abandoned farm overgrown with ruderal vegetation (alt. 238, GPS: N 50 26 14,1/E 23 34 02,1; N 50 25 15/E 23 33 57,2).
Habitat: a community with a high share of ruderal species of the classes Artemisietea vulgaris and Agropyretea intermedio-repentis and meadow species of the class Molinio-Arrhenatheretea.
Abundance: 2009 – 4 shoots.
Host: *Cirsium arvense*.
ATPOL: GF 1544.
leg. det. P. Chmielewski, 20.08.2009, rev. R. Piwowarczyk, 2009.

8. Równina Bełska plain, Korhynie
Location: ca 250 m NE of the village road from Przeorsk to Korhynie, near abandoned farm buildings overgrown with ruderal vegetation (alt. 272 m, N 50 24 39,1/E 23 31 53,1).
Habitat: a community with a high share of ruderal species of the classes Artemisietea vulgaris and Agropyretea intermedio-repentis and meadow species of the class Molinio-Arrhenatheretea.
Abundance: 2009 – seven shoots.
Host: *Cirsium arvense*.
ATPOL: GF 1561.
leg. det. P. Chmielewski, 20.08.2009, rev. R. Piwowarczyk, 2009.

9. Równina Bełska plain, Żurawce
Location: the northern part of the "Żurawce" ecological site, ca. 1200 m N of the Żurawce village, SW exposure (alt. 280 m, GPS: N 50 23 49/E 23 33 19).
Habitat: previously used to store artificial fertilisers; at present mostly colonised by ruderal vegetation of the class

TABLE 2. Plant communities with *Orobanche pallidiflora* Wimm. et Grab.

No. of relevé		1	2	3	4	5	6	7	8	9	10	11	12	13	
Date		14.08. 2009	14.08. 2009	14.08. 2009	14.08. 2009	14.08. 2009	14.08. 2009	01.09. 2007	09.06. 2007	22.09. 2007	13.07. 2008	20.08. 2009	20.08. 2009	21.08. 2009	C o
Area of relevé [m^2]		50	50	50	50	50	50	100	100	50	50	50	80	40	n
Exposure		W	W	W	W	W	W	N	SW	SW	S	S	S	S	s
Inclination [°]		5	5	5	5	5	5	5	5	3	3	2	2	3	t
Altitude a.s.l. [m]		957	957	977	966	1129	1167	495	275	215	235	238	272	234	a
Cover of tree layer A [%]		30	80	30	-	30	50	-	-	-	-	-		-	n
Cover of shrub layer B [%]		20	20	15	-	15	20	5	-	-	-	-	15	-	c
Cover of herbaceus layer C [%]		100	75	95	100	95	100	100	95	100	85	100	100	90	y
Cover of moss layer D [%]		10	15	10	5	10	10	-	-	-	-	5	5	-	
Number of species		32	23	27	27	26	33	26	25	23	25	22	26	60	
Orobanche pallidiflora		+	+	1	1	+	+	+	+	+	+	+	+	+	V
Acer pseudoplatanus	a	1	1	.	.	.	.	.	.	.	.	.	.	.	I
	b	+	2	.	.	.	1	.	.	.	.	.	.	.	II
	c	+	+	+	.	+	2	.	.	.	.	.	.	.	II
Alnus incana	a	2	3	.	.	.	4	.	.	.	.	.	.	.	II
	b	.	+	1	.	.	.	.	.	.	.	.	.	.	I
Alnus viride	c	.	+	.	+	.	.	.	.	.	.	.	.	.	I
Fraxinus excelsior	c	.	.	.	.	.	.	.	.	.	.	+	+	.	I
Picea abies	a	1	.	2	.	1	.	.	.	.	.	.	.	.	II
Salix silesiaca	b	+	+	.	.	1	1	.	.	.	.	.	.	.	II
Ch. Cl. Betulo-Adenostyletea															
Carduus personata		4	3	3	4	+	+	.	.	.	.	.	.	.	III
Hypericum maculatum		.	.	+	+	.	.	.	.	.	.	.	.	.	I
Ch. Cl. Querco-Fagetea															
Carex sylvatica		.	+	.	.	.	+	.	.	.	.	.	.	.	I
Galeobdolon luteum		.	.	.	.	+	+	.	.	.	.	.	.	.	I
Geranium phaeum		.	.	.	.	+	+	.	.	.	.	.	.	.	I
Ch. Cl. Artemisietea vulgaris															
Urtica dioica		.	+	.	+	+	+	1	.	+	.	1	1	.	IV
Cirsium arvense		.	.	.	+	.	.	.	3	3	3	3	3	2	III
Artemisia vulgaris		.	.	.	.	.	.	.	1	3	.	3	3	2	II
Cichorium intybus subsp. *intybus*		.	.	.	.	.	.	+	.	.	+	+	+	+	II
Galium aparine		.	.	.	.	.	.	.	.	+	.	.	+	+	II
Lamium maculatum		+	+	+	.	+	.	.	.	.	.	.	.	.	II
Geum urbanum		+	.	.	.	.	.	.	.	.	.	+	.	+	II
Rumex alpinus		.	+	+	.	.	+	.	.	.	.	.	.	.	II
Arctium tomentosum		.	.	.	.	.	.	.	.	2	.	.	+	.	I
Carduus acanthoides		.	.	.	.	.	.	.	.	.	.	+	.	+	I
Erigeron ramosus		.	.	.	.	.	.	.	+	.	+	.	.	.	I
Rumex obtusifolius		+	.	+	.	.	.	.	.	.	.	.	.	.	I
Ch. Cl. Agropyretea intermedio-repentis															
Elymus repens		+	.	.	.	.	.	.	+	2	3	2	1	+	III
Convolvulus arvensis		.	.	.	.	.	.	.	.	.	+	+	+	+	II
Equisetum arvense		.	.	.	.	.	.	.	3	1	.	.	.	.	I
Falcaria vulgaris		.	.	.	.	.	.	.	.	.	+	.	.	+	I
Ch. Cl. Stellarietea mediae		.	.	.	.	.	.	.	.	.	.	.	.	.	
Galeopsis speciosa		.	.	+	+	+	+	.	.	.	.	.	.	.	II

TABLE 2. Cont.

No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	
Papaver rhoeas	.	.	.	.	.	.	.	+	.	+	.	.	+	II
Lactuca serriola	.	.	.	.	.	.	.	.	+	.	+	.	+	II
Consolida regalis	.	.	.	.	.	.	.	.	.	+	.	.	+	I
Conyza canadensis	.	.	.	.	.	.	.	.	.	+	.	.	1	I
Ch. Cl. Molinio-Arrhenatheretea														
Achillea millefolium	+	.	1	+	+	+	+	+	.	1	+	+	1	IV
Dactylis glomerata	1	.	2	3	+	.	.	1	2	.	2	2	1	IV
Taraxacum sect. *Ruderalia*	+	.	+	.	+	+	.	2	3	.	+	1	+	IV
Angelica sylvestris	.	+	+	+	+	+	2	.	.	.	.	.	.	III
Heracleum sphondyllium	+	.	+	+	+	+	.	.	.	.	.	+	.	III
Galium mollugo s. l.	.	.	.	.	.	.	1	+	.	+	+	+	1	III
Arrhenatherum elatius	.	.	.	+	.	.	.	.	.	+	.	.	+	II
Cirsium oleraceum	.	.	.	.	+	4	2	.	.	.	.	.	.	II
Daucus carota	.	.	.	.	.	.	.	+	+	.	.	.	3	II
Festuca rubra s. l.	.	.	.	.	.	.	1	.	.	.	1	1	+	II
Knautia arvensis	.	.	.	+	.	.	.	.	.	.	.	.	+	II
Plantago lanceolata	.	.	+	.	.	+	.	+	+	.	.	.	.	II
Prunella vulgaris	+	.	.	.	.	+	+	.	.	.	.	.	.	II
Ranunculus repens	+	+	.	.	.	+	.	.	.	.	.	.	.	II
Trifolium pratense	+	.	.	+	.	.	1	.	.	.	.	.	+	II
Trifolium repens	.	.	+	.	.	+	.	.	1	+	+	.	.	II
Crepis biennis	.	.	.	.	.	.	.	.	+	.	+	.	+	II
Campanula patula s. l.	+	.	.	+	.	.	.	.	.	.	.	.	.	I
Deschampsia caespitiosa	.	.	+	.	.	.	2	.	.	.	.	.	.	I
Festuca pratensis	.	.	.	.	.	.	1	.	.	.	+	.	.	I
Filipendula ulmaria	.	+	.	.	.	.	2	.	.	.	.	.	.	I
Lolium perenne	.	.	.	.	.	.	.	.	.	1	+	.	.	I
Lotus corniculatus	+	.	.	+	.	.	.	.	.	.	.	.	.	I
Ranunculus acer	.	.	+	.	.	.	1	.	.	.	.	.	.	I
Tragopogon orientalis	+	.	.	+	.	.	.	.	.	.	.	.	.	I
Ch. Cl. Festuco-Brometea														
Centaurea scabiosa	.	.	.	.	.	.	.	.	.	+	.	.	+	I
Melampyrum arvense	.	.	.	.	.	.	.	+	.	.	.	.	1	I
Ch. Cl. Trifolio-Geranietea sanguinei														
Agrimonia eupatoria	.	.	.	.	.	.	.	.	.	.	.	+	+	I
Medicago falcata	.	.	.	.	.	.	.	.	.	+	.	+	.	I
Origanum vulgare	.	.	.	.	.	.	+	+	.	.	.	.	.	I
Others														
Alchemilla sp.	+	+	.	.	+	+	.	.	.	.	.	.	.	II
Epilobium sp.	+	.	.	.	+	.	.	.	.	.	.	.	+	II
Hypericum perforatum	+	+	+	+	.	+	.	.	.	.	.	.	.	II
Plantago major	.	.	.	.	.	+	.	.	2	+	+	.	.	II
Rubus idaeus	+	1	1	3	.	+	.	.	.	.	.	.	.	II
Tusillago farfara	+	.	.	.	.	+	.	+	.	.	.	.	.	II
Centaurea kotschiana	.	.	+	+	.	.	.	.	.	.	.	.	.	I
Centaurea phrygia	.	.	+	+	.	.	.	.	.	.	.	.	.	I
Erigeron annuus	.	.	.	.	.	.	.	.	+	+	.	.	.	I

Artemisietea vulgaris and meadow vegetation of the class Molinio-Arrhenatheretea.

Host: *Cirsium arvense*.

Abundance: four specimens.

ATPOL: GF 1583.

vid. P. Chmielewski & K. Barańska, 07.10.2009.

10. Wyżyna Małopolska upland, Jędrzejów Plateau, Potok Mały

Location: on top of the escarpment between the Potok Mały village and the Mierzawa river; 200 m S of the last buildings in Potok Mały. The locality is 500 m W of the E77 road (alt. 234 m, GPS: N 50 35 13/E 20 13 36).

Habitat: fallow land on shallow rendzina with a large amount of skeletal parts, on a chalky substrate. A community patch covering 40 m^2 (10×4 m), S exposure, bordering on a cereal field on one side and a xerothermic grassland belonging to Thalictro-Salvietum pratensis, which creates a mosaic of species of the class Festuco-Brometea, weeds of cereal crops of the class Stellarietea mediae, ruderal species of the class Artemisietea vulgaris and meadow species of the class Molinio-Arrhenatheretea.

Abundance: 30 individuals.

Host: *Cirsium arvense*.

ATPOL: EF 0166.

leg. B. Piwowarski, 15.07.2009, leg. det. R. Piwowarczyk, 21.08.2009 (KTC).

CONCLUSIONS

Orobanche pallidiflora is one of the rarest and highly endangered elements of the Polish flora. It has been recorded only at 51 localities situated in 18 ATPOL cartogram units of 10×10 km squares (Zając 1978) after 2000: 7 localities in the Western Sudetes, 31 in Szczecin Pomerania, 1 in the Lower Vistula Valley, 2 in the Puszcza Romincka Forest, and at 10 new localities: 1 in the Western Sudetes Mts, 1 in the Western Bieszczady Mts, 7 in the Równina Bełska plain and Middle Roztocze, and 1 in the Wyżyna Małopolska upland (Fig. 1). The present sites are the south-easternmost localities in Poland.

O. pallidiflora is characterised by a broad and variable flowering spectrum. The flowering optimum was mostly observed from July until August (September). Sometimes secondary flowering occurred in late October and early November, especially in the Równina Bełska plain.

As a polyphagous parasite, *O. pallidiflora* feeds on many hosts. Polyphagous species of the genus *Orobanche*, including *O. pallidiflora*, usually feed on hosts belonging to one family and even to the same genus. *O. pallidiflora* prefers species of the genera *Cirsium* and *Carduus*. It usually parasitises *Carduus personata* and less frequently *Cirsium oleraceum* at the localities in Rudawy Janowickie Mts in the Sudetes (Kwiatkowski 2005). Host species of the genus *Cirsium* (*C. arvense*, *C. palustre*, *C. oleraceum*, *C. vulgare*) and *Carduus acanthoides* have been reported at the localities between Wojcieszów and Bolków (Kwiatkowski 2000, 2001, 2005). It parasitises *Cirsium oleraceum* in the Puszcza Romincka Forest (Łachacz 2002) and mainly *Cirsium arvense* or sporadically *C. oleraceum* and *C. palustre* in Szczecin Pomerania (Celiński 1964; Bacieczko 1984, 1991, 1995, 2002; Bacieczko and Myśliwy 2005, 2008). It parasitises *Cirsium arvense* in the Równina Bełska plain, Middle Roztocze and Wyżyna Małopolska upland, *C. oleraceum* in the Góry Kaczawskie Mts and *Carduus personata* or sporadically *Cirsium oleraceum* in the Western Bieszczady Mts at the present localities.

Population abundance at individual localities fluctuates and the species sometimes does not occur annually. Population abundance in the Western Sudetes was estimated at 200 flowering individuals in Rudawy Janowickie Mts (Kwiatkowski 2005) and ranged from ca. ten to over 300 individuals at the localities between Wojcieszów and Bolków (Kwiatkowski 2001, 2005). A total of ca. 300 individuals were recorded in the Puszcza Romincka Forest (Łachacz 2002) although a more numerous occurrence was al-

Sporadic species: **Ch. Cl. Betulo-Adenostyletea:** *Anthriscus nitida* 2; *Calamagrostis villosa* 1(1); *Chaerophyllum hirsutum* 1(1); *Orobanche flava* 5(1); *Petasites albus* 4(5); *Senecio nemorensis* gr. 3; **Ch. Cl. Querco-Fagetea:** *Alnus incana* C 2; *Astrantia major* 6; *Impatiens noli-tangere* 2; *Lysimachia nemorum* 6; *Mercurialis perennis* 5; *Milium effusum* 8; *Primula elatior* 3; *Stachys sylvatica* 6; **Ch. Cl. Artemisietea vulgaris:** *Aegopodium podagraria* 12(3); *Anthriscus sylvestris* 12(1); *Arctium tomentosum* 9(2); *Ballota nigra* 12; *Chaerophyllum aromaticum* 7(2); *Cirsium vulgare* 9; *Cynoglossum officinale* 13; *Echium vulgare* 13; *Glechoma hederacea* 5; *Linaria vulgaris* 13; *Melandrium album* 13; *Melilotus officinalis* 10(1); *Rubus caesius* 7(1); **Ch. Cl. Stellarietea mediae:** *Aetchusa cynapium* subsp. *agrestis* 9; *Anagallis foemina* 13, *Anthemis arvensis* 13; *Apera spica-venti* 13; *Atriplex patula* 9; *Caucalis daucoides* 13; *Chenopodium album* 9; *Elymus hispidus* 8; *Euphorbia exigua* 13; *Geranium dissectum* 13; *Lamium purpureum* 12; *Lathyrus tuberosus* 10; *Matricaria maritima* subsp. *inodora* 13; *Myosotis arvensis* 8; *Papaver argemone* 10; *Polygonum aviculare* 13; *Rhinanthus serotinus* 8; *Sinapis arvensis* 13; *Sonchus arvensis* 10; *Stachys annuua* 13; *Veronica persica* 13; *Vicia hirsuta* 8; *Viola arvensis* 13; **Ch. Cl. Molinio-Arrhenatheretea**: *Bromus hordeaceus* 7; *Centaurea jacea* 1; *Cirsium canum* 7(1); *C. rivulare* 9; *Colchicum autumnale* 7(2); *Geranium palustre* 7(2); *G. pratense* 12(1); *Lathyrus pratensis* 4; *Leucanthemum vulgare* 4; *Lychnis flos-cuculi* 7(1); *Myosotis palustris* 2; *Phleum pratense* 9; *Poa pratensis* 7; *Potentilla anserina* 9(3); *Trifolium hybridum* s.l. 9; *Valeriana officinalis* 7(2); *Vicia cracca* 10; **Ch. Cl. Festuco-Brometea:** *Allium oleraceum* 13; *Asperula cynanchica* 13; *Hieracium bauhinii* 8; *Poa compressa* 13; *Salvia verticillata* 13(1); **Ch. Cl. Trifolio-Geranietea sanguinei**: *Astragalus glycyphyllos* 8; *Coronilla varia* 13; *Vicia sylvatica* 7; *V. tenuifolia* 13; **Others:** *Ajuga reptans* 5; *Alchemilla acutiloba* 7; *Allium victorialis* 2; *Alnus viride* B 3(1); *Athyrium filix-femina* 2; *Camelina microcarpa* subsp. *sylvestris* 13; *Carex panicea* 4; *Cerasus vulgaris* C 12; *Cerinthe minor* 13; *Chamaenerion angustifolium* 6; *Crataegus monogyna* C 13; *Epilobium ciliatum* 10; *Erigeron acer* 8; *Eupatorium cannabinum* 1; *Euphorbia esula* 13; *Fragaria vesca* 6; *Fraxinus excelsior* B 12(1); *Galium* sp. 5; *Gentiana asclepiadea* 6; *Geum rivale* 2; *Hypericum perforatum* 8; *Melandrium rubrum* 3; *Muscari comosum* 10; *Picea abies* B 6; *Pimpinella saxifraga* 13; *Pinus sylvestris* C 12; *Poa annua* 1; *Prunus spinosa* C 13; *Rosa* sp. B 1, C 1(1); *Rubus caesius* 13; *R. hirtus* 6; *Salix* sp. A 5(2); *Sambucus nigra* B 12(1); *S. nigra* C 12; *Sanguisorba minor* 13; *Scrophularia scopoli* 5; *Sedum maximum* 13; *Senecio jacobaea* 13(2); *Silene vulgaris* 5; *Sorbus aucuparia* B 2; *Stachys alpina* 4; *Stellaria graminea* 4; *Thymus pulegioides* 1.

Localities of records: 1-6. Western Bieszczady Mts: Wołosate; **7.** Góry Kaczawskie Mts: Nowe Rochowice; Middle Roztocze: **8.** Przeorsk; Małe Polesie: Równina Bełska plain: **9.** Wierzbica, **10.** Kolonia Jarczów I (1), **11.** Kolonia Jarczów I (2), **12.** Korhynie; **13.** Malopolska Upland: Jędrzejów Plateau: Potok Mały.

so observed in some years. Between a few and over 150 individuals were recorded in Szczecin Pomerania (Bacieczko and Myśliwy 2005). Populations were quite sparse in the Równinia Bełska plain and Middle Roztocze, and comprised from a few to ca. 30 individuals. The population in Nowe Rochowice has ranged between five and 60 individuals in the last few years. The abundance, the area colonised and the altitude of the population in the Bieszczady is clearly expanding. From 19 to 223 individuals were gradually recorded between 2005 and 2009, and a mass occurrence of the species was recorded in 2009, when ca. 1000 individuals were observed. It is the most abundant locality in Poland.

The locality in the Western Bieszczady Mts is the highest site of the occurrence of *O. pallidiflora* in Poland recorded so far (995 – 1205 m). In the Western Sudetes, the species was recorded at altitudes ranging from 380 to 550 between Wojcieszów and Bolków (Kwiatkowski 2000, 2001), at an altitude of ca. 420 m in Rudawy Janowickie Mts (Kwiatkowski 2005) and 495 m in Nowe Rochowice. The altitudinal range was between 235 and 275 m in the Równina Bełska plain and Middle Roztocze, and 234 m in the Wyżyna Małopolska upland.

In the Równina Bełska plain and Middle Roztocze, *O. pallidiflora* chooses mostly meadow communities of the class Molinio-Arrhenatheretea, often degraded and humid. It belongs to ecotonal communities, i.e. borders of meadows, fields and fallows. These sites are often disturbed, eutrophied, with a high share of nitrophilous, segetal and ruderal species, especially its host, *Cirsium arvense*. The species was observed in ruderal habitats in abandoned farms in the Równina Bełska plain, with the dominance of species of the class Artemisietea vulgaris. It grows in a humid usable meadow and a ditch in a tall-herb community of the Filipendulo-Geranietum association, with a high share of hygrophilous perennials of the Calthion alliance on the substrate rich in calcium carbonate at the locality in the Góry Kaczawskie Mts. In the Western Bieszczady Mts, it occurs on a stony roadside and in carr and meadow communities, in a tall-herb community of the Adenostylion alliariae alliance with a high quantitative share of dicotyledonous perennials of the class Molinio-Arrhenatheretea. Numerous similarities between the species composition in the community, especially the domination of *Carduus personata*, and the Carduuetum personatae (Hadač et al. 1969) association (Hadač 1969; Kliment 1989), differentiated at the locality of *O. pallidiflora* in the Sudetes (Kwiatkowski 2005), are observed.

The localities of *O. pallidiflora* recorded in the Lublin region are relatively sparse and highly threatened. They occur in usable or pastured meadows, often in the vicinity of arable fields. Cultivation intensification, including excessive fertilisation and mowing, is the main threat. Overgrowing and an increase in the abundance of herbaceous vegetation are the main threats posed to the populations occurring in abandoned farms. The locality in Wierzbica is situated within the Sołokija Dolina valley, a Natura 2000 sanctuary (PLB060021). The relatively most numerous locality of the species in Przeorsk in the Middle Roztocze plain at the foothill of Mt Łysa Góra as well as the adjacent xerothermic grassland should be protected, also because of the local occurrence of rare calcilophilous species. The population in the Bieszczady Mts is protected within the Bieszczady National Park and does not seem to be directly threatened. However, as a busy tourist trail has been developing nearby, some shoots may be destroyed mechanically by trampling or picking. The road near which the species grows is also used by Border Guard vehicles. Over ten developing shoots of *O. pallidiflora* that were broken by vehicle wheels were observed along the road edge in 2008. The locality in Nowe Rochowice is located within a private area in an extensive meadow. Changes in the usage method (cultivation, application of agrochemical agents) or any building developments within it pose serious threats to the population developing in the area. The locality in the Wyżyna Małopolska upland does not seem to be threatened at present. It is, however, located on the edge of an arable field where it can be exposed to the run-off of chemical agents.

Due to the instability of the localities occupied by the species and considerable fluctuations of the abundance at the sites, environmental monitoring of *O. pallidiflora* is recommended.

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