

## ***Impatiens glandulifera* (Balsaminaceae) in Ukraine: history of distribution, ecological and coenotic peculiarities and invasiveness**

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**Abstract:** We present the history of introduction and further naturalization, recent distribution, ecological and coenotic peculiarity of *Impatiens glandulifera* Royle (Balsaminaceae) in Ukraine. The species of Asian origin was cultivated as an ornamental plant at the beginning of the 20<sup>th</sup> century in west regions of Ukraine. The main periods and directions of spreading are reconstructed. The map of recent distribution of the species is presented. The first escape from cultivation was recorded in 1938 in the villages Osii and Hankovytsia of Transcarpathian region and in 1939 in Mykhailivka of Khmelnytskyi

region. Recently it is a species with high invasive potential in Ukraine, especially in Transcarpathian and western forest region of Ukraine, where it is a transformer. Syntaxonomical scheme of plant communities with participation of *I. glandulifera* in Ukraine is presented, the species is a component of 13 associations of 6 classes. The species was noted in 11 habitat types of the EUNIS classification. The assessment of the impact of the species on the phytobiota is given.

*Keywords:* alien species, I-Rank values, map, plant communities, spreading, transformer, syntaxonomical scheme, Ukraine.

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## Introduction

Himalayan balsam (*Impatiens glandulifera* Royle, Balsaminaceae) [syn. *I. roylei* Walp.] is a summer-annual plant species of the Asian origin. Its native range extends Western Himalayas (foothills), Northwestern India and western Nepal where the species grows on river banks, in disturbed wet forests and as an agricultural weed, from 1800 to 4000 m a.s.l. (Nasir 1980; Gupta 1989).

The secondary area of *I. glandulifera* is in Europe (32 countries from the British Isles in the west to Poland, Belarus and Russia in the east, and from northern Italy, northern Spain, in the south to northern Scandinavia) (Helsen et al. 2021; <https://www.cabi.org/isc/datasheet/28766>), Asia and North America and New Zealand, where it has spread along the banks of rivers, lakes and other riparian habitats, in wet meadows, shrubs, in lighted floodplain forests, as well as in anthropogenic habitats. In the last three decades, it has rapidly distributed throughout Europe (Beerling & Perrins 1993; Pyšek & Prach 1995) and North America (Cockel & Tanner 2011). It is considered as one of the most invasive and problematic species in Europe (Beerling & Perrins 1993; Perrins et al. 1993; Helsen et al. 2021).

The plant is an object of introduction, it is used as a honey and medicinal plant. The species has a minor economic and medicinal value (Fowler & Holden 1994), but it is a significant invasive species. The species is consequently included on the list of invasive alien species of Union concern of the European Union and the European and Mediterranean Plant Protection Organisation (EPPO) list of invasive alien plants (Regulation (EU) 1143/2014; Tanner & Gange 2020; Helsen et al. 2021). In some countries, for example, Britain and Poland, it is included in the list of 20 most dangerous invasive species (Pacanoski & Saliji 2014). Its high rate of spontaneous distribution attracts attention. In particular, for the Czech Republic it is indicated that its populations have covered 65% of the territory of the main river valleys over the last 70 years (Pyšek & Prach 1995).

*Impatiens glandulifera* is one of the first to colonize disturbed moisturized habitats, forms derivative communities and dense stands in which it dominates. Further, it invades natural forests, meadows, river banks and marsh phytocenoses. As a result, we can observe oppression of annual, but also perennial native species, as well as tree seedlings in forest communities. Subsequently, this leads to a reduction of

native species, disruption or destruction of natural communities and prevents the regeneration of forest tree species in damp habitats. The species has a high level of polymorphism (Valentine 1971), phenotypic plasticity (Skálová et al. 2012) and high seed production, which causes colonization where the plant forms dense monocultures along riverbanks, leading to a decrease in plant species diversity (Weiss 2015). The species contributes to erosion processes (Dybovik et al. 2020). Since *I. glandulifera* seems to respond positively to increased CO<sub>2</sub> and higher temperatures, the species could potentially become even more aggressive invader in a changing climate (Vinogradova et al. 2009; Didukh et al. 2016). The rapid spread of the species leads to disruption of the food chains of a number of insects that leads to their decrease (Weiss 2015); it competes successfully with native species for pollinating insects (Didukh et al. 2016). In forestry, Himalayan balsam is considered an unpleasant weed that prevents the regeneration of woody plants. The spread of this species in forests will cause significant economic losses (Balogh 2008; Weiss 2015). A significant amount of the species strongly disturbs the water balance, as it extracts a large amount of water from the soil and stores it in stems (Weiss 2015).

In Ukraine *I. glandulifera* is one of highly invasive species (Protopopova & Shevera 2019) in regions of Northern and Western Forest zone of Ukraine, in Transcarpathian and Polissia (Protopopova & Shevera 1998; Vykhor & Prots 2014; Zavialova et al. 2021). It is a transformer, included in the Regional list of invasive species of Transcarpathian (Shevera et al. 2017). The spread of the species still continues.

The main aim of our research is to summarize the history of introduction of *I. glandulifera* in Ukraine, to describe the main periods of introduction and recent spread of the species and its phytocoenotic features, to prepare the map of the actual distribution and to assess the invasiveness of the species.

## Material and Methods

The study of *Impatiens glandulifera* is based on the original data of field studies of the authors, the critical analysis of herbarium specimens and open databases, literary sources and unpublished phytosociological relevés. We analyzed the following herbarium collections of Ukraine: CHER, CWU, KHER, KW, KWHA, KWHU, LW, LWKS, LWS, PWU, UU, Pavlo Tychyna Uman State Pedagogical University, Podilski Tovtry National Nature Park and Carpathian Biosphere reserve; data bases: UkrBin: National Biodiversity Information Network (<https://ukrbin.com/>), iNaturalist – social network of naturalists, citizen scientists and biologists, built on the concept of mapping and sharing biodiversity observations around the world (<https://www.inaturalist.org/>). The herbarium codes follows Thiers (2022+).

The unpublished database «Chorology of *Impatiens glandulifera* in Ukraine» was created in the Microsoft Excel program, which contains 484 localities with the following characteristics: name of herbarium, number of specimens, region, district, location (city/village), ecotope type, geographical coordinates, date of collection, collectors and the source (where the information was taken from).

The distribution map, based on all known data and locations identified in the relevés, was prepared in the program SimpleMapp (https://www.simplemapp.net). We used multi-layer mapping. The list of localities (Appendix) of *I. glandulifera* in Ukraine was compiled on the basis of analysis of field research data, herbarium materials, literature sources and databases (containing the settlement, geolocation and links). We collected all available relevés, where *Impatiens glandulifera* occurred from Ukraine, both from literature sources and private databases (Tab. 1), and stored them in the Turboveg database (Hennekens & Schaminée 2001).

Juice software (Tichý 2002) was used to perform analysis and vegetation classification. To find out the phytosociological affiliation of *I. glandulifera*, we used modified TWINSpan (Roleček et al. 2009) with Whittaker's beta as a measure of clusters' heterogeneity and cover 0–5–25% as pseudospecies cut levels. Clusters were identified according to diagnostic species, where phi-coefficient was used as a fidelity measure (Chytrý et al. 2002). Species with a fidelity  $\phi \geq 0.3$  were considered as diagnostic of syntaxon. The significance of fidelity was tested using Fisher's exact test ( $P < 0.001$ ). To clarify the habitat preferences of *I. glandulifera* we assigned vegetation plots to corresponding habitat types using the EUNIS-ESy expert system (Chytrý et al. 2020).

The nomenclature of taxa follows the Euro+Med PlantBase (2006). The names of the syntaxa follow Dubyna et al. (2019, 2021), Douda et al. (2016) and Chytrý (2013).

The term "transformer" is adopted according to Richardson et al. (2000) and it is a subset of invasive plants which change the character, condition, form or nature of ecosystems over a substantial area relative to the extent of that ecosystem.

Based on the analysis of the above data of complex studies of the species, it is possible to determine the strategy of its further distribution and to carry out an assessment of the impact on the phytobiota as a whole. According to the An Invasive Species Assessment Protocol system, we assessed the impact of *I. glandulifera* on phytodiversity in the certain regions and Ukraine in general, and obtained the following indicators (Tab. 3). An Invasive Species Assessment Protocol was used to assess the impact *I. glandulifera* on biodiversity (Morse et al. 2004). It includes 20 questions, which are divided between 4 following sections: 1) ecological impacts, 2) current distribution and abundance, 3) trend in distribution and abundance, and 4) management difficulty. The sum of the points for the questions gives a general assessment of the species.

## Results

Information about the primary stages of naturalization of *Impatiens glandulifera* was summarized by Protopopova and based on the information of Makowiecki (1939), Kotov (1954), Barbarych (1955) and Berko (1962). Firstly, the records of escaped plants are presented in the map: in Khmelnytskyi region (1), Volyn region (1), Lviv region (3) and Kyiv region (2) (Protopopova 1973). The next period of the

recent distribution of the species on the territory of Ukraine was generalized on the basis of the analyzed herbarium materials and databases.

#### Cultivation of *I. glandulifera* in Ukraine

According to Margittai (1938), in the middle of 1930s *I. glandulifera* was a popular ornamental plant in Transcarpathia. In particular, the plant was cultivated at the flower gardens in railway stations in the region from Batyovo to Volovets and was also cultivated by the local population in mountainous areas. Probably the plants were also cultivated in other western regions of Ukraine, in particular in recent Khmelnytskyi, Lviv, Volyn and other regions, where the escaped plants were later found. Until now it has been grown in private gardens of some settlements in Transcarpathian, e.g. one of the authors observed cultivated plants at the territory of Synevyr National Nature Park.

#### Naturalization of *I. glandulifera* in Ukraine

The first escaped plants of *I. glandulifera* in Ukraine were recorded by Margittai in 1938, in the valley of the Vicha River, in the villages Osii and Hankovytsia in Transcarpathian region (Margittai 1938) and by Makowiecki in 1939 in the village Mykhailivka (vicinity of Kamianets-Podilskyi) in Khmelnytskyi region (Makowiecki 1939).

From the cultivation centers of the species in the western region of Ukraine in the 1950s, new localities arose in the northern and the northwestern regions, for example, in Volyn (Kovel, 12.VIII.1949, Barbarych, KW, s.n.), in Lviv (Truskavets, weed in the territory of the sanatorium Khrustalny dvorets, 3.X.1953, Kotov, KW, s.n.) and Chernihiv regions (Oster, escaped from gardens, 2.IX.1967, Kotov, KW, s.n.).

In the middle of 1970s, the escaped plants were recorded in the central and eastern regions of Ukraine, e.g., in Kyiv region [Vasylkiv, weeds under the fence also in culture, 20.09.1975, Bortniak, KWHU, 11408; Makariv village, weeds on the waste, probably escaped, 06.08.1976, Bortniak, KWHU, 011409].

At the beginning and in the mid-late 90s the species was recorded in the most eastern locality in Kharkiv where it was a component of disturbed tiber bank-swampy vegetation (Rjabockon 1994), in Ternopil region (vicinity of Ternopil, [Berensanskyi] forest park, among shrubs, 13.06.1995, Balitskyi, KW, s.n. [sub nom. *I. noli-tangere* L.]), in Cherkasy region [cultivated as an ornamental plant and escaped near Ros River, VI.1995, Matviychuk, UPU, s.n.] and the forest line near the agrobiostation of Pavlo Tychyna Uman State Pedagogical University [VI.1996, Buzhylo, UPU, s.n. ] and again Khmelnytskyi [Kamianets-Podilskyi, park; near the stream 07.07.1999, Skibitska, LWKS, 09650; Horodotskyi Distr., vicinity of Lisovody village, hornbeam forest, 08.08.1999, Kagalo & Skibitska, LWKS, 10038]. First escaped plants in Kharkiv were noted in 1993 by Rjabockon and in 1994 by Burda & Rjabockon (1994).

At the same time, the species began expansion in Transcarpathia, and in the western and northern forest regions of the country (Protopopova & Shevera 1998; Prots & Drescher 2010; Vykhor & Prots 2014; Protopopova & Shevera 2014, 2019).

The period from the first finds to the expansion in some regions of Ukraine is about 50 years, which is significantly less than in Europe. According to Vinogradova et al. (2009) this can be explained by pre-adaptation in the culture of the first escaped plants.

At the beginning of the 21<sup>st</sup> century, separate localities of the species were recorded in different regions in Ukraine: in Chernivtsi region (Chernivtsi, Zhovtnevyi park, near stream, 15.06.2000, Khlystun, CHER, s.n.), Vinnytsia region (Vinnytsia, park of the hospital, 27.06.2022, Dobrovolska, KW, 088935), Sumy region (Seredyna-Buda, 23.08.2003, bank of canal, Panchenko, KW, 042537), Zhytomyr region (Zhytomyr, under the fence, 12.09.2004, Orlov, KW, 073179; vicinity of Lugyny, the edge of the alder forest, 30.09.2004, Orlov, KW, 090862, 073189, 073187), Ivano-Frankivsk region (Verkhovyna, synanthropic community on right bank of Chorny Cheremosh River, near the bus station, 06.08.2007, N. Sytschak, LWKS, 019733) and Poltava region (Poltava, “Shvedska mohyla” railways station, near the source, 11.08.2011, T. Dvirna, KW, 099377).

In general, we recorded 484 localities from 16 regions of Ukraine. The map of distribution of *I. glandulifera* is presented in the Fig. 1. The spreading of *I. glandulifera* is concentrated to the western, northern and to the northeastern regions of the country, in Polissia and partly in central Ukraine.

It should be noted that herbarium data correspond to a more or less adequate distribution of the species in the regions. Ivano-Frankivsk, Transcarpathia and Kyiv regions are the largest regions where herbarium specimens and databases are collected. Recently, a large number of new localities have been recorded according to the open database iNaturalist. This indicates a rapid consolidation of the range of the species. More than 100 localities are known according to herbarium data, 286 are known from iNaturalist, 43 from UkrBin, and the others are literary data, phytosociological relevés and personal information; but in some cases many photos present localities actually from one of the places or the very close ones.

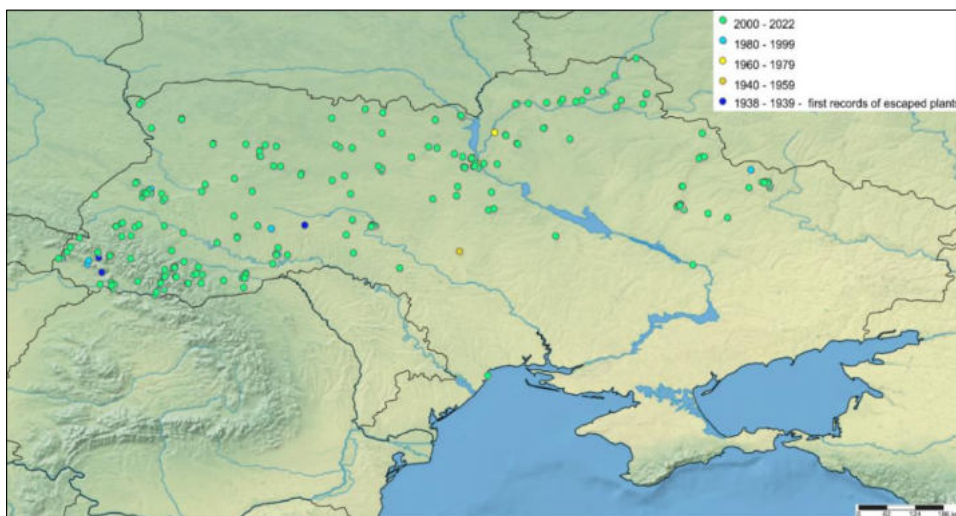


Fig. 1 The map of distribution of *Impatiens glandulifera* in Ukraine.

From the beginning of the fixation of the first wild plants until the 80s, the localities in different regions occurred more or less sporadically, without changes in their number. At the 4<sup>th</sup> stage, there is an increase in localities, which is connected with the activation of spreading in the western regions. At the last stage, the end of the 20<sup>th</sup> and the beginning of the 21<sup>st</sup> century, there is a significant increase in the number of localities, which is associated with new floristic finds in various regions, the consolidation of the range of already known places, as well as a large number of photographs from iNaturalist.

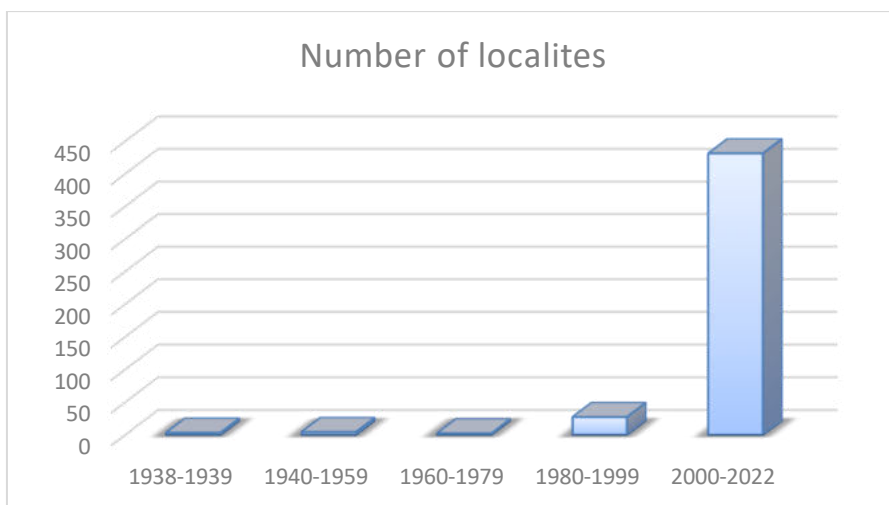
Number of records of *I. glandulifera* in Ukraine grew dynamically over the past 84 years (Fig. 2).

### Ecology

*Impatiens glandulifera* has grown in a wide range of environmental conditions. The general nature of current localities of *I. glandulifera* suggests that it in all cases escaped from cultivation (it occurs near houses in ruderal stands, on railway embankments and along railways (Fig. 3), at garbage dumps, on roadsides, in gardens, in wastelands, in parks, in arboretums and plantations, in cemeteries, etc.). Moreover, the majority of them are confined to various types of riparian habitats (tall grass eutrophic wetlands and swampy thickets, riverbanks, streams (Fig. 4), lakes, ponds, as well as springs, low-lying areas of drying watercourses, ditches). This pattern in the distribution of the species is the most typical and is observed throughout Europe and Canada (Beerling & Perrins 1993; Čuda et al. 2020; Helsen et al. 2021). There are also collections from forest (alder, hornbeam and beech) habitats located in the vicinity of different settlements.

### Phytocoenology

Tree diagram of cluster analysis of vegetation plots with different coverage partici-



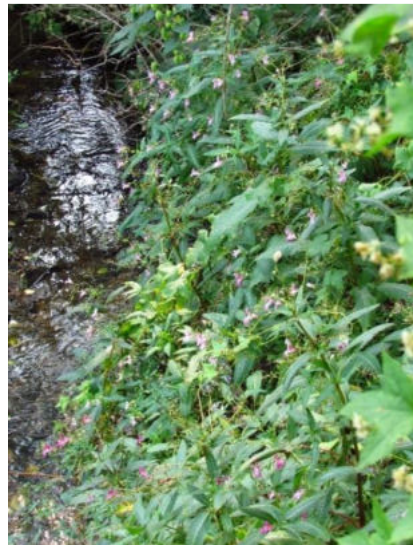
**Fig. 2** Number of localities of *Impatiens glandulifera* in Ukraine from 1938 to 2022.

pation of *I. glandulifera* is shown in Fig. 5. We got two main groups of clusters. The first one (clusters 1–8) presents herbaceous plant communities. In this group we identified vegetation (clusters 1–5) where diagnostic species were tall helophytes and sedges, such as *Phragmites australis*, *Glyceria maxima*, *Leersia oryzoides* and *Carex acuta*. Typical wetland herbs (*Lysimachia vulgaris*, *Naumburgia thyrsiflora*, *Oenanthe aquatica*, *Sium latifolium*, etc.) are frequent in the species composition of these plant communities. Another vegetation type (clusters 6–8) is presented by ruderal nutrient-demanding highly productive phytocoenoses of mesic to wet habitats, which belonged to *Bidentetea* and *Galio-Urticetea* classes. The high frequency of other invasive neophytes (*Solidago canadensis*, *Impatiens parviflora*, *Reynoutria japonica*, *Erigeron annuus*) is a characteristic feature of this group of plant communities.

The second main group of clusters (9–13) combines riparian willow and alder forests. Clusters 9–11 comprise softwood floodplain forest type dominated by *Salix alba* and *S. × fragilis* as well as willow scrub dominated by *Salix triandra*. Herb layer has very often been dominated by *Aegopodium podagraria*, *Brachypodium sylvaticum*, *Geum urbanum*, *Chaerophyllum aromaticum*, *Glechoma hederacea*, *Heracleum sosnowskyi* and *Urtica dioica*. Clusters 12–13 include vegetation of *Alnus glutinosa*-dominated forested swamps and broad-leaved floodplain forests with *Alnus glutinosa* and *Fraxinus excelsior*. Herb layer is composed of tall sedges and wetland herbs among which *Carex riparia*, *C. brizoides*, *Urtica dioica*, *Impatiens parviflora*, *I. noli-tangere*, *Galium aparine*, *Glechoma hederacea*, *Ficaria verna*, *Aegopodium podagraria*, *Lamium galeobdolon* are the dominants.



**Fig. 3** *Impatiens glandulifera* along the railway in Transcarpathia Region: vicinity of Perechyn (photo by Shevera M., 1997).



**Fig. 4** *Impatiens glandulifera* along the stream in Poltava Region: vicinity of Karlivka (photo by Dvirna T., 2012).



According to diagnostic species, we identified the following 13 clusters represented by associations of 6 classes, 9 orders and 10 alliances.

Syntaxonomical scheme of plant communities with participation of *I. glandulifera* in Ukraine is given below:

**PHRAGMITO-MAGNOCARICETEA KLIKA IN KLIKA ET NOVÁK 1941**

*Phragmitetalia* Koch 1926

*Phragmition communis* Koch 1926

*Phragmitetum australis* Savič 1926

*Glycerietum maximae* Nowiński 1930 corr. Šumberová, Chytrý et Danihelka in Chytrý 2011

*Magnocaricetalia* Pignatti 1953

*Magnocaricion gracilis* Géhu 1961

*Caricetum gracilis* Savič 1926

*Nasturtio-Glycerietalia* Pignatti 1953

*Glycerio-Sparganion* Br.-Bl. et Sissingh in Boer 1942

*Leersietum oryzoidis* Egger 1933

**BIDENTETEA TX. ET AL. EX VON ROCHOW 1951**

*Bidentetalia* Br.-Bl. et Tx. ex Klika et Hadač 1944

*Bidention tripartitae* Nordhagen ex Klika et Hadač 1944

*Myosoto aquatici-Bidentetum frondosae* O. de Bolòs, Montserrat et Romo 1988

**GALIO-URTICETEA PASSARGE EX KOPECKÝ 1969**

*Convolvuletalia sepium* Tx. ex Moor 1958

*Senecionion fluviatilis* Tx. ex Moor 1958

*Calystegio sepium-Impatientetum glanduliferae* Hilbig 1972

*Galio-Alliarietalia* Oberd. in Görs et T. Müller 1969

*Aegopodion podagrariae* Tx. 1967

*Reynoutrietum japonicae* Görs et Müller in Görs 1975

**ALNETEA GLUTINOSAE BR.-BL. ET TX. EX WESTHOFF ET AL. 1946**

*Alnetalia glutinosae* Tx. 1937

*Alnion glutinosae* Malcuit 1929

*Ribo nigri-Alnetum Solińska-Górnicka* (1975) 1987

**SALICETEA PURPUREAE MOOR 1958**

*Salicetalia purpureae* Moor 1958

*Salicion albae* Soó 1951

*Salicetum albae* Issler 1926

*Salicetum fragilis* Passarge 1957

*Salicion triandrae* T. Müller et Görs 1958

*Salicetum triandrae* Malcuit ex Noirfalise in Lebrun et al. 1955

**CARPINO-FAGETEA SYLVATICAE JAKUCS EX PASSARGE 1968**

*Alno-Fraxinetalia excelsioris* Passarge 1968

*Alnion incanae* Pawłowski et al. 1928

*Alnetum incanae* Lüdi 1921

*Stellario nemorum-Alnetum glutinosae* Lohmeyer 1957

**Tab. 1** Data sources of plots with participation of *Impatiens glandulifera* in Ukraine.

Data sources	No. of plots
Personal data of L. Borsukevych	44
EU-UA-012 (Ukrainian Wetland Database) (Tokaryuk et al. 2018)	15 5
Private data of V. Shevchyk et al.	3

**Tab. 2** Overview of the EUNIS habitat types with participation of *Impatiens glandulifera* and the number of plots assigned to each of them by the EUNIS-ESy expert system.

EUNIS 2020 code	EUNIS 2020 habitat name	No. of plots
Q51	Tall-helophyte bed	5
Q53	Tall-sedge bed	1
R55	Lowland moist or wet tall-herb and fern fringe	4
S91	Temperate riparian scrub	5
Sa	Scrub	8
T	Forest	3
T11	Temperate <i>Salix</i> and <i>Populus</i> riparian forest	11
T12	<i>Alnus glutinosa</i> - <i>Alnus incana</i> forest on riparian and mineral soils	8
T13	Temperate hardwood riparian forest	15
V	Man-made habitats	1
V39	Mesic perennial anthropogenic herbaceous vegetation	3
? (Unclassified)		3

**Tab. 3** Assessment of the impact of *Impatiens glandulifera* on biodiversity in different regions in Ukraine.

Regions	I-Rank	I-Rank Values
Ukraine in general	47	low
Transcarpathia lowland	80	high
Polissia:		
Right bank	89	high
Left bank	53	medium
Left Bank Forest Steppe (within Poltava and Kharkiv regions)	33	low

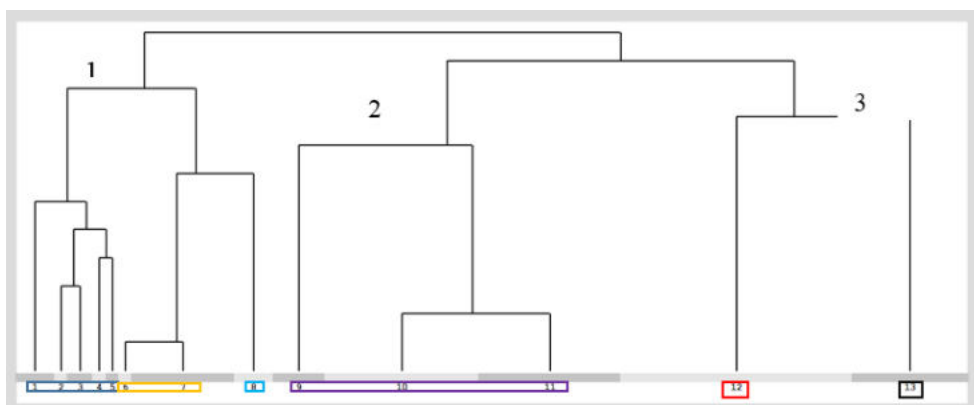
### Habitats

A study of the participation of the species in different types of habitats was conducted. Collected relevés with *I. glandulifera* were referred to 11 habitat types of the EUNIS classification (Tab. 2). The most widespread are Temperate hardwood riparian forest (15), Temperate *Salix* and *Populus* riparian forest (11) and *Alnus glutinosa*-*Alnus incana* forest on riparian and mineral soils (8).

## Discussion

Our results show that the abundance and the frequency of occurrence of *I. glandulifera* was considerably higher in the riparian forest plant communities than in other types of vegetation. The key factors that contribute to the spread of *I. glandulifera* into forests are (i) the ability of plants to grow in shade and to tolerate canopy closure of almost 90% (Čuda et al. 2014); (ii) the high propagule pressure from large and widespread riparian populations (Hejda & Pyšek 2006; Čuda et al. 2020) and extensive anthropogenic and natural disturbances in forest ecosystems. Due to the high propagule pressure *I. glandulifera* can reach sites that are distant from riverbanks (Maule et al. 2000). Further, the potential of this species to invade different habitats and plant communities is high due to *I. glandulifera*'s ability to maintain massive seed production (Janczak 2013; Skálová et al. 2019), its increasing distribution within the territory of Ukraine, and the current increasing human impact on riparian and other habitats that facilitates its establishment and spread.

Thus, the most of occurrences of *I. glandulifera* were found across temperate *Salix* and *Populus* riparian forest habitat type which includes vegetation of *Salicetea purpureae* class. This vegetation has one of the highest level of invasion and very often *I. glandulifera* is accompanied by other non-native plants with high invasive possibility, such as *Solidago canadensis*, *Reynoutria japonica*, *Helianthus tuberosus* (Wagner et al. 2017). *Impatiens glandulifera* also occurs frequently across another forest habitat types – Temperate hardwood riparian forest and *Alnus glutinosa*-*Alnus incana* forest on riparian and mineral soils. These habitats syntaxonically correlate with the vegetation classes *Alnetea glutinosae* and *Carpino-Fagetea sylvaticae*. Within these vegetation *I. glandulifera* is characterized by a high coverage (to 25–30%) and average height to 140–180 cm. It demonstrates that alder forests are a very favorable phytocoenotic environment for this species. In the study area, these two forest types are separated territorially and do not overlap:



**Fig. 5** TWINSpan diagram of cluster analysis of vegetation plots with participation of *Impatiens glandulifera*. Group 1: blue line – class *Phragmito-Magnocaricetea*; orange line – class *Galio-Urticetea*; sea-blue line – class *Bidentetea*; Group 2: violet line – class *Salicetea purpurea*; Group 3: red line – class *Alnetea glutinosae*; black line – class *Carpino-Fagetea sylvaticae*.

in the Carpathians and Transcarpathian region *I. glandulifera* is usually spread in the communities of the *Alnion incanae* alliance, in the lowland regions of Ukraine – *Alnion glutinosae* alliance.

We found rare distribution of *I. glandulifera* within non-forest habitats. In our dataset we could identify two types of such habitats – wetlands and anthropogenic habitats, which related with *Phragmito-Magno-Caricetea*, *Bidentetea* and *Galio-Urticetea*. The coverage of *I. glandulifera* in the stands of the above mentioned vegetation types usually does not exceed 15%. Phytocoenoses of the association *Calystegio sepium-Impatientetum glanduliferae* are an exception. They are formed by *I. glandulifera* with the coverage 40–50% and other aliens with high invasive possibility, such as *Solidago canadensis*, *Erigeron annuus* and *Impatiens parviflora*.

Our results showed also quite high ability of *I. glandulifera* to relate to scrub habitats. But with EUNIS-Esy we could not precisely identify specific scrub habitat types, except for 5 vegetation plots assigned to Temperate riparian scrub dominated by *Salix triandra*. This is the prospect for further analysis as well as large-scale study of populations of *I. glandulifera* with phytosociological viewpoint across all territory of Ukraine.

The ecological requirements of *I. glandulifera* are best met by the conditions of the forested northern and western regions of Ukraine, where the species is the most widely distributed. In the central areas, it is spread sporadically or locally. In the southern and eastern directions, its distribution decreases significantly. This is also confirmed by the I-Rank assessment (Tab. 3). The I-Rank is high significance (the species represents a severe threat to native species and ecological communities) in the Polissia zone (Right Bank – 89) and Transcarpathia reg. (80), where it is a transformer. The success of the species in these territories is ensured by the high viability and productivity, the ability to form derivative communities and rapid spread. The I-Rank is medium in Left Bank Polissia zone (53 – medium – species represents moderate threat to native species and ecological communities) and low in the Left Bank Forest-Steppe zone (e.g. Poltava and Kharkiv regions – 33). Such values are due to the moderate or isolated distribution of the species, as well as its complete absence in the southern regions and its insignificant influence on the natural vegetation cover.

## Conclusion

We have established the main stages of introduction and naturalization of *Impatiens glandulifera*; it has been recorded in 16 regions of the forest and forest-steppe zones. The species is recorded in 13 associations of 6 classes.

The spreading of *I. glandulifera* largely depends on climatic conditions. It has been established that the optimum distribution of the species in Ukraine covers the northern and the western forest and forest-steppe areas, in which it shows a fairly high coenotic activity. The spreading activity decreases in the southeast direction. An important element of control over the spread of the species should be constant

monitoring at the regional level and also adaptation of the European experience of control measures (Krzysztofciak et al. 2022).

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## Appendix

### List of localities of *Impatiens glandulifera* in Ukraine

Each localities are separated with dash “–”. All data cited from webpage “<https://uk.inaturalist.org/observations/...>” is shortened to “observations/...” followed by number of record.

### **Cherkasy Region**

Cultivated as ornamental plants, escaped, near Ros River (Matviychuk, VI.1995, UPU, s.n.). – A forest strip near the agrobiostation of Uman State Pedagogical University (Buzhylo, VI.1996, UPU, s.n.). – Uman', the suburb of Turok – near the market, in a drying watercourse (Chorna. 2001. Ukr. Bot. J. 58(1)1: 37, 2001).

### **Chernihiv Region**

Oster, escaped from gardens (Kotov M., 2.IX.1967, KW, 126668). – Oster, escaped from gardens (Kotov M., 2.IX.1967, KW, s.n.). – Yalivcschyna area, dump (Zavialova L.V., 08.08.2001, KW, 065821). – Yalivcschyna area, dump near the former state farm of ornamental cultures (Shevera M., 09.10.2001, KW, 009825). – M.-Kotsiubynske, Kruta str., dump (Zavialova L.V., 30.09.2004, KW, 062701). – M.-Kotsiubynske, Kruta str., wet ravine, on the side of the road, sporadically (Zavialova L.V., 30.09.2004, KW, 049258, 049261). – M.-Kotsiubynske, Kruta str., wet ravine with *Rubus* colony and small group of *Persicaria* (Zavialova L.V., 30.09.2004, KW, 049266, 049267, 049259, 049265, 062701, 062702). – Kozelets Distr., Krasylivka village, bank of canal (Lukash O.V., 04.09.2006, KW, 064233). – Chernihiv, «Russian cemetery» (Protopopova V.V., Shevera M.V., Zavialova L.V., 25.09.2007, KW, 072710). – Ichnia Distr., Olshana village, on a pond near the road (Dvirna T.S., 10.07.2012, KW, 00106214). – Sosnytsia Distr., Sosnytsia, northern vicinity, near road, 51.535833, 32.501183, 2017, [https://ukrbin.com/show\\_image.php?imageid=43497](https://ukrbin.com/show_image.php?imageid=43497). – Novgorod-Siverskyi Distr., 2007, M. Shevera (photo). – Chernihiv, along Desna River, 51.476333, 31.307889, 2011, [https://ukrbin.com/show\\_image.php?imageid=87369](https://ukrbin.com/show_image.php?imageid=87369). – Kulykivskyi Distr., «Ledan» botanical protected area, bank of the lake, 51.500844, 31.556044, 2018, [https://ukrbin.com/show\\_image.php?imageid=90235](https://ukrbin.com/show_image.php?imageid=90235). – Kordivka, 51.496269, 31.332534, 2019, [https://ukrbin.com/show\\_image.php?imageid=90235](https://ukrbin.com/show_image.php?imageid=90235).



show\_image.php?imageid=147949. – Velychkivka, 51.578455, 32.233085, 2019, [https://ukrbin.com/show\\_image.php?imageid=144830](https://ukrbin.com/show_image.php?imageid=144830). – Oster River, 51.04811, 31.874303, 2020, <https://www.inaturalist.org/observations/117481750>. – Nizhyn Distr., 51.038385, 31.855480, 2021, Plant cover of Ukraine (Facebook). – Khlopianyky, 51.734102, 32.719381, 2022, [observations/130746927](https://www.inaturalist.org/observations/130746927). – Chernihiv, along Desna River, 51.485498, 31.309419, 2021, Peregrym M., Plant cover of Ukraine (Facebook).

### **Chernivtsi Region**

Bukovinian Cis-Carpathian, Chernivtsi Reg., Chernivtsi, a park-monument of the garden and park art «Park Zhovtnevyi» (Korzhan K., Bucha O., 09.07.2000, CHER, s.n.). – Chernivtsi, Zhovtnevyi park, near the stream (Khlystun N.Ya., 15.07.2000, CHER, s.n.). – Glyboka, Shyrokyi dub area, along the road (Tokaryuk A., Lytvin L., 16.07.2007, CHER, s.n.). – Chernivtsi, Sadky area, Kovelska str. (Korzhan K., Volutsa O., 24.07.2007, CHER, s.n.). – Chernivtsi, Srotozhenetska str., forest plantation (Korzhan K., Tokaryuk A., 11.09.2007, CHER, s.n.). – Chernivtsi, Kovelska str. (Korzhan K., Tokaryuk A., 11.09.2007, CHER, s.n.). – Chernivtsi, Ashgabat str., in the garden (Korzhan K., 21.09.2007, CHER, s.n.). – Storozhynets Distr., Stara Zhadova, under the fence near the railway track (Korzhan K., Tokaryuk A., 11.10.2007, CHER, s.n.). – Glyboka, Glyboka Bukovynska station, along railways (Chorney I., Budzhak V., Tokaryuk A., 12.10.2007, CHER, s.n.). – Chernivtsi, Pivdenno-Kiltseva str., forest plantation, opposite the central cemetery (Korzhan K., Bucha O., 21.07.2008, CHER, s.n.). – Chernivtsi, along the road on Kalynivska str., forest plantation (Korzhan K., 18.07.2008, CHER, s.n.). – Chernivtsi, forest plantation near the airport (K. Korzhan, 22.07.2008, CHER, s.n.). – Chernivtsi, Rogizna, along the stream (Korzhan K., Volutsa O., Lytvin L., 24.07.2009, CHER, s.n.). – Putyvliia Distr., Okolena, forest, 48.158081, 25.080655, 2019, [https://ukrbin.com/show\\_image.php?imageid=123981](https://ukrbin.com/show_image.php?imageid=123981). – Khotyn, near the stream, 48.523018, 26.498169, 2019, [https://ukrbin.com/show\\_image.php?imageid=129859](https://ukrbin.com/show_image.php?imageid=129859). – Chernivtsi, 48.257774, 25.947072, 2019, <https://www.inaturalist.org/observations/31415223>.

### **Ivano-Frankivsk Region**

Tlumach Distr., south vicinity of Dibrova, near Dnister. Synanthropized shrub community under the bridge in the river valley (Kagalo O., Skibitska N., Andreyeva O., Bednarska I., 17.08.2005, LWKS, 014855). – Verkhovyna Distr., Verkhovyna, Synanthropized community on the right bank of Cheremosh River, near bus station (Sytchak N., 06.08.2007, LWKS, 019733). – Yaremche, 48.45697, 24.56742, 2022, [observations/131779219](https://www.inaturalist.org/observations/131779219). – Yaremche, 48.457308, 24.567764, 2022, [observations/131778977](https://www.inaturalist.org/observations/131778977). – Lanchyn, 48.557921, 24.74197, 2022, [observations/131639322](https://www.inaturalist.org/observations/131639322). – Yaremche, 48.445392, 24.538808, 2022, [observations/13137188](https://www.inaturalist.org/observations/13137188). – Yaremche, 48.4456, 24.537866, 2022, [observations/131371874](https://www.inaturalist.org/observations/131371874). – Yaremche, 48.444809, 24.549432, 2022, [observations/131364319](https://www.inaturalist.org/observations/131364319). – Yaremche, 48.444423, 24.538897, 2022, [observations/131213638](https://www.inaturalist.org/observations/131213638). – Yaremche, 48.444431, 24.538419, 2022, [observations/131213634](https://www.inaturalist.org/observations/131213634). – Yaremche, 48.444721, 24.537817, 2022, [observations/131213309](https://www.inaturalist.org/observations/131213309). – Yaremche, 48.444814, 24.53807, 2022, [observations/131213307](https://www.inaturalist.org/observations/131213307). – Yaremche, 48.44474, 24.538706, 2022, [observations/131213633](https://www.inaturalist.org/observations/131213633). – Yaremche, 48.444971, 24.538056, 2022, [observations/131048467](https://www.inaturalist.org/observations/131048467). – Yaremche, 48.444721, 24.537978, 2022, [observations/131213109](https://www.inaturalist.org/observations/131213109). – Nadvirnianskyi Distr., 48.448963, 24.546492, 2022, [observations/131107445](https://www.inaturalist.org/observations/131107445). – Yaremche, 48.444654, 24.53985, 2022, [observations/131048296](https://www.inaturalist.org/observations/131048296). – Yaremche, 48.444754, 24.540315, 2022, [observations/131048156](https://www.inaturalist.org/observations/131048156). – Yaremche, 48.444655, 24.548853, 2022, [observations/131047738](https://www.inaturalist.org/observations/131047738). – Yaremche, 48.444838, 24.548997, 2022, [observations/130942986](https://www.inaturalist.org/observations/130942986). – Yaremche, 48.444878, 24.549698, [observations/130942982](https://www.inaturalist.org/observations/130942982). – Yaremche, 48.453266, 24.559895, 2022, [observations/130941665](https://www.inaturalist.org/observations/130941665). – Yaremche, 48.456303, 24.560736, 2022, [observations/130941664](https://www.inaturalist.org/observations/130941664). – Yaremche, Prut River, 48.45371, 24.561556, 2021, <https://www.inaturalist.org/observations/91948964>. – Sheshory, 48.316224, 24.933026, 2015, <https://www.inaturalist.org/observations/68592394>. – Vorokhta, bank of Prut River, 48.275849,

24.586141, 2017, [https://ukrbin.com/show\\_image.php?imageid=89687](https://ukrbin.com/show_image.php?imageid=89687). – Dolyna Distr., Skolivski Beskydy, Polianytskyi regional landscape park, 49.039929, 23.692360, 2018, [https://ukrbin.com/show\\_image.php?imageid=123612](https://ukrbin.com/show_image.php?imageid=123612). – Kosiv Distr., Staryi Kosiv, Rybnitsia River bank, 48.316906, 25.105997, 2019, [https://ukrbin.com/show\\_image.php?imageid=127460](https://ukrbin.com/show_image.php?imageid=127460). – Yaremche, Kazneny str., Chornohorchyk stream, 48.453517, 24.559545, 2021, <https://www.inaturalist.org/observations/90685417>. – Yaremche, Kutotyna str., 48.448201, 24.556665, 2018, [https://ukrbin.com/show\\_image.php?imageid=91090](https://ukrbin.com/show_image.php?imageid=91090). – Kolomyia Reg., Spas, 48.460881, 25.025374, 2019, [https://ukrbin.com/show\\_image.php?imageid=137487](https://ukrbin.com/show_image.php?imageid=137487). – Verkhovyna Distr., Verkhovyna, 48.153500, 24.828333, 2019, [https://ukrbin.com/show\\_image.php?imageid=130143](https://ukrbin.com/show_image.php?imageid=130143). – Nadvirna, Prutets River, 48.352039, 24.40827, 2019, <https://www.inaturalist.org/observations/28697126>. – Berkhovyna Distr., Verkhovyna, 48.152642, 24.810489, 2020, <https://www.inaturalist.org/observations/60662356>. – Nadvirna, Vorokhta, Prut River, 48.283681, 24.572865, 2011, <https://www.inaturalist.org/observations/42359588>. – Yaremche, 48.460696, 24.559268, 2022, [observations/130893815](https://www.inaturalist.org/observations/130893815). – Yaremche, 48.458777, 24.558337, 2022, [observations/130893598](https://www.inaturalist.org/observations/130893598). – Yaremche, Carpathian National Nature, 48.444134, 24.553881, 2022, [observations/128816229](https://www.inaturalist.org/observations/128816229). – Yaremche, 48.453433, 24.560626, 2022, [observations/132314543](https://www.inaturalist.org/observations/132314543). – Yaremche, 48.453484, 24.558789, 2022, [observations/132314541](https://www.inaturalist.org/observations/132314541). – Yaremche, 48.453489, 24.559861, 2022, [observations/132314540](https://www.inaturalist.org/observations/132314540). – Yaremche, 48.453319, 24.559243, 2022, [observations/132314536](https://www.inaturalist.org/observations/132314536). – Yaremche, 48.45368, 24.558201, 2022, [observations/132314114](https://www.inaturalist.org/observations/132314114). – Yaremche, 48.45423, 24.55707, 2022, [observations/132314112](https://www.inaturalist.org/observations/132314112). – Yaremche, 48.45437, 24.556707, 2022, [observations/132314111](https://www.inaturalist.org/observations/132314111). – Yaremche, 48.454632, 24.556621, 2022, [observations/132313895](https://www.inaturalist.org/observations/132313895). – Yaremche, 48.454696, 24.556015, 2022, [observations/132313892](https://www.inaturalist.org/observations/132313892). – Yaremche, 48.456187, 24.556892, 2022, 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[observations/130910549](https://www.inaturalist.org/observations/130910549). – Yaremche, 48.445814, 24.549296, 2022, [observations/130910547](https://www.inaturalist.org/observations/130910547). – Yaremche, 48.44602, 24.549323, 2022, [observations/130910352](https://www.inaturalist.org/observations/130910352). – Yaremche, 48.445879, 24.549678, 2022, [observations/130910350](https://www.inaturalist.org/observations/130910350). – Yaremche, 48.464364, 24.566413, 2022, [observations/130894966](https://www.inaturalist.org/observations/130894966). – Yaremche, 48.464146, 24.56624, 2022, [observations/130894965](https://www.inaturalist.org/observations/130894965). – Yaremche, 48.46402, 24.56608, 2022, [observations/130894964](https://www.inaturalist.org/observations/130894964). – Yaremche, 48.463419, 24.566029, 2022, [observations/130894963](https://www.inaturalist.org/observations/130894963). – Yaremche, 48.464411, 24.566427, 2022, [observations/130894820](https://www.inaturalist.org/observations/130894820). – Yaremche, 48.464574, 24.566571, 2022, [observations/130894818](https://www.inaturalist.org/observations/130894818). – Yaremche, 48.464614, 24.566617, 2022, [observations/130894649](https://www.inaturalist.org/observations/130894649). – Yaremche, 48.464118, 24.565715, 2022, [observations/130894493](https://www.inaturalist.org/observations/130894493). – Yaremche, 48.464805, 24.565959, 2022, [observations/130894491](https://www.inaturalist.org/observations/130894491). – Yaremche, 48.464481, 24.565138, 2022, [observations/130894300](https://www.inaturalist.org/observations/130894300). – Yaremche, 48.464412, 24.565367, 2022, [observations/130894299](https://www.inaturalist.org/observations/130894299). – Yaremche, 48.464521, 24.565477, 2022, [observations/130894229](https://www.inaturalist.org/observations/130894229). – Yaremche, 48.464257, 24.565117, 2022, 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### **Kharkiv Region**

Kharkiv, Lopan' River, under the metro bridge (Zviagintseva K.A., 24.08.2013, KW, 00107561, 001077562). – Kharkiv, Klochkovska str., turn to direction on plant of food technologies, near the stream, on moist soil. A lot. (Zviagintseva K.A, 26.09.2010, KW, 00105903, 00105902; CWU s.n.). – Zolochiv, Gnoyanka River bank (Chorna, 08.08.1998, UPU, s.n.). – Kharkiv, Sarzhynka River, 50.042542, 36.253985, 2019, <https://www.inaturalist.org/observations/30432707>. – Kharkiv, Toploye lake, 50.028384, 36.241585, 2019, <https://www.inaturalist.org/observations/29721772>. – Kharkiv, bank of Kharkiv River, 50.038756, 36.313375, 2018, [https://ukrbin.com/show\\_image.php?imageid=87355](https://ukrbin.com/show_image.php?imageid=87355). – Kharkiv, Kharkiv River, 50.00202, 36.283286, 2013, <https://www.inaturalist.org/observations/28430298>. – Kharkiv, Toploye lake, 50.027315, 36.23639, 2019, <https://www.inaturalist.org/observations/29721630>. – Kharkiv, Shevchekiskiyi Distr., 50.023606, 36.221479, 2020, [observations/129836452](https://www.inaturalist.org/observations/129836452). – Kharkiv, Shevchekiskiyi Distr., 50.027668, 36.237987, 2020, [observations/129836476](https://www.inaturalist.org/observations/129836476). – Liubotyn, 2 pond, 49.935133, 35.923017, 2020, <https://www.inaturalist.org/observations/64733554>. – Kharkiv, Toploye lake, 50.028927, 36.242265, 2020, <https://www.inaturalist.org/observations/62492055>. – Kharkiv, Toploye lake, 50.02699, 36.233629, 2020, <https://www.inaturalist.org/observations/62489746>. – Kharkiv, Komsomolske lake, 50.044506, 36.262887, 2020, <https://www.inaturalist.org/observations/61658084>. – Kharkiv, Horbani area Zhykharets River, 49.936221, 36.332243, 2020, <https://www.inaturalist.org/observations/61378317>. – Kharkiv, Komsomolske lake, 50.043412, 36.256164, 2020, <https://www.inaturalist.org/observations/60047131>. – Kharkiv, Nemyshlia River, 49.976078, 36.335652, 2020, <https://www.inaturalist.org/observations/57368379>. – Kharkiv, Nemyshlia River, 49.97641, 36.335763, 2020, <https://www.inaturalist.org/observations/57367569>. – Kharkiv, Nemyshlia River, 49.976378, 36.335663, 2020, <https://www.inaturalist.org/observations/57367561>. – Kharkiv, Klenova str., Sarzhynka lake, 50.026622, 36.236416, 2020, <https://www.inaturalist.org/observations/51813805>. – Kharkiv, 50.027288, 36.235351, 2021, <https://www.inaturalist.org/observations/96872551>. – Kharkiv, Toploye lake, 50.027148, 36.237871, 2021, <https://www.inaturalist.org/observations/90253705>. – Kharkiv, Toploye lake, 50.026438, 36.237634, 2021, <https://www.inaturalist.org/observations/83113> 853. – Kharkiv, Sarzhyn yar area, 50.026367, 36.236212, 2022, [observations/135713761](https://www.inaturalist.org/observations/135713761). – Kharkiv, Kharkiv Reg., Krasnograd, along small stream - tributaries of the Berestova River in eastern vicinity, N 49.377040°, E 35.497806, 2015 (Davydov D.A. 2022. Nature Almanac (Biological Sciences). Vol. 32: 5–19.). – Kharkiv, 50.027132, 36.237672, 2022, <https://www.inaturalist.org/observations/128342382>. – Krasnograd, along small stream - tributaries of the Berestova River in eastern vicinity, N 49.377040°, E 35.497806, 2015 (Davydov D.A. 2022. Nature Almanac (Biological Sciences). Vol. 32: 5–19.). – Kharkiv, Lopan River, meadow park (Zviagintseva K., per. comm. 2022). – Kharkiv, Ivanivska Str., near breedge, left bank of Lopan River (Burda R.I., Rjabockon A.A., 03.08.1993, DNZ, s.n.; Burda R.I., Rjabockon A.A. 1994. Ukr. Botan. J., 51(6):140–145). – Kharkiv, near the fur plant, Uda River left bank, swamp (Rjabockon A.A., 22.08.1993, DNZ, s.n.; Burda R.I., Rjabockon A.A. 1994. Ukr. Botan. J., 51(6):140–145). – Kharkiv, near «Serp i molot» plant, acad. Pavlov Str., Nemyshlia River right bank (Rjabockon A.A. 28.08.1993, DNZ, s.n.; Burda R.I., Rjabockon A.A. 1994. Ukr. Botan. J., 51(6):140–145). – Kharkiv, to the right of the main entrance to the cemetery № 2, in the garbage (Rjabockon A.A., 10.10.1993, DNZ, s.n.; Burda R.I., Rjabockon A.A. 1994. Ukr. Botan. J., 51(6):140–145).

### **Khmelnyskyi Region**

Shepetivka, Kosetska River bank (Gubar, 02.07.2002, KW, 059973). – Shepetivka, Zbytenka River bank (Gubar, 05.07.2002, KW, 060892). – Netishyn, Staronetishynska str. (Gubar, 02.08.2003, KW, 060891). – Netishyn, Staronetishynska str., bank of the stream (Gubar, 11.08.2004, KW, 059999).

– Polonne Distr., near Vorobyivka village, Pivdennyi Bug River bank (Zhydkova, 25.08.2017, KW, 130515). – Horodok Distr., the southern outskirts of the Kryntsyiv village, ‘Podilski Tovtry’ Nat. Park, wet ravine near the village in the forest (Kagalo O., 21.08.2009, LWKS, 025484). – Kamianets-Podilskiy, Ruski filvarky, ruderalized river bank community (Kagalo O., 06.07.2012, LWKS, 028855). – Kamianets-Podilskiy, Lenin park, near the stream under the willows, the left bank of the Smotrych River (Skibitska N.V., 07.07.1999, LWKS, 09650). – Horodok Distr., 2 km eastern of the Lisovody village, poplar forest (Kagalo O.O., Skibitska N.B., 08.08.1999, LWKS, 002215). – Kamianets-Podilskiy, Zhovtnevyi Distr., Jewish cemetery, near the Stone bridge (Skibitska N., 18.07.1999, LWKS, 006914). – Shepetivka Distr., Shepetivka, Huska River, 50.170954, 27.05912, 2020, <https://www.inaturalist.org/observations/57623205>. – Polonne Distr., 50.070924, 27.672119, 2022, <https://www.inaturalist.org/observations/128485580>. – Kamianets-Podilskiy, Old town, 48.669693, 26.576172, 2022, [observations/131370108](https://www.inaturalist.org/observations/131370108). – Kamianets-Podilskiy, 48.68254, 26.789069, 2022, [observations/138226754](https://www.inaturalist.org/observations/138226754). – In the village Mykhailivka [vicinity of Kamyianets-Podilskiy (Makowiecki S., 1939. Sprawozdanie Komisji Fizjograficznej (Kraków), 72: 269–326).

### Kyiv Region

Vicinity of Kyiv, Lysa mountain, near the road (Protopopova V.V., 21.IX.1979, KW, s.n.). – Kyiv-Sviatoshyn Distr., on the stream bank near the railway station Bucha, abundantly (Mosyakin S.L., 13.08.1988, KW, 013973). – Lutizh, Lutizh River bank, 50.679074°N 30.393801°E (Zavyalova L.V., Korniyenko O.M., 06.08.2013, KW, 00111687, 00111688). – Lutizh, Lutizh River bank. 50.679074°N 30.393801°E (Zavyalova L.V., Korniyenko O.M., 06.08.2013, KW, 00111689, 00111690). – Makariv Distr, a weed in the wasteland, probably wild or accidentally introduced (Bortnyak, 06.08.1976, KWHU, 011409). – Vasyli'kiv, Makariv, weeds under the fence (in culture also) (Bortnyak, 20.09.1975, KWHU, 011408). – Obukhiv Distr., Vytachiv village, near the stream (Bortnyak, 27.09.1982, KWHU, 011407). – Obukhiv Distr., Trypillia village, near the road, under the fence (Bortnyak, 07.10.1978, KWHU, 011405). – Kyiv, Kyiv-Moskovskiy station, ruderal place on Lybid' River (Bortnyak, 07.08.1976, KWHU, 011406). – Kyiv, Botanical garden of Kyiv State University, cultivated (Glovatska O., 15.09.1965, KWHU, 011403) (sub. nom. *l. Roylei* Walp. Notae criticae: *Impatiens glandulifera* Royle). – Kyiv, Lysa mountain, near the road, in the place of origin of native rocks (Liubchenko, 24.08.1979, KWHU, 011404). – Kyiv, the foothills of Lysa mountain from the Dnipro side, in canal under the bridge (Melnyk R.P., 16.09.2000, KHER, 00001026, 00001029, 00001030). – Kyiv, the foothills of Lysa mountain from the Dnipro side, in canal under bridge (Moysiyenko I., 16.09.2000, KHER, 00001027). – Tetiyiv, Ros' River, right bank, near the bridge (Chorna G.A., 6.07.2000, UPU, s.n.). – Kyiv-Sviatoshyn Distr., Irpin; Irpin River, 50.511047, 30.255849, 2011, <https://www.inaturalist.org/observations/56829862>. – Kyiv-Sviatoshyn Distr., Boyarka, 50.318728, 30.271859, 2012; <https://www.inaturalist.org/observations/18751230>. – Piskivka, Piskivka River, 50.696491, 29.581934, 2013, <https://www.inaturalist.org/observations/34796978>. – Kyiv-Sviatoshyn Distr., Boyarka, 50.310485, 30.299106, 2013, <https://www.inaturalist.org/observations/18742313>. – Bohuslav, Dubyntsi, 49.520931, 30.77191, 2015, <https://www.inaturalist.org/observations/100809657>. – Ivankiv Distr., Chornobyl', 25 richhia Zhovtnia str., 51.27777, 30.217906, 2007, <https://www.inaturalist.org/observations/97047964>. – Kyiv, Syrets area, 50.468957, 30.428567, 2016, <https://www.inaturalist.org/observations/70033609>. – Kurenivka area, Syrets River, 50.48341, 30.435556, 2017, <https://www.inaturalist.org/observations/64147614>. – Kaharlyk Distr., Rosava River, 49.852973, 30.826875, 2017, <https://www.inaturalist.org/observations/31147035>. – Borodianka Distr., Nova-Buda, 50.670937, 29.748014, 2018, <https://www.inaturalist.org/observations/68326996>. – Khotiv, 50.327446, 30.48639, 2018, <https://www.inaturalist.org/observations/68326996>.

observations/70203621. – Borodianka Distr., Nemyshaievom near the stream in ravine, 50.564584, 30.092447, 2018, [https://ukrbin.com/show\\_image.php?imageid=88869](https://ukrbin.com/show_image.php?imageid=88869). – Khotiv, 50.328119, 30.486171, 2018, <https://www.inaturalist.org/observations/70203590>. – Boyarka, 50.310799, 30.306972, 2019, <https://www.inaturalist.org/observations/37208154>. – Radynka, Radynka River, 51.195461, 29.713315, 2020, <https://www.inaturalist.org/observations/119195755>. – Boyarka, 50.310141, 30.298839, 2020, <https://www.inaturalist.org/observations/109671468>. – Boyarka, 50.310804, 30.307104, 2020, <https://www.inaturalist.org/observations/61140695>. – Kyiv, Syrets area, Syretskyi park, 50.475047, 30.428591, 2020, <https://www.inaturalist.org/observations/59360802>. – Kyiv-Shiatoshyn Distr., Boyarka, 50.310657, 30.305605, 2020, <https://www.inaturalist.org/observations/65377257>. – Koncha-Zaspa, 50.299043, 30.569615, 2020, <https://www.inaturalist.org/observations/64045931>. – Kyiv-Shiatoshyn Distr., Boyarka, Prytvarka River, 50.305776, 30.314776, 2020, <https://www.inaturalist.org/observations/67017019>. – Boyarka, 50.306825, 30.316544, 2020, <https://www.inaturalist.org/observations/64006809>. – Boyarka, 50.305847, 30.314759, 2020, <https://www.inaturalist.org/observations/64005809>. – Kyiv, Kurenivka area, Bilytska str., 50.492416, 30.439651, 2021, <https://www.inaturalist.org/observations/100227367>. – Bila Tserkva, Protoka River (tributary Ros; River), 49.783487, 30.135022, 2021, <https://www.inaturalist.org/observations/97620287>. – Bila Tserkva, Protoka River (tributary Ros; River), 49.783441, 30.134894, 2021, <https://www.inaturalist.org/observations/97620285>. – Bila Tserkva, Protoka River (tributary Ros; River), 49.783237, 30.134698, 2021, <https://www.inaturalist.org/observations/97620250>. – Kyiv-Shiatoshyn Distr., Boyarka, Prytvarka River, 50.310859, 30.30721, 2021, <https://www.inaturalist.org/observations/85122044>. – Kyiv-Shiatoshyn Distr., Boyarka, Prytvarka River, 50.310353, 30.299105, 2021, <https://www.inaturalist.org/observations/85119706>. – Khotiv, 50.329768, 30.474286, 2021, <https://www.inaturalist.org/observations/83544511>. – Khotiv, 50.329778, 30.474085, 2021, <https://www.inaturalist.org/observations/91422633>. – Khotiv, 50.329884, 30.473597, 2021, <https://www.inaturalist.org/observations/91422299>. – Khotiv, 50.329876, 30.473359, 2021, <https://www.inaturalist.org/observations/91422296>. – Khotiv, 50.329871, 30.47348, 2021, <https://www.inaturalist.org/observations/91421926>. – Ivankiv Distr., Uzh River, 51.246628, 30.248747, 2021, <https://www.inaturalist.org/observations/91506917>. – Kyiv, Sovski ponds, 50.409559, 30.503842, 2021, <https://www.inaturalist.org/observations/82639397>. – Bohuslav Distr., Dybyntsi, 49.520694, 30.770376, 2021, <https://www.inaturalist.org/observations/89239782>. – Bohuslav, 49.543795, 30.874557, 2021, <https://www.inaturalist.org/observations/128862756>. – Skvyra, 49.724774, 29.663319, 2021, <https://www.inaturalist.org/observations/126118104>. – Kyiv Reg., Vasyl'kiv Distr., 49.955896, 30.158309, 2022, <https://www.inaturalist.org/observations/133799489>. – Kyiv, Magistral'na str., Syrets stream, 50.469833, 30.427969, 2022, <https://www.inaturalist.org/observations/122836408>. – Kyiv, Kurenivka area, 50.485048, 30.439627, 2022, <https://www.inaturalist.org/observations/120211864>. – Kyiv, Kurenivka area, 50.485085, 30.438235, 2022, <https://www.inaturalist.org/observations/120211009>. – Kyiv, Kurenivka area, 50.484677, 30.437315, 2022, <https://www.inaturalist.org/observations/120210211>. – Kyiv, Nyvky area, 50.475348, 30.428074, 2022, <https://www.inaturalist.org/observations/119924434>. – Kyiv, Nyvky area, 50.475233, 30.427971, 2022, <https://www.inaturalist.org/observations/119924035>. – Kyiv, Nyvky area, 50.473978, 30.428409, 2022, <https://www.inaturalist.org/observations/119922559>. – Kyiv, Kyiv-Sviatoshyn Distr., 50.306794, 30.316496, 2022, <https://www.inaturalist.org/observations/119635935>. – Kyiv, 50.475521, 30.428339, 2022, <https://www.inaturalist.org/observations/138390392>. – Bortnychi, 50.382738, 30.67712, 2022, <https://www.inaturalist.org/observations/129584673>. – Kurenivka, 50.481809, 30.435321, 2022, <https://www.inaturalist.org/observations/139752650>. – Flood of Irpin' River near Irpin', 1986-1987 (Mosyakin S.L. 1988. Ukr. Bot. J., 45(4): 66). – Flood of

Prypiat' River near Chernobyl' 1986–1987 (Mosyakin S.L. 1988. Ukr. Bot. J., 45(4): 66). – Kyiv, Spartak railways station, in forest, bank of stream, 1986–1987 (Mosyakin S.L. 1988. Ukr. Bot. J., 45(4): 66). – Vicinity of Khotiv village, along Vita stream (Koniakin S.M., Gubar L.M. 2019, Kharkiv, September 6–9, 2019, p. 36). – Boryspil, among the shrubs on north-west vicinity, N 50.377212°, E 30.939166°, 07.VIII.2021, Davydov D. A. (Davydov D.A., 2022. Nature Almanac (Biological Sciences). Vol. 32: 5–19). – Kyiv, 30.09.2022, Plant world of Ukraine (Facebook).

### Lviv Region

Weeds in the sanatorium «Khrustalni dvorets» (Kotov, 1.X.1953, KW, s.n.). – Weeds in the sanatorium «Khrustalni dvorets» (Kotov, 3.X.1953, KW, s.n.). – Truskavets, weeds in the sanatorium «Khrustalni dvorets» (Kotov, 4.X.1953, KW, s.n.). – Lviv vicinity, Krybchytzi, under fence (16.08.1948 [s. coll.], LWS, s.n.). – Novoyarychiv Distr., Bilka village, among blackthorn shrubs, common (21.7.1962 [s. coll.], LWS, s.n.). – Zhovkva Distr., vicinity of Dublyany, bank of pond (Kuzyarin O.T., Smyrnova N.O., 20.08.1993, LWS, s.n.). – Lviv, Northern vicinity of Levandivka, peat bog. On the bank of a stream and at a landfill (Kuzyarin O.T. 29.09.2009, LWS, s.n.). – Zhovkva, Zolochiv Distr., Verkhobyzh village, near the road, near the stream (Sytschak N., Kagalo O., 12.07.2001, LWKS, 000175). – Drohobych Distr., Truskavets, Stebnytska str., the territory of the schoolboy's house, near the garages (Rykhlynska M., 16.08.2004, LWKS, 027177). – Drohobych Distr., Truskavets, near town clinic, shrub thickets in the Solonytsia River valley (Kagalo O., 09.08.2005, LWKS, 0164610). – Mostyska Distr., southern vicinity of Shegyni village (Kagalo O., Skybitska N., Korotchenko I., 29.07.2006, LWKS, 018639). – Zhovkva Distr., Fayna village, synanthropic community near the road (Sytschak N., Kagalo O., 30.08.2007, LWKS, 020046). – Zhovkva Distr., 50.023139, 23.810889, 2017, [https://ukrbin.com/show\\_image.php?imageid=99285](https://ukrbin.com/show_image.php?imageid=99285). – Peremyshliany Distr., Pidyarkiv, near the road, 49.738839, 24.365719, 2018, [https://ukrbin.com/show\\_image.php?imageid=88921](https://ukrbin.com/show_image.php?imageid=88921). – Stare selo, 49.227601, 24.346875, 2019, [https://ukrbin.com/show\\_image.php?imageid=126176](https://ukrbin.com/show_image.php?imageid=126176). – Brody Distr., Boratyn, near the road, 49.993874, 25.160028, 2019, [https://ukrbin.com/show\\_image.php?imageid=127056](https://ukrbin.com/show_image.php?imageid=127056). – Peremyshliany Distr., Pidgorodysche, synanthropic community, 49.694021, 24.328724, 2020, [https://ukrbin.com/show\\_image.php?imageid=184536](https://ukrbin.com/show_image.php?imageid=184536). – Stryi Distr., Koniukhov, Stryi River, synanthropic community, 49.204140, 23.773143, 2020, [https://ukrbin.com/show\\_image.php?imageid=175713](https://ukrbin.com/show_image.php?imageid=175713). – Lviv, Pylyp Orlyk str., synanthropic community, 49.877694, 24.027889, 2021, [https://ukrbin.com/show\\_image.php?imageid=212744](https://ukrbin.com/show_image.php?imageid=212744). – Lviv, 49.833348, 23.932343, 2021, [https://ukrbin.com/show\\_image.php?imageid=212545](https://ukrbin.com/show_image.php?imageid=212545). – Zhivkva Distr., Krekhiv, 50.036354, 23.796313, 2020, [https://ukrbin.com/show\\_image.php?imageid=169026](https://ukrbin.com/show_image.php?imageid=169026). – Stryi Distr., Stryi, 49.245480, 23.848850, 2020, [https://ukrbin.com/show\\_image.php?imageid=190424](https://ukrbin.com/show_image.php?imageid=190424). – Lviv, Sknyliv park, 49.813736, 23.971447, 2020, [https://ukrbin.com/show\\_image.php?imageid=201165](https://ukrbin.com/show_image.php?imageid=201165). – Lviv Distr., Hodovytsia, 49.765084, 23.916956, 2021, [https://ukrbin.com/show\\_image.php?imageid=216558](https://ukrbin.com/show_image.php?imageid=216558). – Lviv, Kintseva str., 49.832088, 24.084858, 2022, <https://www.inaturalist.org/observations/128284830>. – Lviv, Mayoruvka area, 49.826815, 24.078402, 2022, [observations/132136089](https://www.inaturalist.org/observations/132136089). – Drohobych Distr., 49.215103, 23.391466, 2022, [observations/135767599](https://www.inaturalist.org/observations/135767599). – Drohobych Distr., 49.214169, 23.398234, 2022, [observations/135763872](https://www.inaturalist.org/observations/135763872). – Lviv, near Lviv, 2022, Plant world of Ukraine (Facebook). – Lviv, forest park, 04.09.2022, Plant world of Ukraine (Facebook). – Yavoriv, Yavorivskiy National Natural Park (Hrytsyna M., Lyubynets I. 2015. Visnyk of Lviv University, Biological series, 69: 102–110). – Novoyarychiv Distr., V. Bilka village, park (Berko O., Aug. 1962, LWS; Berko O.N., 1962. Ukr. Bot. J., 20(1): 102–103).

### **Poltava Region**

Poltava, «Shvedska mohyla» railways station, near the stream along slope (Dvirna T.S., 11.08.2011, KW, 099377). – Poltava, Chervonyi shliakh on Tarapun'ka River (Dvirna T.S., 27.08.2012, KW, 00106189). – Zin'kiv Distr., Opishnia village, along the road, near bright on river (Dvirna, 20.07.2013, KW, 00109760). – Poltava, Tarapun'ka River, near the monastery, 2012, Dvirna T., Klepets O. (vidi, non lecta). – Zin'kiv Distr., Opishnia, territory of museum, colony, 2013, Dvirna T. (vidi, non lecta). – Poltava, Poltava Kyivska × Poltava Pivdenna railway stations, near the railway, in stream, 2011, Dvirna T. (vidi, non lecta). – Poltava, Poltava Kyivska, dendrological park, 2011, Dvirna T. (vidi, non lecta). – Poltava Distr., Karlivka, 2012, Dvirna T. (vidi, non lecta). – Poltava, near Khresto-Vozdvizhenskyi monastery, 2011, Dvirna T. (vidi, non lecta). – Poltava, Jewish cemetery, 2015, Klepets O. (vidi, non lecta). – Poltava, 49.628676, 34.570377, 2014, <https://www.inaturalist.org/observations/41980179>. – Poltava, 49.630779, 34.567684, 2014, <https://www.inaturalist.org/observations/41812320>. – Poltava, 49.592365, 34.581352, 2019, [https://ukrbin.com/show\\_image.php?imageid=124914](https://ukrbin.com/show_image.php?imageid=124914). – Poltava, a tributary of the Pushkariv pond, 49.585416, 34.497621, 2021, <https://www.inaturalist.org/observations/100254406>. – Poltava, 49.530976, 34.63626, 2021, <https://www.inaturalist.org/observations/100675266>. – Poltava, 49.582151, 34.498855, 2021, <https://www.inaturalist.org/observations/100992666>. – Poltava, Podilskyi Distr., 49.589834, 34.586087, 2022, [observations/129693723](https://www.inaturalist.org/observations/129693723). – Opishnia, 49.960593, 34.59618, 2022, [observations/132792887](https://www.inaturalist.org/observations/132792887).

### **Rivne Region**

Goshcha Distr., Tuchyn, 50.704472, 26.571219, 2011, <https://www.inaturalist.org/observations/35918335>. – Rivne Distr., Klevan', near the castle, 50.742500, 25.966417, 2017, [https://ukrbin.com/show\\_image.php?imageid=87081](https://ukrbin.com/show_image.php?imageid=87081). – Rivne, Basivkutska str., Basiv Kut lake, 50.605728, 26.2533, 2021, <https://www.inaturalist.org/observations/88378739>. – Rivne, 50.60684, 26.238826, 2022, [observations/133884295](https://www.inaturalist.org/observations/133884295). – Zdolbuniv, 50.525401, 26.238035, 2022, [observations/131743136](https://www.inaturalist.org/observations/131743136). – Rivne Distr., Zdolbuniv, 50.519902, 26.263143, 2022, [observations/131097493](https://www.inaturalist.org/observations/131097493). – Ostrog (Gubar L.M. 2004. Ukr. Bot. J., 61(1): 70–74). – Rivne (Gutsman S.V., Gutsman M.V. 2014. Naukovi zapysky Ternopil National Pedagogical University, ser. Biol., №4 (61): 28–32). – Oleksandria, 2021 (Volodymerets V., pers. comm., 2022). – Rivne, 2021 (Volodymerets V., pers. comm., 2022). – Rivne Distr., Tuchyn (Volodymerets V., pers. comm., 2022). – Liubomyrska railways station, 2021 (Volodymerets V., pers. comm., 2022).

### **Ternopil Region**

Kremenets Distr., Zhoboby village, on the eadge of the forest, near the village (Galagan, 25.07.2005, KW, s.n.). – Vicinity of Ternopil, [Berensanskyi] forest park, among shrubs (Balitskyi, 13.06.1995, KW, s.n.) [sub nom. *Impatiens noli-tangere* L.]. – Chortkiv Distr., 49.020869, 25.794984; 2021, [https://ukrbin.com/show\\_image.php?imageid=216989](https://ukrbin.com/show_image.php?imageid=216989). – Buchach Distr., Skomorokhy, along Strypa River, 48.909333, 25.395611, 2016, [https://ukrbin.com/show\\_image.php?imageid=87377](https://ukrbin.com/show_image.php?imageid=87377). – Buchach Distr., Skomorokhy, Strypa River, 48.910131, 25.395812, 2016, <https://www.inaturalist.org/observations/65413108>. – Lanivtsi village, Zherd' River, 49.867264, 26.090969, 2020, [https://ukrbin.com/show\\_image.php?imageid=171957](https://ukrbin.com/show_image.php?imageid=171957). – Chortkiv Distr., 49.002654, 25.792284, 2022, [https://ukrbin.com/show\\_image.php?imageid=261450](https://ukrbin.com/show_image.php?imageid=261450). – Kremenets, 50.10695, 25.7393, 2022, [observations/135111192](https://www.inaturalist.org/observations/135111192).

### **Sumy Region**

Seredyna-Buda, bank of the eastern ditch (Panchenko S.M., 23.08.2003, KW, 042537). – Putyvl, 2021, O. Miskova (Herb. State Historical and Cultural Reserve in Putyvl s.n.). – Trostianets Distr.,

50.515737, 34.983427, 2008, <https://www.inaturalist.org/observations/106933978>. – Putyvl' Distr., 51.491413, 33.825515, 2009, <https://www.inaturalist.org/observations/106973541>. – Trostianets Distr., 50.51394, 35.041587, 2018, <https://www.inaturalist.org/observations/106933254>. – Sumy Distr., 50.946526, 34.999307, 2019, <https://www.inaturalist.org/observations/106848766>. – Krolevets Distr., Spas'ke, shaded area, 51.428612, 33.302736, 2021, <https://www.inaturalist.org/observations/89502475>. – Krolevets Distr., Spas'ke, 51.438794, 33.303012, 2021, <https://www.inaturalist.org/observations/89502472>. – Putyvl', 2021, <https://www.inaturalist.org/observations/125945855>. – Leninske, 51.428612, 33.302736, 2021, <https://www.inaturalist.org/observations/89502475>. – Leninske, 51.438794, 33.303012, 2021, <https://www.inaturalist.org/observations/89502472>. – Shostka Distr., Glukhiv, near the Pavlovske lake, 51.666127, 33.886794, 2021, O. Miskova (vidi, non lecta). – Krolevets (Koval L.V. 2005. Ukr. Bot. J., 62(2): 244). – Glukhiv, Esman River (a tributary of the Kleven River) (Koval L.V., 2005. Ukr. Bot. J., 62(2): 244).

### **Transcarpathian**

Syniak, escaped (Fodor, 10.X.1981, UU, s.n.). – Uzhhorod, old cementary (Fodor, 11.VI.1988, UU, s.n.). – Nyzhnia Hrabovnitsia village, along the road (Fodor, 12.IX.1990, UU, s.n.). – Rachiv Distr., Kostylivka village, meadow on pond bank, 412 m a.s.l. (Sytschak N., Skibitska N., 17.08.2004, LWKS, 22446). – Rachiv Distr., Yasinia, Mytu str., near the railway station, in a roadside ditch (Sytschak N., 04.08.2009, LWKS, 031030). – Khust Distr., near the bridge in the direction on Veliatyno village, 200 m downstream, the left bank of the Tysa River (Vykhor B.I., 07.08.2010, LWS, s.n.). – floodplain of the Uzh River, right bank. The outskirts of Uzhhorod (Omel'chuk O.S., 25.09.2009, LWS, s.n.). – Uzhgorod - Peretchyn highway, near the «Bears» sculptural group (Shevera M., 02.09.2008, KW, 090791). – Uzhgorod, Uzh River bank (Shevera M., 31.08.2016, KW, 126689). – Rachiv Distr., Shchaulske forestry, Shchaud River bank, 650 m a.s.l., Maramarosh massive (Melesh Ye.A., 13.08.2021, Herb. Carpathian Biosphere Reserve s.n.). – Mizhhiria Distr., Pylypets, 48.664323, 23.298497, 2013, <https://www.inaturalist.org/observations/104587977>. – Khust Distr., Sokyrnytsia, 48.134036, 23.365139, 2016, [https://ukrbin.com/show\\_image.php?imageid=134452](https://ukrbin.com/show_image.php?imageid=134452). – Volovets Distr., Latorytsia River, 48.733315, 23.036147, 2018, [https://ukrbin.com/show\\_image.php?imageid=87130](https://ukrbin.com/show_image.php?imageid=87130). – Volovets Distr., 48.665301, 23.275571, 2020, [https://ukrbin.com/show\\_image.php?imageid=178878](https://ukrbin.com/show_image.php?imageid=178878). – Rachiv Distr., Bogdan village, Bila Tysa River, 48.039279, 24.345679, 2020, <https://www.inaturalist.org/observations/59571375>. – Yasynia, Chorna Tysa River, 48.267642, 24.351933, 2021, <https://www.inaturalist.org/observations/93070739>. – Synevyr village, Synevyr-Poliana lake, 48.61642, 23.684772, 2021, <https://www.inaturalist.org/observations/91416953>. – C-071117, Tereshul River, 48.190797, 23.828395, 2021, <https://www.inaturalist.org/observations/91653634>. – Rachiv Distr., near Trostianets, 48.165984, 24.275543, 2021, <https://www.inaturalist.org/observations/109643331>. – Perechyn Distr., Pastiljy village, 48.826288, 22.494853, 2021, Plant cover of Ukraine (Facebook). – Volovets Distr., Shypit waterfall, 48.664870, 23.262865, 2021, [https://ukrbin.com/show\\_image.php?imageid=217064](https://ukrbin.com/show_image.php?imageid=217064). – Vynogradiv Distr., Tysa River, 48.134340, 23.079010, 2021, [https://ukrbin.com/show\\_image.php?imageid=204772](https://ukrbin.com/show_image.php?imageid=204772). – Rachiv Distr., 47.938793, 24.173915; 2022, [observations/131469926](https://www.inaturalist.org/observations/131469926). – Khust Distr., 48.05952, 23.353734, 2022, [observations/130930990](https://www.inaturalist.org/observations/130930990). – Khust Distr., Shaian village, 48.059648, 23.351841, 2022, [observations/130926068](https://www.inaturalist.org/observations/130926068). – Khust Distr., 48.056147, 23.335377, 2022, [observations/130925187](https://www.inaturalist.org/observations/130925187). – Khust Distr., 48.05874, 23.345629, 2022, [observations/130697665](https://www.inaturalist.org/observations/130697665). – Rachiv Distr., 48.119368, 24.293249, 2022, [observations/130520274](https://www.inaturalist.org/observations/130520274). – Kvasy, 48.145628, 24.283016, 2022, [observations/130514445](https://www.inaturalist.org/observations/130514445). – Uzhhorod, 48.620209, 22.277481, 2022, [observations/135806539](https://www.inaturalist.org/observations/135806539). – Uzhhorod, 48.620207,



22.278078, 2022, observations/135806535. – Uzhhorod, 48.622295, 22.283716, 2022, observations/135640211. – Uzhhorod, 48.622487, 22.284046, 2022, observations/135640156. – Uzhhorod, 48.622379, 22.294475, 2022, observations/135407283. – Uzhhorod, 48.621321, 22.298084, 2022, observations/135403407. – Uzhhorod, 48.618634, 22.302864, 2022, observations/135402015. – Uzhhorod, 48.618704, 22.302709, 2022, observations/135401664. – Uzhhorod, 48.61852, 22.303158, 2022, observations/135401655. – Uzhhorod, 48.618569, 22.302958, 2022, observations/135401390. – Uzhhorod, 48.618244, 22.303574, 2022, observations/135401233. – Uzhhorod, 48.617983, 22.304327, 2022, observations/135400528. – Uzhhorod, 48.617342, 22.30692, 2022, observations/135400040. – Uzhhorod, 48.617309, 22.306987, 2022, observations/135398956. – Shaian, 48.059607, 23.353193, 2022, observations/133955835. – Shaian, 48.059635, 23.351869, 2022, observations/133955826. – Transcarpathian Reg., 48.056737, 23.336943, 2022, observations/133955804. – Khust Distr., 48.056691, 23.336665, 2022, observations/133952560. – Khust, 48.166871, 23.30329, 2022, observations/132136089. – Rachiv, private house territory (Mokaliuk B., pers. comm., 2022). – Perechyn Distr., 48.739312, 22.43198, 2022, observations/133210180. – Rachiv Distr., Roztoky, near Bila Tysa River (Mokaliuk B., pers. comm., 2022). – Rachiv Distr., Shaul, near Bila Tysa River (Mokaliuk B., pers. comm., 2022). – Rachiv Distr., Lishchynka area, near Tysa River (Mokaliuk B., pers. comm., 2022). – Rachiv Distr., Dilove, near Bilyi stram, Maramarosh massive (Mokaliuk B., pers. comm., 2022). – Uzhhorod (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Chop (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Solomonovo (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Serednie (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Berezyinka (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Chynadiyev (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Holubyne (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Korolevo (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Khust (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Novoselytsia (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Vilhivtsi (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Chumalevo (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Negrovets (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Mizhhiria (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Tiachiv (Protopopova V., Shevera M. 1998. *Thaiszia* – J. Bot. 8(2): 40). – Uzhanskyi National Nature Park (Kvakovska I.M. PhD (Biol.) thesis. Kyiv, 2012). – Between Uzhgorod and Peretchyn (Shevera M., pers. comm. 2022). – Svaliava (Shevera M., pers. comm. 2022). – Berehove Distr., in the valley of the Vicha River, in the villages Osii and Hankovytsia (Margittai A., 1938. Bot. Közlem. 35(1–2): 58–63). – Berehove (Shevera M., pers. comm. 2022).

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2021, <https://www.inaturalist.org/observations/122712319>. – Lytvyn, 49.334961, 28.074046, 2021, <https://www.inaturalist.org/observations/122279036>. – Kryzhopil' Distr., Sokolivka, 48.441137, 29.011125, 2021, <https://www.inaturalist.org/observations/90685457>. – Vinnytsia, Pivdennyi Bug River bank, 49.218519, 28.462605, 2021, <https://www.inaturalist.org/observations/88719174>. – Vinnytsia, Tsaryna, Pivdennyi Bug River bank, 49.218831, 28.462852, 2021, <https://www.inaturalist.org/observations/88718789>. – Vinnytsia, Pivdennyi Bug River (small river from it), 49.24101, 28.474937, 2021, <https://www.inaturalist.org/observations/88679650>. – Vinnytsia, Pivdennyi Bug River bank, 49.244539, 28.46946, 2021, <https://www.inaturalist.org/observations/88678927>. – Vinnytsia, Pivdennyi Bug River bank, 49.247177, 28.47029, 2021, <https://www.inaturalist.org/observations/88678758>. – Vinnytsia, Pivdennyi Bug River bank, 49.247291, 28.47045, 2021, <https://www.inaturalist.org/observations/88678577>. – Vinnytsia, Pivdennyi Bug River bank, 49.247986, 28.469413, 2021, <https://www.inaturalist.org/observations/88678423>. – Vinnytsia, Pivdennyi Bug River, 49.248131, 28.469303, 2021, <https://www.inaturalist.org/observations/88678420>. – Vinnytsia, Pivdennyi Bug River, 49.247775, 28.468665, 2021, <https://www.inaturalist.org/observations/88678202>. – Vinnytsia, Tsaryna, Pivdennyi Bug River, 49.218757, 28.462836, 2021, <https://www.inaturalist.org/observations/88586812>. – Vinnytsia, Pivdennyi Bug River, 49.22073, 28.464327, 2021, <https://www.inaturalist.org/observations/88585659>. – Vinnytsia, Pivdennyi Bug River, 49.222298, 28.465632, 2021, <https://www.inaturalist.org/observations/88584889>. – Vinnytsia, Pivdennyi Bug River, 49.222511, 28.465509, 2021, <https://www.inaturalist.org/observations/88581272>. – Vinnytsia, Pivdennyi Bug River, 49.225271, 28.465931, 2021, <https://www.inaturalist.org/observations/88581110>. – Vinnytsia, Old town, 49.227265, 28.47252, 2021, <https://www.inaturalist.org/observations/88580582>. – Vinnytsia, Old town, 49.227202, 28.472631, 2021, <https://www.inaturalist.org/observations/88565033>. – Vinnytsia, Old town, 49.227477, 28.473235, 2021, <https://www.inaturalist.org/observations/88565032>. – Vinnytsia, Old town, 49.227471, 28.473315, 2021, <https://www.inaturalist.org/observations/88561198>. – Vinnytsia, Old town, 49.229372, 28.479284, 2021, <https://www.inaturalist.org/observations/88560870>. – Vinnytsia, Pivdennyi Bug River bank (Chorna G.A. 2006. Biologicheskyy Vestnik (Kharkiv), 10(2): 49–51). – Vinnytsia, Old town, 49.229322, 28.479217, 2021, <https://www.inaturalist.org/observations/88560867>.

### **Volyn' Region**

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### **Zhytomyr Region**

Zhytomyr, near fence (Orlov O., 12.09.2004, KW, 073179). – Lygyny Distr., Lugyny, the edge of the alder forest (Orlov O., 30.09.2004, KW, 090862, 073189, 073187). – Romaniv Distr., Romanov, 50.158668, 27.91739, 2016, <https://www.inaturalist.org/observations/101840015>. – Korosten', Uzh River, 50.951054, 28.657828, 2017, <https://www.inaturalist.org/observations/67703199>. – Zhytomyr, Kroshnia area, 50.284836, 28.661027, 2019, <https://www.inaturalist.org/observations/107376126>. – Zhytonyr, Kroshenko River, 50.285344, 28.660001, 2019, [https://ukrbin.com/show\\_image.php?imageid=124577](https://ukrbin.com/show_image.php?imageid=124577). – Radomyshl', Teteriv River, 50.500498, 29.244638, 2021, <https://www.inaturalist.org/observations/92361580>. – Yemil'chyno Distr., 50.68477, 27.823164, 2021, <https://www.inaturalist.org/observations/103113131>. – Olevs'k, Volodymyrska str. × Naberezhnyi lane, Ubort River, 51.226035, 27.663757, 2021, <https://www.inaturalist.org/observations/90393271>. – Zhytomyr Distr., Zhytomyr, Kroshnia area, 50.285824, 28.659838, 2021; <https://www.inaturalist.org/observations/107305198>. – Zhytomyr, Kamianka River, 50.246982, 28.655474, 2022, <https://www.inaturalist.org/observations/121051497>. – Zhytomyr, Teteriv River, 50.246907, 28.655383, 2022, <https://www.inaturalist.org/observations/121051496>. – Zhytomyr, 50.246083, 28.655963, 2022, <https://www.inaturalist.org/observations/121050901>. – Zhytomyr, 50.246187, 28.656008, 2022, <https://www.inaturalist.org/observations/121050776>. – Zhytomyr, 50.245973, 28.656168, 2022, <https://www.inaturalist.org/observations/121050775>. – Zhytomyr, 50.245783, 28.656181, 2022, <https://www.inaturalist.org/observations/121050774>. – Zhytomyr, 50.245123, 28.656873, 2022, <https://www.inaturalist.org/observations/121050561>. – Zhytomyr, Bohunia area, 50.244158, 28.657087, 2022, <https://www.inaturalist.org/observations/121050318>. – Zhytomyr, Bohunia area, 50.244201, 28.657354, 2022, <https://www.inaturalist.org/observations/121050315>. – Zhytomyr, Bohunia area, 50.24423, 28.657568, 2022, <https://www.inaturalist.org/observations/121049891>. – Zhytomyr, Korol'iov area, 50.244805, 28.657266, 2022, <https://www.inaturalist.org/observations/121049679>. – Zhytomyr, Korol'iov area, 50.244843, 28.657141, 2022, <https://www.inaturalist.org/observations/121049538>. – Zhytomyr, Bohunia area, 50.244766, 28.656143, 2022, <https://www.inaturalist.org/observations/127520420>. – Zhytomyr, Bohunia area, 50.244442, 28.655952, 2022, <https://www.inaturalist.org/observations/138965337>. – Zhytomyr, Kroshnia area, 50.286564, 28.659845, 2022, <https://www.inaturalist.org/observations/136414765>. – Olevs'k Distr., Kamianka village, on the edge of alder forest (Orlov O., per. comm., 2022). – Olevs'k Distr., Varvarivka village, along the

road and on the edge of forest (Orlov O., per. comm., 2022). – Ovruch Distr., vicinity of Klynets village, along the road (Orlov O., per. comm., 2022). – Ovruch Distr., vicinity of Tkhoryn village, edge of forest (Orlov O., per. comm., 2022). – Yemilchyno Distr., Kyianka village, vicinity, on the edge of alder forest (Orlov O., per. comm., 2022). – Korosten' Distr., Krasnopil, on the edge of alder forest (Orlov O., per. comm., 2022).