



## VACCARIA HISPANICA (CARYOPHYLLACEAE) REDISCOVERED IN POLAND

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**ABSTRACT.** *Vaccaria hispanica*, due to the lack of statements in recent years in Poland, was considered extinct. It was rediscovered in the agricultural areas of Wrocław between Domaszczyn and Zakrzów. Plant communities with *V. hispanica* were classified into the *Stellarietea mediae* class and the *Artemisietea vulgaris* class. All collected soil samples were characterized by slightly acidic soil pH between 6.4–6.7. Based on the results, we suggest changing the status of *V. hispanica* in the Polish red list and the red book from “extinct” to “critically endangered”.

**KEY WORDS:** *Vaccaria hispanica*, endangered species, distribution, habitat, Caryophyllaceae, Poland

### INTRODUCTION

*Vaccaria hispanica* (Mill.) is a species most likely native of the Mediterranean region, from where it was further spread widely in the rest of Europe and further to Asia (CONERT 1979). It has also been dragged to North America, South America, South Africa, New Zealand and Australia (KÄSTNER et al. 2001). In addition to the typical taxon *Vaccaria hispanica* ssp. *hispanica*, there is also *V. hispanica* var. *grandiflora* with petals up to 18–23 mm long (ELIÁŠ 2006), however, both subspecies are not geographically diverse (CONERT 1979). The cow cockle is a thermophilic species that prefers soils rich in calcium compounds. It was noted on arable fields and balks. *Vaccaria hispanica* is considered as a species characteristic for cereal crops on limestone soils of the *Caucalidion lappulae* association (MATUSZKIEWICZ 2005). This species was also found in ports, on roadsides, on railway grounds and near grain elevators (SZCZEŚNIAK 2011).

In Poland, the species is widespread, with two distinct clusters in south-western Poland, especially in Lower Silesia and in eastern Poland, mainly in the Lublin Upland, Roztocze and Polesie (ZAJĄC & ZAJĄC 2001, WĘGRZYNEK 2014). Polish populations were limited to a few individuals or, as in Lower Silesia, described as mass (SZCZEŚNIAK 2011, WĘGRZYNEK 2014).

Despite the wide range of *V. hispanica*, the species has been withdrawing from all over Europe in recent years. It was considered, probably extinct in the Czech Republic (KROPÁČ 2006), critically endangered in Austria (NIKLFIELD & SCHRATT-EHRENDORFER 1999), critically endangered in Slovakia (ELIÁŠ et al. 2005) threatened in Hungary (KIRÁLY 2007), endangered in Croatia (HULINA 2005). In Poland, due to the lack of observation in recent years, it was considered extinct (WĘGRZYNEK 2014 – EX category, KAŹMIERCZAKOWA et al. 2016 – category RE).

The reasons for the disappearance of *V. hispanica* from Poland are not fully known, most probably due

to the introduction of modern agrotechnical methods, especially chemical weed control, the introduction of fast growing varieties and effective seed treatment (WĘGRZYNEK 2014). In Lower Silesia, *V. hispanica* probably disappeared as a result of seed exchange after 1945, which was related to the population exchange of this area after World War II (SZCZEŚNIAK 2011).

## MATERIAL AND METHODS

Floristic observations were conducted from June to September 2018. For the documentation, phytosociological relevés were taken according to the Braun-Blanquet method (BARKMAN et al. 1964). The nomenclature of vascular plants was adopted according to MIREK et al. (2002), phytosociological classifications were based on the study of MATUSZKIEWICZ (2005). The current position of the species in Poland is expressed in a square system of the ATPOL (ZAJĄC 1978), additionally GPS coordinates (Garmin 62sc) were registered. For IUCN Red List Categories and Criteria were used (IUCN STANDARDS... 2016).

During the research, the soil samples were collected at one time to measure soil pH. Topsoil samples

(0–10 cm depth) were collected in three replicates from each site. The pH was determined using the potentiometric method by soaking 1 g of soil samples in vials with 10 ml deionised water. The vials were stoppered and left overnight. The mixtures were vacuum filtered through washed paper filters. The pH of the filtrates was determined by pH-meter CP-105 (Elmetron, Poland).

## RESULTS AND DISCUSSION

*Vaccaria hispanica* ssp. *hispanica* was found in the agricultural areas of the Mirków village, between Domaszczyn and Zakrzów in the south-western part of Poland. The stand is located in the ATPOL CE40 square (Fig. 1). The *V. hispanica* population is scattered over an area of 1 ha, creating smaller groups in places. In total, 36 flowering plants were recorded, including 15 which later bound the plant stems (Fig. 2).

*Vaccaria hispanica* occupies the margins of cereal crops and sugar beets reminiscent of the plant communities from the *Stellarietea mediae* class. In addition, part of the largest population was found in

Table 1. Relevé with *Vaccaria hispanica* ssp. *hispanica* and pH from the studied populations

Relevé number	1	2	3	4
Relevé area (m <sup>2</sup> )	25 m <sup>2</sup>	25 m <sup>2</sup>	25 m <sup>2</sup>	25 m <sup>2</sup>
Date	10.08.2018	10.08.2018	10.08.2018	05.10.2018
Latitude N	51°09'49.4"	51°10'06.9"	51°10'12.1"	51°10'23.5"
Longitude E	17°08'34.2"	17°08'42.2"	17°08'44.5"	17°09'20.6"
pH	6.7	6.4	6.4	6.5
Herb cover (%)	70	60	40	40
I. ChCl. <i>Stellarietea mediae</i>				
<i>Setaria viridis</i>	+	2	1	1
<i>Apera spica-venti</i>	2	1	1	.
<i>Echinochloa crus-galli</i>	2	1	1	.
<i>Matricaria chamomilla</i>	2	1	1	.
<i>Fallopia convolvulus</i>	1	+	+	.
<i>Centaurea cyanus</i>	1	+	r	.
<i>Anagallis arvensis</i>	1	+	.	.
<i>Vaccaria hispanica</i> ssp. <i>hispanica</i>	r	+	+	+
<i>Viola arvensis</i>	+	r	.	.
<i>Polygonum aviculare</i>	+	.	.	.
<i>Anchusa arvensis</i>	r	.	.	.
II. ChCl. <i>Artemisietea vulgaris</i>				
<i>Chenopodium album</i>	.	.	.	2
<i>Echium vulgare</i>	.	.	.	+
<i>Hypericum perforatum</i>	.	.	.	+
<i>Solidago gigantea</i>	r	.	.	.
III. Others				
<i>Beta vulgaris</i> ssp. <i>vulgaris</i> var. <i>altissima</i>	.	.	3	.
<i>Secale cereale</i>	1	2	.	.
<i>Elymus repens</i>	.	.	.	1
<i>Plantago lanceolata</i>	.	.	.	+
<i>Plantago major</i>	+	.	.	.
<i>Erodium cicutarium</i>	.	.	.	r
<i>Panicum barbipulvinatum</i>	.	.	.	r

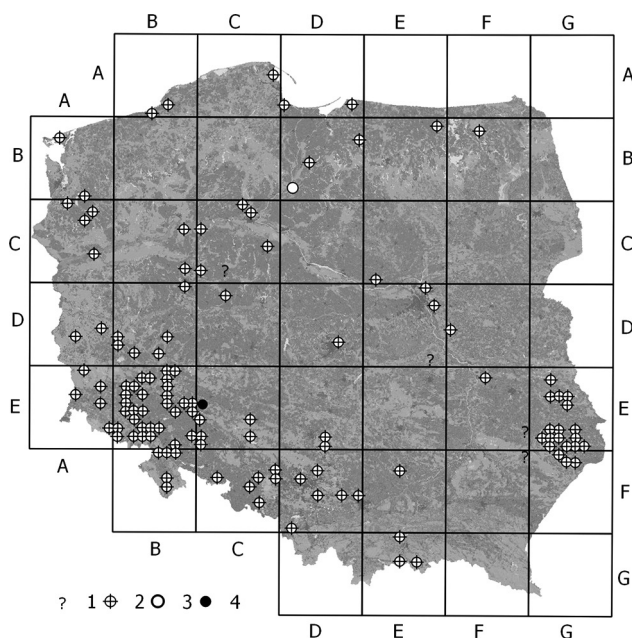


Fig. 1. Distribution of *Vaccaria hispanica* ssp. *hispanica* in Poland (according to WĘGRZYNEK 2014; supplemented) 1 – doubtful position, 2 – historical position, 3 – unconfirmed position, 4 – new position.

ruderal communities reminiscent of the *Artemisietea vulgaris* class. The phytosociological characteristics of occupied plant communities are represented by the following four phytosociological relevés. All collected soil samples were characterized by slightly acidic soil pH between 6,4–6,7 (Table 1).

The newly discovered *V. hispanica* population in Wrocław is currently the only known one in Poland. It is located about 10 km from the last quotation from this area in the district of Wrocław-Krzyki (ROSTAŃSKI 1961, SZCZĘŚNIAK 2011).

In spite of intensive searches in the adjacent areas, no other populations were found. During the inspections carried out in the summer of 2018, the flowering was confirmed in August and September, which was caused by the cutting of the shoots by agricultural machines. Despite the late flowering, part of the *V.*



Fig. 2. Flowering *Vaccaria hispanica* ssp. *hispanica*, Mirków, 5.10.2018 (photo: K. Torzewski)

*hispanica* specimens formed seeds. The main threat to the found populations is the intensification of agriculture, especially the chemical control of weeds and change of physical and chemical properties of soils. This would indicate the occupation of non-herbicide borders. It also seems that this alkaline species has adapted to a neutral pH of the soil. It is therefore necessary to conduct further observations of the examined position. The active protection *in situ* conditions can be helpful in protecting this species.

Based on the results and classification of the IUCN, we propose to change the status of *V. hispanica* in the Polish red list (category – RE) and in the red book (category – EX) changing the category from “extinct” to “critically endangered” – CR.

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