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VASCULAR FLORA OF THE VILLAGE OF JAROSŁAWIEC IN VIEW OF ITS DEVELOPMENT AND NATURAL CONDITIONS

Mariola Truchan, Zbigniew Sobisz

M. Truchan, Z. Sobisz, Department of Botany and Genetics, Pomeranian Academy in Słupsk, Arciszewskiego 22 B, 76-200 Słupsk, Poland, e-mail: truchan@apsl.edu.pl, sobisz@apsl.edu.pl

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ABSTRACT. The paper presents results of studies on vascular flora in Jarosławiec conducted in the years 2006-2008. In the investigated area a total of 480 taxa of vascular plants were identified, belonging to 87 families. Flora of the analysed area consists of 360 apophytes, 59 archeophytes, 38 kenophytes and 23 ergasiophytes. Several rare, vulnerable and legally protected species were found, e.g. *Aquilegia vulgaris*, *Chimaphila umbellata*, *Epipactis atrorubens*, *Eryngium maritimum*, *Galium odoratum*, *Goodyera repens*, *Listera cordata*, *Lonicera periclymenum*, *Matteucia struthiopteris*. The incidence of *Salicornia europaea* was reported – a species considered extinct in the Gdańsk Pomerania region and endangered in the Western Pomerania region. In contrast, several species previously reported by German researchers, i.e. *Agrimonia procera*, *Blysmus rufus*, *Botrychium lunaria*, *B. matricariifolium*, *Callitriche stagnalis*, *Corallorhiza trifida*, *Gentianella campestris*, *Juncus ranarius*, *Linaria odora*, *Mentha ×niliaca*, *Minuartia viscosa*, *Oenanthe fistulosa* and *Potentilla neumanniana* connected with the cliff top and pine coniferous forest, were not found in the course of this study.

KEY WORDS: vascular flora, Jarosławiec, Central Pomerania, the Słowińskie Coast

INTRODUCTION

The contemporary landscape of the village of Jarosławiec, and especially the plant life, are to a considerable extent the effect of human activity, lasting for many centuries now. The first signs of human settlements in the area of Jarosławiec and its environs date back to the Neolithic Age (4500-1800 B.C.) on light, podzolic-dune soils (Wiślański 1969). The population at that time up to the early historic times was mainly involved in fishing, growing of cereals (rye, barley, millet) and rearing of animals (cattle, pigs, sheep, goats). These activities could have a very limited impact on the transformation of the primeval landscape (Skrzypek 2004). The landscape of the settlement in those times was marked by forests in the east and west, while from the south there were overflow areas and swamps associated with the Głownicki Channel (Guth 1937).

The first historical information concerning Jarosławiec comes from the year 1460. The village was the property of the Stettin dukes and was located in the Darłowo domain. It results from the survey records from 1493 that in the village there were several fishermen and farmers growing rye. Intensive trade by sea between Darłowo and Jarosławiec, and Wicie was mentioned in documents from 1508. Inhabitants, using their own boats or barges, transported grain, wool, flax, hemp, tar, lead and wood. Transport of goods to and from Jarosławiec lasted until 1630 (Weissmann and Medger-Hamerla 1989). According to a description from 1748, Jarosławiec with its 21 farmsteads was one of the biggest villages administered by the Office in Darłowo (Brüggemann 1784). The development of agriculture caused conflicts with the neighbouring villages, especially that the latter also increased their agriculturally utilized area. The biggest conflict took place in 1775 with the village of Rusinowo. The dispute was finally settled at the Court Chamber in Stettin, where the village limits were established to be Hohe Höft (today the highest elevation of the cliff) in the north and the commune forest in the west. The commune forest turned into a dune forest, in which starting from 1832 black pine *Pinus nigra* was being planted (Drapała 2006). In the years 1841-1945 in the vicinity of the lighthouse there was a mill, belonging to the families of Peter Stegmann and Gustav Freischmidt. Trade in grain and the operation of the mill, working without interruptions for over 200 years, undoubtedly resulted in foreign species being brought to the area.

The unique location of Jarosławiec resulted in 1895 in the construction of a hotel, Strandschlösschen, and since then tourists started coming to the village. A tourist attraction of Jarosławiec was its beach, up to 1 km wide, and the cliff. With the population of 327 inhabitants in 1945, Jarosławiec was visited during the tourist season by 2000 guests. In the 1970's and 1980's 22 ac-

commodation facilities were built – hotels, guesthouses and summer youth camp facilities. Starting from the late 1990's new housing developments were being constructed: Nowe Osiedle and Osiedle Południe (Drapała 2006).

One of the most active cliffs on the Polish coast is located within the Jarosławiec housing area. The cliff stretches at a distance of approx. 2 km (between 254.550 and 256.520 km of the Polish coast) and ranges in altitude from 9 to 24 m above sea level in its central part. For centuries the cliff was subjected to the natural abrasion processes. Annual coastline decrements started to be measured as early as 1842. Due to the cliff top recession on average by 60 cm annually, a system of groynes was constructed in the years 1889-1892. According to Hartnack (1926) in the years 1883-1922 the cliff receded by 154 m. Changes in the upper cliff edge are presented in Figure 1. Additionally in the years 1916--1936 the coast was strengthened with a wide concrete sea wall. These works facilitated the stabilization of the cliff slope and the development of vegetation. Unfortunately, neglected repairs of groynes resulted in 1970 in it becoming active again. In 1976 its upper edge moved by 6 m and in 1983 houses and some resort facilities were threatened (Ellwart 2003). In the years 1987-1991 a 800 m heavy sea wall was built (a sheeting section with tetrapods as a fill) and in 1994 it was extended in length in the easterly direction with another section of a 250 m filled sea wall with tetrapods, with the core constructed of geofiber rolls. At present together with the German sea wall it is 1200 m in length (Dziedzic 1996).

Progressing synanthropization of the vegetation cover is frequently connected with resulting adverse effects on the natural environment of man. Thus knowledge on the composition of flora, including synanthropic flora, the rate of migration and factors affecting its development, apart from the contribution to pure science, is also of paramount practical value. This pertains, e.g. to the management of green areas, reclamation of landfills, military waste disposal sites and testing grounds, proper maintenance of land reclaimed areas, as well as weeding prevention and control of arable land.

A more marked interest in synanthropic flora in Poland has been observed only after 1945, since degraded areas, rubble heaps and ruins were advantageous habitats for ruderal flora. Moreover, increased land and sea transport contributed to new species being brought and enriching native flora. In the Central Pomerania studies on flora and synathropic vegetation have been prepared for many towns, e.g. Koszalin (Ćwikliński 1971), Słupsk (Misiewicz 1978), Ustka (Sobisz and Antkowiak 2005) and Łeba (Sobisz and Antkowiak 2007). Moreover, a study was written on the flora and ruderal vegetation of Polish sea ports (Misiewicz 1976). To date fragmentary floristic studies have been conducted in Jarosławiec (Müller 1898, Abromeit et al. 1903, Leick 1926, Holzfuss 1924, 1937). Valuable materials for investigations on the flora of Jarosławiec are contained in a herbarium from the Museum in Darłowo, coming from the years 1897-1943 (Misiewicz 1977).

This study concerns vascular flora of Jarosławiec, a seaside resort village. It is one of the oldest fishing villages on the Baltic Sea, which under the influence of increasing tourist traffic has completely changed its character, being transformed into a single-function, resort settlement. It is situated on the Jarosławiec Head-

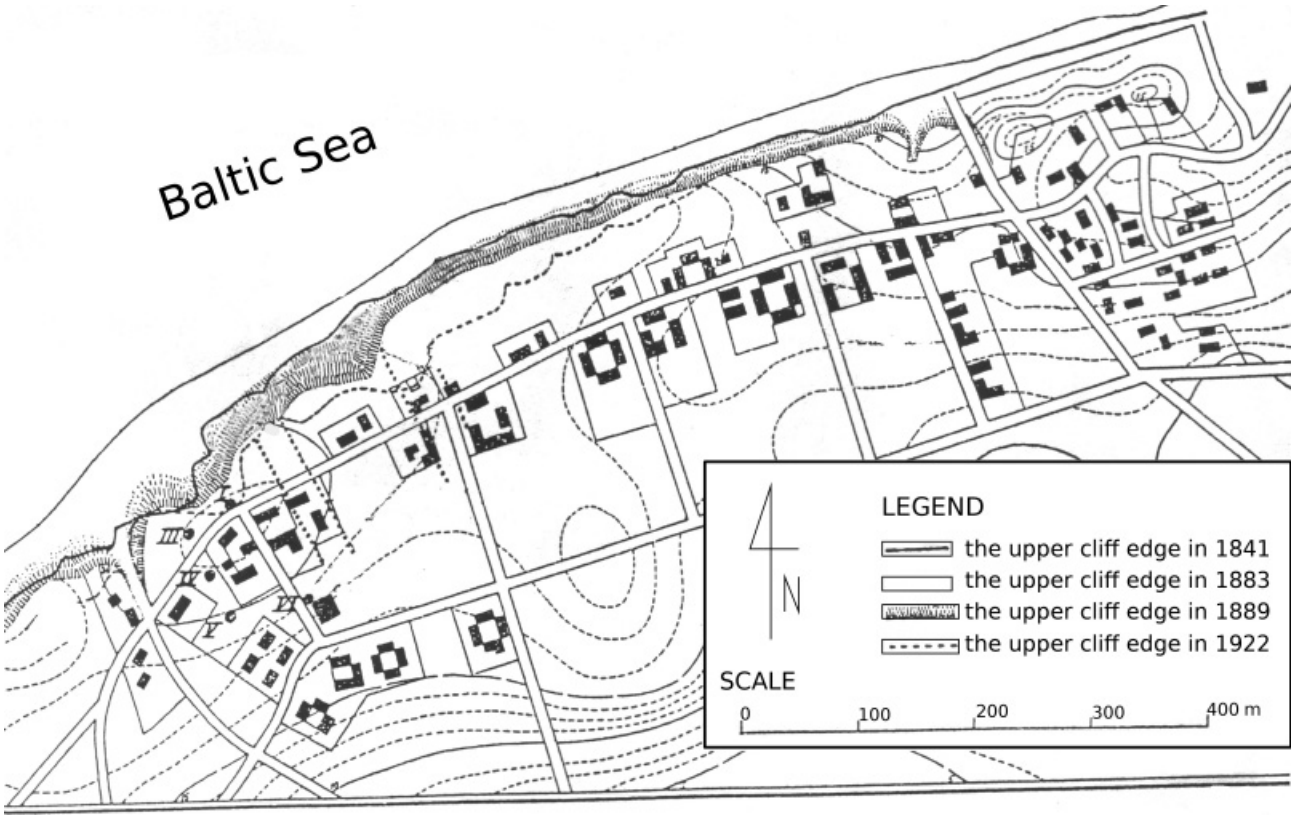

Fig. 1. Development of cliff coastline in Jarosławiec in the years 1841-1922. According to Hartnack (1926), modified

land, one of the most protruding sections of the Polish coastline. It is located on the River Głownica and covers the area of 534 ha, of which 115 ha are meadows, 113 ha – forests, 106 ha – arable land, 54 ha – pastures, 44 ha – fallow land, 7 ha – waters and 4 ha – greens (Unpublished materials of the Postomino Commune Office). Administratively it belongs to the commune of Postomino and the Ustka Forest Division.

In terms of the physico-geographical division of Poland (Kondracki 2000) Jarosławiec is located within the mesoregion of the Słowińskie Coast. The mesoregion belongs to the macroregion of the Koszalin Coastland and the subprovince of South-Baltic Coastlines.

According to the geobotanical division of Poland (Matuszkiewicz 1993) the village belongs to the Central District, Subdistrict of Lakes Jamno and Bukowo, included within the Baltic Coast Region and the Pomerania Divide.

MATERIAL AND METHODS

Studies on the flora of vascular plants of Jarosławiec were conducted in the years 2006-2008. Nomenclature of vascular plants and the affiliation of taxa to families are consistent with a list by Mirek et al. (2002). Only *Hieracium umbellatum* L. var. *dunense* Reyn. was reported after Rutkowski (2004). Nomenclature of trees and shrubs was adopted after Seneta and Dolatowski (2003). The position of taxa in the geographical-historical classification, taking into consideration the specific character of the region, was determined based on lists given by Zając (1979), Zając and Zając (1992) and Zając et al. (1998).

The term "position" refers here to the site where a given species is found, located at least 500 m away from another site of this type. The frequency of species in the analysed area was determined according to the arbitrary scale: 1 – very rare (1-2 positions), 2 – rare (3-5 positions), 3 – occasional (6-10 positions), 4 – frequent (11--20 positions), 5 – common (over 20 positions). Types of habitats are given for each species: A – cliff, B – beach, C – forests and thickets, D – roadside, E – fallow, F – damp meadows and pastures, G – watercourses, H – greens, I – fields under cultivations, J – retaining wall.

Protected species were given following the Ordinance of the Minister of the Environment (Rozporządzenie... 2004). Protected and vulnerable species found in anthropogenic positions are marked with an asterisk *. When assessing the current threat to species the following categories were used, as defined in a study by Żukowski and Jackowiak (1995): R – rare, V – vulnerable and E – dying out. In turn, the categories of threat, i.e.: LC – least concern, NT – near threat, VU – vulnerable, EN – endangered and RE – regionally extinct, were given after a study by Markowski and Buliński (2004).

RESULTS

A total of 480 taxa of vascular plants, belonging to 87 families, were identified in Jarosławiec. A list of flora is given in Table 1. The families representing by the biggest numbers of species include *Asteraceae* (68), *Poaceae* (37), *Fabaceae* (31), *Brassicaceae* (27), *Rosaceae* (26), *Caryophyllaceae* (20), *Lamiaceae* (20).

The following taxons belong to the group occuring rarely in the region: *Achillea ptarmica*, *Aethusa cynapium*,

Table 1. List of vascular flora in Jarosławiec

Family/Species	Geografical-historical status in Poland	Protected species, rare in region (RG)	Categories of threats		Frequency	Habitat
			Buliński and Markowski (2004)	Żukowski and Jackowiak (1995)		
1	2	3	4	5	6	7
ACERACEAE						
Acer negundo L.	Ken				1	D, H
Acer platanoides L.	Ap				3	C, D, H
Acer pseudoplatanus L.	Ap				3	C, D, H
ALISMATACEAE						
Alisma plantago-aquatica L.	Ap				1	G
ALLIACEAE						
Allium oleraceum L.	Ap				2	A
AMARANTHACEAE						
Amaranthus retroflexus L.	Ken				1	D
ANACARDIACEAE						
Rhus typhina L.	Erg				1	H
APIACEAE						
Aegopodium podagraria L.	Ap				5	C, D, E, H
Aethusa cynapium L.	Ar	RG			1	E
Anethum graveolens L.	Erg				3	D
Angelica silvestris L.	Ap				2	C

1	2	3	4	5	6	7
Antriscus sylvestris (L.) Hoffm.	Ap				5	D, E, H
Carum carvi L.	Ap				1	D
Chaerophyllum hirsutum L.	Ap				1	C
Chaerophyllum temulum L.	Ap				2	C, D
Conium maculatum L.	Ap	RG	LC	R	1	D
Daucus carota L.	Ap				5	D, E, H, I
Eryngium maritimum L.	Ap	!!, RG	NT	V	1	A
Heracleum sibiricum L.	Ap				5	D, E, H
Pastinaca sativa L.	Ap				1	D
Peucedanum oreoselinum (L.) Moench	Ap				2	A
Peucedanum palustre (L.) Moench	Ap				2	F
Pimpinella saxifraga L.	Ap				2	A, C
Sium latifolium L.	Ap				2	G
Torillis japonica (Houtt.) DC.	Ap				3	C, E
APOCYNACEAE						
Vinca minor L.	Erg	!			1	H
ARACEAE						
Acorus calamus L.	Ken				1	G
Calla palustris L.	Ap				1	G
ARALIACEAE						
Hedera helix L.	Erg	!				C, H
ASTERACEAE						
Achillea millefolium L.	Ap				5	C, D, E, H
Achillea ptarmica L.	Ap	RG			1	F
Anthemis arvensis L.	Ar				2	D, E
Anthemis tinctoria L.	Ap	RG			1	D
Arctium lappa L.	Ap				2	D, H
Arctium tomentosum Mill.	Ap				3	D, H
Artemisia absinthium L.	Ap				3	A, E
Artemisia campestris L.	Ap				2	D
Artemisia campestris L. subsp. *sericea* (Fr.) Lemke & Rothm.	Ap	RG			1	A
Artemisia vulgaris L.	Ap				5	D, E, H
Aster novae-angliae L.	Ken				2	H
Aster novi-belgii L.	Ken				2	H
Bellis perennis L.	Ap				5	D, E, F, H
Bidens cernua L.	Ap				1	E
Bidens tripartita L.	Ap				2	F, G
Cardus acanthoides L.	Ar				1	E
Cardus crispus L.	Ap				1	D, E
Carlina vulgaris L.	Ap	RG			1	A
Centaurea cyanus L.	Ar				5	D, E
Centaurea jacea L.	Ap				2	E, F
Chamomilla recutita (L.) Rauschert	Ar				3	E, I
Chamomilla suaveolens (Pursh) Rydb.	Ken				5	D, E
Cichorium intybus	Ap				3	D, E
Cirsium arvense (L.) Scop.	Ap				5	D, E
Cirsium oleraceum (L.) Scop.	Ap				3	F
Cirsium vulgare (Savi) Ten.	Ap				2	A, E
Conyza canadensis (L.) Conquist	Ken				4	D, E
Cosmos bipinnatus Cav.	Erg				3	H
Crepis biennis L.	Ap				2	D, E
Crepis tectorum L.	Ap				2	D, E
Echinops sphaerocephalus L.	Ap	RG			1	H
Erigeron acris L.	Ken				3	A, E
Eupatorium cannabinum L.	Ap				2	F, G
Filago arvensis L.	Ap	RG			1	E
Galinsoga ciliata (Raf.) S.F. Blake	Ken				4	E, I
Galinsoga parviflora Cav.	Ken				4	E, I
Gnaphalium sylvaticum L.	Ap				3	C
Gnaphalium uliginosum L.	Ap				1	F, I
Helianthus tuberosus L.	Ken				1	E, H
Helichrysum arenarium (L.) Moench	Ap	!			3	A, E
Hieracium pilosella L.	Ap				3	E
Hieracium umbellatum L.	Ap				2	E

1	2	3	4	5	6	7
Hypochoeris radicata L.	Ap				1	D, E
Inula britannica L.	Ap				1	F
Lactuca serriola L.	Ar				3	D, E, H
Lapsana communis L.	Ap				3	E, I
Leontodon autumnalis L.	Ap				3	E, F, H
Leontodon hispidus L.	Ap				2	E
Leucanthemum vulgare Lam.	Ap				3	D, E, H, I
Matricaria maritima L. subsp. *inodora* (L.) Dostál	Ar				5	D, E, H, I
Matricaria recutita (L.) Rauschert	Ar				3	E, I
Petasites hybridus (L.) P. Gaertn., B. Mey. & Scherb.	Ap				2	F
Petasites spurius (Retz.) Rcheb.	Ap	RG			2	A, B
Rudbeckia laciniata L.	Ken				2	D, G
Senecio jacobaea L.	Ap				4	E
Senecio vernalis Waldst. & Kit.	Ken				2	A, D, E
Senecio vulgaris L.	Ar				2	E
Solidago canadensis L.	Ken				3	E
Solidago gigantea Aiton	Ken				2	D, E
Solidago virgaurea L.	Ap				2	E
Sonchus asper (L.) Hill	Ar				2	E, I
Sonchus arvensis L.	Ap				3	E, F, I
Sonchus oleraceus L.	Ar				3	E, I
Tanacetum vulgare L.	Ap				5	D, E, H
Taraxacum officinale F.H. Wigg.	Ap				5	C, D, E, H
Tragopogon pratensis L.	Ap				3	D, E
Tussilago farfara L.	Ap				5	A, E, F, I
BALSAMINACEAE						
Impatiens glandulifera Royle	Ken				1	D, H
Impatiens noli-tangere L.	Ap				2	F
Impatiens parviflora DC.	Ken				5	C
BERBERIDACEAE						
Berberis vulgaris L.	Ap				2	H
BETULACEAE						
Alnus glutinosa (L.) Gaertn.	Ap				4	F, G
Alnus incana (L.) Moench	Ap	RG			1	F, G
Betula pendula Roth	Ap				4	C, E, H
Betula pubescens Ehrh.	Ap				3	F, G
Carpinus betulus L.	Ap				3	F, G
Corylus avellana L.	Ap				4	C, D, H
BORAGINACEAE						
Anchusa arvensis (L.) M. Bieb.	Ar				3	E
Anchusa officinalis L.	Ap				2	E, H
Cynoglossum officinale L.	Ap				2	D, E, H
Echium vulgare L.	Ap				2	E
Lithospermum officinale L.	Ap	RG	VU	V	1	I
Myosotis arvensis (L.) Hill	Ar				4	D, E, H, I
Myosotis palustris (L.) L. Emend. Rchb.	Ap				2	F, G
Myosotis stricta Link ex Roem. & Schult.	Ap				2	A, I
Symphytum officinale (L.)	Ap				2	F, G
BRASSICACEAE						
Alliaria petiolata (M. Bieb) Cavara & Grande	Ap				4	C, D, F, G
Arabidopsis thaliana (L.) Heynh.	Ap				5	A, E, I
Arabis glabra (L.) Bernh.	Ap	RG			1	A
Armoracia rusticana P. Gaertn., B. Mey. & Scherb.	Ar				2	D, E
Barbarea vulgaris R. Br.	Ap	RG			1	D
Berteroa incana (L.) DC.	Ap				3	D, E, H
Bunias orientalis L.	Ken	RG			1	D
Cakile maritima Scop.	Ap		NT		2	B
Capsella bursa-pastoris (L.) Medik.	Ar				5	D, E, I
Cardamine amara L.	Ap				1	F
Cardamine pratensis L.	Ap				4	F
Cardaminopsis arenosa (L.) Hayek	Ap				4	A, E

1	2	3	4	5	6	7
Descurainia sophia (L.) Webb ex Prantl	Ar				4	D, E, A
Diplotaxis muralis (L.) DC.	Ken	RG			1	D
Erophila verna (L.) Chevall	Ap				3	A, E, I
Erysimum cheiranthoides L.	Ap				3	E, I
Hesperis matronalis L.	Ken				2	D, H
Lepidium ruderale L.	Ar				2	D, E
Lunaria rediviva L.	Ap	RG	EN	E	1	H
Raphanus raphanistrum L.	Ar				4	D, E, I
Raphanus sativus L.	Erg				1	E
Rorippa palustris (L.) Besser	Ap				2	F, G
Rorippa silvestris (L.) Besser	Ap				1	F, G
Sinapis arvensis L.	Ar				4	E, I
Sisymbrium officinale (L.) Scop.	Ar				4	D, E, I
Teesdalea nudicaulis (L.) R. Br.	Ap				3	A, E, I
Thlaspi arvense L.	Ar				5	E, I
BUXACEAE						
Buxus sempervirens L.	Erg				1	H
CALLITRICHACEAE						
Callitriche cophocarpa Sendtn.	Ap				1	G
CAMPANULACEAE						
Campanula patula L.	Ap				1	E, H
Campanula rotundifolia L.	Ap				2	C, H, I
Jasione montana L.	Ap				3	A, E
CANNABACEAE						
Humulus lupulus L.	Ap				2	C, H
CAPRIFOLIACEAE						
Lonicera periclymenum L.	Ap	!!	VU		4	A, H
Lonicera xylosteum L.	Ap				2	A
Sambucus nigra L.	Ap				4	C, D, A
Symphoricarpos albus (L.) S.F. Blake	Ken				3	H
Viburnum opulus L.	Ap	!			2	A, G
CARYOPHYLLACEAE						
Agrostemma githago L.	Ar				2	E, I
Arenaria serpyllifolia Schrad.	Ap				3	A, I
Cerastium arvense L.	Ap				2	E, I
Cerastium holosteoides Fr. emend. Hyl.	Ap				3	A, I
Dianthus deltoides L.	Ap				2	A, E
Herniaria glabra L.	Ap				3	D, H
Honckenya peploides (L.) Ehrh.	Ap	RG			1	B
Lychnis flos-cuculi L.	Ap				3	C, F, H
Melandrium rubrum (Weigel) Garcke	Ap				2	C, F, H
Moehringia trinervia (L.) Clairv.	Ap				2	D, E
Sagina procumbens L.	Ap				2	H
Saponaria officinalis L.	Ap				4	C, E, F
Scleranthus annuus L.	Ar				3	E, A, I
Scleranthus perennis L.	Ap				2	A, E
Silene nutans L.	Ap	RG			1	A
Silene vulgaris (Moench) Garcke	Ap				2	D, E, H
Spergula arvensis L.	Ar				4	A, E, I
Spergularia rubra (L.) J. Presl & Presl	Ap				2	E, I
Stellaria holostea L.	Ap				4	C, H
Stellaria media (L.) Vill.	Ap				5	C,D,E,H, I
CELASTRACEAE						
Euonymus europaea L.	Ap				2	C, A
CHENOPODIACEAE						
Atriplex patula L.	Ar				3	D, E, H, I
Atriplex prostrata Boucher ex DC.	Ap				1	A
Chenopodium album L.	Ap				5	D, E, H, I
Chenopodium glaucum L.	Ap	RG	NT		1	F
Chenopodium hybridum L.	Ap				1	E
Chenopodium polyspermum L.	Ap				1	E, I
Chenopodium rubrum L.	Ap				1	F
Corispermum leptopterum (Asch.) Iljin	Ap	RG			1	A

1	2	3	4	5	6	7
Salicornia europaea L.	Ap	!!, RG	RE	E	1	B
Salsola kali L.	Ap	RG	VU	V	1	B
CONVALLARIACEAE						
Convallaria majalis L.	Ap	!			2	C, H
Maianthemum bifolium (L.) F.W. Schmidt	Ap				2	C, H
Polygonatum multiflorum (L.) All.	Ap				2	C, H
CONVOLVULACEAE						
Calystegia sepium (L.) R. Br.	Ap				2	F, H
Convolvulus arvensis L.	Ap				2	E, I
CRASSULACEAE						
Sedum acre L.	Ap				3	A, E, H
Sedum maximum (L.) Hoffm.	Ap				1	A
CUCURBITACEAE						
Bryonia alba L.	Ken				2	D, H
Sicyos angulata L.	Ken				2	H
CUPRESSACEAE						
Juniperus communis L.	Ap				2	C, H
CUSCUTACEAE						
Cuscuta europaea L.	Ap				1	D
CYPERACEAE						
Carex acutiformis Ehrh.	Ap				2	F, G
Carex arenaria L.	Ap	!			3	A
Carex flacca Scherb.	Ap				1	C, F
Carex gracilis Curtis	Ap				3	G
Carex hirta L.	Ap				2	E
Carex lepidocarpa Tausch	Ap	RG	V	V	1	G
Carex nigra Rreichard	Ap				1	C, G
Carex pseudocyperus L.	Ap				3	F, G
Carex vesicaria L.	Ap				2	F
DENNSTAEDTIACEAE						
Pteridium aquilinum (L.) Kuhn	Ap				2	C
DIPSACACEAE						
Knautia arvensis (L.) J.M. Coult.	Ap				3	A, E
DRYOPTERIDACEAE						
Dryopteris carthusiana (Vill.) H.P. Fuchs	Ap				1	C, F
Dryopteris filix-mas (L.) Schott	Ap				4	G, H
ELAEAGNACEAE						
Hippophaë rhamnoides L.	Ap	!!			2	A, H
EMPETRACEAE						
Empetrum nigrum L.	Ap			R	3	A, C
EQUISETACEAE						
Equisetum arvense L.	Ap				5	E, I
Equisetum palustre L.	Ap				1	F
Equisetum sylvaticum L.	Ap				1	C
ERICACEAE						
Calluna vulgaris (L.) Hull	Ap				3	C
Ledum palustre L.	Ap				1	F
Vaccinium myrtillus L.	Ap				3	C
Vaccinium vitis-idaea L.	Ap				4	C
EUPHORBIACEAE						
Euphorbia cyparissias L.	Ap				2	A, E
Euphorbia helioscopia L.	Ar				3	E, I
Euphorbia peplus L.	Ar				1	I
FABACEAE						
Anthyllis vulneraria L.	Ap				3	A
Caragana arborescens Lam.	Erg				1	A
Coronilla varia L.	Ap				1	D, C
Lathyrus japonicus Willd. subsp. *maritimus* (L.) P.W. Ball	Ap				1	A

1	2	3	4	5	6	7
Lathyrus pratensis L.	Ap				2	F, H
Lathyrus sylvestris L.	Ap				1	C
Lotus corniculatus L.	Ap				2	D, E
Lotus uliginosus Schkuhr	Ap				1	E
Lupinus polyphyllus Lindl.	Ken				2	A, E
Medicago falcata L.	Ap				1	E
Medicago lupulina L.	Ap				2	A, D, E
Medicago minima (L.)	Ap	RG	VU		1	A
Medicago sativa L.	Ken				2	E, I
Melilotus alba Medik.	Ap				3	D, E, I
Melilotus officinalis (L.) Pall.	Ap				2	D, E
Ononis arvensis L.	Ap	!, RG			1	D, E
Ornithopus perpusillus L.	Ap	RG			1	A
Pisum sativum L.	Erg				2	E, H, I
Robinia pseudoacacia L.	Ken				1	A, H
Sarothamnus scoparius (L.) Wimm	Ap				3	A, D, H
Trifolium arvense L.	Ap				3	A, E
Trifolium aureum Pollich	Ap				1	E
Trifolium dubium Sibth.	Ap				1	E, H
Trifolium hybridum L.	Ap				1	D, E
Trifolium pratense L.	Ap				3	D, E, H
Trifolium repens L.	Ap				3	C, D, E, H, I
Vicia cracca L.	Ap				1	D, E
Vicia grandiflora Scop.	Ken	RG			1	E
Vicia hirsuta (L.) Gray	Ar				3	D, E, I
Vicia sativa L.	Ar				3	E, I
Vicia sepium L.	Ap				2	D
FAGACEAE						
Fagus sylvatica L.	Ap				3	C, D, H
Quercus petraea (Matt.) Liebl.	Ap				1	C, H
Quercus robur L.	Ap				3	C, H
Quercus rubra L.	Ken				1	H
FUMARIACEAE						
Fumaria officinalis L.	Ar				2	E, I
GENTIANACEAE						
Centaurium erythraea Rafn subsp. *erythraea*	Ap	!!			1	A
GERANIACEAE						
Erodium cicutarium (L.) L' Hér.	Ap				4	A, E, I
Geranium pratense L.	Ap				3	E, H
Geranium pusillum Burm. F. ex L.	Ar				3	D, E, I
Geranium robertianum (Hoffm.) Newman	Ap				3	C, E, H
HIPPOCASTANACEAE						
Aesculus hippocastanum L.	Ken				3	A
HYDROCHARITACEAE						
Elodea canadensis Michx.	Ken				1	G
Stratiotes aloides L.	Ap				1	G
HYDROCOTYLACEAE						
Hydrocotyle vulgaris L.	Ap				1	G
HYPERICACEAE						
Hypericum perforatum L.	Ap				4	D, E, H, I
IRIDACEAE						
Iris pseudacorus L.	Ap				3	G
JUNCACEAE						
Juncus bufonius L.	Ap				4	E, F, I
Juncus conglomeratus L. emend. Leers	Ap				2	F
Juncus effusus L.	Ap				2	F
Juncus squarrosus L.	Ap				1	C
Juncus tenuis Willd.	Ken				1	F

1	2	3	4	5	6	7
LAMIACEAE						
Ajuga reptans L.	Ap				2	E, F
Ballota nigra L.	Ar				2	D
Galeobdolon luteum Huds.	Ap				2	C, H
Galeopsis speciosa Mill.	Ap				3	E, F
Galeopsis tetrahit L.	Ap				4	D, E, H, I
Glechoma hederacea L.	Ap				3	E, H
Lamium album L.	Ar				5	D, E, H, I
Lamium amplexicaule L.	Ar				2	D, H, I
Lamium maculatum L.	Ap				2	D, H
Lamium purpureum L.	Ar				3	D, E, H, I
Leonurus cardiaca L.	Ar				2	D, F
Lycopus europaeus L.	Ap				2	D, F
Mentha aquatica L.	Ap				2	F, G
Mentha arvensis L.	Ap				3	F, G
Nepeta cataria L.	Ar	RG	VU		1	A
Prunella vulgaris L.	Ap				3	D, E, H
Scutellaria galericulata L.	Ap				2	E, F
Stachys palustris L.	Ap				4	F, I
Stachys sylvatica L.	Ap				3	C
Thymus serpyllum L. emend. Fr.	Ap				2	A, E
LEMNACEAE						
Lemna minor L.	Ap				2	G
Spirodela polyrhiza (L.) Schleid.	Ap				2	G
LILIACEAE						
Gagea lutea (L.) Ker Gawl.	Ap				1	H
LORANTHACEAE						
Viscum album L.	Ap				2	D
MALVACEAE						
Malva alcea L.	Ar				1	D, E
Malva neglecta Wallr.	Ar				2	D
Malva sylvestris L.	Ar				1	C
MONOTROPACEAE						
Monotropa hypopitys L.	Ap				1	C, G
NYMPHAEACEAE						
Nuphar lutea (L.) Sibth. & Sm.	Ap				1	G
Nymphaea alba L.	Ap				1	G
OLEACEAE						
Fraxinus excelsior L.	Ap				3	C, H
Syringa vulgaris L.	Erg				4	D, H
ONAGRACEAE						
Chamaenerion angustifolium (L.) Scop.	Ap				3	D, E
Epilobium ciliatum Raf.	Ken				2	D, H
Epilobium hirsutum L.	Ap				2	D, E
Epilobium montanum L.	Ap				2	E
Epilobium parviflorum Schreb.	Ap				2	E
Epilobium roseum Schreb.	Ap				2	F, H
Oenothera biennis L.	Ap				3	E
ORCHIDACEAE						
Epipactis atrorubens (Hoffm.) Besser	Ap	!!	VU	V	2	A
Goodyera repens (L.) R. Br.	Ap	!!	NT	V	2	A
Listera cordata (L.) R. Br.	Ap	!!			1	A
OXALIDACEAE						
Oxalis acetosella L.	Ap				3	C, E, H
Oxalis fontana Bunge	Ken				2	E, H
PAPAVERACEAE						
Chelidonium majus L.	Ap				3	D, E, H
Papaver argemone L.	Ar				2	D, I
Papaver dubium L.	Ar				1	D, I
Papaver somniferum L.	Erg				2	E
Papaver rhoeas L.	Ar				3	I

1	2	3	4	5	6	7
PINACEAE						
Picea abies (L.) H. Karst.	Erg				4	C, H
Picea omorika (Pančić) Purk.	Ken				1	A
**Pinus mugo* Turra	Erg	!!			1	A
Pinus nigra J.F. Arnold	Erg				3	A
Pinus sylvestris L.	Ap				4	A, C, H
Pseudotsuga menziesii (Mirb.) Franco	Erg				2	C, H
PLANTAGINACEAE						
Plantago intermedia Gilib.	Ap				2	D, F
Plantago lanceolata L.	Ap				4	E, H, I
Plantago major L.	Ap				5	D, H, I
PLUMBAGINACEAE						
Armeria maritima (Mill.) Willd. subsp. *maritima*	Ap				3	A, E
POACEAE						
Agrostis stolonifera L.	Ap				2	E, F
Agrostis capillaris L.	Ap				1	E
Aira praecox L.	Ap				1	A
Alopecurus pratensis L.	Ap				2	F
Ammophila arenaria (L.) Link	Ap				3	A, B
Anthoxanthum odoratum L.	Ap				3	E, F
Apera spica-venti (L.) P. Beauv.	Ar				4	D, E, I
Arrhenatherum elatius (L.) P. Beauv. ex J. Presl & C. Presl	Ap				3	E, H
Bromus hordeaceus L.	Ap				2	A, E
Bromus inermis Leyss.	Ap	RG			1	A
Bromus sterilis L.	Ar				1	E
Bromus tectorum L.	Ar				1	A
Calamagrostis arundinacea (L.) Roth	Ap				2	D
Calamagrostis epigejos (L.) Roth	Ap				1	A, E
Corynephorus canescens (L.) P. Beauv.	Ap				3	A, E
Dactylis glomerata L.	Ap				4	D, E, H, I
Deschampsia caespitosa (L.) P. Beauv.	Ap				3	A, E
Deschampsia flexuosa (L.) Trin.	Ap				4	C, E
Echinochloa crus-galli (L.) P. Beauv.	Ar				3	E, I
Elymus repens (L.) Gould	Ap				5	D, E, H, I
Festuca gigantea (L.) Vill.	Ap				2	C
Festuca ovina L.	Ap				3	A
Festuca pratensis Huds.	Ap				3	E, F
Festuca rubra L.	Ap				3	A
Holcus lanatus L.	Ap				3	E, H
Leymus arenarius (L.) Hochst.	Ap				3	A
Lolium perenne L.	Ap				4	D, E
Milium effusum L.	Ap				2	E, F
Phalaris arundinacea L.	Ap				2	F, G
Phleum pratense L.	Ap				3	E
Phragmites australis (Cav.) Trin. ex Steud.	Ap				3	G
Poa annua L.	Ap				5	D, E, H, I
Poa nemoralis L.	Ap				4	C, H
Poa pratensis L.	Ap				3	E, F
Poa trivialis L.	Ap				2	C, F
Setaria pumila (Poir.) Roem. & Schult.	Ar				3	D, E, I
Trisetum flavescens (L.) P. Beauv.	Ap				1	A
POLYGALACEAE						
Polygala vulgaris L.	Ap				2	D, E
POLYGONACEAE						
Fallopia convolvulus (L.) Á. Löve	Ar				5	D, E, H, I
Polygonum amphibium L.	Ap				2	F, G
Polygonum aviculare L.	Ap				4	D, E, H, I
Polygonum bistorta L.	Ap				2	E, F
Polygonum hydropiper L.	Ap				2	D, F, I
Polygonum lapathifolium subsp. *lapathifolium*	Ar				2	E, I

1	2	3	4	5	6	7
Polygonum lapathifolium subsp. *pallidum* (With.) Fr.	Ap				2	E, I
Polygonum persicaria L.	Ap				2	E, H, I
Reynoutria japonica Houtt.	Ken				3	D, E, H
Rumex acetosa L.	Ap				3	D, E, F, I
Rumex acetosella L.	Ap				4	A, E, H, I
Rumex crispus L.	Ap				2	D, E
Rumex hydrolapathum L.	Ap				1	G
Rumex obtusifolius L.	Ap				2	D, E, H
POLYPODIACEAE						
Polypodium vulgare L.	Ap	!!			2	A, C
PRIMULACEAE						
Anagallis arvensis L.	Ar				2	E, I
Lysimachia nummularia L.	Ap				1	F
Lysimachia vulgaris L.	Ap				3	F, G
Trientalis europaea L.	Ap				1	A
PYROLACEAE						
Chimaphila umbellata (L.) W.P.C. Barton	Ap	!!, RG			1	A
Moneses uniflora (L.) A. Gray	Ap	RG			1	A
Orthilia secunda (L.) House	Ap	RG			1	A
Pyrola chlorantha Sw.	Ap	RG			1	A
RANUNCULACEAE						
Actaea spicata L.	Ap	RG	LC	V	1	C
Anemone nemorosa L.	Ap				3	C, H
**Aquilegia vulgaris* L.	Erg	!!, RG	VU	V	1	C, H
Caltha palustris L.	Ap				3	F, G
Consolida regalis Gray	Ar	RG			1	I
Ficaria verna Huds.	Ap				4	C, F, H
Hepatica nobilis Schleb.	Ap	!!			3	A, H
Ranunculus acris L.	Ap				4	D, E, F, I
Ranunculus bulbosus L.	Ap				1	D
Ranunculus lanuginosus L.	Ap				1	F
Ranunculus repens L.	Ap				5	E, F, H
Ranunculus sceleratus L.	Ap				1	F, G
Thalictrum aquilegiifolium L.	Ap				1	F
RHAMNACEAE						
Frangula alnus Mill.	Ap	!			3	C, H
Rhamnus cathartica L.	Ap				1	C
ROSACEAE						
Agrimonia eupatoria L.	Ap				2	F
Alchemilla gracilis Opiz	Ap				1	F
Alchemilla monticola Opiz	Ap				2	F
Aphanes arvensis L.	Ar				2	E, I
Cerasus avium (L.) Moench	Erg				2	D, H
Crataegus laevigata (Poir.) DC.	Ap				1	C, H
Crataegus monogyna Jacq.	Ap				1	C, H
Filipendula ulmaria (L.) Maxim.	Ap				2	F, G
Fragaria vesca L.	Ap				3	C, H
Geum rivale L.	Ap				2	F
Geum urbanum L.	Ap				3	E, A
Padus avium Mill.	Ap				2	C
Potentila anserina L.	Ap				4	D, E, H, I
Potentila argentea L.	Ap				3	A
Potentila erecta (L.) Raeusch.	Ap				2	E, H
Prunus cerasifera Ehrh.	Ken				3	C, H
Prunus spinosa L.	Ap				3	C, H
Pyrus pyraster (L.) Burgsd.	Ap				2	D
Rosa canina L.	Ap				4	D
Rosa rubiginosa L.	Ap				1	A
Rosa rugosa Thunb.	Ken				3	D, H
Rubus caesius L.	Ap				4	C, H
Rubus idaeus L.	Ap				4	C, H
Rubus plicatus Weihe & Nees	Ap				2	A
Sorbus aucuparia L.	Ap				3	C, D, H

1	2	3	4	5	6	7
Spiraea salicifolia L.	Erg				3	H
RUBIACEAE						
Galium mollugo L.	Ap				2	E, H
Galium odoratum (L.) Scop.	Ap	!			1	C
SALICACEAE						
Populus alba L.	Ap				2	C, H
Populus nigra L. 'Italica'	Erg				1	A, H
Populus tremula L.	Ap				3	C, E, H
Salix alba L.	Ap				2	D, H
Salix caprea L.	Ap				2	F, H
Salix cinerea L.	Ap				2	F, H
Salix fragilis L.	Ap				2	D, G
Salix purpurea L.	Ap				1	F, G
Salix repens L. subsp. *repens* var. *arenaria* (L.) Ser.	Ap				2	A
Salix vinimalis L.	Ap				3	E, G
SAXIFRAGACEAE						
Ribes alpinum L.	Ap	RG			1	A, C
Ribes rubrum L.	Erg					H
Ribes uva-crispa L.	Ap				1	D, H
Saxifraga granulata L.	Ap				2	A, H
SCROPHULARIACEAE						
Cymbalaria muralis P. Gaertn., Mey. & Scherb.	Ken	RG			1	J
Euphrasia rostkoviana Hayne	Ap				3	C, F
Linaria vulgaris Mill.	Ap				1	A, E
Melampyrum pratense L.	Ap				2	C, E
Odontites serotina (Lam.) Rchb. s.	Ap				2	D, E, F, I
Scrophularia nodosa L.	Ap				2	C
Verbascum nigrum L.	Ap				2	A, E
Veronica arvensis L.	Ar				3	E, H, I
Veronica beccabunga L.					1	F, G
Veronica chamaedrys L.	Ap				2	D, E, I
Veronica officinalis L.	Ap				2	C
Veronica persica Poir.	Ken				1	
SOLANACEAE						
Lycium barbarum L.	Ken				2	H
Solanum dulcamara L.	Ap				3	F, G
Solanum nigrum L. emend. Mill.	Ar				2	F, G
Solanum tuberosum L.	Erg				2	E, I
TAXACEAE						
**Taxus baccata* L.	Erg	!!			1	C, H
TILIACEAE						
Tilia cordata Mill.	Ap				2	C, D, A
Tilia platyphyllos Scop.	Ap	RG			1	H
TRILLIACEAE						
Paris quadrifolia L.	Ap	RG			1	C
ULMACEAE						
Ulmus laevis Pall.	Ap		NT		2	C, H
Ulmus minor Mill. emend. Richens	Ap		NT		2	C, H
URTICACEAE						
Urtica dioica L.	Ap				5	D, E, H, I
Urtica urens L.	Ar				4	E, H
VALERIANACEAE						
Valeriana officinalis L.	Ap				2	F, G
Valeriana sambucifolia J.C. Mikan	Ap				1	F
VIOLACEAE						
Viola arvensis Murray	Ar				4	E, H, I
Viola odorata L.	Ar				3	C, H
Viola tricolor L.	Ap				3	A
WOODSIACEAE						
**Matteucia struthiopteris* (L.) Tod.	Erg	!!, RG	NT	V	1	A

Alnus incana, *Anthemis tinctoria*, *Arabis glabra*, *Artemisia campestris* subsp. *sericea*, *Barbarea vulgaris*, *Bromus inermis*, *Bunias orientalis*, *Carlina vulgaris*, *Chimaphila umbellata*, *Consolida regalis*, *Corispermum leptopterum*, *Cymbalaria muralis*, *Diplotaxis muralis*, *Echinops sphaerocephalus*, *Filago arvensis*, *Honckenya peploides*, *Moneses uniflora*, *Ononis arvensis*, *Ornithopus perpusillus*, *Orthilia secunda*, *Paris quadrifolia*, *Petasites spurius*, *Pyrola chlorantha*, *Ribes alpinum*, *Silene nutans*, *Tilia platyphyllos* and *Vicia grandiflora*.

The flora of the analysed area comprises 360 apophytes, 59 archeophytes, 38 kenophytes and 23 ergasiophytes. Taxa covered by full legal protection in the investigated area are *Centaurium erythraea* subsp. *erythraea*, *Chimaphila umbellata*, *Hepatica nobilis*, *Hippophaë rhamnoides*, *Listera cordata*, *Pinus mugo*, *Polypodium vulgare*. Species covered by partial protection and found in Jarosławiec include *Carex arenaria*, *Convallaria majalis*, *Frangula alnus*, *Galium odoratum*, *Hedera helix*, *Helichrysum arenarium*, *Ononis arvensis*, *Viburnum opulus* and *Vinca minor*. Legally protected species, at the same time rare and vulnerable in the Gdańsk Pomerania region (Markowski and Buliński 2004) and Western Pomerania (Żukowski and Jackowiak 1995) include *Aquilegia vulgaris*, *Epipactis atrorubens*, *Eryngium maritimum*, *Goodyera repens*, *Lonicera periclymenum*, *Matteucia struthiopteris* and *Taxus baccata*.

Among identified taxa, regionally rare ones include *Achillea ptarmica*, *Aethusa cynapium*, *Alnus incana*, *Anthemis tinctoria*, *Arabis glabra*, *Artemisia campestris* subsp. *sericea*, *Barbarea vulgaris*, *Bromus inermis*, *Bunias orientalis*, *Carlina vulgaris*, *Chimaphila umbellata*, *Consolida regalis*, *Corispermum leptopterum*, *Cymbalaria muralis*, *Diplotaxis muralis*, *Echinops sphaerocephalus*, *Filago arvensis*, *Honckenya peploides*, *Moneses uniflora*, *Ononis arvensis*, *Ornithopus perpusillus*, *Orthilia secunda*, *Paris quadrifolia*, *Petasites spurius*, *Pyrola chlorantha*, *Silene nutans*, *Ribes alpinum*, *Tilia platyphyllos* and *Vicia grandiflora*.

In the analysed area at the foot of the cliff *Salicornia europaea* was found, a regionally extinct species (RE) in the Gdańsk Pomerania and endangered species (E) in the Western Pomerania regions. Moreover, in the spa park at the promenade *Lunaria rediviva* was observed, an endangered species (E) both in the Gdańsk Pomerania and in the Western Pomerania (Żukowski and Jackowiak 1995, Markowski and Buliński 2004).

The survey did not confirm the incidence on the cliff of species, previously reported by German researchers (Holzfuss 1924 and herbarium collections of Słupsk pastors, Reverend Bannier and Otte from the years 1927-1928), i.e. *Agrimonia procera* Walor, *Linaria odora* (M. Bieb.) Fisch. and *Potentilla neumanniana* Rchb. The absence of these species is probably connected with the very active recession of the cliff edge (Hartnack 1926). Other species, previously recorded in Jarosławiec and not observed there at present, include *Blysmus rufus* (Huds.) Link., *Botrychium lunaria* (L.) Sw., *B. matricariifolium* (Retz.) A. Braun ex W.D.J. Koch, *Callitriche stagnalis* Scop., *Corallorhiza trifida* Châtel., *Gentianella campestris* (L.) Börner, *Juncus ranarius* J.O.E. Perrier & Songeon, *Mentha* ×*niliaca* (Juss.) ex Jacq., *Minuartia viscosa* (Schreb.) Schinz & Thell. and *Oenanthe fistulosa* L. The absence of the above mentioned species is probably the effect of the transformation of their habitats. Species growing in damp habitats disappeared as a result of intensive land reclamation works, connected with the regulation of the Głownica river bed and the Głownicki Channel, whereas species of arid habitats, connected with the cliff top and pine coniferous forest (*Corallorhiza trifida* Châtel., *Gentianella campestris* (L.) Börner), most probably receded as a result of strong pressure of tourist traffic, connected with the construction of resort facilities.

The effect of strong anthropopressure is the incidence of several species foreign to the Jarosławiec flora, which were not reported previously by German researchers. These include e.g. *Amaranthus retroflexus*, *Bunias orientalis*, *Diplotaxis muralis*, *Epilobium ciliatum*, *Heliantus tuberosus*, *Impatiens glandulifera*, *Juncus tenuis*, *Lupinus pollyphyllus*, *Malva alcea* and *Vicia grandiflora*.

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