Biodiv. Res. Conserv. 46: 35-55, 2017

BRC
www.brc.amu.edu.pl

DOI 10.1515/biorc-2017-0008

Submitted 2.01.2017, Accepted 25.05.2017

Checklist of the vascular flora of Wielkopolska (Poland): casual alien species

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Abstract. The list of alien vascular plant species only temporarily occurring in Wielkopolska refers to the previously published list of native and permanently established plants. Together, these two lists document the vascular flora of this region at the beginning of the 21st century. The current list, like the previous one, is a result of critical analysis of both contemporary and historical data, collected since the beginning of the 19th century. All information accessible in herbarium collections, publications and unpublished materials was used. A critical analysis was conducted at the taxonomic, nomenclatural, chorological and habitat levels, based on the verification of negative information not supported by sufficient arguments. The list is presented in an alphabetical order. Information on each species includes: family affinity, life form, geographic and historic status. In cases particularly disputable, the standard characteristic of a species was supplemented with an additional commentary.

Key words: regional biodiversity assessment, flora, vascular plants, alien species, synanthropisation, Great Poland, Central Europe

1. Introduction

The appearance of alien species in the flora has been a subject of intensive research for a long time. This phenomenon was noticed already in the mid-nineteenth century by De Candolle (1855), who introduced the term of an adventive plant to literature. The classification regarding the time of introduction and the stability of occurrence of alien species in a new region was of key importance for the development of research in this area (Thellung 1918/1919). With reference to the concept of A. Thellung, many variants of the classification of alien plants and definitions of particular groups of anthropophytes were created in the twentieth century (e.g., Holub & Jirásek 1967; Kornaś 1968, 1977, 1981; Schroeder 1969; Jackowiak 1990; Protopopova 1991). Finally, an attempt was made to put in order the classification system and definitions (Pyšek *et al.* 2004), because research in this field is developing very dynamically.

In many countries and regions, the appearance of alien species is carefully analyzed and evaluated in terms of biodiversity changes and the invasion process. Alien plant species were commonly recognized in the floras of many countries (Crawley *et al.* 1996; Celesti-Grapow *et al.* 2009; Pyšek *et al.* 2012; Protopopova & Shevera 2014; Elvisto *et al.* 2016). This phenomenon has also been summed up on a European scale (Lambdon *et al.* 2008). However, it is still necessary to monitor this phenomenon both on a regional and local scale, and to pay even greater attention to casual alien species.

The subject of this paper are alien species occurring accidentally in Wielkopolska (western part of Poland) over the whole period of geobotanical research conducted in this region. The aim of the study was to evaluate the changes in regional flora resulting from the presence of accidentally introduced alien species. The checklist of casual alien species supplements the list of native and permanently established species of Wielkopolska (Jackowiak *et al.* 2013b).

The observations of alien plant species appearing in Wielkopolska have a long history (Jackowiak *et al.* 2013a). The first scientific work on this region was

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published at the end of the 19th century: "Immigration of some plants in the city of Poznań after 1850 year …" (Pfuhl 1896). In the first half of the twentieth century, two works are primarily noteworthy: (*i*) "The newcomers and waifs in the vegetation of Poznań" (Szulczewski 1931) and (*ii*) "Geographical analysis of the synanthropic flora of the city of Poznań" (Krawiecowa 1951). Both in the second half of the twentieth century and presently, foreign plant species have been as standard included in local floristic studies. Particular attention has been paid to alien plant species in geobotanical monographs devoted to anthropogenic changes of the flora of Poznan (Jackowiak 1990, 1993), Gniezno Lake District (Chmiel 1993) and archeological objects (Celka 1999, 2004). A lot of data from Wielkopolska has been included in works concerning the entire country (Rostański & Sowa 1986/1987; Tokarska-Guzik 2005; Urbisz 2012).

2. Material and methods

2.1. Limits of the research area and material

The area of study almost entirely coincides with the Wielkopolska-Kujawy Lowland, thus, it corresponds to a second-level unit in the geobotanical division of Poland (Szafer 1972). The research area also included fragments of two other geobotanical units: the Northern Marginal Plateau Region and Trzebnicko-Ostrzeszowskie Hills.

Similarly as in our previous publications (e.g., Żukowski & Jackowiak 1995; Jackowiak *et al.* 2013a, 2013b), Wielkopolska is defined in this study within broad limits, covering both Kujawy (in the east) and Ziemia Lubuska (Central Nadodrze) in the west (Fig. 1). In total, the area of research covered about 50 thousand km^2.

The list of plant species found in the Wielkopolska region includes data from all available literature sources, as well as materials collected in the herbarium of Adam Mickiewicz University (POZ), and verified own and other authors' data not yet published. The main list of sources is included in the work on the history of floristic studies in Wielkopolska (Jackowiak *et al.* 2013a). Currently, it has been supplemented with publications that appeared in 2013-2017.

2.2. Taxonomy, nomenclature and basis for species classification

The alphabetical list of alien species not established in the vascular flora of Wielkopolska includes: name of the species and its author, in some cases also synonyms, family name, life form, information on native range, classification according to the source of introduction, and data regarding the observation period Additional notes have been added to several dozen of species.

The taxonomy, nomenclature and biological form of species, as well as the region of origin, were determined primarily on the basis of the flora of Rothmaler *et al.* (2005), Jäger *et al.* (2008) and the Plant List (2013). In

Fig. 1. Location and borders of the Wielkopolska Region (according to Jackowiak *et al.* 2007)

general, species names are given, only in justified cases, subspecies names were used (e.g. *Lathyrus japonicus* Willd. subsp. *maritimus* (L.) P. W. Ball). The list also includes hybrid species (e.g.,. *Mentha ×piperita* L.).

The following categories of plants are included in the classification of biological forms: (1) annual plants, including summer annual plants that sprout, flower, produce seeds, and die during the warmer months of the year, as well as annual plants that germinate in autumn or winter, live through the winter, then bloom in winter or spring; (2) biennial plants that take two years to complete their biological lifecycle. In the first year, the plant grows leaves, stems, and roots (vegetative structures), then it enters a period of dormancy over the colder months. Usually, the stem remains very short and leaves are low to the ground, forming a rosette; (3) perennial, monocarpic plants that live more than two years, but they die after the first fruiting; (4) perennial, polycarpic plants that live, bloom and bear fruit for more than two years; (5) dwarf shrubs and sub-shrubs; (6) shrubs and trees.

In terms of the source of the introduction, casual alien species (diaphytes sensu Kornaś 1981) were divided into two subgroups: ephemerophytes and ergasiophygophytes (Thellung 1918/19). The first sub-group includes species not cultivated in Wielkopolska and neighboring regions, but brought from other areas ("occasional escapees" sensu Munz 1968, and "ephemeral taxa" sensu Elven & Elvebakk 1996). They correspond to the term "adventive" introduced by De Candolle (1855), later often used both in this and a much broader sense (Muhlenbach 1979; Burda 1991; Provost 1998). Only for species belonging to this subgroup, the region of origin was given. The second subgroup includes casual alien species spreading from cultivation ("waifs" sensu Hickman 1993).

Important information, especially in the case of ephemeral species, is their observation date. Taking into account the history of floristic research in Wielkopolska (Jackowiak *et al.* 2013a), data on the appearance of species were divided into four periods: (1) until 1901, (2) in the years 1901-1951; (3) in the years 1952-2001; (4) after 2001. It was also indicated whether the species was observed once or repeatedly.

3. Results

3.1. Systematic structure of casual alien plant flora

The list of alien plants appearing ephemerally in Wielkopolska from the beginning of the 19th century to the present includes 481 species (Appendices 1-2). They represent 297 genera and 80 families.

The distribution of species within families is very diverse. Close to 60% of the flora of casual alien plants consists of species belonging to 10 families that are the most numerous in Wielkopolska (Table 1). On the other hand, worth of noting is the high number of families represented by a single species (33 families), and two species (14 families).

Table 1. Species diversity of families represented in the flora of casual alien plants of Wielkopolska

Family name	Number of species in the family	Number of families	Total number of species	%
Asteraceae	62	1	62	12.9
Poaceae	46	1	46	9.6
Brassicaceae	37	1	37	7.7
Rosaceae	34	1	34	7.1
Fabaceae	30	1	30	6.2
Liliaceae	21	1	21	4.4
Lamiaceae	19	1	19	4.0
Caryophyllaceae	15	1	15	3.1
Apiaceae	14	1	14	2.9
Chenopodiaceae, Solanaceae	12	2	24	5.0
Onagraceae, Polygonaceae	9	2	18	3.7
Malvaceae	8	1	8	1.7
Boraginaceae, Papaveraceae, Pinaceae	7	3	21	4.4
Amaranthaceae, Cucurbitaceae, Ranunculaceae, Salicaceae	6	4	24	5.0
Campanulaceae, Cuscutaceae, Scrophulariaceae	5	3	15	3.1
Caprifoliaceae, Euphorbiaceae, Linaceae, Resedaceae, Rubiaceae	4	5	20	4.2
Convolvulaceae, Fumariaceae, Plantaginaceae, Violaceae	3	4	12	2.5
see Appendix 1 and 2	2	14	28	5.8
see Appendix 1 and 2	1	33	33	6.9
Total		**80**	**481**	**100.0**

Table 2. Species diversity of genera represented in the flora of casual alien plants of Wielkopolska

Names of genera	Number of species in genus	Number of genera	Total number of species	%
Allium	9	1	9	1.9
Oenothera	8	1	8	1.7
Bromus, Chenopodium, Rosa	7	3	21	4.4
Amaranthus, Artemisia, Centaurea, Spiraea, Vicia	6	5	30	6.2
Cuscuta, Lathyrus, Silene	5	3	15	3.1
Linum, Pinus, Prunus, Rumex, Salix, Solanum	4	6	24	5.0
see Appendix 1 and 2	3	21	63	13.1
see Appendix 1 and 2	2	54	108	22.5
see Appendix	1	203	203	42.2
Total		**297**	**481**	**100.0**

The distribution of species in genera is very characteristic. The most numerous group consists of genera represented by single or two species. These genera constitute together nearly 65% of the analyzed flora (Table 2).

3.2 Biological spectrum of casual alien plant flora

In the flora of casual alien plants of Wielkopolska dominate annual species, whose share exceeds 42% (Fig. 2). A significant share have also perennial and polycarpic herbaceous plants, followed by trees and shrubs. On the other hand, biennial plants and shrubs and semi-shrubs are of minor importance. The group "other" includes species that may occur in various biological forms, but the lack of information from the region prevents their unambiguous determination.

3.3. Geographical origin, sources of dispersion and the frequency of records of casual alien species

Among casual alien species, escapees from crops predominate, constituting 60.3% of the analyzed flora (290 species). Thus, the share of foreign plants, introduced directly from other geographical areas, is 39.7% (191 species). In many cases, it was not easy to classify a species into a proper group, due to the limited knowledge of crops grown within the contemporary borders of Wielkopolska, especially in the 19th and the first half of the 20th century. For this reason, the

Fig. 2. Share of biological forms in the flora of casual alien plants of Wielkopolska

Table 3. The number of ephemerophytes representing different continents and range groups in the flora of Wielkopolska

North America	South and Central America	Africa	Europe	Asia	Australia
Total number of species					
22	22	71	127	31	2
Number of species in the range group					
1					
			1		
21					
	8				
	13				
		9			
		39			
		22			
			4		
			30		
			34		
				8	
					1

status of certain species may prove to be controversial.

The frequency of records of casual alien species is very low. Over 70% of them were observed only once (338 species), while about 30% were recorded from two to several times (136 species). It is worth noting that there is a significant difference between the two subgroups of casual alien species. Over 81% of ephemerophytes (155 species) were recorded only once. However, ergasiophygophytes are significantly more frequently observed, of which about 63.1% of species have been observed only once (183 species).

The phytogeographic analysis of ephemerophytes shows that in the flora of Wielkopolska, plants from all continents are represented (Table 3). The most numerous group consists of alien species whose native ranges cover Europe (66.5%). They include species with very different primary ranges covering: only Europe (30 species), southern and southwestern Europe and northern Africa (39 species), Eurasia (34 species) and finally Europe, Asia and North Africa (22 species). The second place is occupied by a group of species covering different parts of the African continent (39.3%). It is worth noting here that next to the taxa with a wider intercontinental range, there are also plants whose native range is limited to Africa (9 species). The third place is taken by a group of plants distributed in Asia (18.3%), including 8 species found naturally only on this continent. The participation of elements representing North America and South America, including Central America is the same (11.5% each). Among the ephemerophytes, one species originating from Australia was recorded.

4. Conclusion

The full list of vascular plants found in the Wielkopolska region during nearly 200 years includes more than 2,230 species (Jackowiak *et al.* 2013b). A significant part of the flora is composed of non-established species (481). This means that every fifth species (21.6%) occurs only temporarily. As the history of the invasion of many plant species shows, it is possible that at least some of casual alien taxa may become permanently established in the future. Therefore, regular monitoring of casual alien species is required. This applies to both escapees from crops, which prevail on the checklist of flora of Wielkopolska, and ephemerophytes that spread regardless of human activity.

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Appendix 1. Checklist of casual alien species of Wielkopolska – ephemerophytes

Name of species	Name of family	BF	OP	Native range
Abutilon theophrasti Med.	Malvaceae	A	4b	Asia (N China)
Achillea nobilis L.	Asteraceae	P	2a	Europe S, C; Asia W
Acroptilon repens (L.) DC.	Asteraceae	P	3b	Asia W, C
Aegilops cylindrica Host	Poaceae	A	3b, 4b	Europe S, Russia
Aegilops speltoides Tausch subsp. **ligustica** (Savign.) Zhuk. [= Aegilops ligustica Asch. & Graebn.]	Poaceae	A	2a	Medit
Amaranthus deflexus L.	Amaranthaceae	AP	4a?	S America
Amaranthus dinteri Schinz	Amaranthaceae	A	3b	Africa S
Amaranthus palmeri S. Watson	Amaranthaceae	A	3b	N America S, W
Amaranthus powellii S. Watson [= Amaranthus bouchonii Thell.]	Amaranthaceae	A	3a	N America S; S America N
Ambrosia trifida L.	Asteraceae	A	2a	N America
Ammi majus L.	Apiaceae	A	2a	Medit, Asia S, W
Amsinckia calycina (Moris) Chater	Boraginaceae	A	4a	S America S
Anacyclus radiatus Loisel.	Asteraceae	A	1a	Medit W
Anthemis austriaca Jacq.	Asteraceae	A	4a	Asia W; Europe S
Artemisia verlotiorum Lamotte	Asteraceae	P	?	Asia E (China)
Asperula arvensis L.	Rubiaceae	A	2a	Asia S, W; Africa N
Azolla filiculoides Lam.[1]	Azollaceae	AP	4a	N and S America (warm and moderate regions)
Bidens pilosa L.	Asteraceae	A	2a	S America ?
Bifora radians M. Bieb.[2]	Apiaceae	A	4a	Asia W; Europe S, E
Brachypodium distachyon (L.) P. Beauv.	Poaceae	A	2a	Medit
Briza minor L.	Poaceae	A	2a	Medit
Bromus commutatus Schrad.	Poaceae	A	2b	Europe W, S, E; Africa N; Asia W
Bromus grossus Desf. ex DC.	Poaceae	A	1a, 2a	Europe (Austria, Belgium, Italy, Luxembourg, Czech Republic, Liechtenstein)
Bromus lanceolatus Roth	Poaceae	A	2a	Medit
Bromus rigidus Roth	Poaceae	A	2a	Medit
Bromus squarrosus L.	Poaceae	A	?	Europe S; Asia S, W
Bromus briziformis Fisch. et. C. A. Mey.	Poaceae	A	1a	Asia S, W
Bromus catharticus Vahl [= Bromus willdenowii Kunth]	Poaceae	AP	4a	S America
Bunium bulbocastanum L.	Apiaceae	P	2a	Europe S, W
Bupleurum fontanesii Caruel	Apiaceae	A	2a	Medit
Calamintha menthifolia Host [= Calamintha sylvatica Bromf.]	Lamiaceae	P	2a	Medit
Camelina rumelica Velen.[3]	Brassicaceae	A	3a	Europe E, S; Asia W
Carthamus tinctorus L.	Asteraceae	A	2a	Asia (Middle East, India)
Centaurea calcitrapa L.[4]	Asteraceae	B	1a, 2a	Medit
Centaurea diluta Aiton	Asteraceae	AP	2a	Medit W
Centaurea solstitialis L.	Asteraceae	A	4a	Medit
Centaurea stenolepis A. Kern.	Asteraceae	P	4a	Europe S, E (Anatolia N-W)

[1] Oxbow lakes in the Odra valley in the vicinity of Bytom Odrzański (leg S. Rosadziński 2008, det. K. Latowski, POZ).
[2] At the railway station in Jarocin (Czarna 2005).
[3] On the railway embankment between Drawski Młyn and Krzyż Wielkopolski (Latowski 1981).
[4] The following species were also reported from Wielkopolska: *Centaurea decipiens* Thuill. and *C. pratensis* Thuill. (Szulczewski (1951). These species were not included in the checklist due to the lack of comparative materials and subsequent confirmations, as well as some taxonomic doubts.

Name of species	Name of family	BF	OP	Native range
Chenopodium pratericola Rydb.	Chenopodiaceae	A	2a	N America
Chenopodium quinoa L.	Chenopodiaceae	A	2a	S America (Ecuador, Peru, Bolivia)
Chenopodium ambrosioides L.	Chenopodiaceae	A	2a	S America; N America S
Chenopodium berlandieri Moq.	Chenopodiaceae	A	2a	N America
Chenopodium hircinum Schrader	Chenopodiaceae	A	2a	S America
Chenopodium schraderanum Schult.	Chenopodiaceae	A	?	Africa N
Chloris barbata Sw.	Poaceae	A	2a	Asia S, E, tropic
Chloris truncata R. Br.	Poaceae	B	2a	Australia
Chloris virgata Sw.	Poaceae	A	4a	Eurasia; Africa; and the Americas (the warmer temperate, subtropical, and tropical regions)
Chorispora tenella (Pall.) DC.	Brassicaceae	A	4a	Europe S, E; Asia
Citrullus lanatus (Thunb.) Matsum. et. Nakai	Cucurbitaceae	A	3a	Africa S (Namibia)
Cladanthus mixtus (L.) Oberpr. & Vogt [= Chamaemelum mixtum (L.) All.]	Asteraceae	A	2a	Medit
Claytonia perfoliata Donn ex Willd.	Portulacaceae	A	4a	N America
Cochlearia officinalis L.	Brassicaceae	BP	2a	Europe N, W, C
Coincya monensis (L.) Greuter et. Burdet s. l.	Brassicaceae	AP	2a	Europe S, W
Coleostephus myconis (L.) Rchb. f.	Asteraceae	A	2a	Medit
Commelina coelestis Willd.	Commelianaceae	P	2a	N America S
Conopodium majus (Gouan) Lorent	Apiaceae	P	2a	Europe W, S
Consolida orientalis (J. Gay) Schrödinger [= Consolida hispanica (Costa) Greuter et Burdet]	Ranunculaceae	A	4a	Medit
Corispermum nitidum Kit. ex Schult.	Chenopodiaceae	A	3a	Europe S, E, W; Asia W
Coronopus didymus (L.) Sm.	Brassicaceae	A	2a	S America
Cotula anthemoides L.	Asteraceae	A	2a	Africa S; Asia S, W
Crambe abyssinica Hochst. ex R. E. Fr.	Brassicaceae	A	?	Africa S (Abisynia)
Crepis setosa Haller f.	Asteraceae	A	1a	Europe C, S
Crepis sprengeriana (L.) All. [= Picris sprengeriana (L.) Poir.]	Asteraceae	A	2a	Medit
Crupina vulgaris Pers. ex Cass.	Asteraceae	A	1a	Europe S
Cucurbita ficifolia Bouché	Cucurbitaceae	A	2a	S America (Andes)
Cuscuta australis R. Br.	Cuscutaceae	A	3a	Australia; Asia; Europe S
Cuscuta campestris Yunck.[5]	Cuscutaceae	A	3a	S America
Cuscuta cesatiana Bertol.[6] [= Cuscuta arvensis Beyr. var. calycina Engelm.]	Cuscutaceae	A	3a	Europe S, C to Asia S, W (India)
Cuscuta gronovii Willd. ex Schult.	Cuscutaceae	A	1a, 2a	N America
Cuscuta trifolii Bab. et Gibson [= Cuscuta epithymum (L.) Nathh. subsp. trifolii (Bab. & Gibson) Beger]	Cuscutaceae	A	?	Europe W, S
Cynosurus echinatus L.	Poaceae	A	2a	Medit
Cyperus congestus Vahl	Cyperaceae	P	2a	Africa S
Cytisus elongatus Waldst. & Kit. [= Chamaecytisus glaber (L.f.) Rothm.]	Fabaceae	T	2a	Europe S (Serbia, Montenegro, Bulgaria, Romania)

[5] Railway station in Zbąszynek (leg. et det. K. Latowski 1983, POZ).
[6] Sieraków near Rawicz, on *Origanum majorana* L. and *Capsicum annuum* L. (Golenia & Bayerowa 1956).

Name of species	Name of family	BF	OP	Native range
Dactyloctenium aegyptium (L.) Willd.	Poaceae	A	2a	Africa tropic, Asia S
Dasypyrum villosum (L.) Borbás	Poaceae	A	2a	Europe E, S; Asia W
Dimorphotheca pluvialis (L.) Moench	Asteraceae	AP	2a	Africa S
Draba muralis L.	Brassicaceae	A	2a	Europe; Africa N, W; Asia W
Dracocephalum moldavica L.	Lamiaceae	A	2a	Asia (China, Sibirien, Central Asia), Europe E
Dracocephalum thymiflorum L.	Lamiaceae	A	3a	Asia W, C; Europe E
Echium plantagineum L.	Boraginaceae	AB	2a	Europe S, W; Africa N; Asia S, E
Elymus canadensis L.	Poaceae	P	4a	N America
Eragrostis mexicana (Hornem.) Link	Poaceae	A	2a	S America; N America
Eragrostis multicaulis Steud.	Poaceae	A	2a	Asia E; Europe S; Africa N
Eragrostis cilianensis (All.) Vignolo ex Janch.	Poaceae	A	4a	Eurasia; Africa
Erucastrum nasturtiifolium (Poir.) O. E. Schulz	Brassicaceae	BP	3a	Europe S, W
Erysimum crepidifolium Rchb.	Brassicaceae	BP	2a	Europe C, S
Erysimum diffusum Ehrh.	Brassicaceae	B	?	Europe S, E, C; Asia W
Euphorbia platyphyllos L.	Euphorbiaceae	A	2a	Europe (medit and subatl)
Fumaria capreolata L.	Fumariaceae	A	2a	Medit
Fumaria densiflora DC.	Fumariaceae	A	2a	Europe S (Medit); Asia C, W
Galeopsis segetum Neck.	Lamiaceae	A	2a, 4a	Europe S (Medit)
Galium parisiense L.	Rubiaceae	A	2a	Europe S, W, Africa N, Asia Minor
Galium tricornutum Dandy[7]	Rubiaceae	A	1a, 2a, 3a	Europe N, W; Africa N; Asia W
Gaudinia fragilis (L.) P. Beauv.	Poaceae	A	2a	Medit
Geranium rotundifolium L.	Geraniaceae	A	3a?	Europe S, W; Asia S; Africa N
Glaucium flavum Crantz	Papaveraceae	A	2a	Medit
Glaucium corniculatum (L.) Rudolph	Papaveraceae	A	2a, 3a	Medit
Guizotia abyssinica (L. f.) Cass.	Asteraceae	A	2a	Africa E (Ethiopia)
Gypsophila perfoliata L.	Caryophyllaceae	P	4a	Europe E; Asia W
Heliotropium europaeum L.	Boraginaceae	A	2a, 4a	Medit
Herniaria incana Lam.	Caryophyllaceae	P	4b	Europe (Medit) to Asia W
Hirschfeldia incana (L.) Lagr.-Foss. [= Hirschfeldia adpressa Moench]	Brassicaceae	A	4a	Medit
Hordeum secalinum Schreb.	Poaceae	P	2a	Europe W, S to Asia Minor; Africa N
Humulus scandens (Lour.) Merr.	Cannabaceae	A	2a	Asia E
Hygrophila polysperma (Roxb.) T. Anderson[8]	Acanthaceae	P	4a	Asia S, E (India, Malaysia)
Hypericum mutilum L.	Hypericaceae	A	1a	N America
Hypericum gymnanthum Engelm. & A. Gray	Hypericaceae	A	1a	N America
Juncus anthelatus (Wiegand) R. E. Brooks & Whittem.	Juncaceae	P	4a	N America E; C America (Mexico)
Lactuca tatarica (L.) C. A. Mey	Asteraceae	P	?	Europe E; Asia E to N. & W. America N
Lactuca virosa L.	Asteraceae	AB	1a, 3b	Medit
Lathyrus aphaca L.	Fabaceae	A	4a	Europe W, C, S; Asia W; Africa N
Legousia speculum-veneris (L.) Chaix	Campanulaceae	A	2a	Medit
Lepidium latifolium L.	Brassicaceae	P	4b	Medit, Asia S, W
Lepidium perfoliatum L.	Brassicaceae	A	4a	Europe E; Asia
Linaria repens (L.) Mill.	Scrophulariaceae	P	4a	Europe (Medit-Atl)

[7] In the highland belt and in the Lower Silesia, this species occurs as an archaeophyte Zając 1979; Zając *et al.* 2009.). In Wielkopolska, it appeared only ephemerally in Poznan (Żukowski 1959).

Name of species	Name of family	BF	OP	Native range
Linum austriacum L.	Linaceae	P	?	Europe E, S, C; Africa N; Asia W (Turkey)
Lolium rigidum Gaudin	Poaceae	A	2a	Medit, Asia S, W
Lythrum junceum Banks & Sol.	Lythraceae	P	2a	Medit
Malva nicaeensis All.[9]	Malvaceae	A	2a	Medit
Marrubium peregrinum L.	Lamiaceae	P	2a	Europe S, E; Asia Minor
Medicago arabica (L.) Huds.	Fabaceae	A	1a	Medit
Medicago polymorpha L.	Fabaceae	A	?	Medit
Melica picta K. Koch[10]	Poaceae	P	3a	Europe C, E
Melilotus indicus (L.) All.	Fabaceae	A	2a	Medit, Asia S, W
Mimulus moschatus Douglas ex Lindl.	Scrophulariaceae	P	?	N America W
Minuartia hybrida (Vill.) Schischk.	Caryophyllaceae	A	1a	Medit, Asia S, W
Moenchia mantica (L.) Bartl.	Caryophyllaceae	A	2a	Europe S, E
Myagrum perfoliatum L.	Brassicaceae	A	4a	Europe S; Asia W
Nicotiana rustica L.	Solanaceae	A	2a	America C, S
Nicotiana tabacum L.	Solanaceae	A	2a	America C, S ?
Oenothera ×tacikii Rostański	Onagraceae	B	4a	Europe
Oenothera cruciata Nutt. ex Don	Onagraceae	B	4a	N America
Oenothera fallax Renner em. Rostański	Onagraceae	B	4a	America N
Oenothera flaemingina Hudziok	Onagraceae	B	4a	Europe
Oenothera parviflora L.	Onagraceae	B	4a	N America
Oenothera pycnocarpa G. F. Atk. et Bartlett	Onagraceae	B	4a	N America
Orobanche ramosa L.	Orobanchaceae	A	2a, 3a	Africa, Asia W, Europe
Oxalis tetraphylla Cav. [= Oxalis deppei Lodd. ex Sweet]	Oxalidaceae	P	4b	America C (Mexico)
Panicum capillare L.	Poaceae	A	4b	N America
Panicum dichotomiflorum Michx.	Poaceae	A	?	S America; N America
Papaver albiflorum (Boiss.) Paczoski[11] [= Papaver dubium L. subsp. albiflorum]	Papaveraceae	A	4a	Europe S, W (medit)
Paspalum racemosum Lam.	Poaceae	A	2a	S America W
Petrorhagia saxifraga (L.) Link	Caryophyllaceae	P	2a	Europe S, C; Asia W
Phalaris canariensis L.	Poaceae	A	4a	Medit
Phalaris coerulescens Desf.	Poaceae	P	2a	Medit
Plantago afra L.[12]	Plantaginaceae	A	4a	Africa C, N; Asia S, W; Europe S, E
Plantago lagopus L.	Plantaginaceae	A	2a	Medit
Polycarpon tetraphyllum (L.) L.	Caryophyllaceae	A	2a	Europe (medit)
Polygonum patulum M. Bieb.	Polygonaceae	A	2a	Europe W, Medit, Asia C (Caucas, Siberia, Mongolia, China)
Polypogon monspeliensis (L.) Desf.	Poaceae	A	2a	Medit, Asia S, W
Potentilla intermedia L.	Rosaceae	BP	2a	Europe N, W; Africa N; Asia (Siberia)
Rapistrum perenne (L.) All.	Brassicaceae	P	1a, 3a	Europe E, S; Asia W
Rapistrum rugosum (L.) All.	Brassicaceae	A	1a, 2a, 3a	Medit
Reseda alba L.	Resedaceae	AP	1a, 2a	Medit
Ricinus communis L.	Euphorbiaceae	A	3a?	Africa tropic, Middle East

[8] Reported for the first time from the vicinity of Konin (Gąbka & Owsianny 2009).
[9] *Malva mauritiana* L. – reported from Wielkopolska (Szulczewski 1951; Czarna 2009, Celka 2014 POZ), in this work it was included in *M. sylvestris* L.
[10] Native to Poland, occurs only in a single locality in the south-eastern part of the country (Zając & Zając 2001, Oklejewicz *et al.* 2015).
[11] Railway tracks at the railway station in Kościan (Czarna 2009).
[12] Observed in Kórnik near Poznań in the years 2014-2015; in total, a few individuals occurred (leg. A. Wysocki, det. K. Latowski; POZ); in 2016 – not found.

Name of species	Name of family	BF	OP	Native range
Roemeria hybrida (L.) DC.	Papaveraceae	A	4a	Medit, Asia W
Rosa gorenkensis Besser	Rosaceae	T	4a	Europe S, W; Asia W,
Rumex bucephalophorus L.	Polygonaceae	A	2a	Medit
Rumex longifolius DC.	Polygonaceae	P	?	Asia W, C
Rumex salicifolius Weinm. [= Rumex triangulivalvis (Danser) Rech. f.]	Polygonaceae	P	3a	N America
Rumex stenophyllus Ledeb.[13]	Polygonaceae	P	4a	Europe S, W, Azja C (Siberia)
Salsola collina Pall.	Chenopodiaceae	A	3a	Asia (Korea, Mongolia, China, Pakistan, Russia, Central Asia); Europe E
Salsola soda L.	Chenopodiaceae	A	3a	Medit
Salvia dumetorum Andrz. ex Besser [= Salvia dumetorum Andrz.]	Lamiaceae	P	2a	Europe S, E; Asia C
Scirpus georgianus R. M. Harper	Cyperaceae	P	4a	N America
Senecio inaequidens DC.	Asteraceae	P	4a	Africa (South Africa, Lesotho, Swaziland)
Sesamoides interrupta (Boreau) G. López [=Sesamoides canescens (L.) Kuntze]	Resedaceae	P	3a	Medit W
Sideritis montana L.	Lamiaceae	A	4a	Medit, Asia W
Silene gallinyi Heuff. ex Rchb. [= Silene trinervia Sebast. & Mauri]	Caryophyllaceae	P	2a	Europe (Balkans)
Silene linicola C. C. Gmel.	Caryophyllaceae	A	2a	Europe W (France)
Silene scabriflora Brot.	Caryophyllaceae	A	2a	Europe S, W
Sisymbrium austriacum Jacq.	Brassicaceae	BP	2a	Europe C, S, W
Sisymbrium orientale L.	Brassicaceae	ABP	2a, 3a	Europe S; Asia W
Solanum alatum Moench	Solanaceae	A	3a	Medit, Asia Minor
Solanum angustifolium Mill. [= Solanum cornutum Lam.]	Solanaceae	A	3a	N America S
Solanum triflorum Nutt.	Solanaceae	A	2a	S America; N America
Sorghum bicolor (L.) Moench	Poaceae	A	3a	Africa tropic
Sorghum halepense (L.) Pers.	Poaceae	P	3a	Europe (Medit) to Asia C
Thlaspi alliaceum L.	Brassicaceae	A	?	Africa N, E; Asia W; Europe S, E
Thlaspi caerulescens J. Presl et. C. Presl [= Thlaspi alpestre L.]	Brassicaceae	BP	2a	Europe W, C
Thlaspi perfoliatum L.	Brassicaceae	A	4a	Europe S; Asia W
Urtica cannabina L.	Urticaceae	P	3a	Europe E (Russia), Asia W, C (to China)
Valerianella carinata Loisel.	Valerianaceae	A	1a	Medit ?
Veronica peregrina L.	Scrophulariaceae	AB	4a	N America S
Vicia articulata Hornem.	Fabaceae	A	2a	Medit
Vicia bithynica (L.) L.	Fabaceae	A	2a	Medit
Vicia lutea L.	Fabaceae	A	3a	Europe; Asia W; Africa N
Vicia pannonica Crantz	Fabaceae	A	4a	Europe S, C; Asia W
Viola ambigua Waldst. & Kit.	Violaceae	P	3a?	Europe C, S, E (Caucasus)
Vulpia geniculata (L.) Link	Poaceae	A	2a	Europe S; Africa N
Xanthium orientale L. [= Xanthium macrocarpum DC.]	Asteraceae	A	2a	N America ?
Xanthium spinosum L.	Asteraceae	A	2a	S America

Explanations: BF – biological form, A – annual plants, B – biennial plants, P – perennial, herbaceous plants, S – dwarf shrubs and sub-shrubs, T – shrubs and trees; OP – observation period, 1 – to 1901, 2 – 1901-1951, 3 – 1951-2001, 4 – after 2001, a – species was observed once, b – species was observed repeatedly; Native range: N – north, W – west, E – east, S – south, C – central, Medit – Mediterranean, Atl – Atlantic; ? – no data information uncertain

[13] Railway station in Jarocin (Czarna 2005, 2009).

Appendix 2. Checklist of casual alien species of Wielkopolska – ergasiophygophytes

Name of species	Name of family	BF	OP
Abies concolor (Gord. et Glend.) Lindl. ex Hildebr.	Pinaceae	T	4b
Acer saccharinum L.	Aceraceae	T	4b
Acer tataricum L.[1]	Aceraceae	T	4b
Achillea tomentosa L.	Asteraceae	P	?
Adonis annua L. em. Huds.	Ranunculaceae	A	2a
Aesculus ×carnea Hayne	Hippocastanaceae	T	4b
Aesculus flava Sol.	Hippocastanaceae	T	3a
Alcea rosea L.	Malvaceae	BP	4b
Allium carinatum L.	Liliaceae	P	2a
Allium cepa L.	Liliaceae	P	4a
Allium fistulosum L.	Liliaceae	P	2a
Allium giganteum Regel	Liliaceae	P	4a
Allium moly L.	Liliaceae	P	4a
Allium sativum L.	Liliaceae	P	2a
Allium schoenoprasum L.	Liliaceae	P	4a
Allium sphaerocephalon L.	Liliaceae	P	2a
Allium ampeloprasum L. s. l. [= Allium porrum L.]	Liliaceae	P	2a
Althaea officinalis L.[2]	Malvaceae	P	4a
Alyssum saxatile L.[3]	Brassicaceae	S	4a
Amaranthus caudatus L.	Amaranthaceae	A	4a
Amaranthus cruentus L. [= Amaranthus paniculatus L.]	Amaranthaceae	A	4a
Amelanchier lamarckii F. G. Schroed.	Rosaceae	T	4a
Ammophila arenaria (L.) Link[4]	Poaceae	P	4a
Amorpha fruticosa L.	Fabaceae	T	4a
Anethum graveolens L.	Apiaceae	A	4a
Antirrhinum majus L.	Scrophulariaceae	AP	4a
Apium graveolens L.	Apiaceae	A	4a
Aquilegia caerulea E. James [= Aquilegia ×hybrida hort.]	Ranunculaceae	P	4a
Arabis alpina L.[5]	Brassicaceae	P	4a
Arabis caucasica Willd.	Brassicaceae	P	4a
Aristolochia macrophylla Lam.	Aristolochiaceae	T	4a
Artemisia abrotanum L.	Asteraceae	S	2b
Artemisia dracunculus L.	Asteraceae	P	4b
Artemisia ludoviciana Nutt.[6] [= Artemisia platyphylla Rydb.]	Asteraceae	P	3a
Artemisia maritima L.	Asteraceae	S	1a
Artemisia pontica L.[7]	Asteraceae	P	1a
Aster ×salignus Willd.	Asteraceae	P	4a
Avena sativa L.	Poaceae	A	4b

[1] Some information about *Acer tataricum* L. was attributed to *A. ginnala* Maxim. [*Acer tataricum* L. subsp. *ginnala* (Maxim.) Wesm.].

[2] Probably a synanthropic species. There are some doubts on its status on saline soils (see Zając & Zając 2001; Mirek *et al.* 2002).

[3] In Poland, it is a native species in the Pieniny Mountains (Zając & Zając 2001). In lowlands, this species is cultivated and running wild from cultivation.

[4] In Poland, it is a native species only on the Baltic Sea (Zając & Zając 2001). In addition, this species is cultivated in lowlands and running wild from cultivation.

[5] In Poland, it is a native species in the Tatras and on the Babia Góra Mt. (Zając & Zając 2001). In addition, this species is cultivated in lowlands and runing wild from cultivation.

[6] The species was reported for the first time for Poland from the area of the Wielkopolski National Park. The specimens collected there belong to two varieties: var. *ludoviciana* and var. *incompta* (Nutt.) Cronq. (Żukowski *et al.* 1995).

[7] In Poland, it is a native species only in the south-eastern part of Nidziańska Basin (Kaźmierczakowa 2014a). In other parts of Poland, only anthropogenic populations occur (Żukowski & Piaszyk 1971; Zając & Zając 2001; Kaźmierczakowa 2014a). In Wielkopolska, it was collected by Spribille (1892, POZ) on the Lake Tuczno near Inowrocław (Żukowski & Piaszyk 1971).

Name of species	Name of family	BF	OP
Berberis thunbergii DC.[8]	Berberidaceae	T	4b
Bergenia crassifolia (L.) Fritsch	Saxifragaceae	P	4a
Beta vulgaris L.	Chenopodiaceae	AP	4a
Betula lenta L.[9]	Betulaceae	T	4a
Bidens ferulifolia (Jacq.) DC.	Asteraceae	AB	4a
Borago officinalis L.	Boraginaceae	A	4a
Brassica napus L. subsp. **napus**	Brassicaceae	AB	4b
Buddleja davidii Franch.	Buddlejaceae	T	4a
Calandrinia pilosiuscula DC.	Portulacaceae	AP	1a
Calendula arvensis L.	Asteraceae	A	?
Calendula officinalis L.	Asteraceae	AP	4a
Callistephus chinensis (L.) Nees	Asteraceae	A	?
Campanula carpatica Jacq.	Campanulaceae	P	4a
Campanula rapunculus L.	Campanulaceae	B	2b
Cannabis sativa L.	Cannabaceae	A	4a
Capsicum annuum L.	Solanaceae	A	2a
Caragana arborescens Lam.	Fabaceae	T	4b
Carthamus lanatus L.	Asteraceae	A	2a
Carya ovata (Mill.) K. Koch	Juglandaceae	T	4a
Celastrus orbiculatus Thunb.[10]	Celastraceae	P	4a
Centaurea dealbata Willd.	Asteraceae	P	4a
Centaurea montana L.	Asteraceae	P	2a
Cerastium tomentosum L.	Caryophyllaceae	P	4b
Chaenomeles japonica (Thunb.) Lindl. ex Spach	Rosaceae	T	4a
Chamaemelum nobile (L.) All. [= Anthemis nobilis L.]	Asteraceae	P	2a
Chenopodium capitatum (L.) Asch.	Chenopodiaceae	A	2a
Cicerbita macrophylla (Willd.) Wallr.[11]	Asteraceae	P	4a
Clarkia amoena (Lehm.) A. Nelson & J. F. Macbr. subsp. **lindleyi** (Douglas) H. F. Lewis & M. R. Lewis [= Godetia grandiflora Lindl.]	Onagraceae	A	4a?
Collomia grandiflora Douglas	Polemoniaceae	A	2a
Colutea arborescens L.	Fabaceae	T	4a
Colutea media Willd.[12]	Fabaceae	T	4a
Consolida ajacis (L.) Schur	Ranunculaceae	A	4a
Convolvulus tricolor L.	Convolvulaceae	A	2a
Coriandrum sativum L.	Apiaceae	A	4a
Cornus mas L.	Cornaceae	T	4a
Cosmos bipinnatus Cav.	Asteraceae	A	4b
Cotoneaster divaricatus Rehder et E. H. Wilson	Rosaceae	T	4a
Cotoneaster integerrimus Medik.	Rosaceae	T	?
Cotoneaster villosulus (Rehder & E. H. Wilson) Flinck & B. Hylm	Rosaceae	T	4a
Crataegus pedicellata Sarg.	Rosaceae	T	4a
Crataegus coccinea L.	Rosaceae	T	4a
Cucumis sativus L.	Cucurbitaceae	A	4b

[8] Reported from the Wielkopolski National Park (Purcel 2009).
[9] Planted and running wild in the acidic oak forest in the Gołąbki Forest District (leg. and det. Chmiel 1987, POZ).
[10] Wielkopolski National Park (Danielewicz & Maliński 1995; Purcel 2009).
[11] Found in the village Dobrzyca (Czarna 2003, 2007).
[12] Wielkopolski National Park (Purcel 2009).

Name of species	Name of family	BF	OP
Cucurbita moschata Duchesne	Cucurbitaceae	A	4a
Cucurbita pepo L.	Cucurbitaceae	A	4b
Dianthus barbatus L.	Caryophyllaceae	P	4b
Dicentra spectabilis L.	Fumariaceae	P	4b
Dipsacus sativus (L.) Honck.	Dipsacaceae	BP	4a
Doronicum columnae Ten.	Asteraceae	P	4a
Doronicum pardalianches L.	Asteraceae	P	4a
Echinacea purpurea (L.) Moench	Asteraceae	P	4a
Echinops exaltatus Schrad.	Asteraceae	P	4a
Elaeagnus commutata Bernh. ex Rydb.	Eleagnaceae	T	4a
Eruca sativa Mill. [= Eruca vesicaria (L.) Cav. subsp. sativa (Mill.) Thell.]	Brassicaceae	A	2a
Erysimum cheiri (L.) Crantz [= Cheiranthus ×cheiri L.]	Brassicaceae	S	2a
Eschscholzia californica Cham.	Papaveraceae	AP	4a
Euphorbia lathyris L.	Euphorbiaceae	AB	4a
Euphorbia marginata Pursh	Euphorbiaceae	A	4b
Fagopyrum esculentum Moench	Polygonaceae	A	4b
Fagopyrum tataricum (L.) Gaertn.	Polygonaceae	A	4a
Fallopia baldschuanica (Regel) Holub [= Fallopia aubertii (L. Henry) Holub]	Polygonaceae	P	4a
Foeniculum vulgare Mill.	Apiaceae	P	4a
Fragaria ×ananassa Duchesne ex Rozier	Rosaceae	P	4b
Fraxinus angustifolia Vahl.	Oleaceae	T	4a
Gaillardia pulchella Foug.	Asteraceae	A	4a
Galium anisophyllon Vill.[13]	Rubiaceae	B	2a
Gypsophila repens L.[14]	Caryophyllaceae	P	4a
Helianthus annuus L.	Asteraceae	A	4a
Helianthus decapetalus L.	Asteraceae	P	?
Helianthus ×laetiflorus Pers.	Asteraceae	P	?
Helleborus viridis L.	Ranunculaceae	P	4a
Hemerocallis fulva (L.) L.	Liliaceae	P	4b
Hesperis sylvestris Crantz	Brassicaceae	BP	4a
Hibiscus trionum L.	Malvaceae	A	2a
Hieracium aurantiacum L.[15]	Asteraceae	P	2a, 4a
Hordeum jubatum L.	Poaceae	P	4a
Hordeum vulgare L. em. Alef.[16]	Poaceae	A	4b
Hyssopus officinalis L.	Lamiaceae	S	4a
Iberis amara L.	Brassicaceae	A	4a
Iberis umbellata L.	Brassicaceae	A	4b
Impatiens balsamina L.	Balsaminaceae	A	4a
Impatiens stenosepala E. Pritz. [= Impatiens punctata Franch. ex Hook. f.]	Balsaminaceae	A	4a
Ipomoea purpurea Roth	Convolvulaceae	A	4a
Ipomoea nil (L.) Roth [= Ipomoea hederacea (L.) Jacq.]	Convolvulaceae	A	4a
Iris germanica L.	Iridaceae	P	4b
Isatis tinctoria L.	Brassicaceae	BP	4a

[13] In Poland, it is a native species in the Carpathians (Zając & Zając 2001). In lowlands, it appears only ephemerally (Szulczewski 1951).

[14] In Poland, it is a native species in the Tatras and Pieniny Mts (Zając & Zając 2001). In lowlands, this species occurs only as an escapee from cultivation.

[15] In Poland, it is a native species in the mountains and in the foothills (Zając & Zając 2001). In lowlands, this species occurs only as an escapee from cultivation.

[16] *Hordeum distichon* L., a species reported from Wielkopolska has been included here in *Hordeum vulgare* L. em. Alef.

Name of species	Name of family	BF	OP
Larix ×eurolepis A. Henry[17]	Pinaceae	T	4b
Lathyrus hirsutus L.[18]	Fabaceae	A	4a?
Lathyrus japonicus Willd. subsp. **maritimus** (L.) P. W. Ball[19]	Fabaceae	P	2a
Lathyrus latifolius L.	Fabaceae	P	4a
Lathyrus nissolia L.	Fabaceae	A	?
Lavandula angustifolia Mill.	Lamiaceae	S	4a
Lavatera trimestris L.	Malvaceae	A	4a
Lens culinaris Medik.	Fabaceae	A	2a
Lepidium sativum L.	Brassicaceae	A	4b
Leucanthemum maximum (Ramond) DC.	Asteraceae	P	4a
Levisticum officinale W. D. J. Koch	Apiaceae	P	4b
Lilium bulbiferum L.[20]	Liliaceae	P	4b
Lilium candidum L.	Liliaceae	P	4a
Linum grandiflorum Desf.	Linaceae	A	4a
Linum perenne L.	Linaceae	P	2a
Linum usitatissimum L.	Linaceae	A	4b
Lobelia erinus L.	Campanulaceae	A	?
Lobularia maritima (L.) Desv.	Brassicaceae	AP	4a
Lonicera caprifolium L.	Caprifoliaceae	T	4a
Lonicera involucrata (Richardson) Banks ex Spreng.	Caprifoliaceae	T	4a
Lunaria annua L.	Brassicaceae	AB	4b
Lupinus angustifolius L.	Fabaceae	A	4a
Lupinus luteus L.	Fabaceae	A	4b
Lychnis coronaria (L.) Desr.	Caryophyllaceae	P	4b
Lysimachia punctata L.	Primulaceae	P	4a
Malva verticillata L.	Malvaceae	A	4b
Mathiola incana (L.) W. T. Aiton	Brassicaceae	A	4a?
Melica altissima L.	Poaceae	P	?
Melica ciliata L.[21]	Poaceae	P	?
Melissa officinalis L.	Lamiaceae	P	4a
Mentha ×piperita L. [= Mentha ×citrata Ehrh.]	Lamiaceae	P	4a
Mentha ×rotundifolia (L.) Huds.	Lamiaceae	P	4a
Mentha spicata L. em. L.	Lamiaceae	P	2a
Miscanthus sacchariflorus (Maxim.) Hack.	Poaceae	B	4b
Morus alba L.	Moraceae	T	4b
Muscari botryoides (L.) Mill.	Liliaceae	P	4a
Muscari comosum (L.) Mill.[22]	Liliaceae	P	2a, 4a
Muscari neglectum Guss. ex Ten.	Liliaceae	P	4a
Myrrhis odorata (L.) Scop.	Apiaceae	P	?
Narcissus poeticus L.	Amaryllidaceae	P	4b
Narcissus pseudonarcissus L.	Amaryllidaceae	P	4b
Nepeta grandiflora M. Bieb.	Lamiaceae	P	2a
Nepeta racemosa Lam. [= Nepeta mussinii Spreng. ex Henckel]	Lamiaceae	P	2a

[17] Hybrid of *Larix decidua* Mill. subsp. *decidua* and *L. kaempferi* (Lamb.) Carrière. It is cultivated and running wild from cultivation (Danielewicz & Maliński 1994, 1997; Purcel 2009).

[18] Only some localities in southern Poland are native (Zając & Zając 2001).

[19] Only some localities on the Baltic Sea are native in Poland (Zając & Zając 2001). The species was reported from Poznań by Szulczewski (1951).

[20] Only certain mountain localities are native in Poland (Zając & Zając 2001).

[21] Only the localities in the south-eastern part of the country are native in Poland (Zając & Zając 2001). In Wielkopolska: Trzemeszno surroundings (Pampuch 1840; Ritschl 1850).

[22] Native in southern Poland (Zając & Zając 2001). In Wielkopolska, this species runs wild from cultivation.

Name of species	Name of family	BF	OP
Nicandra physalodes (L.) Gaertn.	Solanaceae	A	4a
Nigella damascena L.	Ranunculaceae	A	4b
Nonea erecta Bernh.[23] [= Nonea pulla (L.) DC.]	Boraginaceae	P	2a
Oenothera fruticosa L.	Onagraceae	P	4a
Oenothera glazioviana Micheli	Onagraceae	B	4a
Omphalodes verna Moench	Boraginaceae	P	4b
Ornithogalum nutans L.	Liliaceae	P	4b
Ornithopus sativus Brot.	Fabaceae	A	4b
Panicum miliaceum L.	Poaceae	A	4b
Papaver orientale L.	Papaveraceae	P	4a
Papaver somniferum L.	Papaveraceae	A	4b
Petroselinum crispum (Mill.) A. W. Hill	Apiaceae	B	4a
Petunia ×hybrida (Hook.) Vilm.	Solanaceae	A	4a
Petunia integrifolia (Hook.) Schinz et Thell. [= Petunia violacea Lindl.]	Solanaceae	A	2a, 4a
Peucedanum ostruthium (L.) W. D. J. Koch[24]	Apiaceae	P	3a?
Phacelia tanacaetifolia Benth.	Hydrophyllaceae	A	4b
Phaseolus vulgaris L.	Fabaceae	A	4a
Philadelphus coronarius L.	Hydrangeaceae	T	4b
Physalis alkekengi L.	Solanaceae	P	4b
Physalis ixocarpa Brot. ex Hornem.	Solanaceae	A	?
Physocarpus opulifolius (L.) Maxim.	Rosaceae	T	4b
Phyteuma nigrum F. W. Schmidt	Campanulaceae	P	?
Phytolacca americana L.[25]	Phytolaccaceae	P	2a
Phytolacca esculenta van Houtte[26] [= Phytolacca acinosa Roxb.]	Phytolaccaceae	P	4a
Pimpinella anisum L.	Apiaceae	A	?
Pinus banksiana Lamb.	Pinaceae	T	4a
Pinus nigra J. F. Arnold	Pinaceae	T	4a
Pinus rigida Mill.	Pinaceae	T	4b
Pinus strobus L.	Pinaceae	T	4b
Pisum sativum L.	Fabaceae	A	4b
Plantago coronopus L.[27]	Plantaginaceae	ABP	4b
Populus balsamifera L.[28]	Salicaceae	T	4a
Populus suaveolens Fisch. ex Loudon[29] [= Populus maximowiczii Henry]	Salicaceae	T	4a
Prunus domestica L.[30]	Rosaceae	T	4b
Prunus persica (L.) Batsch [= Persica vulgaris Mill.]	Rosaceae	T	4b
Prunus armeniaca L. [= Armeniaca vulgaris Lam.]	Rosaceae	T	4b
Prunus cerasus L. [= Cerasus vulgaris Mill.]	Rosaceae	T	4b

[23] Native in the south-eastern part of Poland (Zając & Zając 2001).

[24] In Poland, native localities are located in the Sudetes (Zając & Zając 2001). In Wielkopolska, this species is running wild from cultivation.

[25] Reported from Gubin (Lademann 1937).

[26] Reported from the Wielkopolski National Park (Latowski 2009).

[27] The only native locality in Poland is on Kępa Karsiborska (Sotek 2014). The species was noted at the roadside near the Botanical Garden in Poznan. Perhaps, this population originated from the conservative collection of this species located in the Botanical Garden.

[28] In Wielkopolska, the balsam poplar section (Tacamahaca) is represented by, among others: *Populus ×berolinensis* (K. Koch) Dippel, *P. candicans* Aiton and *P. simonii* Carrière.

[29] *Populus suaveolens* Fisch. ex Loudon (*P. maximowiczii* Henry) has some varieties, e.g., 'NE42' (= 'Hybrida 275'), which reproduce vegetatively by suckers, e.g., in excavations (Chmiel 1993, 2006; Dolatowski & Seneta 2008).

[30] The species is diversified into several subspecies with varying degrees of spread and establishment in the region, such as, among others: subsp. *domestica*; subsp. *insititia* (L.) Bonnier et Layens and subsp. *syriaca* (Borkh.) Janch. ex Mansf.

Name of species	Name of family	BF	OP
Pseudotsuga menziesii (Mirbel) Franco	Pinaceae	T	4a
Ptelea trifoliata L.	Rutaceae	T	4a
Pyrus communis L.[31]	Rosaceae	T	4b
Raphanus sativus L.	Brassicaceae	A	4b
Reseda odorata L.	Resedaceae	A	4a
Reseda phyteuma L.[32]	Resedaceae	A	2a
Rheum rhabarbarum L.	Polygonaceae	P	4b
Rhus hirta (L.) Sudw. [= Rhus typhina L.]	Anacardiaceae	T	4b
Ribes aureum Pursh	Grossulariaceae	T	4b
Ribes rubrum L.	Grossulariaceae	T	4b
Robinia neomexicana A. Gray[33]	Fabaceae	T	4a
Robinia viscosa Vent.[34]	Fabaceae	T	4a
Rosa blanda Aiton	Rosaceae	T	4a
Rosa glauca Pourr.	Rosaceae	T	4a
Rosa multiflora Thunb. ex Murray	Rosaceae	T	4a
Rosa rugosa Thunb.	Rosaceae	T	4b
Rosa spinosissima L.	Rosaceae	T	4a
Rosa virginiana Herrm.	Rosaceae	T	4a
Rubus occidentalis L.	Rosaceae	T	4a
Rudbeckia hirta L.	Asteraceae	ABP	4b
Salix acutifolia Willd.	Salicaceae	T	4a
Salix cordata Michx	Salicaceae	T	4a
Salix daphnoides Vill.[35]	Salicaceae	T	?
Salix eleagnos Scop.[36]	Salicaceae	T	?
Salvia glutinosa L.[37]	Lamiaceae	P	4a
Sambucus ebulus L.[38]	Caprifoliaceae	P	4a
Satureja hortensis L.	Lamiaceae	A	?
Scilla bifolia L.[39]	Liliaceae	P	2a, 4a
Scilla sibirica Haw.	Liliaceae	P	4b
Scorzonera hispanica L.	Asteraceae	P	2a
Scrophularia vernalis L.[40]	Scrophulariaceae	BP	4a
Secale cereale L.[41]	Poaceae	A	4a
Sempervivum tectorum L.	Crassulaceae	P	4b
Setaria italica (L.) P. Beauv.	Poaceae	A	4a
Sicyos angulatus L.	Cucurbitaceae	A	4a
Sida hermaphrodita (L.) Rusby	Malvaceae	P	4a
Silene armeria L.[42]	Caryophyllaceae	AP	2a
Silene chalcedonica (L.) E. Krause [= Lychnis chalcedonica L.]	Caryophyllaceae	P	4a

[31] Very variable and often hybridizing species, e.g., *P. ×myloslavensis* A. Czarna & W. Antkowiak = *P. communis* L. × *P. salicifolia* Pall. (Antkowiak *et al.* 2008). The checklist does not include *Mespilus germanica* L. (= *Pyrus germanica* Hook. F.), a species previously reported by Szulczewski (1951).

[32] Only localities in the Nidziańska Basin are native in Poland (Kaźmierczakowa 2014b). The species was reported from Łopuchowo near Oborniki (Wielkopolska) by Szulczewski (1951).

[33] *Robinia neomexicana* A. Gray hybridizes with *R. pseudoacacia* L. = *R.* × *holdtii* Beissn. (Zieliński *et al.* 2015; Zieliński 2016).

[34] *Robinia viscosa* Vent. hybridizes with *R. pseudoacacia* L. = *R.* × *ambigua* Poir. (see Zielinski *et al.* 2015, Zieliński 2016).

[35] A native species on the coast and in the mountains (Zając & Zając 2001), besides, planted and running wild in lowlands.

[36] Native in the mountains and in the foothills (Zając & Zając 2001), besides, planted and running wild in lowlands.

[37] Native in southern Poland (Zając & Zając 2001). In addition, it was reported from Wielkopolska: Poznań (Czarna & Mielcarski 2004) and in the vicinity of Konin (leg. et det. J. Chmiel 2011, POZ).

[38] Native in southern Poland (Zając & Zając 2001); in Wielkopolska, running wild from cultivation.

[39] Native in south-eastern Poland and the Upper Silesia (Zając & Zając 2001); in Wielkopolska, running wild from cultivation (Szulczewski 1951).

[40] Running wild from cultivation in the Botanical Garden in Poznań (W. Rakowski, P. Górski, D. Tomaszewski, W. Stachnowicz, pers. comm., 1992).

[41] In Wielkopolska, an intergeneric wild hybrid also occurs ×*Triticosecale blaringhemii* A. Camus = ×*Triticale rimpaui* Wittm. (*Secale cereale* L. × *Triticum aestivum* L. em. Fiori et Paol.), which is often cultivated.

[42] Szulczewski (1951) also reports *Silene nemoralis* Waldst et Kit. [*Silene italica* subsp. *nemoralis* (Waldst. et Kit.) Nyman] from Wielkopolska, which is a native species in the mountains.

Name of species	Name of family	BF	OP
Silybum marianum (L.) Gaertn.	Asteraceae	AB	4b
Sinapis alba L.	Brassicaceae	A	4b
Solanum tuberosum L.	Solanaceae	P	4a
Solidago graminifolia (L.) Salisb.	Asteraceae	P	4b
Solidago patula Muhl. ex Willd.[43]	Asteraceae	P	2a
Sorbaria kirilowii (Regel & Tiling) Maxim.	Rosaceae	T	4a
Sorbaria sorbifolia (L.) A. Braun	Rosaceae	T	4a
Sorbus aria (L.) Crantz s. str.	Rosaceae	T	4a
Sorbus hybrida L.[44]	Rosaceae	T	4a
Sorbus intermedia (Ehrh.) Pers.[45]	Rosaceae	T	4b
Spinacia oleracea L.	Chenopodiaceae	A	2a
Spiraea ×biilardii Herincq	Rosaceae	T	4a
Spiraea ×pseudosalicifolia Silverside[46]	Rosaceae	T	4a
Spiraea ×vanhouttei (Briot) Zabel	Rosaceae	T	4a
Spiraea chamaedryfolia L.	Rosaceae	T	4b
Spiraea media Schmidt	Rosaceae	T	4b
Spiraea salicifolia L.[47]	Rosaceae	T	4a
Stachys byzantina K. Koch	Lamiaceae	P	4a
Staphylea pinnata L.[48]	Staphyleaceae	T	2a
Symphytum cordatum Waldst. et Kit.[49]	Boraginaceae	P	2a
Syringa vulgaris L.	Oleaceae	T	4a
Tagetes erecta L.	Asteraceae	A	4a
Tagetes tenuifolia Cav.	Asteraceae	A	4a
Tanacetum balsamita L.	Asteraceae	P	4a
Telekia speciosa (Schreb.) Baumg.	Asteraceae	P	4a
Thuja occidentalis L.	Cupressaceae	T	4b
Thuja plicata Donn ex D. Don	Cupressaceae	T	4b
Thymus vulgaris L.	Lamiaceae	S	4a
Tragopogon porrifolius L.	Asteraceae	ABP	2a
Trifolium incarnatum L.	Fabaceae	A	4b
Trifolium resupinatum L.	Fabaceae	A	4b
Trigonella coerulea (L.) Ser.	Fabaceae	A	2a
Triticum aestivum L. em. Fiori et Paol.[50] [= Triticum vulgare Vill.]	Poaceae	A	4b
Triticum spelta L.	Poaceae	A	?
Tropaeolum majus L.	Tropaeolaceae	A	4b
Tulipa gesneriana L.	Liliaceae	P	4b
Tulipa sylvestris L.	Liliaceae	P	2a
Tulipa tarda Stapf	Liliaceae	P	4a
Typha laxmanii Lepech.[51]	Typhaceae	P	4b
Typha minima Hoppe	Typhaceae	P	?
Verbena rigida Spreng.	Verbenaceae	A	3a?
Verbena urticifolia L.	Verbenaceae	ABP	3a?
Viburnum lantana L.	Caprifoliaceae	T	4a
Vicia faba L.	Fabaceae	A	4a

43 Reported from Gniezno (Szulczewski 1951).
44 Reported from the Wielkopolski National Park (Purcel 2009).
45 In Wielkopolska, the species is planted and running wild from cultivation.
46 Sometimes confused with *Spiraea ×billardii* auct. non Hérincq (Purcel 2007).
47 Native only in the south-eastern part of Poland (Zając & Zając 2001); in Wielkopolska, running wild from cultivation.
48 Native only in the south part of Poland (Zając & Zając 2001); in Wielkopolska, running wild from cultivation (Szulczewski 1951).
49 Native only in the south-eastern part of Poland (Zając & Zając 2001); in Wielkopolska, running wild from cultivation (Szulczewski 1951).
50 See note 41.
51 Specimens of this species were collected near Konin (leg. and det. J. Chmiel 2008, POZ) and Barcin (leg. et det. J. Chmiel 2016, POZ).

Name of species	Name of family	BF	OP
Vicia sativa L.	Fabaceae	A	4b
Vinca minor L.[52]	Apocynaceae	S	4b
Viola suavis M. Bieb.	Violaceae	P	3a?
Viola wittrockiana Gams	Violaceae	AP	4b
Vitis vinifera L.	Vitaceae	T	4b

Explanations: BF – biological form, A – annual plants, B – biennial plants, P – perennial, herbaceous plants, S – dwarf shrubs and sub-shrubs, T – shrubs and trees; OP – observation period, 1 – to 1901, 2 – 1901-1951, 3 – 1951-2001, 4 – after 2001, a – species was observed once, b – species was observed repeatedly; ? – no data information uncertain

[52] The range boundary runs across Poland (Meusel *et al.* 1978). In central and northern Poland, this species is running wild from cultivation. In Wielkopolska, it is found in courtyards, cemeteries (especially evangelical), old gardens, places of former settlement and near sacred buildings.