

DISTRIBUTION AND DYNAMIC TRENDS OF *PEDICULARIS SYLVATICA* L. IN POLAND

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Abstract

This paper presents the distribution of *Pedicularis sylvatica*, an endangered species across the whole Poland. In order to illustrate its dynamics four time periods were taken into consideration: before 1900, 1901-1950, 1951-1990 and after 1990. Until the present, 599 localities of *P. sylvatica*, have been known, half of which, i.e. 276 were recorded during intensive studies on wetland habitats in the years 1951-1990. Numerous localities – 195, were also recorded after 1990. In the 19th century 93 sites were documented and 91 in the first half of the 20th century. The analysis of the dynamics of *P. sylvatica*, shows that despite discovering new localities, primarily in the south of the country, the species exhibits recessive trends, on some areas, especially in the north.

Key words: semiparasite, endangered species, distribution map, disappearance of localities

INTRODUCTION

Polish flora comprises 9 species representing the genus *Pedicularis* L., among them *Pedicularis exaltata* Besser recognized as extinct throughout the our country and *P. kaufmannii* Pinzger of uncertain status, it is suggested to be an anthropophyte (Mirek et al. 2002). Until 2014 all the native species of this genus were under strict protection. However, the currently effective Act on Protection of Plant Species changed the status of two most frequently occurring taxa *P. palustris* L. and *P. sylvatica* L., from strictly protected to partially protected (Regulation 2014). *P. sylvatica*, is a rarer species, belonging to the European temperate sub-element, the group of European temperate lowland of sub-Atlantic range (Zajac M. and Zajac A. 2009). This species occurs in

Western and Central Europe, from Spain and Great Britain in the west, to Poland in the east, and southern Scandinavia in the north. It has never been found in the southern part of the continent. There are some single stands of the species on the island Newfoundland in North America but it is probably not a native species there (Meusel et al. 1978, Hultén and Fries 1986).

P. sylvatica is a biennial or perennial, a semiparasite growing to 5-20 cm. It has creeping runners growing out from the base of mid erect stem. Stems are unbranched whereas leaves are either pinatisect or pinnate. Flowers are dorsiventral, pink or light-purple forming a loose raceme. Egg-shaped capsule, hidden inside an inflated calyx, is its fruit. The plant is found in the sward with *Nardus stricta* of the Nardetalia order, on transitional peatland and lowland moor of the Scheuchzerio-Caricetea nigrae class as well as damp heathland of the Sphagno-Ericetalia order. Besides, it is also encountered in great sedge rushes of the Magnocaricion alliance and wet meadows of the Molinion caeruleae alliance (Petrů 2005, Matuszkiewicz 2008, Sotek 2010).

This species, reaching in Poland the eastern limit of its range, quite frequently occurs in the west and south of the country but seldom in the east and north-west (Atlas rozmieszczenia... 2001). Recently presented plant dynamic distribution in Pomerania, revealed partial loss of some former localities (Sotek et al. 2016). The plant is included in some regional red books and red lists (eg. Czerwona księga... 2012, Żukowski and Jackowiak 1995, Markowski and Buliński 2004), and it has been recognized lately as endangered on the area of whole country (Kaźmierczakowa et al. 2016). The above-mentioned aspects made us undertake the studies on the current distribution and dynamic trends of *P. sylvatica* in Poland.

MATERIAL AND METHODS

The distribution of *Pedicularis sylvatica* was presented on the basis of historical and current floristic data from published and unpublished materials, herbarium specimens as well as the database collected for the analysis of peatbog species in Pomerania (Sotek 2010). Floristic database of Distribution Atlas of Vascular Plants in Poland (ATPOL) (Atlas rozmieszczenia... 2001) was a supplementary material. The distribution of the species was mapped using cartogram and following methodological assumptions for ATPOL (Zajac 1978). The basic unit of cartogram was a 10 km x 10 km square. Filling in a unit of cartogram shows the presence of the species in that area and is considered as a single locality, irrespective of the number of sites within the marked unit. The following time periods were chosen for illustrating the dynamics of the species: before 1900, 1901-1950, 1951-1990 and after 1990. Regions in the description of plant distribution are consistent with physico-geographical regionalisation of Poland (Kondracki 2002).

RESULTS

Until the present 599 localities of *Pedicularis sylvatica* have been recorded. They are concentrated mainly in the South-Pomeranian Lakeland, the uplands: Kielecka,

Krakowsko-Częstochowska and Śląska; the mountains: Tatry, Obniżenie Orawsko-Podhalańskie, Beskid Żywiecki and Sudety. Elsewhere the stands are scattered, except NE part of the country where they scarcely occur (Fig. 1). Before 1900 the species had been known from 93 localities, of which 43 were not given later, but two – near Debrzno and in the Dulowska Forest were observed after 1990. The oldest reports come from the South Baltic Coastland (Szczecin, Kołobrzeg, Koszalin) from 1835 (Homann 1830). In the first half of the 20th century, 91 localities were reported, 51 of them for the first time, the majority of them in Pomerania. Most localities – 276, were discovered in the years 1951-1990, but also recorded a large number – 195, after 1990. They were situated predominantly in southern Poland, and only a few had been given earlier.

Apart from discovering the new sites of *P. sylvatica*, its disappearance is being observed. The highest loss was noticed in Pomerania – 16 sites were not confirmed (Sotek et al. 2016).

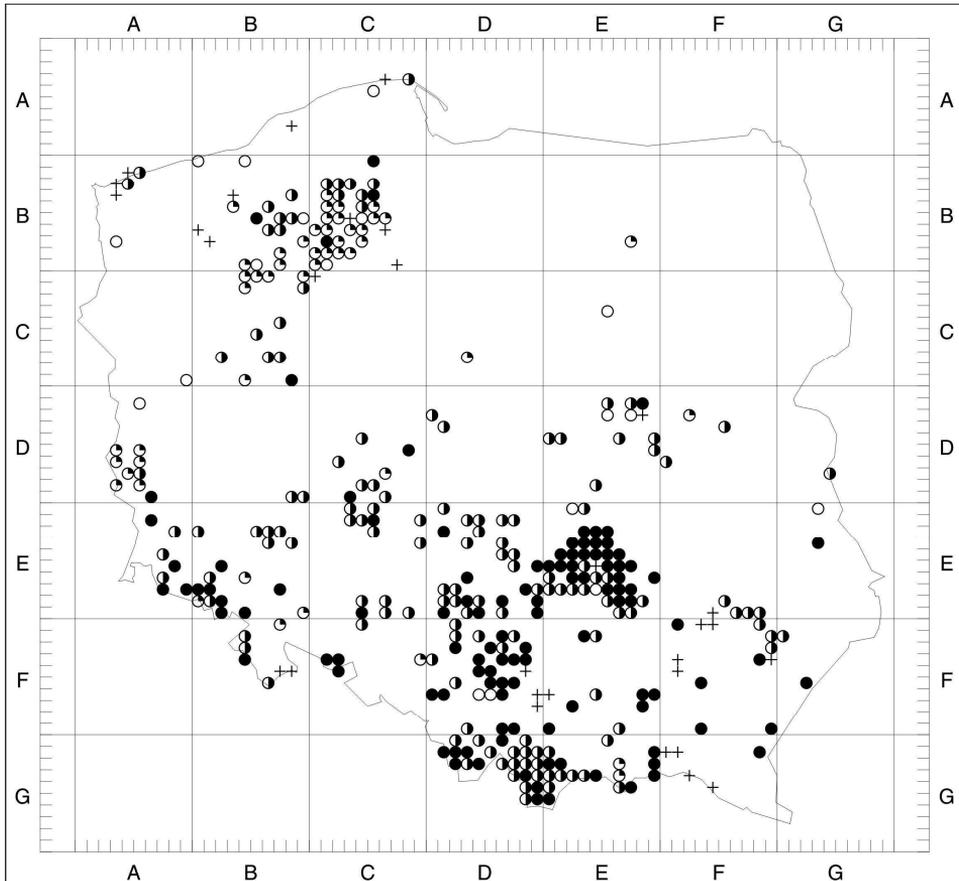


Fig. 1. Distribution of *Pedicularis sylvatica* L. in Poland

- – locality until 1900, ◐ – locality in 1901-1950, ● – locality in 1951-1990,
 ● – locality after 1990, + – extinct locality

In this region, the majority of localities were seen last in the 19th century and the first half of the 20th century. Currently, a few localities have been newly discovered, one of them near Nosalin but soon disappeared, and on three: near Biała Góra, Przybkowo, in the reserve Diabelskie Pustacie, no specimen was found in 2015. In the case of other regions of Poland, among the collected data only 24 localities were labelled as non-existent or not found. *P. sylvatica* disappeared from certain sites, mainly in south-eastern part of the country, located e.g. in Kotlina Sandomierska, Beskid Środkowy and Sudety Wschodnie.

DISCUSSION

In Poland, many localities of *Pedicularis sylvatica*, have been recorded up till now. However, they are distributed unevenly. Their number on a given area is frequently connected with the intensity of conducted studies. In the 19th century and the first half of the 20th the majority of sites with *P. sylvatica* were detected in Pomerania, which can be explained by the preservation of herbarium documentation and the availability of pre-war literature on the results of nature explorations by German florists, teachers, doctors and pharmacists. Among the analyzed time periods, the years 1951-1990 were most abundant in the number of observed localities. In this period, especially in its first half, intensive studies were conducted to inventory peatlands and examine their floristic diversity. Contemporary studies on regional flora in south-eastern part of the country resulted in finding many localities of *P. sylvatica*, mostly unknown earlier. Detailed studies of flora make it possible to detect the absence of the species on a given area. During the latest studies of this kind the species was still found to be absent in the central part of the Myślibórz Lakeland (Startek 2013), southern part of the Nowogard Lowland (Konopska 2013) and eastern part of Drawskie Lakeland (Umiastowska 2012).

In some regions of the country the loss of localities of *P. sylvatica* is being observed. It is difficult to estimate the scale of this phenomenon since there is not much available information about the attempts to confirm the old localities. At present in the Podkarpackie Province only 9 have been confirmed, whereas 14 are considered to be extinct (Oklejewicz et al. 2015). Some former stands were also lost in Dolny Śląsk (Pender 2003). It is supposed that many localities in central Poland ceased to exist (Jakubowska-Gabara et al. 2011, Pisarek and Kucharski 2012). In the Opolskie Province the species is regarded as extinct (Kuźniewski 2002).

The adopted time periods not only illustrate the distribution of *Pedicularis sylvatica* in Poland, but enable tracing its last occurrence on a given area. Taking this into account, in the case of localities which have not been confirmed for at least 60 years despite intensive floristic explorations, it can be supposed that at least some of them are historic. Probably some localities of the species from central Pomerania can be regarded as such. Similar conclusion can be drawn about Wielkopolska, where 2/3 of sites were reported last time in the 19th century or the first half of the 20th century (Żukowski et al. 2001).

Populations of *P. sylvatica* are generally not numerous, eg. Dolny Śląsk (Pender 2003), Sudety Zachodnie (Kwiatkowski 2002) and Pomerania (Sotek et al. 2016).

A small number of specimens can be linked to the plant semiparasite character. Despite the fact that, *Pedicularis* spp. are non host-specific (Kuijt 1979), and seed germination of *P. sylvatica* does not depend on the presence of host plants (Petrů 2005), the seedlings require being attached to host roots to successfully establish themselves (Ter Borg 1985). Their survival can be affected both by the density and distribution of host plants (Petrů 2005). Some isolated populations, covering small areas, are particularly exposed to extinction due to habitat instability and worsening of growing conditions. The species is encountered on moderately but permanently moist soils: organic hemic-muck, typical muckous, mineral-gley and sandy, of strongly to slightly acid reaction (Zarzycki 1958, Hereźniak 1972, Głazek and Wolak 1991, Sotek et al. 2016). It is sensitive to hydrological and trophic changes in the soil (Pender 2003). Drainage and habitat eutrophication as well as intensive, especially mechanical, use of meadows and pastures, or their abandonment, pose a threat to *P. sylvatica* (Hendrych and Hendrychová 1989). Extensive grazing or mowing have a positive impact on seedling recruitment (Petrů 2005).

The analysis of *P. sylvatica* dynamics at the limit of its range in Poland, shows that despite discovering new localities, predominantly in the south of the country, on many areas, especially in the north, the species exhibits recessive trends. The main reasons of this phenomenon undoubtedly are: habitat instability or disappearance, and the size of populations i.e. small populations on small areas. In light of present facts, it is proposed to verify the present status of the species protection and include *Pedicularis sylvatica* into the group of species under strict protection.

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ROZMIESZCZENIE I TENDENCJE DYNAMICZNE
PEDICULARIS SYLVATICA L. W POLSCE

Streszczenie

Praca przedstawia rozmieszczenie w Polsce *Pedicularis sylvatica*, gatunku zagrożonego w skali kraju. Dla zobrazowania jego dynamiki zastosowano cezurę czasową: stanowiska do 1900, 1901-1950, 1951-1990 i po 1990 roku. Dotychczas znanych jest 599 stanowisk *P. sylvatica*, z których blisko połowa, tj. 276, notowana była w okresie intensywniejszych badań siedlisk mokradłowych, w latach 1951-1990. Liczne stanowiska – 195 – notowane są również współcześnie, po 1990 roku. Z XIX wieku znane są 93 miejsca występowania tego gatunku, a z pierwszej połowy XX wieku – 91. Analiza dynamiki *P. sylvatica* wykazuje, że mimo wciąż nowo odkrywanych stanowisk, które są zlokalizowane głównie na południu kraju, gatunek ten na niektórych obszarach, a zwłaszcza na północy, przejawia tendencje recesywne.