

Communication

Silene coronaria (Caryophyllaceae), an established alien plant in the flora of Poland

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Abstract

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Silene coronaria, a Eurasian herbaceous plant, has been introduced as an ornamental or medicinal plant to many countries worldwide, where it has escaped from cultivation and become established, even invasive in some regions. In Poland, the naturalisation of this species has not yet been confirmed. However, it is often cultivated in gardens, cemeteries, and urban green areas and occasionally escapes from cultivation to grow on roadsides, forest edges, wastelands or garbage dumps. In this study, we update the status of *Silene coronaria* in the Polish flora by proving its establishment at three sites in the northeastern and central-southern parts of the country. The distribution of the species is illustrated using the ATPOL cartogram method, and its further spread into thermophilic seminatural habitats is discussed.

Keywords: alien species, biological records, Central Europe, naturalisation.

INTRODUCTION

Plant naturalisation or establishment is when an introduced plant species establish permanent, self-replacing populations in a new area for at least 10 years. Unlike invasive species, the progeny of naturalised species usually occurs in small numbers and close to the parental individuals or initial sites (Pyšek et al., 2004). Because naturalised plants are more likely to become invasive than non-established ones, studying naturalisation is important for determining the invasive potential of introduced plants and taking early preventive measures to protect native biodiversity from plant invasions (Richardson & Pyšek, 2012).

Silene coronaria (L.) Clairv., a biennial or short-lived perennial herb of the family Caryophyllaceae, is native to central and southeastern Europe, to western and central Asia. It was introduced as an ornamental or medicinal plant to other parts of Europe and Asia and to Africa, North America, South America, and Australia, where it escaped from cultivation and became established (Randall, 2017; POWO, 2024). In Europe, *Silene coronaria* has been naturalised in the Czech Republic, Germany, the Netherlands, Belgium, Spain, the United Kingdom, Ireland, Sweden, and Norway (Pyšek et al., 2012; Aymerich & Sáez, 2019; Lusby & Stroh, 2020; Verloove, 2023; Hasler, 2024; NOBANIS, 2024). Moreover, it is locally

abundant and invasive in some regions of Spain (Aymerich & Sáez, 2019).

Silene coronaria prefers sunny to partially shaded places with dry, usually well-drained, mesotrophic, slightly acidic to neutral soil (National Gardening Association, 2024; Pladías, 2024). It is a diagnostic species of thermophilic oak forests of submediterranean and east-European distribution of the class *Quercetea pubescentis* Doing-Kraft ex Scamoni et Passarge 1959 and xerothermic fringe and tall-herb vegetation of subcontinental western and central Europe of the alliance *Geranion sanguinei* Tüxen in Müller 1962 (Mucina, 1997; Hübl, 2021). Nevertheless, it shows a wide ecological tolerance occurring in various types of temperate forests as well as in clearings, thickets, heathlands, grasslands, sandy dunes, screes, roadsides, railway embankments, lawns, and wastelands (Morton, 2005; Dobravolskaitė & Gudžinskas, 2011; Hartman & Rabeler, 2012; Lusby & Stroh, 2020; Vojík et al., 2022; Verloove, 2023; Hassler, 2024). Furthermore, it reproduces generatively by seeds, which can be dispersed through autochory, anemochory, and anthropochory (Pladías, 2024).

Silene coronaria is an alien species in Poland, commonly cultivated as an ornamental plant in flower beds, naturalistic gardens, rock gardens, and

cemeteries (Czarna et al., 2011; Snowarski, 2024). Additionally, in many regions, it has been recorded as a casual alien plant escaping from cultivation and occurring mainly near gardens, on roadsides, forest edges, dumps, and wastelands (Janowska & Adamczewska, 2000; Jackowiak et al., 2017; Trojecka-Brzezińska, 2017; Urbisz, 2021). However, the naturalisation of *Silene coronaria* in Poland has not been confirmed so far (Tokarska-Guzik et al., 2012; Mirek et al., 2020).

In this study, we aimed to update the status of *Silene coronaria* in the flora of Poland by proving its establishment.

MATERIALS AND METHODS

Taxonomic and morphological remarks

Silene coronaria is a member of *Silene* sect. *Agrostemma* (DC.) Greuter which includes tomentose plants with monopodial growth, lateral stems, and rounded to emarginate petal limbs (Greuter, 1995; Jafari et al., 2020). It is characterised by dense, woolly silvery hairs on stems, leaves, and sepals, as well as usually magenta-pink corollas (Fig. 1A). The stems are several, erect, branched distally, up to 40–100 cm in height. The basal leaves are oblanceo-



Fig. 1. *Silene coronaria* in northeastern Poland. Flowering shoots (A) and individuals growing on a fallow land in Suwałki (B). Photographs by A. Pliszko.

late, spatulate, 5–10 cm × 10–25(–30) mm, with entire margins and acute apex, while the cauline leaves are arranged in 5–10 pairs, opposite, sessile, and reduced distally. The inflorescences are dichotomously branched with one to several flowers per branch, which are ca. 3.5 cm in diameter. Moreover, the mature capsules (ca. 1.4 cm) are ellipsoid-ovoid and open with five teeth at the top (Morton, 2005).

Silene coronaria is sometimes confused with *Silene flos-jovis* (L.) Greuter & Burdet due to similar pubescence and leaf shape. However, the latter species is distinguished by a head-like (more compact) inflorescence and bifid corolla petals (Verloove, 2014).

Field surveys and data presentation

Field surveys were carried out in the Podlaskie and Świętokrzyskie provinces in 2024 by revisiting previously documented (Łazarski, 2015; Pliszko, 2015) and unpublished localities of *Silene coronaria*. Plant nomenclature was adapted from POWO (2024). The criteria of plant naturalisation followed Pyšek et al. (2004). The distribution map was prepared using the ATPOL cartogram method (Zajac, 1978).

RESULTS AND DISCUSSION

We confirmed the naturalisation of *Silene coronaria* at three sites in Poland, namely Suwałki (54.103566° N, 22.899866° E; altitude 168 m a. s. l.; ATPOL cartogram unit FB08), Karsznice (50.780920° N, 20.301360° E; altitude 282 m a. s. l.; ATPOL cartogram unit EE82), and Kielce (50.827490° N, 20.613220° E; altitude 280 m a. s. l.; ATPOL cartogram unit EE74) (Figs 1–3).

In Suwałki, it has been growing on fallow land for at least 12 years, and its population has increased almost fivefold since it was first recorded in 2012 (Pliszko, 2015; KRA0474577). In 2024, it formed three patches, distanced about 10 m from each other. The largest patch covered an area of about 25 m², while the other two occupied about 0.25 m². Moreover, it was associated with plant species typical of grassland (e.g. *Achillea millefolium* L., *Artemisia campestris* L., *Daucus carota* L., *Echium vulgare* L., *Medicago falcata* L., *Pilosella officinarum* F.W. Schultz & Sch. Bip., and *Pimpinella saxifraga* L.) and ruderal habitats (e.g. *Erigeron annuus* (L.) Desf,

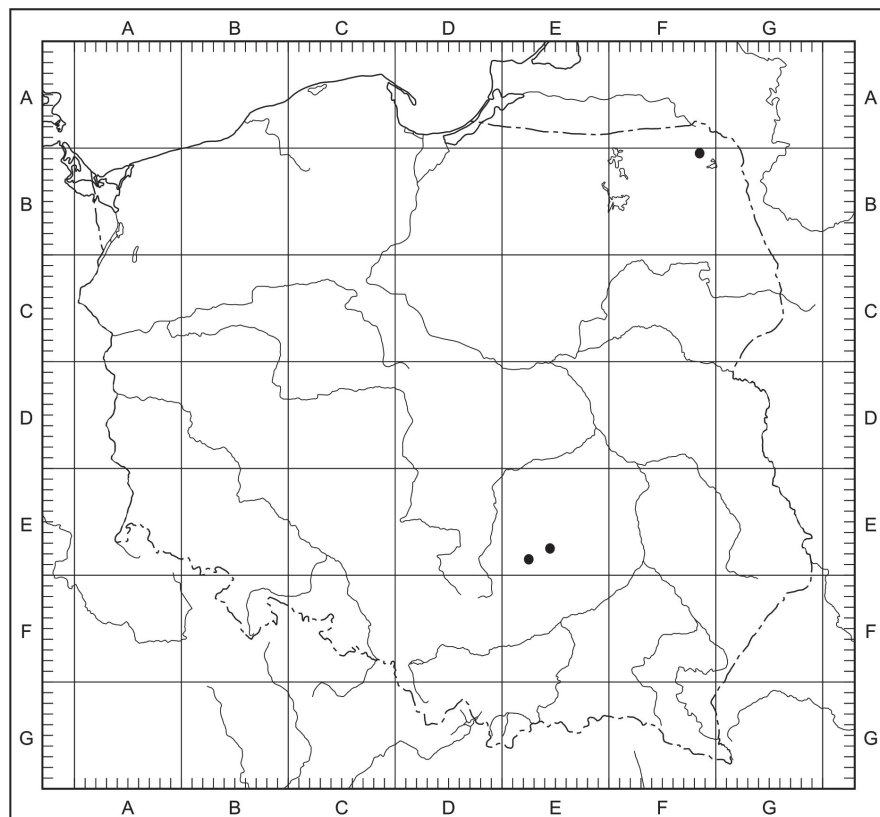


Fig. 2. Distribution of *Silene coronaria* in Poland within the ATPOL cartogram grid (Zajac, 1978).

Solidago canadensis L., and *Tanacetum vulgare* L.) (Fig. 1B). Most likely, it was introduced by garden waste dumping.

In Karsznice, the population has been present for at least 13 years (G. Łazarski, unpublished data). In 2024, it consisted of three generative individuals and nine vegetative rosettes. In addition, numerous seedlings (more than 100) were observed in the vegetation gaps with exposed soil. The plant formed one patch of about 2.25 m² in a strongly transformed xerothermic grassland on the edge of a limestone quarry, which has been occasionally used as an illegal waste dump (Fig. 3A), hence the assumption that it was introduced by being thrown away with garden waste. Furthermore, it was accompanied by thermophilic grassland and fringe species (e.g. *Agrimonia eupatoria* L., *Coronilla varia* L., *Cynanchica pyrenaica* subsp. *cynanchica* (L.) P. Caputo & Del Guacchio, *Falcaria vulgaris* Bernh., *Medicago falcata*, and *Pimpinella saxifraga*) as well as ruderal species (e.g. *Parthenocissus inserta* (A. Kern.) Fritsch and *Rudbeckia hirta* L.).

During the first observation of *Silene coronaria* near Leśniówka Street in Kielce in 2013, its population numbered a dozen or so individuals growing behind the fence of allotment gardens (Łazarski, 2015).

Nevertheless, most individuals were destroyed when the road near the fence was hardened. In 2024, only two flowering individuals were noticed, accompanied by ruderal species such as *Aegopodium podagraria* L., *Chelidonium majus* L., *Elymus repens* (L.) Gould, *Erigeron annuus*, *Glechoma hederacea* L., and *Taraxacum* F. H. Wigg. sp. (Fig. 3B).

Many studies have shown that illegal garden waste dumping can lead to the naturalisation and invasion of alien plants in natural and seminatural habitats (Rusterholz et al., 2012; Plaza et al., 2018; Strgulc Krajšek et al., 2020; Šipek & Šajna, 2020). Therefore, responsible cultivation of non-native species with proper disposal of garden waste is strongly recommended (Heywood & Brunel, 2008; Strgulc Krajšek et al., 2020). Throwing garden waste containing *Silene coronaria* seeds into thermophilic habitats may accelerate its naturalisation since high temperatures favour seed germination of this species (Vojtk et al., 2022). The spread of *Silene coronaria* at stands in Suwałki and Karsznice will probably continue due to the easy production of fruits with a high number of seeds. Interestingly, in experimental conditions, a two-year-old individual of *S. coronaria* can produce 19 thousand seeds (on average), indicating its inva-



Fig. 3. *Silene coronaria* in the central part of southern Poland. Individuals are growing in a disturbed xerothermic grassland at the top of a limestone quarry in Karsznice (A), and generative individuals are growing at the fence of the allotment gardens in Kielce (B). Photographs by G. Łazarski.

sive potential (Vojík et al., 2022). In addition to high seed production, the invasiveness of *Silene coronaria* may be expressed by its drought tolerance, its occurrence in various habitats and the formation of compact patches that may limit the abundance of native plant species. However, further research is needed to better understand the distribution and ecological impact of *Silene coronaria* in Poland.

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Author contributions. AP – conceptualisation and supervision, methodology, field surveys, photographic documentation, writing the original draft, figure preparation; GL – methodology, field surveys, photographic documentation, writing the original draft. Both authors read and approved the final version of the article.

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