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SHORT COMMUNICATION in FLORISTICS AND PLANT CONSERVATION

New Easternmost Locality of *Phelipanche bohemica* in South Poland

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Abstract

Phelipanche bohemica (Čelak.) Holub is a species with a narrow geographic range that is limited to Central Europe and a few regions in western and southern Europe. Taxonomic complexities within the *Phelipanche purpurea* s. l. group (to which the species belongs) cause difficulties in fully describing its range. In Poland, to date, this species has been known only from two verified localities in the Lower Oder Valley and Kraków-Częstochowa Upland. A new site was found in 2020 in Korzecko near Chęciny (Świętokrzyskie Mountains, Małopolska Upland, southern Poland). According to the present state of knowledge, this is the easternmost locality of this species. This species was found in xerothermic grasslands of the *Festuco-Brometea* class. In 2020, 18 individuals were found. However, in 2021 only two individuals were present, and in 2022 only one. Thus, the population showed the dynamics typically observed in this group of plants. As a population of a globally very rare species, located at the edge of its range in an unstable phytocoenosis, it should be subject to monitoring and special protection.

Keywords

broomrape; parasitic plants; endangered species; distribution; range limits of species

1. Introduction

Phelipanche bohemica (Čelak.) Holub is a thermophilic species that usually grows on sunny slopes where calcium carbonate is present in the substrate. The species is a component of the xerothermic grasslands of the *Festucetalia valesiacae* order, but it is also found on fallow land and balks in the vicinity of xerothermic grasslands. Its host species is *Artemisia campestris* (Piwowarczyk, 2012; Zázvorka, 2000). *Phelipanche bohemica* is critically endangered in Poland and neighboring countries (Holub & Zázvorka, 1999; Piwowarczyk, 2014; Pusch, 2006). It is one of the rarest species in the parasitic Orobanchaceae family. *Phelipanche bohemica* is endemic to Central Europe (Germany, the Czech Republic, Poland, and Austria) (Holub & Zázvorka, 1999; Pusch, 2006). Nevertheless, the species has also been found in areas further to the west and south, such as Switzerland, France, Italy, and Spain (Piwowarczyk, 2014; Pusch, 2006; Pusch & Günther, 2009). The range of *P. bohemica* is probably not fully described; moreover, some researchers do not distinguish this species from *P. purpurea* s. l. or, due to morphological similarity, incorrectly identify it as *P. purpurea* s. str. (Piwowarczyk, 2014). In Poland, the species has been known to date from two verified localities found in 2010. The first is located in southern Poland in the Częstochowa Upland (near Zawiercie-Bzów), and the second in northwestern Poland, in the Lower Oder Valley (near Raduń). According to published historical data, the species also occurred in Gross-Zarnow (now Czarnowo near Pyrzyce) in Pomerania, but this locality was never confirmed, and no herbarium specimen remains (Piwowarczyk, 2012; Römmer, 1907; Zajac & Zajac, 2019).

2. Material and Methods

Phytogeographical research was conducted in the southwestern Świętokrzyskie Mountains, where in 2020, the locality of *P. bohemica* was found. In addition, this locality was monitored during two subsequent growing seasons (2021 and 2022). Species identification was based on morphological features provided by Piwowarczyk (2012) and Zázvorka (2000). The determination of the floristic composition and plant cover of the habitat in which the plant grew was based on a phytosociological relevé using the Braun-Blanquet method (Braun-Blanquet, 1964). Photographic documentation was taken of the species in the locality. An updated distribution map of *P. bohemica* in Poland was prepared using the ATPOL cartogram method (Zajac, 1978). The nomenclature of this plant species follows that of Mirek et al. (2020).

3. Results and Discussion

The locality was found on June 27, 2020, in Korzecko near Chęciny, Świętokrzyskie Mountains, Małopolska Upland, south Poland (301 m a.s.l.). The site was located in the ATPOL EE83 square (Figure 1). In 2020, the population was 18 individuals. However, in 2021, two individuals were observed, and in 2022, only one. The species was growing on unused xerothermic grasslands overgrown with shrubs, adjacent to regularly mown grasslands to the east and west and shrubs to the north (Figure 2). In the phytocoenosis where it was found, species from the *Festuco-Brometea* class (Relevé 1) were dominant. The host plant, *A. campestris*, grew near *P. bohemica*. The soil is of the rendzina type and developed on dolomites.

Relevé 1. Korzecko near Chęciny; date: 2020-06-27; area of relevé – 20 m²; southern exposure; slope ~10°; coverage of herb layer (c) – 95%; coverage of moss layer (d) – 5%. c: *Aster amellus* 2, *Centaurea stoebe* 2, *Festuca trachyphylla* 2, *Thymus austriacus* 2,

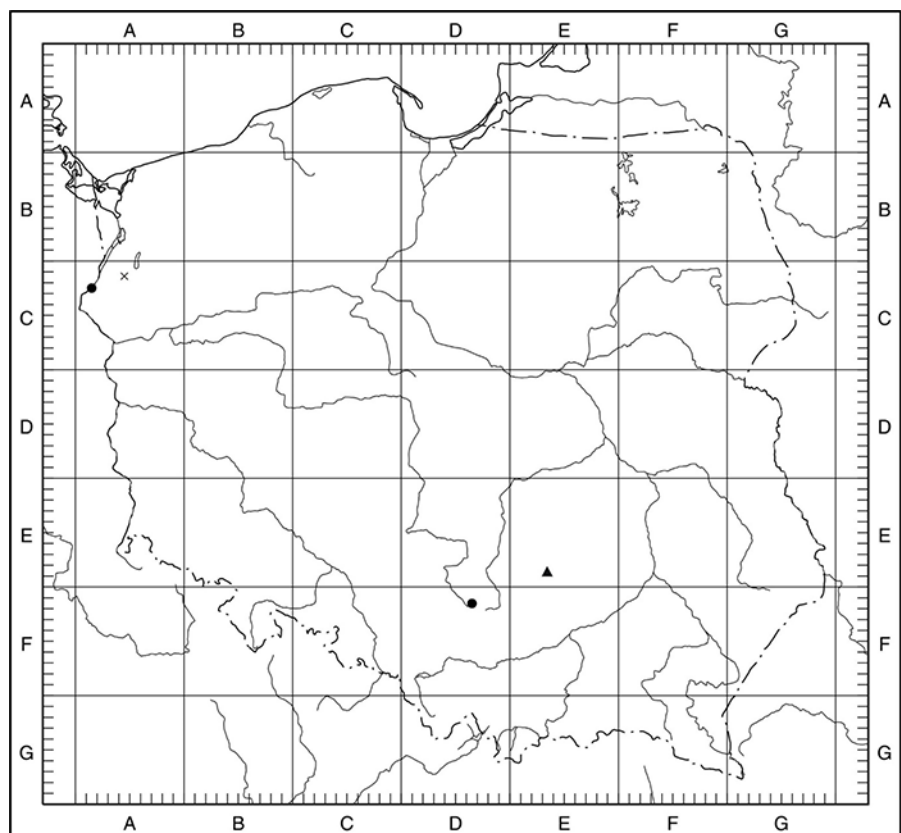


Figure 1 Updated distribution of *Phelipanche bohemica* in Poland within the ATPOL cartogram grid. Explanations of symbols: triangle – new locality; circle – locality confirmed after 2000; x – locality not confirmed at present and uncertain (Zajac & Zajac, 2019; modified).



Figure 2 *Phelipanche bohemica* in the newly discovered locality in Korzecko near Chęciny. Photographs by G. Łazarski; June 27, 2020.

Artemisia campestris 1, *Brachypodium pinnatum* 1, *Securigera varia* 1, *Dianthus carthusianorum* 1, *Euphorbia cyparissias* 1, *Fragaria viridis* 1, *Hypericum perforatum* 1, *Koeleria macrantha* 1, *Melampyrum arvense* 1, *Thymus glabrescens* s. str. 1, *Veronica spicata* 1, *Achillea pannonica* +, *Asperula cynanchica* +, *Campanula sibirica* +, *Carex caryophyllea* +, *Chamaecytisus ruthenicus* +, *Centaurea scabiosa* +, *Euphorbia esula* +, *Falcaria vulgaris* +, *Galium album* +, *Helianthemum nummularium* subsp. *obscurum* +, *Lotus corniculatus* +, *Medicago falcata* +, ***Phelipanche bohemica*** +, *Pimpinella saxifraga* +, *Plantago lanceolata* +, *Potentilla arenaria* +, *Prunella grandiflora* +, *Sanguisorba muricata* +, *Senecio jacobaea* +, *Seseli annuum* +, *Silene vulgaris* +, *Thesium linophyllum* +, *Vincetoxicum hirundinaria* +, *Viola collina* +.

Throughout the range of *P. bohemica*, approximately 40 localities have been found, of which, less than half can be considered up-to-date (Pusch, 2006). To date, only two verified locations are known in Poland (Piwowarczyk, 2012, 2014). The newly discovered site in Korzecko is located approximately 70 km northeast of the site in Zawiercie-Bzów. Hence, the eastern boundary of the species has shifted (Figure 1).

Moreover, this is the first record of this species on the Małopolska Upland (Piwowarczyk, 2012; Zając & Zając, 2019).

The abundance of *P. bohemica* populations throughout the range is low, and some have not been confirmed in recent years (Piwowarczyk, 2014; Pusch, 2006). The size of the population found during the first observation in 2020 (18 individuals) was similar to the highest numbers found in the populations at Zawiercie-Bzów (10 individuals) and Raduń (15 individuals; Piwowarczyk, 2014). However, as shown in published data (Piwowarczyk, 2014), abundance in subsequent growing seasons may be highly variable (two individuals were observed in Korzecko in 2021, and only one in 2022).

Within the hill on which the site is located, there are visible remains of historical mining (probably dating back to the fourteenth century). The town of Chęciny, which has functioned since the Middle Ages as an important administrative and mining center, is also located nearby (Paulewicz, 1992). The traces of historical human activity present at Korzecko are also associated with other *P. bohemica* localities (e.g., near Skała Rzędowa in Zawiercie-Bzów) (Piwowarczyk, 2012). It can be assumed that these historical settlement and mining activities led to the creation of non-forest habitats on limestone hills, which was favorable for the survival of this xerothermic species.

Phelipanche bohemica is considered a critically endangered species (Holub & Zázvorka, 1999; Piwowarczyk, 2014; Pusch, 2006). The currently observed grassland overgrowth, which occurs in the absence of agro-pastoral use, may pose a serious threat to this species (Piwowarczyk, 2014; Pusch, 2006). Because the site is among the few up-to-date sites, has a small population, and is located on the edge its range in a habitat that, after the cessation of agro-pastoral activity, is subject to rapid successive changes, it should be protected (e.g., in the form of an ecological site such as the *użytek ekologiczny* classification of protected areas in Poland) and should be subject to regular monitoring. Currently, the shrub cover on the xerothermic grasslands does not pose a threat to this species. However, in the coming years, it will undoubtedly be necessary to carry out protective measures, consisting of thinning the layers of shrubs on the site and in the surroundings. Moreover, the area where the site is located is heavily visited by tourists, which may lead to the trampling of individuals or breaking of flowering shoots.

Seeds from this population were stored in the seed bank at the Centre for Research and Conservation of Biodiversity (Institute of Biology, Jan Kochanowski University in Kielce). In addition, attempts will be made to cultivate this species in the Botanical Garden in Kielce (R. Piwowarczyk, oral information, 2022).

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