

NEW LOCALITY
OF *OROBANCHE COERULESCENS* STEPHAN EX WILLD. (OROBANCHACEAE)
AT THE NW LIMIT OF ITS GEOGRAPHICAL RANGE

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ABSTRACT

A new locality of *Orobanche coerulescens* Stephan ex Willd. in the Wyżyna Małopolska upland (Garb Pińczowski hummock) in central Poland is presented. Over 290 specimens were recorded in a xerothermic grassland of the class Festuco-Brometea comprising species of the class Koelerio glaucae-Corynephoretea canescentis on alkaline, sandy soil. *O. coerulescens* is extinct at the majority of its localities in Poland and only two localities are known at present.

KEY WORDS: *Orobanche coerulescens*, Orobanchaceae, distribution, Wyżyna Małopolska upland, Garb Pińczowski hummock, Poland.

INTRODUCTION

Orobanche coerulescens Stephan ex Willd. (*O. amorphila* C. A. Mey), the bluish broomrape, is one of the rarest representatives of the family Orobanchaceae in Poland. It is red-listed as a critically endangered species (E) in Poland (Zarzycki and Szela 2006) and as an extinct species (Ex) in Western Pomerania (Żukowski and Jackowiak 1995). The taxon had been thought to be extinct until 2002 (Małdalski 1967; Zając and Zając 2001; Mirek et al. 2002). A new locality of the species, the only one in Poland until now, was published by Ciosek in 2002. The Polish species of *Orobanche*, including *O. coerulescens*, are strictly protected (Regulation of the Minister of Environment of 24th July 2004).

O. coerulescens belongs to the sect. *Osproleon* Wallr. (*Orobanche* L.) subsect. *Inflatae* Beck, grex *Coerulescences* Beck (Beck 1890). A number of its forms have been described based mainly on the corolla length; f. *occidentalis* (G. Beck Monogr. Bot. 1890) is considered to be one of the most common forms in central Europe. Plants with white-yellow flowers which have been recognized as f. *korshinskyi* Novopokr. or var. *albiflora* O. Kuntze have been reported from Japan as well as from Europe, Mongolia and Russia (Beck 1930; Zhiyun and Tzvelev 1998).

O. coerulescens is quite easy to distinguish from related species because of the characteristic thick stem, especially near the inflorescence, and numerous tiny, geniculately bent pale blue flowers. The entire plant, the stem in parti-

cular, is heavily hairy and looks as if covered with mould when dry (Fig. 1).

METHODS

Field studies were carried out in the flowering period of *Orobanche coerulescens* from June until the end of July in 2007. The distribution of its localities was mapped using the ATPOL grid based on cartogram units 10×10 km (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).

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

GENERAL DISTRIBUTION

Orobanche coerulescens represents the Euro-Asian type of distribution (Rothmaler et al. 2002). It has been reported from: south-eastern Bavaria, northern Lithuania, Austria, the Czech Republic, Slovakia, Hungary, Poland, Belarus, Moldavia, the Russian Federation (European part), Ukraine, Bulgaria, Yugoslavia, Romania, the Caucasus, Ciscaucasia, Dagestan, Siberia, former Soviet Middle Asia: Kaza-



Fig. 1. *Orobanche coerulea* Stephan ex Willd. on the Garb Pińczowski hummock (fot. R. Piwowarczyk, 25.06.2007).

khstan, Turkmenistan, Kyrgyzstan, former Soviet Far East: Amur, Khabarovsk, Primorye; Mongolia, China, Eastern Asia: Japan, Korea, Taiwan; Indian Subcontinent: Nepal. Its northernmost sites in Europe are located in eastern Russia and Perm. It occurs in the centre of its range in desert and steppe areas as well as on sandy or rocky Asian coasts, especially in Central and East Asia, for instance Turkmenistan, Mongolia, China or Siberia (Beck 1890, 1930; Novopokrovskij 1958; Zoku 1965; Popov and Busik 1966; Charter et al. 1972; Meusel et al. 1978; Malyshev and Peschkova 1979; Tzvelev 1981; Uhlich et al. 1995; Kreutz 1995; Zhiyun and Tzvelev 1998; Zázvorka 2000). The species probably does not occur in the Mediterranean countries and south of the Danube. It has been erroneously reported from Italy (Pignatti 1982). The species is recognized as extinct at the majority of its localities at the western limit of its distribution (Kreutz 1995). Its populations are very scarce in central Europe; for instance, they comprise only a few specimens, sporadically up to 30 specimens, in the Czech Republic. They also occur at irregular, often long-term intervals (Zázvorka 2000; Holub and Zázvorka 1999). In Ger-

many, it probably occurs only sporadically in Bavaria at present (Uhlich, Rätzel 2009 verb. inf.).

DISTRIBUTION IN POLAND

In Poland, the bluish broomrape has been reported from 10 localities in Pomerania currently considered to be extinct (Żukowski and Jackowiak 1995; Zając and Zając 2001). One locality has also been reported by Mądalski (1967) from Mt Krzyżowa near Olsztyn (Wyżyna Krakowsko-Częstochowska upland); the lack of herbarium specimens, however, makes its identification impossible. The present authors inspected the station in 2007 but no records were found. Fijałkowski (1994) also lists the species from the Lublin area; he does not, however, specify the exact location and no herbarium specimens are available. The Bohułaty village near Terespol in the Podlaski Przełom Bugu gorge was the only current locality in Poland (Ciosek 2002) (Fig. 2).

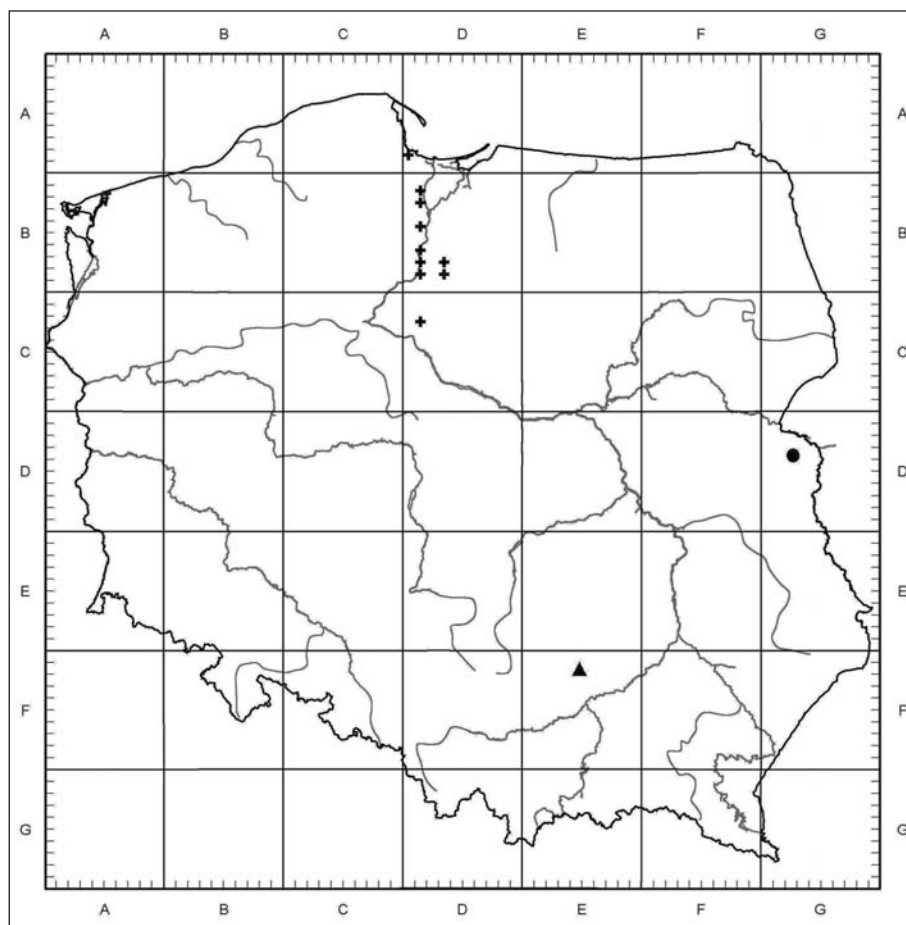


Fig. 2. Distribution of *Orobanche coerulescens* Stephan ex Willd. in Poland (in ATPOL grid 10×10 km); [▲] – new locality, [●] – locality given in literature, + – extinct locality.

BIOLOGY AND HABITAT PREFERENCES

Species of the genus *Artemisia* are mostly reported as host plants of *O. coerulescens*: *A. campestris*, *A. capillaris*, *A. commutata*, *A. dracunculus*, *A. frigida*, *A. glauca*, *A. inodora*, *A. latifolia*, *A. marschalliana* as well as *Achillea millefolium*, *Lotus corniculatus*, *Medicago falcata* (Beck 1890, 1930; Uhlich et al. 1995). Beck (1890, 1930) considers the latter three as incorrect. However, the species is mostly reported as a parasite of *Artemisia campestris* in central Europe, including Poland (Abromeit et al. 1898; Kreutz 1995; Uhlich et al. 1995; Zázvorka 2000; Ciosek 2002).

Orobanche coerulescens usually flowers from June until July, depending on the geographical position (Kreutz 1995).

It occurs in China at altitudes ranging from 900 to 4000 m (Zhiyun and Tzvelev 1998).

The data on phytocenotic amplitude of *O. coerulescens* are insufficient. In Europe, the species has been recorded mainly in the communities of the *Festucion rupicolae* association (Soó 1968) and of the orders *Festucetalia valesiacae* (Oberdorfer 1990; Rothmaler et al. 2002) and *Festucion valesiacae* (*Potentillo arenariae*-*Festucenion pallentis*) (Zázvorka 2000). In Bohukały near Terespol, the bluish broomrape grows in a xerothermic grassland of the class *Festuco-Brometea*, which is formed on former wastelands and cultivated fields (Ciosek 2002).

In Europe, the bluish broomrape grows in dry and semi-dry meadows, steppes, xerothermic grasslands, cultivated fields and xerothermic shrubs. It colonises warm alkaline

and sandy soils, often rendzinas, based on the dolomite, chalk, limestone and basalt substructure (Kreutz 1995; Uhlich et al. 1995; Zázvorka 2000). In Asia, it prefers steppes, rocky or grassy slopes, grasslands, cultivated fields, desert areas, sandy hillsides, areas along rivers and near seashores (Zoku 1965; Tolmaczev 1974; Charkevich 1996; Zhiyun and Tzvelev 1998; Sató 2004); it is reported less frequently from dry pinewoods and mixed woods (Malyshchev and Peschkova 1979; Krasnoborov 1984).

The entire plant is used medicinally to invigorate the kidneys and strengthen yang, relax the bowels and strengthen the bones and muscles (Zhiyun and Tzvelev 1998).

RESULTS

New locality

A new locality of *Orobanche coerulescens* was found in the Wyżyna Małopolska upland within the Garb Pińczowski hummock between Pińczów and Pasturka during floristic studies in June 2007 (Fig. 3). The species grows in an old fallow between a cultivated field and a xerothermic grassland in a low-lying area at the foot of a chalky slope in the Garb Pińczowski hills. Species of the class *Festuco-Brometea* dominate in the community (order *Festucetalia valesiacae*) which also comprises a number of species belonging to the class *Koelerio glaucae*-*Corynephoretea canescentis*. The hillside is slightly sloping towards the north and calcareous sands are present in the subsoil. The locality borders with xerothermic grasslands in the north and north-west and with fallows and cultivated fields in the

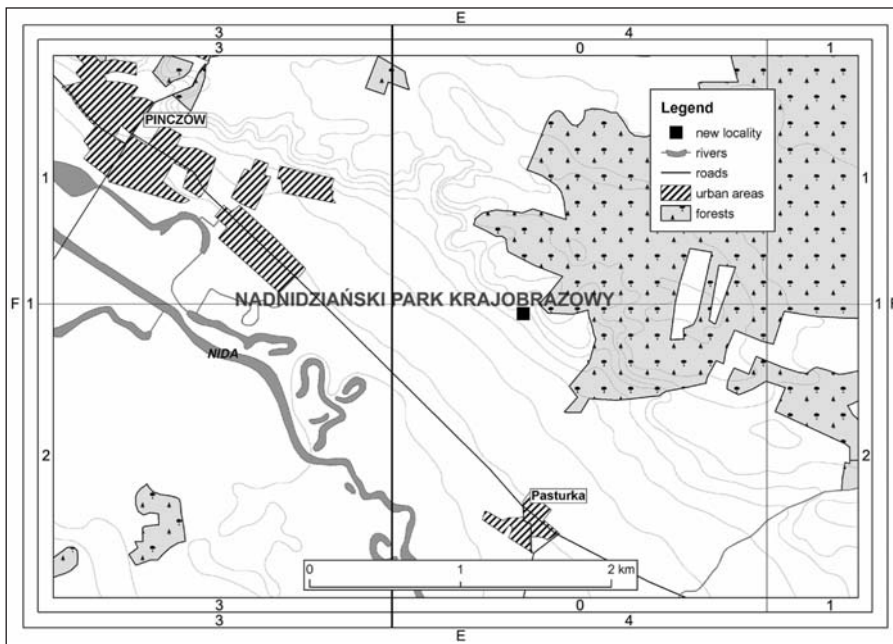


Fig. 3. New locality of *Orobanche coerulescens* Stephan ex Willd. on the Garb Pińczowski hummock.

south and south-east. A total of 290 specimens which parasitizes only *Artemisia campestris* were observed in an area of 1500 m². The species rarely occurs individually; it usually grows in clumps of several to even over 20 specimens.

The floristic composition of the community is given in a relevé below.

Relevé 1. Xerothermic grassland on the edge of the foot of the Garb Pińczowski slope and a fallow land and a cultivated field between the „Grodzisko” housing estate in Pińczów and the Pasturka village. Geogr. coord. 50°30'36''N/20°33'39''E; date: 25.06.2007; patch area 100 m²; altitude 227 m; exposure S; inclination 3°; ATPOL cartogram grid 2,5×2,5 km (Zajac 1978): EF1420. The cover of the herb layer 'C': 90%.

Orobanche coerulescens +, *Trifolium arvense* 4, *Artemisia campestris* 3, *Arenaria serpyllifolia* 2, *Lolium perenne* 2, *Elymus repens* 2, *Silene otites* 1, *Verbascum lychnitis* 1, *Medicago minima* 1, *Plantago indica* 1, *Sedum maximum* +, *Lappula squamosa* +, *Orobanche arenaria* +, *O. picridis* +, *Androsace septentrionalis* +, *Berteroa incana* +, *Medicago lupulina* +, *M. sativa* +, *Apera spica-venti* +, *Dianthus cartusianorum* +, *Raphanus raphanistrum* +, *Sedum acre* +, *Lathyrus tuberosus* +, *Vicia hirsuta* +, *V. tetrasperma* +, *Conyza canadensis* +, *Erigeron acer* +, *Matricaria maritima* subsp. *inodora* +, *Coronilla varia* +, *Anchusa officinalis* +, *Anthemis tinctoria* +, *Veronica arvensis* +, *Veronica spicata* +, *Veronica verna* +, *Polygonum convolvulus* +, *Asparagus officinalis* +, *Bromus tectorum* +, *Phleum phleoides* +, *Knautia arvensis* +, *Centaurea stoebe* +, *Tragopogon major* +, *Linum hirsutum* +, *Descurainia sophia* +, *Campanula sibirica* +, *Senecio jacobaea* +, *Pastinaca sativa* +, *Linaria vulgaris* +, *Artemisia vulgaris* +, *Daucus carota* +, *Picris hieracioides* +, *Taraxacum officinale* s.l. +, *Echium vulgare* +, *Melandrium album* +, *Origanum vulgare* +, *Papaver rhoeas* +, *Viola arvensis* +.

CONCLUSIONS

The bluish broomrape grows on sands in a thermophilous grassland with a high number of species of the classes Fe-

stuo-Brometea and *Koelerio glaucae*-*Corynephoretea canescentis*, the *Koelerio glaucae* alliance, and an admixture of meadow, ruderal and segetal species at the present locality. The species parasitizes only *Artemisia campestris*. The flowering optimum was observed in the first half of June.

At present, it is the second confirmed and most numerous locality (290 specimens) in Poland. Only one clump with 19 shoots was recorded in Bohuń (Ciosek 2002). The new locality is situated within the general range limit of the species. It is probably one of the most numerous populations of the species at the western and north-western range limit.

THREATS AND PROTECTION METHODS

The future occurrence of *Orobanche coerulescens* populations at the locality depends mainly on the continuation of the current extensive agricultural practice: combined periodic shallow ploughing and mowing. If mowing only is performed, vegetation could transform into a xerothermic grassland, the cover degree of the herb layer will increase, annual and biennial species will be driven out by perennial plants and secondary succession of shrubs and trees will begin. The bluish broomrape stops occurring in such conditions. Intensification of cultivation methods, mostly the application of chemical agents (herbicides), also constitutes a threat. Numerous specimens probably paralysed following herbicide treatment were found during inspection in 2008.

The station is located within the Nida Landscape Park, where a sanctuary has been planned as part of the Natura 2000 ecological network. It may also be recommended to introduce other forms of nature conservation.

The new locality of *O. coerulescens* in Poland should be recognized as a relic and critically endangered site where special protection measures must be used. It should be included in an environmental monitoring programme and active protection treatment should be locally applied, especially as other rare species of the Orobanchaceae family, e.g. *Orobanche arenaria*, *O. elatior*, *O. picridis*, *O. lutea*, also occur in the area.

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