

ANTHROPOGENIC SITES OF *VULPIETUM MYURI* PHILIPPI 1973 IN OPOLE SILESIA

SYLWIA NOWAK¹, ARKADIUSZ NOWAK²

Department of Biosystematics, Opole University, Oleska 48, 45-052 Opole;

¹snowak@uni.opole.pl; ²anowak@uni.opole.pl;

ABSTRACT: During phytosociological surveys conducted in 2009-2013, the association of *Vulpietum myuri* Philippi 1973 has been documented for the first time in Opole Silesia. Despite the main diagnostic plant, the plots of phytocoenosis were dominated by small therophytes like *Veronica dillenii* or *Filago arvensis*. Also several mosses contribute to the vegetation plots with considerable share: *Ceratodon purpureus*, *Pseudoscleropodium purum* and *Funaria hygrometrica*. The association develops on ground road verges, wastelands of sand-pit and on railway track embankments in central and south-eastern part of the region. Ecological details of newly discovered plots with short description of their habitats and vegetation structure are given. A list of locations based on the literature data of *Vulpia myuros* in the Opole Silesia region is also presented.

KEY WORDS: *Vulpia myuros*, threatened association, distribution, flora conservation, SW Poland.

Introduction

Vulpia myuros is a small grass with solitary or caespitose, erect or decumbent culm. The stem is ca. 10–70 cm long with 2–3 nodes. Leaves are filiform, up to 15 cm long, 0.5–3 mm wide with sheaths without keel, smooth and glabrous on surface. Ligules are eciliate membrane, 0.3–1 mm long. Leaf-blades are flat, or involute with attenuate apex. Inflorescence is a panicle, exserted, or embraced at base by subtending leaf. Panicle linear, nodding, curved, 5–30 cm long. Primary panicle branches appressed. Spikelets solitary with oblong pedicels, 1–3 mm long. Fertile spikelets comprising 3–10 fertile florets. Glumes persistent, similar, shorter

than spikelet. Lower glume linear to lanceolate, 1–3.5 mm long, 0.15–0.4 length of upper glume, membranous with one vein. Upper glume lanceolate, 3–8 mm long, 1–3 -veined. Fruit caryopsis with adherent pericarp, linear and glabrous. It blooms from May to August (Tutin et al. 2005; Rutkowski 2008).

The species grows in most European countries, in northern Africa and Macaronesia, in Central, Middle, eastern and southern Asia, Caucasus, Arabia and China. As an alien species it was also found in Australia and New Zealand as well as in North America, Mesoamerica and South America. Sporadically it was also spotted on Subantarctic islands.

Vulpia myuros grows in dry, sandy, acid or alkaline soils. It occurs often in disturbed open habitats, especially in non native range. It was noted as component for loose swards, dry meadows, trampled lawns and ruderal vegetation from the alliances of *Sisymbrium* and *Onopordion* (Oberdorfer 1994; Tutin et al. 2005). According to Chytrý (2010), it is a characteristic taxon of the *Vulpietum myuri* Philippi 1973 association within the *Thero-Airion* Tüxen ex Oberdorfer 1957 alliance.

Vulpia myuros belongs to the European-temperate - Mediterranean - Irano-Turanian connective element (Zajac and Zajac 2009). According to (Pyšek et al. 2002), it should be regarded as an archeophyte in the area of Czech Republic. In Poland, it is a sporadically appearing taxon, occurring mainly in south-western part of the country from Lubuskie Province to Małopolska region (Zajac and Zajac 2001). In Opole Silesia, *Vulpia myuros* was reported from twenty five locations. Most of them were found at the beginning of the XX century: Osowiec Śląski, Pawłowice Gorzowskie, Biskupice near Olesno, Skrońsko, Suchy Bór, Prądy, Szczepanowice, between Goświnowice and Głębinów, Dobra, Głuchołazy, Kędzierzyn, Dobrosławice, between Dąbrówka and Prószków, between Maciowakrze and Raków, Murów (Fiek 1881; Schube 1903a, 1903b; Schalow 1931, 1933; leg. Bialucha 1937-1943 according to Michalak 1965; leg. Bialucha 1940 according to Nowak and Nowak 2005a). Several populations, mainly on anthropogenic sites were discovered in the second half of the XX century: Bukowo, Jarnołówce, Markotów Mały, Gorzów Śląski, Tuły, Opole (Zakrzów, Szczepanowice, Groszowice districts), Zębówice and Szumirad (Michalak 1970; Szotkowski 1971; Sendek 1973; Nowak and Nowak 2005b). In recent years *Vulpia myuros* has been confirmed only on few sites in Kędzierzyn and Kotlarnia (Kozak et al. 2005; Nowak and Nowak 2006) (Fig. 1).

Vulpia myuros has a high threat status within the Opole Silesia region. It was assessed as critically endangered species on the regional red list (CR category; Nowak et al. 2008). In neighbouring regions the species was assigned to the same threat category - VU (vulnerable) in Lower Silesia (Kącki et al. 2003) and in Wielkopolska (Jackowiak et al. 2007). *Vulpia myuros* was also given VU category in the Czech Republic (Procházka 2001).

Methods

The geobotanical studies were conducted in the central and the southern part of Opole Silesia within the area of the most suitable habitats for *Vulpia myuros* occurrence. Studies were carried out in 2009-2013. As phenological aspects were also considered in the fieldwork, basic investigations were conducted from June to August. Generally, three sites and eight vegetation plots with *Vulpia myuros* swards were sampled using the phytosociological Braun-Blanquet approach (1964). The species nomenclature follows Mirek et al. (2002). The syntaxonomical classification was done according to Chytrý (2010) and Matuszkiewicz (2007). The description of new plot of *Vulpietum myuri* comprises exact stand location, population size, habitat conditions and threats on new site.

Results

As a result of geobotanical studies conducted within the central and the southern part of Opole Silesia, three new sites of *Vulpietum myuri* were found. In all cases the association occupies man made habitats with moderate anthropogenic disturbance.

The new locations of *Vulpietum myuri*:

1. Osowiec Śląski (N 50° 45' 17,4"; E 18° 04' 03,2"; 175 m; ATPOL square: CE86) (Phot. 1). The association occupies outskirts of out of use sand-pit and road verges in pine forest. The area is extensively used mainly by tourist and anglers as well as by forest administration during the thinning or clearance works. The association patches cover ca. 100 square meters. All vegetation plots contain the main diagnostic species - *Vulpia myuros*. Apart from the taxon mentioned above, also species which characterize the *Thero-Airion* alliance, the *Corynephorretalia* order and the *Koelerio-Corynephorretea* class occur: *Spergularia rubra*, *Veronica dillenii*, *Rumex acetosella* and *Ceratodon purpureus* (Tab. 1). *Vulpia myuros* occur in great number on the site. More than thousand specimens were counted in July 2013.

2. Kotlarnia (N 50° 16' 25,4"; E 18° 17' 48,1"; 173 m; ATPOL square: CF84). The population grows on the ground road within the older part of sand pit which is still under exploitation. Therefore the place is closed to the public and fenced. The neighboring areas are

overgrown by juvenile pine tree stands. The association plots cover ca. 50 square meters alongside the road growing on its verges as well as in central part. They are well developed with frequent contribution of *Vulpia myuros*. Despite the main diagnostic species, there are also other phytosociologically important species like *Filago arvensis*, *Potentilla argentea* and *Rumex acetosella* contributing to the vegetation plots (Tab. 1). *Vulpia myuros* is not very numerous, ca. 200 individuals were counted in 2009.

3. Stare Koźle (N 50° 19' 21,9"; E 18° 13' 40,3"; 178 m; ATPOL square: CF73). In Stare Koźle *Vulpietum myuros* grows on the railway embankments of infrequently used side rail. The neighboring areas are used as a arable lands and forest plantations of *Pinus sylvestris* and *Quercus rubra*. It seems that the railway track is not intensively weeded with the use of chemical herbicides. The association covers ca. 50 square meters. They are quite well developed with evident domination of main diagnostic species, however with relatively scarce total abundance of herb layer and significant contribution of alien taxa like e.g. *Conyza canadensis* (Tab. 1). Population size of *Vulpia myuros* is relatively small, ca. 150 specimens were counted in 2013.

Discussion and conclusions

Despite the discovered sites of *Vulpia myuros* are located close to the species range limit, none of the populations have generative propagation limited by suboptimal habitat conditions, contrary to suggestions that such is the case in peripheral populations (Lawton 1993; Young et al. 1996). The populations examined were robust and competent in terms of generative propagation. As it was observed in the Czech Republic (Chytrý 2010), the species could adapt to anthropogenic habitats with moderate disturbance level and survive here for many years (see Sendek 1973). Biology and fitness of the individuals observed suggest that these populations are not genetically isolated and could be the part of a large metapopulation, covering whole area of south-western Poland. Nevertheless *Vulpia myuros*, despite it could adapt to man made habitats, has be still regarded as rare and probably threatened species. At present only 3 populations are known within Opole Silesia. All of them inhabit small land patches on sandy, mesotrophic soils. The distribution of the main diagnostic species shows, that the *Vulpietum myuri* could thrive in almost all parts of the region, however with suitable, acidiphilous and psammophilous habitats. The places of historical occurrence of the *Vulpia myuros* have often anthropogenic origin, so the populations could have an ephemerical character and depend on the present level of disturbances (e.g. Sendek 1973; Nowak and Nowak 2006). All of the three discovered sites are not save in terms of human impact. In

Kotlarnia, the sand-pit is going to be filled in water within the period of few years, in Osowiec Śląski the population is in very close to heavy recreational activities and in Stare Koźle the existence of *Vulpietum* depends fully on the weeding intensity on railway track. So, it is possible, that within short period of time, all populations of *Vulpia myuros* could be wiped out from the region. That is why the species was assessed as critically endangered in Opole Silesia (Nowak et al. 2008). Also the association of *Vulpietum* (as synonymous *Filagini-Vulpietum* Oberd. 1938) was assigned to critically endangered in Opole voivodeship (Nowak and Nowak 2008) as it was known at the time of assessment from the single plot. Using the current data on the association distribution, the threat category has to be changed to EN (endangered). Nevertheless the *Vulpietum* still deserves the monitoring and conservation measures to be effectively protected.

This is also interesting, that in recent years, *Vulpia myuros* in majority has been found on anthropogenic sites. This could support the idea, that the species is not native to Opole Silesia. As we know from the Czech Republic, the species could be regarded as archeophyte (Pyšek et al. 2002). In fact, the species in many areas has the optimum of syntaxonomical amplitude in *Sisymbrium* and *Onopordion*, sometimes also in other ruderal or segetal syntaxa (Chytrý 2010). However further research is needed to prove this thesis.

The presently existing population of *Vulpia myuros* and its association occupy small land plots exposed to direct threat of human activities. The maintenance of the species depends on intensity of usage of anthropogenic habitats. So, to maintain the association, the special management regulation has to be implemented with cooperation with land owners. To protect the gene pool of the species, ca. 300 seeds of *Vulpia myuros* were stored in gene bank of the Polish Academy of Sciences in Warsaw.

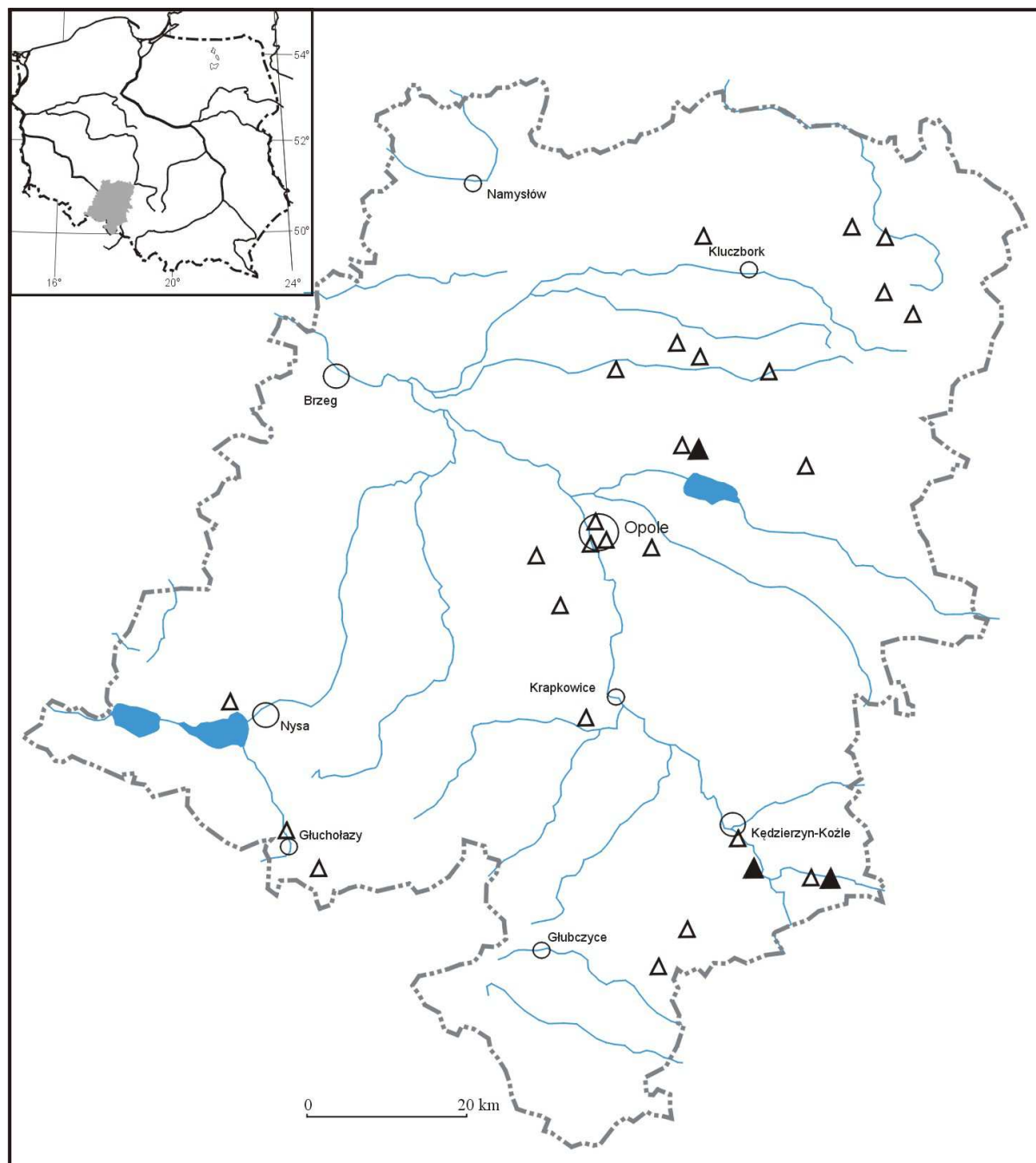


Fig. 1. Distribution map of *Vulpietum myuri* Philippi 1973 in Opole Silesia - ▲.
Literature locations of *Vulpia myuros* (L.) C. C. Gmel. - Δ.

Tab. 1. *Vulpietum myuri* Philippi 1973 in Opole Silesia.

Successive number of relevé	1	2	3	4	5	6	7	8	C
day	7	7	7	30	30	15	15	15	O
Date: month	7	7	7	6	6	6	6	6	N
year	2013	2013	2013	2013	2013	2009	2009	2009	S
Altitude (m)	178	178	178	175	175	173	173	173	T
Cover of herb layer (%)	60	20	15	50	30	40	40	25	A
Cover of moss layer (%)	20	25	-	10	15	10	-	5	N
Relevé area (m ²)	3	2	2	2	2	2	2	2	C
pH	6.0	6.2	6.7	5.8	5.8	5.4	6.0	5.9	Y
Locality	S	S	S	O	O	K	K	K	rel.
Number of species	15	11	9	12	13	8	6	6	1-8
Diagnostic species									
Ass. <i>Vulpietum myuri</i>									
<i>Vulpia myuros</i>	3	1	1	3	2	3	3	2	V
All. <i>Thero-Airion</i>									
<i>Filago arvensis</i>	.	.	.	.	.	+	+	1	II
<i>Spergularia rubra</i>	.	+	.	+	+	.	.	.	II
<i>Potentilla argentea</i>	.	.	.	.	.	+	+	.	II
Sporadic species: <i>Aira praecox</i> 4.									
O. <i>Corynephoralia</i> et Cl. <i>Koelerio-Corynephoretea</i>									
<i>Veronica dillenii</i>	2	1	+	1	1	.	.	.	IV
<i>Rumex acetosella</i>	.	.	.	+	1	+	+	+	IV
<i>Ceratodon purpureus</i> d	.	.	.	1	1	1	.	1	III
<i>Corynephorus canescens</i>	.	.	.	.	.	1	1	+	II
<i>Trifolium arvense</i>	+	1	.	.	+	.	.	.	II
Sporadic species: <i>Trifolium campestre</i> 3(1).									
Others									
<i>Festuca rubra</i>	1	+	1	1	+	.	.	.	IV
<i>Conyza canadensis</i>	1	1	.	.	+	+	.	.	III
<i>Pseudoscleropodium purum</i> d	.	.	.	.	1	1	.	+	II
<i>Funaria hygrometrica</i> d	2	2	.	.	.	.	.	.	II
<i>Bryum argenteum</i> d	1	1	.	.	.	.	.	.	II
<i>Rhytidiadelphus squarrosus</i> d	.	.	.	1	1	.	.	.	II
<i>Poa compressa</i>	.	.	.	1	+	.	.	.	II
<i>Achillea millefolia</i>	+	+	.	.	.	.	.	.	II
<i>Epilobium montanum</i>	+	+	.	.	.	.	.	.	II
<i>Luzula campestris</i>	.	.	.	+	+	.	.	.	II
<i>Pinus sylvestris</i> c	.	.	.	+	+	.	.	.	II
<i>Viola arvensis</i>	+	+	.	.	.	.	.	.	II
<i>Betula pendula</i> c	r	.	.	+	.	.	.	.	II
Sporadic species: <i>Apera spica-venti</i> 1; <i>Cardamine hirsuta</i> 3(1); <i>Lactuca serriola</i> 3; <i>Lepidium virginicum</i> 7; <i>Matricaria maritima</i> subsp. <i>inodora</i> 3(1); <i>Papaver argemone</i> 3; <i>Senecio fuchsii</i> 1; <i>Tanacetum vulgare</i> 1; <i>Trifolium hybridum</i> 1; <i>Vicia hirsuta</i> 3.									
Explanations: S - Stare Koźle (501921,9; 181340,3); O - Osowiec (504517,4; 180403,2); K - Kotlarnia (501625,4; 181748,1).									



Phot. 1. *Vulpietum myuri* on the ground road verge in Osowiec Śląski.

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