

## New localities of *Viola stagnina* in Poland

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New localities of *Viola stagnina* in Poland. – Acta Mus. Siles. Sci. Natur., 64: 69-74, 2015.

**Abstract:** *Viola stagnina* Kit. is a species regarded as a river corridor plant because of its confinement to river valleys in Central Europe. It is a component of alluvial meadows with natural flooding regime (Cnidion dubii alliance). *V. stagnina* is rare and red-listed in some European countries. Seven new localities of *V. stagnina*, its distribution map in Poland and information about possible methods of protecting the species are presented.

**Keywords:** vascular plants, distribution, endangered species, river corridor species, Cnidion dubii alliance

### Introduction

*Viola stagnina* Kit. (= *V. persicifolia* Schreb.) is a native species representing an European-temperate sub-element in the Polish flora (Zajac & Zajac 2009). Because its distribution is confined to river valleys, it is regarded as a river corridor plant in Central European lowlands (Burkart 2001). In Poland it grows mostly within valleys of Oder (Odra), Vistula (Wisła), Warta, Bug and San rivers (Zajac & Zajac 2001).

*Viola stagnina* is mainly a component of alluvial meadows with natural flooding regime. The patches of grasslands with this species usually cover small areas. They are often located between meadows from the Arrhenatherion and Molinion alliances and phytosociologically belong to Cnidion dubii alliance (Matuszkiewicz 2008). This type of meadow communities develops within river floodplains being under sub-continental to continental climatic conditions. Despite regular flooding, they usually dry out during hot summer (Šeffler *et al.* 2008). Large coverage of *Cnidium dubium* or *Allium angulosum* is typical for patches representing Cnidion dubii alliance (Zaluski 2012). Another species diagnostic for this alliance are: *Carex praecox*, *Gratiola officinalis*, *Juncus atratus*, *Lathyrus palustris*, *Scutellaria hastifolia*, *Viola elatior* and *V. pumila* (Matuszkiewicz 2008, Zaluski 2012). Alluvial meadows are also considered to be of European interest and are listed as very valuable habitat in Annex I of the Habitats Directive (EC 2013).

*Viola stagnina* is legally protected (Dz. U. z 2004 r., poz. 1764 z dn. 9 lipca 2004 r.; Dz. U. z 2012 r., poz. 81 z dn. 5 stycznia 2012 r.; Dz. U. z 2014 r., poz. 1409 z dn. 9 października 2014 r.) and considered to be threatened in Poland. It is extinct species (RE) in Silesian Voivodship (Parusel 2012), critically endangered (CR) in Central Poland (Jakubowska-Gabara & Kucharski 1999) and endangered (EN) both in Opole Voivodship (Nowak *et al.* 2008) and in the Małopolska Upland (Bróz & Przemyski 2009). In the national red list of vascular plants it has a status of vulnerable species (Zarzycki & Szelağ 2006). Recently, *V. stagnina* has been included as a vulnerable in the *Polish red data book of plants* (Kaźmierczakowa *et al.* 2014). It is also red-listed in the other European countries. *V. stagnina* is on the red lists as vulnerable (VU) in Slovakia (Feráková *et al.* 2001), strongly threatened (C2) in the Czech Republic (Procházka 2001, Grulich 2012), critically endangered (CR) in Austria (Niklfeld & Schratt-Ehrendorfer 1999) and strongly endangered (2) in Germany (Korneck *et al.* 1996).

## Methods

Field studies were conducted in central and south-eastern Poland. In the list of stations provided below also herbarium data derived from the revision of the plant materials in Herbarium of the Jagiellonian University in Cracow (KRA) are included. ATPOL grid system was used to show the species distribution and location of new stations in Poland (Fig 1). Capital letters indicate the 100-km squares, while the numbers denote the 10-km squares (Zajac 1978).

## Results

Seven new localities of *Viola stagnina* which have been never published before are given below. Populations newly found by us were rather small. They included from 3 to ca. 500 individuals.

- BD08:** Dębina (near Poznań); meadow on the edge of the forest near Warta River; 6<sup>th</sup> May 1936; leg. F. Krawiec; (KRA) 008195.
- EE26:** 30 m N of the road between Orońsko and Wola Gózowska; wet meadow (20 specimens); 29<sup>th</sup> Jul 2014; not. M. Nobis.
- FF37:** approx. 1,5 km N of Przychojec village (near Leżajsk); wet meadow (3 specimens); 26<sup>th</sup> Jul 2012; not. A. Nobis.
- FF48:** approx. 500 m W of crossroad in the northern part of the Leżachów village (near Sieniawa); at the drainage ditch (50 specimens); 13<sup>th</sup> Jul 2009; not. A. Nobis.
- FF58:** approx. 500 m N of eastern part of Ujezna village (near Przeworsk); wet meadow (50 specimens); 24<sup>th</sup> Jul 2006; not. A. & M. Nobis.
- FF58:** Opaleniec (near Gniewczyzna Tryniecka); marshy high sedge meadow; 19<sup>th</sup> Jul 1975; leg. J. Kornaś; (KRA) 110413, 110414.
- FF59:** approx. 1 km S of the central part of Piwoda village (north-east of Jarosław); dried, degraded wet meadow (30 specimens); 1<sup>st</sup> Aug 2009; not. A & M. Nobis.

## Discussion

*Viola stagnina* grows usually within river valleys (Burkart 2001, Eckstein *et al.* 2006, Nobis & Skórka 2015). River corridors in Europe have been subjected to severe human-induced changes for centuries. These changes are mainly related to an encroachment of human settlements, and conversion of natural and semi-natural communities into croplands. Consequently, *V. stagnina* is threatened in a significant part of its distributional range. Reduction in the number of its locations and decreasing of its populations are observed for a long time in some European countries (Daníhelka *et al.* 2009).

During research it should be kept in mind that *Viola stagnina* forms hybrids with *V. elatior*, *V. pumila* and *V. canina* in natural conditions (Eckstein *et al.* 2006, Daníhelka *et al.* 2009). In addition Daníhelka *et al.* (2009), who revised the herbarium materials from Austria, Czech Republic and Slovakia, have stressed that botanists sometimes misidentify *V. stagnina* especially with *V. canina* or *V. pumila*.

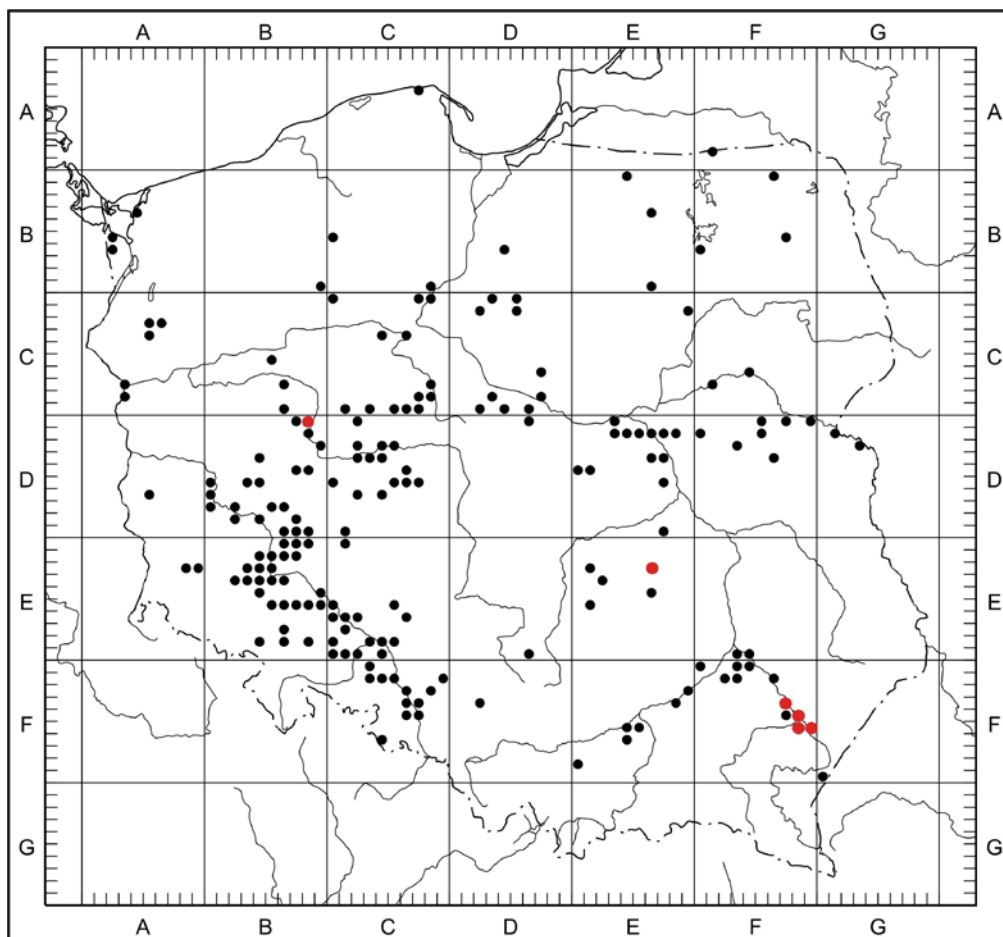
Despite the fact that *Viola stagnina* is red-listed in Poland and it has been recently included in the Polish red data book of plants, new localities of the species are still found in different parts of the country (Wayda 2001, Krukowski *et al.* 2004, Nobis 2007, Nobis 2008, Krawczyk 2010, Kalinowski 2012, Kuzuń 2012, Pierścińska 2014, Pliszko 2014).

*Viola stagnina* is stenotypic like many other threatened species (Zarzycki 2002). As compared to other wet meadow but widespread species it has mostly requirements to a higher temperature and soil alkalinity (Nobis & Skórka 2015).

Because *Viola stagnina* is a component of semi-natural communities it is not enough to protect the species alone. Flood meadows representing *Cnidion dubii* alliance depend on proper agricultural management to attend their ecological functions (Šeffler *et al.* 2008). They require extensive but systematic usage (Załoski 2014). Mowing and grazing are methods mainly recommended for their conservation. Mowing mostly prevents degradation, scrub encroachment and can cause a reduction of the number of some invasive species which

compete with natural components of the alluvial meadows. Depending on floods and weather conditions, it should be done once or twice per year (Šeffler *et al.* 2008). The delayed mowing, in early September, is recommended because of the flowering season of some species (Gaudillat & Haury 2002, Załuski 2012). If the meadows are abandoned, the accumulation of litters and decreasing of vitality of species can be observed. Grazing has to be done in a proper duration and intensity under suitable control. It is very important to not graze the meadows in the late wet and early dry season (Šeffler *et al.* 2008). Intensive usage (including fertilization and sowing of grasses) is undesirable in the case of patches typical of *Cnidion dubii* alliance (Załuski 2014).

As in the case of other endangered species, protection of *Viola stagnina* can also be done by *ex situ* conservation. *In vitro* micropropagation followed by the introduction of regenerated plants into botanic gardens and then to the natural sites should be taken into consideration. *V. stagnina* had been regenerated and acclimatized under *in vitro* cultures by Żabicki *et al.* (2013b). Received specimens were genetically stable which means that the protocol of micropropagation had been done successfully and regenerated plants can be used in the process of *ex situ* conservation in future prospects (Żabicki *et al.* 2013a).



**Fig 1:** Distribution map of *Viola stagnina* Kit. in Poland (in the ATPOL grid of squares 10 km x 10 km):  
 ● – new locality

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**Fig 2:** Flowering specimen of fen violet (*Viola stagnina*). Foto by Artur Pliszko, 8th June 2009.





**Fig 3:** Flowering specimen of fen violet (*Viola stagnina*). Photo by Artur Pliszko, 14th June 2015.

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