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RESEARCH ARTICLE

Flora of the botanical-geographical plot "Steppes of Ukraine" in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine

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Abstract

In 2020–2022, the complete taxonomic composition of the flora for the botanical-geographical plot "Steppes of Ukraine" at the M.M. Gryshko National Botanical Garden of the NAS of Ukraine (NBG) was studied and analyzed. This plot was established at the NBG in 1949 to demonstrate the floristic diversity of the Ukrainian Steppes *ex situ*. According to the inventory results, 347 species and infraspecific taxa from 196 genera and 53 families of higher vascular plants were recorded in the flora of the plot. The steppic component of this plot joins 213 species and infraspecific taxa (61.38 % of the total number of inventoried taxa) belonging to the collection fund and representing the flora of the Steppes of Ukraine, 126 species and infraspecific taxa (36.31 %) of which are introduced plants and 87 species and infraspecific taxa (25.07 %) are native plants. During the inventory, spontaneously growing plants that are not a part of the collection fund were precisely studied. Among inventoried plants, native non-steppic plants are represented by 46 species and infraspecific taxa (13.26 %); alien plants – by 88 taxa (25.36 %), including ergasiophygophytes (45 taxa, 12.97 %) and xenophytes (43 taxa, 12.39 %). The plants of the collection fund predominate on the plot and form the main vegetation cover.

Currently, the taxonomic composition of the plot is similar to the characteristics of regional meadow-steppes. The perennials dominate in the biomorphological structure of the plot's flora (63.69 %), which is typical for the steppic phytocoenoses. In general, a significant number of trees is present here (5.48 %), which is explained by the forest communities surrounding the plot and, as a result, their active self-sowing. Hemicryptophytes prevail in the plot's flora (60.52 %). Nevertheless, the collection fund of the plot is distinguished by the absence of trees, a greater number of perennials (79.34 %), and hemicryptophytes (72.77 %). The steppic (33.33 %) and marginal (33.33 %) plants prevail in the collection fund, while the amount of meadow plants (18.78 %) is still significant. In the plot "Steppes of Ukraine", most of the rare introduced plants formed stable homeostatic introduction coenopopulations. Among them, 15 species and rare infraspecific taxa are listed in the Red Book of Ukraine.

Keywords: artificial phytocoenosis, flora structure, plant introduction, native plants, alien plants, rare taxa

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Introduction

Floristic studies of certain areas (Grechyshkina, 2010), clarification of the current state of urban floras (Biliavskyi, 2021), and inventory of spontaneous floras of botanical gardens and arboretums (Kovtoniuk, 2021; Shynder et al., 2022) are the current issues. Floristic investigations on higher vascular plants were implemented in many botanical gardens, in particular, in Japan (Kurosawa et al., 1995), Poland (Galera & Sudnik-Wójcikowska, 2004), Armenia (Akopian, 2011), Romania (Szatmari & Căprar, 2015), the United States of America (Atha et al., 2016), Indonesia (Manan et al., 2016), Brazil (Silva et al., 2020), Lithuania (Vainoriene, 2021), and Ukraine (Borsukevych & Prokopiv, 2012). In the M.M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine (NBG), such studies of the taxonomic diversity of natural and cultivated plants were also conducted (Shynder, 2015, 2019; Shynder et al., 2020, 2022; Shynder & Negrash, 2022).

In botanical gardens, arboretums and other botanical institutions, plant collections can be presented according to various principles: systematic, utilitarian, ecological or botanical-geographical. The outstanding geographer and botanist A.M. Krasnov first proposed and successfully tested the botanical-geographical principle of plant representation in the Batumi Botanical Garden (Melnyk et al., 2018). The scientific principle of the creation of plantations of introduced plants was also applied in the plots of the Department of Natural Flora at the NBG. The collections of living plants from different regions of the temperate zone of Eurasia are presented here in the botanical-geographical plots "Forests of the plain part of Ukraine", "Steppes of Ukraine", "Ukrainian Carpathians", "Crimea", "Caucasus", "Central Asia", "Altai and Western Siberia", and "Far East". The taxonomic inventory of introduced, native and alien plants was carried out for the botanical-geographical plot "Caucasus" based on modern systematics principles (Shynder & Kruglyak, 2014; Shynder, 2015; Didenko & Shynder, 2020). A similar inventory was also carried out in the botanical-geographical plot "Central Asia" (Shynder & Negrash, 2022). Taking into account the positive experience, the botanical-geographical plot "Steppes of Ukraine was the consequent step of a complete inventory of the NBG vegetation cover.

Natural conditions

The NBG is located in the southeast of the historical center of Kyiv, near the northern natural border of the Forest Steppe (Fig. 1 A) and the north border of the physiographic region of the Kyiv Plateau (Bagmet & Palienko, 2006). In turn, the botanical-geographical plot "Steppes of Ukraine" is located in the southeastern part of the NBG (Fig. 1 B) and is mainly surrounded by tree plantations of other plots (i.e., "Altai and Western Siberia", "Forests of the plain part of Ukraine", and "Ukrainian Carpathians"). The eastern part of the plot "Steppes of Ukraine" adjoins the high, steep slope of the Dnepr River, covered with trees too. As a result, trees and other forest species from nearby communities penetrate the plot "Steppes of Ukraine".

The plot "Steppes of Ukraine" has polygonal shape (Fig. 1 C) and area ca. 2.5 ha. The numbers of landmarks that were placed on the corners of this polygon are indicated in Fig. 1 C. Corresponding numbers are also indicated in Table 1, where the coordinates of the landmarks are shown.

The botanical-geographical plot "Steppes of Ukraine", in general, is characterized by a flat topography (Fig. 2). However, there are microclimatic features caused by an open area with a slight inclination (ca. 10°) in the southeast direction (Fig. 2). Due to the surface exposure, the indicators of the thermal regime in this territory are somewhat higher, in comparison with the surrounding forest communities. There is no artificial irrigation. Anti-erosion drainage ditches run along the southeastern edge of the plot.

The soils on the plot are gray forestal, acidic, or slightly acidic, with a pH of 5.6 to 6.8. Before the plot "Steppes of Ukraine" was established, the native forest communities were probably located there. Currently, grassy plants (Fig. 2) mostly represent the vegetation cover of the plot. Therefore, during the growing season, this cultural phytocoenosis requires artificial support (ie., removal of self-sowing trees and shrubs and highly active and aggressive adventive plants). Only thanks to these measures can the overall steppe appearance of the plot be ensured (Fig. 2).

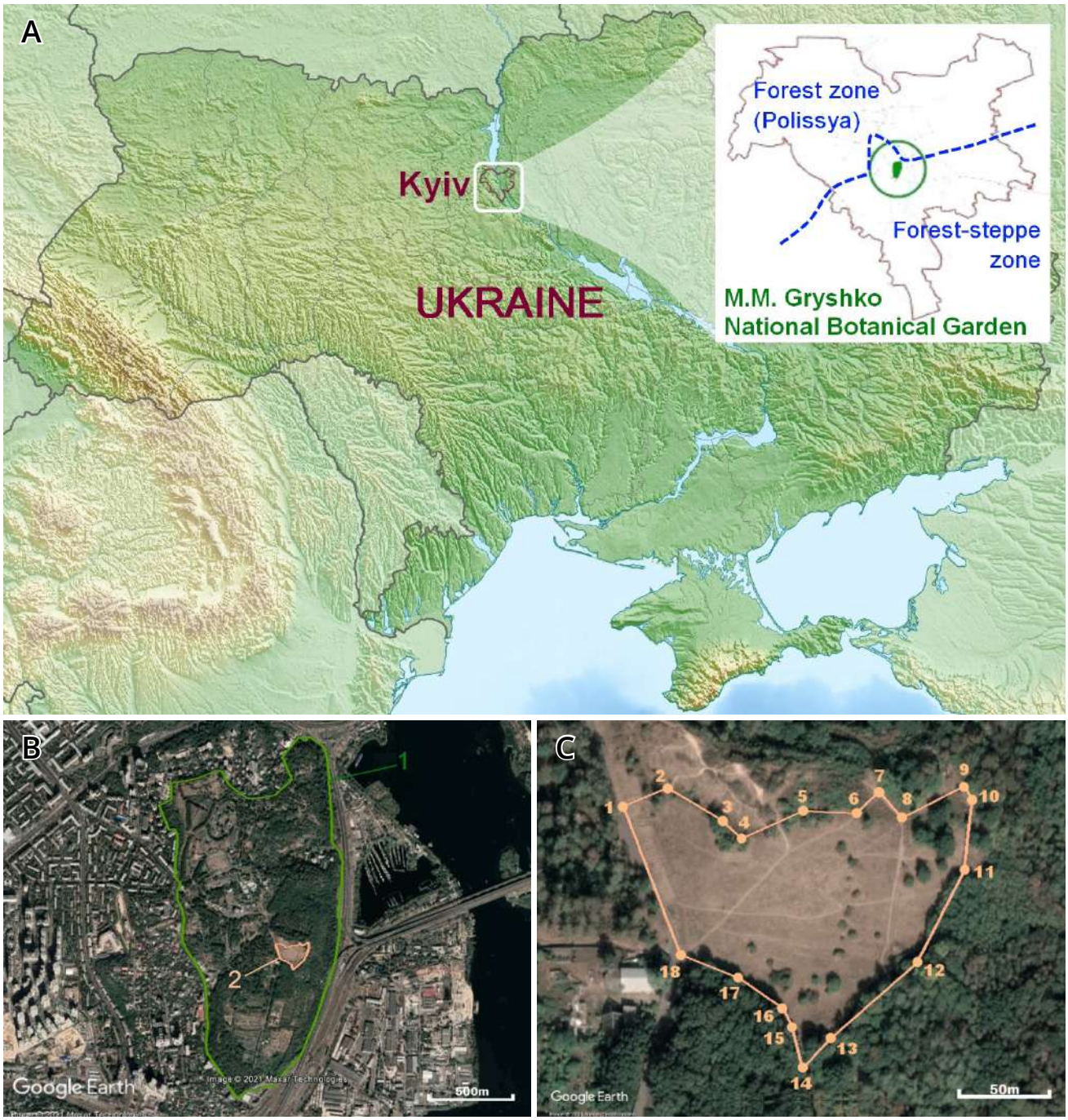

Figure 1. Geographical location of the study area: **A** – location of the M.M. Gryshko National Botanical Garden of the NAS of Ukraine (NBG); **B** – boundaries of the NBG (**1**) and botanical-geographical plot "Steppes of Ukraine" (**2**), **C** – area configuration of the plot "Steppes of Ukraine" and angular landmarks along its perimeter (**1–18**).

In the spring and summer, this territory subjected to anthropogenic influence (e.g., recreational load), negatively affecting the vegetation cover. Every autumn, after the end of the growing season, its grass cover is mowed to maintain the aesthetic appearance of the plot.

The natural conditions in the plot "Steppes of Ukraine" primarily differ from those in the natural steppes and are rather close to the meadow-steppes of the Kyiv Plateau (Gritsenko, 2007, 2009), which are geographically located in the geographic zone of Forest-Steppe (Marynych et al., 2003). According to modern ideas, the study area is situated within the Palaearctic steppe biome (Wesche et al., 2016).

Historical overview

The flora and vegetation of the steppes were studied in different regions of Ukraine (Barbarych, 1973; Krytska, 1985; Eremko, 1995; Babko, 1999; Goncharenko, 2000). The flora and vegetation in general (Chopyk et al., 1998; Fitsaylo, 2000), in the steppes (Korotchenko & Fitsaylo, 2003; Gritsenko, 2007), and in the protected meadow-steppe areas (Kucheryava et al., 2007; Doiko, 2014) were studied on the territory of the Kyiv Plateau. Parnikoza et al. (2009) collected information on steppe areas in the Kyiv region and analyzed the state of *in situ* protection of steppes in this region.

The botanical-geographical plot "Steppes of Ukraine" was established at the NBG in 1949 to demonstrate the floristic diversity of the Ukrainian Steppes *ex situ*. It was constructed according to the techno-working project of Professor O.I. Sokolovsky (Borodina, 1972). After 70 years of its existence, in 2019, the

Table 1. Angular landmarks of the botanical-geographical plot "Steppes of Ukraine" of the NBG.

Nr	Decimal latitude and longitute, °	Nr	Decimal latitude and longitute, °
1	50.412355, 30.564414	10	50.412427, 30.567158
2	50.412451, 30.564760	11	50.412062, 30.567103
3	50.412294, 30.565191	12	50.411597, 30.566746
4	50.412205, 30.565347	13	50.411209, 30.566078
5	50.412347, 30.565831	14	50.411056, 30.565863
6	50.412342, 30.566249	15	50.411273, 30.565771
7	50.412453, 30.566423	16	50.411357, 30.565699
8	50.412323, 30.566609	17	50.411506, 30.565347
9	50.412487, 30.567091	18	50.411615, 30.564888

Figure 2. General appearance of the botanical-geographical plot "Steppes of Ukraine" of the NBG in May (**A**), June (**B**), July (**C**), and August (**D**).

history of the introduction of plants and scientific activity in the plot "Steppes of Ukraine" was analyzed and four periods were distinguished (Gritsenko, 2019b): *I* (1949–1969) – large-scale intensive primary introduction of a significant number of representatives of the flora of the steppes of Ukraine; *II* (1970–1990) – the beginning of research of the biology, morphology, decorative and medicinal properties, and ontogenesis of introduced plants (Borodina, 1970, 1972, 1976a, 1976b, 1977, 1983); *III* (1991–2000) – initial stages in the study of introduction populations of steppe plants (Parubok, 2000); *IV* (2001–2019) – enrichment and replenishment of the collection of introduced plants, restoration of lost rare species, floristic (Gritsenko, 2004, 2009, 2017b, 2019c; Shynder, 2019), population (Melnik et al., 2003, 2018; Gritsenko, 2004, 2009, 2017a, 2019a; Melnyk & Parubok, 2004), ontogenetic (Gnatiuk & Gritsenko, 2019) and other phytodiverse studies (Maryushkina & Gritsenko, 2002; Maryushkina, 2003; Gritsenko, 2019b, 2019c). During this time, certain groups of plants were characterized and analyzed: ephemeroids, rarities, bushes, adventive plants, tumbleweeds, and decorative flowering plants (Gritsenko, 2012, 2019a).

In 2020–2022, morphological, phenological, and population studies of rare species were conducted at the plot "Steppes of Ukraine" (Gritsenko, 2020, 2021, 2022). Besides this, the phytoinvasion and conservation of phytodiversity were in also considered. Thus, artificial phytocoenosis modeled on the plot "Steppes of Ukraine" for many years served as an experimental platform for different botanical studies. Since the establishment of the botanical-geographical plot "Steppes of Ukraine", many theoretical and practical scientific outputs were accumulated to consider the results of the large-scale purposeful introduction of steppe plants at the NBG. However, the long-term and non-linear development of the plot required the complete revision of its taxonomic composition (taking into account introduced, native, and alien plants). Hence, our research aimed to clarify, supplement, analyze and summarize the information on the flora of the botanical-geographical plot "Steppes of Ukraine" at present.

Material and methods

The research was conducted in 2020–2022. Due to different weather and climate conditions in these years, the composition of introduced and alien plants that vegetated in these years slightly differed. In 2020, the growing season started very early, at the end of February, and the spring was dry. In 2021–2022, the growing season started later; it began in mid-March, while the first half of the growing season was cold and prolonged. In 2022, the investigations were temporarily suspended due to the invasion of Russian terroristic forces into Ukraine and active hostilities in the vicinity of Kyiv. Despite these issues, detailed research over the past three years has allowed us to sufficiently complete and clarify the taxonomic diversity of the flora of this plot.

The flora of the plot "Steppes of Ukraine" included all taxa within its boundaries (Fig. 1 B, C; Table 1). A complete checklist of the flora of the plot "Steppes of Ukraine" is given in Appendix. The nomenclature of taxa is provided following POWO (2022). For the study, all plants found on the plot were divided into three blocks and five groups by their origin in the plot "Steppes of Ukraine" (i.e., immigration groups).

Block 1. Collection fund – representatives of the flora of the Steppes of Ukraine. This block includes two groups. *Group 1 of introduced plants* – representatives of the flora of the Ukrainian Steppes. These are predominantly herbaceous perennials, rarely other biomorphs introduced from natural steppe phytocoenoses of the Steppe and Forest-Steppe zones of Ukraine. *Group 2 of native plants* – representatives of the flora of the Ukrainian steppes, which grow naturally in the plot "Steppes of Ukraine", and are also background plants in the natural regional meadow-steppe plots. These are mostly herbaceous perennials, less often shrubs. Ecologically and coenotically, these are mainly steppe, marginal, and meadow plants; less often, they are confined to other phytocoenoses.

Block 2. Native non-steppic plants. It includes a single *Group 3 of native plants* that grow naturally in the plot "Steppes of Ukraine", but are not representatives of the flora of the Ukrainian Steppes. These are mostly forest

and synanthropic species, and sometimes these are species of wetlands.

Block 3. Alien plants. It includes two groups. *Group 4 of ergasiophygophytes (escaped plants)* – naturalized ergasiophytes previously introduced in other plots of the NBG, and later spontaneously spread beyond their borders. Four types of non-steppic plants, which were probably meaningly planted in the plot "Steppes of Ukraine" (i.e., *Lonicera tatarica* L., *Hepatica nobilis* Schreb., *Lycium barbatum* L., and *Vitis amurensis* Rupr.) are also included here. *Group 5 of xenophytes* – independently entered alien plants that represent a background element of most urbanized and synanthropized landscapes. These are mostly annuals from the southern regions of Eurasia (Mediterranean and Asia) and North America. Detailing such plants by the time of penetration, we can distinguish archaeophytes (*subgroup 5a*), which penetrated the flora of Ukraine by the end of the 15th century, and kenophytes (*subgroup 5b*), which penetrated Ukrainian flora starting from the 16th century (Thellung, 1922; Mosyakin & Yavorska, 2002; Shynder, 2019).

The adventization level (*AL*) was determined by the following formula:

$AL = y \times 100 / x$, where

x – the total number of valid taxa of higher vascular plants,

y – the number of taxa of alien species.

Eight other systematic categories, which are not objects of traditional floristic analyses (e.g., microspecies, forms, hybrids, etc.) were also noted among the inventoried plants.

The collection fund is precisely the core that reflects the steppe essence of the plot "Steppes of Ukraine". Therefore it requires in-depth research, preservation, enrichment, and protection. In this regard, a comparison was made between the entire flora of the plot "Steppes of Ukraine", the flora of the collection fund of the plot, and the regional steppic flora. The percentage difference (*PD*) between the two compared operational taxonomic units (OTUs) in Tables 3–9 was calculated by the formula:

$PD = 100 - y \times 100 / x$, where

x – number of taxa in the first OTU,

y – number of taxa in the second OTU.

To establish the biomorphological structure of the flora, the classification of life forms of plants was carried out according to two generally accepted schemes. The primary life forms of plants were distinguished based on the standard scheme of Clements (1920) according to the stem lignification and duration of life. Clements (1920) divided woody perennials into trees, shrubs, bushes, and half-shrubs. To avoid confusion, we have distinguished trees, shrubs, sub-shrubs (dwarf shrubs), and half-shrubs (plants with only the bases of the stems become woody). In addition, woody lianas were distinguished (Sokolov & Svyazeva, 1965). The most common classification of plant life forms or ecobiomorphs of Raunkiaer (1934) was also applied. According to Raunkiaer (1934), plants are classified by the plant growth point (bud) location during the less favorable seasons.

To establish the ecological and coenotic structure of the flora, the plants were divided according to the types of their habitats. In this regard, one of the most detailed and accepted in Eastern Europe is Belgard's plant ecomorph system (Baranovski et al., 2018).

Reference sources (Prokudin, 1987; Sobko & Mordatenko, 2004) were used to identify plants. Funds of the Herbarium of the NBG (KWHA) were also applied to identify introduced plants. Photographs were taken with a Canon Power Shot SD 4000 IS ELPH and mobile digital cameras. Many of captured plant photos are featured on the iNaturalist web resource in the projects "Biota of the plot "Steppes of Ukraine" in Gryshko NBG" (https://www.inaturalist.org/projects/biota-of-the-plot-steppes-of-ukraine-in-gryshko-nbg) and "Flora of M.M. Gryshko National Botanical Garden" (https://www.inaturalist.org/projects/flora-of-m-m-gryshko-national-botanical-garden).

Results and discussion

Taxonomic diversity of flora

According to the results of the study, 347 taxa of higher vascular plants (i.e., species and subspecies) from 196 genera and 53 families were recorded within the botanical-geographical plot "Steppes of Ukraine" (Appendix). Among them, one species, *Ephedra distachya* L., represents gymnosperms (0.29 % of the total number of taxa), 68 taxa (19.60 %)

Table 2. Diversity of higher taxa of the flora of the botanical-geographical plot "Steppes of Ukraine" of the NBG.

Higher taxa	Entire flora of the plot "Steppes of Ukraine"	Immigration groups					
		1	2	3	4	5	
		Plants introduced from the Ukrainian Steppes	Native plants		Alien plants		
			Steppic plants	Non-steppic plants	Ergasio-phygophytes	Xenophytes	
						5a	5b
		Collection fund				Archaeo-phytes	Keno-phytes
		Number of taxa / %					
Gymnosperms Gnetopsida	1 / 0.29	1 / 0.29	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Angiosperms Monocots	68/ 19.60	35 / 10.08	17 / 4.90	3 / 0.86	5 / 1.44	7 / 2.02	1 / 0.29
Angiosperms Eudicots	278/ 80.11	90 / 25.94	70 / 20.17	43 / 12.40	40 / 11.53	23 / 6.62	12 / 3.46
Total	347 / 100	126 / 36.31	87 / 25.07	46 / 13.26	45 / 12.97	30 / 8.64	13 / 3.75
			133 / 38.33			43 / 12.39	
		213 / 61.38		46 / 13.26	88 / 25.36		

represent monocots, and 278 taxa (80.11%) – eudicots (Tables 2 & 3).

Native plants are characterized by the largest number of taxa – 133 taxa (38.33%). In second place is a group of introduced representatives of the flora of the Steppes of Ukraine – 126 taxa (36.31%) (Table 2).

The collection fund includes 213 taxa (61.38%) representing the flora of the steppes of Ukraine from 128 genera (65.31%) and 35 families (66.04%). Among them, one species (0.29%) is from gymnosperms, 52 taxa (14.98%) of monocots, and 160 (46.11%) of eudicots (Tables 2 & 3). In particular, the collection fund includes 126 taxa (36.31%) of introduced representatives and 87 taxa (25.07%) of native representatives of the flora of the steppes of Ukraine (Table 2). Forty-six taxa (13.26%) are native non-steppic plants.

Eighty-eight taxa (25.36%) should be considered alien, among which groups of ergasiophygophytes (45 taxa, 12.97%) and xenophytes (43 taxa, 12.39%) are almost equal in volume (Table 2). The level of adventitization (25.36%) is relatively low, considering the artificial origin of this culturphytocoenosis and a significant number of ergasiophygophytes.

Thus, the flora of the botanical-geographical plot "Steppes of Ukraine" has a complex structure according to five main groups of taxa (Table 2). In general, in the artificially created phytocoenosis at the plot "Steppes of Ukraine", plants of the collection fund (i.e., representatives of the flora of the steppes of

Table 3. Comparison of the number of taxonomic units of the flora of the botanical-geographical plot "Steppes of Ukraine" of the NBG and its collection fund.

Taxonomic units	Flora of the plot "Steppes of Ukraine"	Collection fund	Percentage difference (PD), %
	Number of taxa / %		
Families	53 / 100.00	35 / 66.04	+33.96
Genera	196 / 100.00	128 / 65.31	+34.69
Species and lower taxa	347 / 100.00	213 / 61.38	+38.62

Table 4. Comparison of the number of taxonomic units of the flora of the botanical-geographical plot "Steppes of Ukraine" of the NBG and regional natural floras.

Taxonomic units	Flora of the plot "Steppes of Ukraine" (original data, 2022)	Flora of meadow steppes of the Kyiv Plateau (Gritsenko, 2007)	Percentage difference (PD), %	Flora of the plot "Steppes of Ukraine" (original data, 2022)	Complete flora of the Kyiv Plateau (Fitsaylo, 2000)	Percentage difference (PD), %
	Number of taxa			Number of taxa		
Families	53	57	−7.55	53	120	−126.42
Genera	196	272	−38.78	196	507	−158.67
Species and infraspecies	347	548	−57.93	347	1222	−252.16

Ukraine) prevail by the number of taxa and also dominate in the plant cover (Table 2).

In the plot "Steppes of Ukraine", the number of taxa of the entire flora is undoubtedly higher than that of the collection fund (Table 3). However, the contribution of the collection fund in a general number of the taxa is relatively high. Taxa of the collection fund represent over half the entire flora of the plot "Steppes of Ukraine".

The flora of the botanical-geographical plot "Steppes of Ukraine", if compared with the regional flora of the meadow steppes (Gritsenko, 2007) or entire regional flora (Fitsaylo, 2000), is expectedly characterized by a lower number of taxa (Table 4). The smallest (−7.55%) is the PD between the number of families of the flora of the plot "Steppes of Ukraine" and the regional flora of the meadow steppes. PDs between the number of taxa in the flora of the plot "Steppes of Ukraine" and the entire regional flora (Fitsaylo, 2000) are very high (Table 4). Therefore, considering a certain number of common native and alien plants that these floras share, it is more appropriate to compare the flora of the plot "Steppes of Ukraine" with the regional flora of the meadow steppes.

Compared with other botanical-geographical plots of the NBG, the plot "Steppes of Ukraine" has a high level of floristic diversity – 347 taxa are spread on ca. 2.5 ha (Table 5). The number of taxa in the plot "Steppes of Ukraine" lies within the frames inherent to the other botanical-geographical plots of the NBG. PD of the number of taxa in the plot "Steppes of Ukraine" from other botanical-geographical plots of the NBG ranges from −17.00% to +54.76%. The smallest (−1.44%) is the PD between the number of taxa in the plots "Steppes of Ukraine" and "Crimea" (Table 5).

Table 5. Difference between the taxa representativeness in the plot "Steppes of Ukraine" and other botanical-geographical plots of the NBG.

The name of the botanical-geographical plot of the NBG	Area, ha	Number of taxa	Percentage difference (PD), %
"Forests of the plain part of Ukraine"	12,0	360 (Melnyk et al., 2018)	−3.75
"Steppes of Ukraine"	2,5	347 (original data, 2022)	0.00
"Ukrainian Carpathians"	6,0	297 (Shynder, 2015)	+14.41
"Crimea"	2,5	352 (Shynder, 2015)	−1.44
"Caucasus"	6.0	406 (Shynder, 2015)	−17.00
"Central Asia"	3,5	308 (Shynder & Negrash, 2022)	+11.24
"Altai and Western Siberia"	1,8	157 (Shynder, 2015)	+54.76
"Far East"	6.0	186 (Shynder, 2015)	+46.40

Table 6. Difference between the leading families shared for the entire flora of the plot "Steppes of Ukraine" and its collection fund.

Flora of the plot "Steppes of Ukraine"				Collection fund				Percentage difference (PD), %
Rank	Family	Number of taxa	%	Rank	Family	Number of taxa	%	
1	Asteraceae	44	12.68	1	Asteraceae	31	14.55	–14.75
2	Fabaceae	31	8.93	2	Fabaceae	24	11.27	–26.20
3	Poaceae	29	8.36	3	Poaceae	19	8.92	–6.70
4	Rosaceae	24	6.92	4	Ranunculaceae	13	6.11	–17.73
5–6	Lamiaceae	19	5.47	5	Lamiaceae	12	5.64	–3.11
5–6	Brassicaceae	19	5.47	6	Rosaceae	11	5.17	25.29
7	Ranunculaceae	18	5.19	7–10	Apiaceae	10	4.69	–25.07
8	Plantaginaceae	15	4.32	7–10	Asparagaceae	10	4.69	–35.55
9	Apiaceae	13	3.75	7–10	Caryophyllaceae	10	4.69	–35.55
10	Caryophyllaceae or Asparagaceae	12	3.46	7–10	Plantaginaceae	10	4.69	–8.56
1–3	In three leading families	104	29.97	1–3	In three leading families	74	34.74	–15.92
1–10	In ten leading families	224	64.55	1–10	In ten leading families	150	70.42	–9.09
Total in 53 families		347	100.00	Total in 35 families		213	100.00	0.00

Ten leading families usually reflect the main characteristics of the flora. The plot "Steppes of Ukraine" shares eight of the ten leading families (i.e., Asteraceae, Fabaceae. Poaceae, Rosaceae, Lamiaceae, Brassicaceae, Ranunculaceae, and Caryophyllaceae) with the regional flora of meadow steppes (Gritsenko, 2007; Kucheryava et al., 2007). However, most of shared families occupy different ranks (except Asteraceae and Rosaceae) within compared floras.

Nine leading families are shared for the flora of the plot "Steppes of Ukraine" and its collection fund. The ranks of the first three families coincide for these two floras, but the other six shared families occupy different ranks (Table 6). PD of the taxonomic diversity within the shared leading families of the flora of the plot "Steppes of Ukraine" and its collection fund ranges from –35.55% to +25.29% . The smallest PDs are recorded for Lamiaceae (–3.11%), Poaceae (–6.70%), and Plantaginaceae (–8.56%). The Brassicaceae family, dominated by alien taxa, was not included in the ten leading families of the collection fund.

The largest genera of regional meadow steppes (i.e., *Campanula*, *Carex*, *Centaurea*, *Potentilla*, *Veronica*, and *Vicia*) are pretty well represented in the plot "Steppes of Ukraine" of the NBG. Thus, the taxonomic composition of the flora of this plot in general and its collection fund in particular, are similar to the taxonomic composition of the regional meadow steppes flora.

Biomorphological structure of the flora

The biomorphological structure of the flora reflects the results of its formation under regional ecological and climatic conditions. Steppe phytocoenoses are primarily herbaceous communities dominated by herbaceous perennials and other life forms of steppe plants: subshrubs, half-shrubs, and biennials (Zyman, 1976; Fitsaylo, 2000).

All terrestrial life forms of plants of the regional flora are represented in the biomorphological structure of the flora of the plot "Steppes of Ukraine" (Table 7). Among them, perennials predominate (63.69%), like in the regional flora of meadow steppes (60.04%) (Gritsenko, 2007).

The flora of the plot "Steppes of Ukraine" includes 19 tree species (5.48%) (Table 7), 12

Table 7. Difference between the plant life forms (Clements, 1920; Sokolov & Svyazeva, 1965) of the entire flora of the plot "Steppes of Ukraine" and its collection fund.

Life forms (vegetation forms)	Flora of the plot "Steppes of Ukraine"		Collection fund		Percentage difference (PD), %
	Number of taxa	%	Number of taxa	%	
Trees	19	5.48	0	0.00	100.00
Shrubs	14	4.03	6	2.82	30.02
Subshrubs	7	2.02	5	2.35	–16.34
Halfshrubs	1	0.29	1	0.47	–62.07
Lianas	4	1.15	0	0.00	100.00
Perennials	221	63.69	169	79.34	–24.57
Biennials and short-lived perennials	29	8.36	18	8.45	–1.08
Annuals	52	14.98	14	6.57	56.14
Total	347	100.00	213	100.00	0.00

of which (3.46%) are native to Ukraine. This contrast with only three tree species (0.55%) recorded for the regional flora of meadow steppes of the Kyiv Plateau (Gritsenko, 2007). A significant number of trees in the flora of the plot "Steppes of Ukraine" is due to the close allocation of the forest communities to the plot and the associated active formation of self-seeding and undergrowth of trees.

The total presence of shrubs and subshrubs in the flora of the plot is 6.05% (Table 7), while in the flora of meadow steppes of the Kyiv Plateau, there is 7.48% of shrubs and subshrubs. The presence of other life forms in the flora of the plot and the flora of meadow steppes of the Kyiv Plateau also slightly differ (Gritsenko, 2007).

Perennials also are the most represented (79.34%) in the collection fund of the plot (Table 7). PD between the plant life forms of the entire flora of the plot "Steppes of Ukraine" and its collection fund is the smallest for biennials (–1.08%), and the largest (+100.00%) for trees and lianas, which are absent in the collection fund of the plot at all.

Following Raunkiaer's (1934) classification, hemicryptophytes (60.52%) prevail in the biomorphological structure of the flora of the plot "Steppes of Ukraine" (Table 8). Hemicryptophytes are more abundant here than in the regional flora of meadow steppes, where they compile only 50.55% (Gritsenko, 2007). In the collection fund of the plot, the percentage of hemicryptophytes (72.77%) is even higher. PD between plant life forms represented in the entire flora of the plot "Steppes of Ukraine" and its collection fund ranges from –62.07% to +59.23%. The smallest PD is recorded for cryptophytes (–10.93%), while for other life forms, it is much higher.

The biomorphological structure of the flora of the plot "Steppes of Ukraine" (Tables 7 & 8) is generally close to the corresponding structure of flora of natural steppe ecosystems (Babko, 1999; Doiko, 2014), in particular regional meadow steppes (Gritsenko, 2007). However, the surrounding of the plot by forest communities and the related formation of self-seeding and undergrowth of trees resulted in a much higher presence of trees. Nevertheless, the biomorphological structure of the core of the plot, the collection fund, is characterized by the absence of trees and lianas and the predominance of perennials and hemicryptophytes, which reflects the steppic specificity of this collection.

Ecological and coenotic structure of the flora

In the ecological and coenotic structure of the flora of the plot "Steppes of Ukraine", marginal, steppic, and synanthropic plants prevail, but the participation of meadow and forest plants is also significant (Table 9). In the ecological and coenotic structure of the collection fund of the plot, steppic and marginal plants prevail, the participation of which is equal. The percentages of synanthropic and forest plants are significantly lower, while the rate

Table 8. Difference between the plant life forms (Raunkiaer, 1934) of the entire flora of the plot "Steppes of Ukraine" and its collection fund.

Life forms (ecobiomorphs)	Flora of the plot "Steppes of Ukraine"		Collection fund		Percentage difference (PD), %
	Number of taxa	%	Number of taxa	%	
Phanerophytes	44	12.68	11	5.17	59.23
Chamaephytes	1	0.29	1	0.47	–62.07
Hemicryptophytes	210	60.52	155	72.77	–20.24
Cryptophytes	47	13.54	32	15.02	–10.93
Therophyte	45	12.97	14	6.57	49.34
Total	347	100.00	213	100.00	0.00

of meadow plants is high. PDs between the representativeness of plants of different habitats in the entire flora of the plot "Steppes of Ukraine" and its collection fund are the largest for plants of wetlands and mountain meadows (+100.00 %). It is due to the presence of *Populus* ×*canescens* (Aiton) Sm., *Salix caprea* L., and *Centaurea mollis* Waldst. & Kit. here, which are absent in the collection fund of the plot. PDs are also high for plants of synanthropic (+82.60 %) and forestal (+83.69 %) habitats, which are much better represented in the entire flora of the plot than in its collection fund. PDs for meadow (–33.00 %), marginal (–36.10 %), and steppe (–52.19 %) plants are moderate.

It should be noted that some plants have a wide ecological and coenotic amplitude and can occur in different habitats. For example, *Tulipa sylvestris* L. subsp. *australis* (Link) Pamp. naturally grows in plakor and bairak (beam) forests, shrub thickets, steppic and stony habitats. In this regard, this taxon in the flora of Ukraine was divided into several microspecies. Forestal plants are recognized as *T. quercetorum* Klokov & Zoz, steppic – as *T. scythica* Klokov & Zoz, and plants growing on granite and limestone outcrops of the steppe zone – as *T. hypanica* Klokov & Zoz and *T. ophiophylla* Klokov & Zoz (Prokudin, 1987). Two fragments of *T. sylvestris* subsp. *australis* are represented in the plot

Table 9. Ecological and coenotic structure of the flora on the botanical-geographical plot "Steppes of Ukraine".

Habitat type	Flora of the plot "Steppes of Ukraine"		Collection fund		Percentage difference (PD), %
	Number of taxa	%	Number of taxa	%	
Clay	2	0.58	2	0.94	–62.07
Forests	40	11.53	4	1.88	+83.69
Marginal	85	24.49	71	33.33	–36.10
Meadows	49	14.12	40	18.78	–33.00
Mountain meadows	1	0.29	0	0.00	+100.00
Salted meadows	1	0.29	1	0.47	–62.07
Sands	15	4.32	15	7.04	–62.96
Steppes	76	21.90	71	33.33	–52.19
Stony	1	0.29	1	0.47	–62.07
Synanthropic	75	21.61	8	3.76	+82.60
Wetlands	2	0.58	0	0.00	+100.00
Total	347	100.00	213	100.00	0.00

"Steppes of Ukraine": 1) introduced plants of *T. ophiophylla* from the steppe zone of Ukraine (Luhansk region) and 2) ergasiophygophytic *T. quercetorum* spontaneously entered plants from the neighboring botanical-geographical plot "Forests of the plain part of Ukraine" of the NBG (section "Mapple-oak forest").

The ecological and coenotic structure of the flora of the plot "Steppes of Ukraine" and its collection fund (Table 9), taking into account the research specifics at the NBG and surrounding of this plot by forest communities, in general, reflect the ecological and coenotic structure of the flora of natural steppes (Babko, 1999), in particular, regional meadow steppes (Gritsenko, 2007).

Plants introduced from Ukrainian steppes

The group of purposefully introduced representatives of the flora of the steppes of Ukraine is numerous (126 taxa). These plants prevail in the composition of the collection fund of the plot and make a pre-planned primary basis (Table 2). One species of gymnosperms; 35 taxa of monocots (including *Agropyron cristatum* (L.) Gaertn., *Bellevalia speciosa* Woronow ex Grossh., *Festuca valesiaca* Schleich. ex Gaudin., *Gagea fragifera* (Vill.) Ehr. Bayer & G. López, *Iris graminea* L., *I. pumila* L., *Muscari comosum* (L.) Mill., *Ornithogalum fischerianum* Krasch., *O. orthophyllum* Ten. subsp. *kochii* (Parl.) C. Zahariadi, *Poa angustifolia* L., *Scilla siberica* Andrews. and others – Fig. 3), and 90 taxa of eudicots (including *Dianthus membranaceus* Borbás., *Eryngium planum* L., *Limonium platyphyllum* Lincz., *Phlomis herba-venti* L. subsp. *pungens* (Willd.) Maire ex DeFilipps, *Vinca herbacea* Waldst. & Kit. and others – Fig. 4), were introduced to the plot (Table 2). Gritsenko (2019b) discussed historical aspects of the plant introduction in the plot "Steppes of Ukraine". Many plants were introduced there from different regions of Ukraine within their natural ranges (e.g., *Adonis vernalis* L., *Anemonoides sylvestris* (L.) Galasso, Banfi & Soldano, *Clematis integrifolia* L., *Crocus reticulatus* Steven ex Adams., *Dianthus membranaceus* Borbás., *Echinops sphaerocephalus* L., *Eryngium campestre* L., *Filipendula vulgaris* Moench., *Gypsophila paniculata* L., *Hyacinthella leucophaea* (K. Koch) Schur., *Iris aphylla* L., *Linum austriacum* L., *Muscari neglectum* Guss. ex Ten., *Phlomoides tuberosa* (L.) Moench, *Prunus tenella* Batsch., *Pulsatilla pratensis* (L.) Mill., *Salvia nutans* L., *Stachys recta* L., *Stipa capillata* L., *S. pennata* L. and others). Such plants occur in regional meadow steppes (Gritsenko, 2007). Other plants were introduced to the plot outside their natural ranges (e.g., *Alcea rugosa* Alef., *Caragana frutex* (L.) K. Koch., *Clematis lathyrifolia* Besser ex Trautv., *Delphinium sergii* Wissjul., *Galatella sedifolia* (L.) Greuter subsp. *dracunculoides* (Lam.) Greuter, *Gymnospermium odessanum* (DC.) Takht., *Iris halophila* Pall., *Linum nervosum* Waldst. & Kit., *Ornithogalum fimbriatum* Willd., *Paeonia tenuifolia* L., *Rhaponticoides ruthenica* (Lam.) M.V. Agab. & Greuter, *Tulipa suaveolens* Roth, *T. sylvestris* subsp. *australis* and others). These plants form a distinctive component, thanks to which the flora of the artificially created phytocoenosis in the plot "Steppes of Ukraine" differs from the regional flora and acquires a unique character in *ex situ* conditions. In *ex situ* conditions these taxa showed ecological and coenotic plasticity, successfully coexisting with other plants for decades. Such an artificial taxonomic composition of the flora in the plot "Steppes of Ukraine" is possible only under introduction and does not occur in nature.

Rare introduced plants represent the main phytosozological value of the plot "Steppes of Ukraine". Certain rare taxa and a whole complex of rare plants (Gritsenko, 2012) were characterized, and the success of the introduction of all rare plant species was evaluated by Gritsenko (2019a).

Among the rare introduced plants in the plot "Steppes of Ukraine", there are 15 taxa listed in the Red Book of Ukraine (Decree, 2021): *Adonis vernalis* (Parubok, 2000; Melnyk & Parubok, 2004), *A. volgensis* Steven ex DC., *Colchicum bulbocodium* Ker Gawl. subsp. *versicolor* (Ker Gawl.) K. Perss., *Crambe tataria* Sebeok., *Crocus reticulatus* (Gritsenko, 2020), *Delphinium sergii*, *Gymnospermium odessanum* (Gritsenko, 2021, 2022), *Ornithogalum boucheanum* (Kunth) Asch., *Paeonia tenuifolia* (Melnik et al., 2003; Gnatiuk & Gritsenko, 2019), *Pulsatilla pratensis*, *Sternbergia colchiciflora* Waldst. & Kit., *Stipa capillata*, *S. pennata*, *Tulipa suaveolens* (= *T. schrenkii* Regel, Decree, 2021), *T. sylvestris* subsp. *australis* (= *T. ophiophylla*, Decree, 2021) (Fig. 5). Most of the rare introduced plants (80 %) formed stable homeostatic introduction

Figure 3. Monocots of the Ukrainian steppes introduced to the botanical-geographical plot "Steppes of Ukraine": **A** – *Bellevalia speciosa*; **B** – *Hyacinthella leucophaea*; **C** – *Muscari comosum*; **D** – *Muscari neglectum*; **E** – *Ornithogalum fimbriatum*; **F** – *O. fischerianum*; **G** – *O. orthophyllum* subsp. *kochii*; **H** – *Scilla siberica*; **I** – *Iris aphylla*; **J** – *I. graminea*.

Figure 3. Continued: **K** – *Iris halophila*; **L** – *I. pumila*; **M** – *Gagea fragifera*; **N** – *Agropyron cristatum*; **O** – *Festuca valesiaca*; **P** – *Poa angustifolia*.

coenopopulations in the plot “Steppes of Ukraine” (Gritsenko, 2017a, 2019a).

In the plot “Steppes of Ukraine”, introduced plants giving it the steppic appearance, are the most valuable group (Table 2) and certify a successful multi-decade introduction experiment. Now this plot represents a model of the meadow steppe of Ukraine and is of significant scientific interest (Gritsenko, 2019c).

Native plants

Native plants that grow naturally on the territory of the NBG and its surroundings are an integral component of the artificially created meadow-steppe cultural phytocoenosis on the plot “Steppes of Ukraine”. Native plants are the most numerous and represented by 133 species and infraspecific taxa (Table 2). Most of the native plants (87 taxa) found on the plot naturally occur in steppe phytocoenoses and, therefore, were included in the collection fund together with introduced steppic

Figure 4. Eudicots of the Ukrainian steppes introduced to the botanical-geographical plot "Steppes of Ukraine": **A** – *Eryngium campestre*; **B** – *E. planum*; **C** – *Vinca herbacea*; **D** – *Echinops sphaerocephalus*; **E** – *Dianthus membranaceus*; **F** – *Gypsophila paniculata*; **G** – *Caragana frutex*; **H** – *Phlomis herba-venti* subsp. *pungens*.

Figure 4. Continued: **I** – *Phlomoides tuberosa*; **J** – *Linum austriacum*; **K** – *L. nervosum*; **L** – *Limonium platyphyllum*; **M** – *Clematis integrifolia*; **N** – *C. lathyrifolia*; **O** – *Prunus tenella*; **P** – *Salvia nutans*.

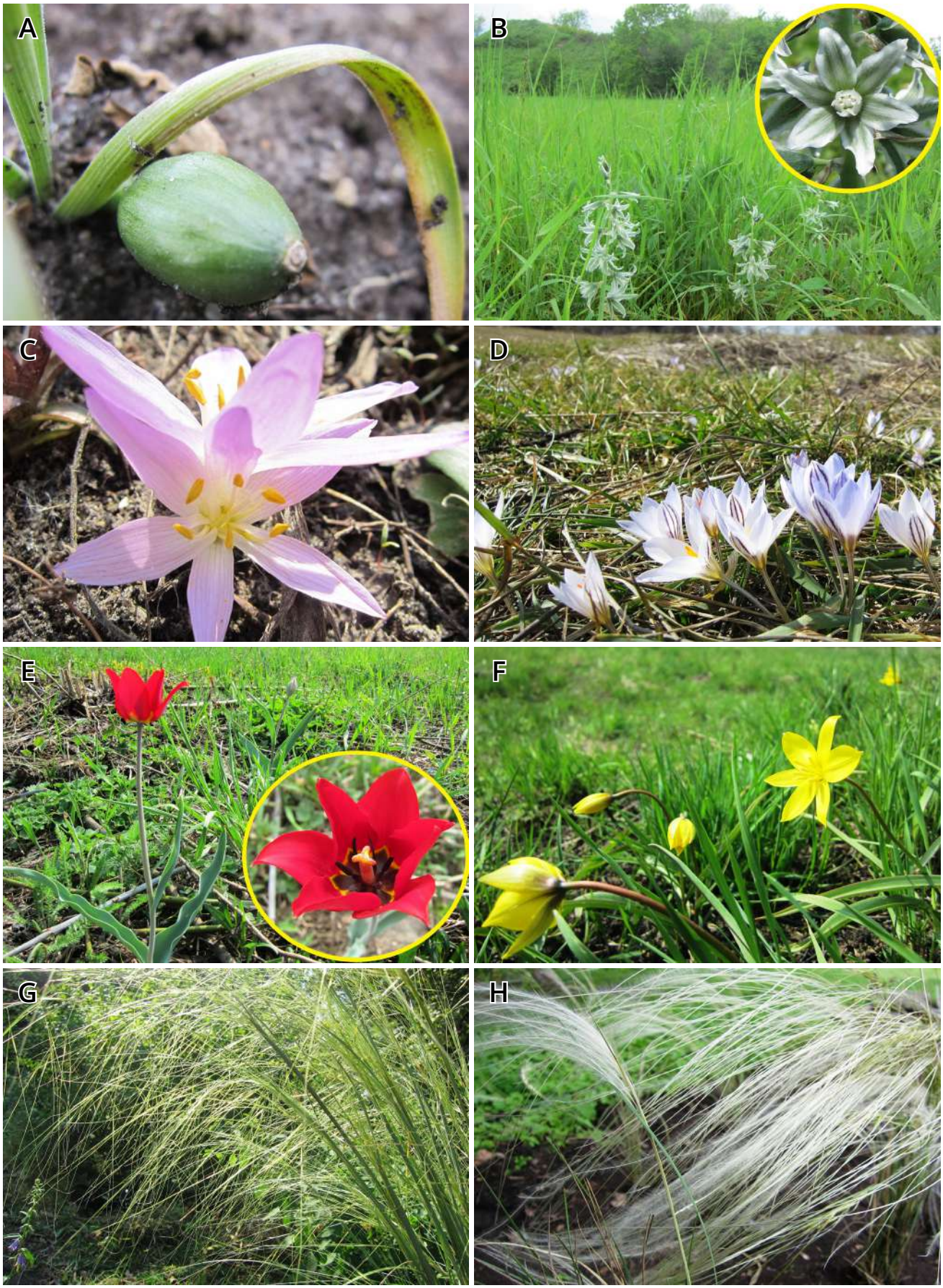

Figure 5. Rare plants of the Ukrainian steppes introduced to the botanical-geographical plot "Steppes of Ukraine": **A** – *Sternbergia colchiciflora*; **B** – *Ornithogalum boucheanum*; **C** – *Colchicum bulbocodium* subsp. *versicolor*; **D** – *Crocus reticulatus*; **E** – *Tulipa suaveolens*; **F** – *T. sylvestris* subsp. *australis*; **G** – *Stipa capillata*; **H** – *S. pennata*.

Figure 5. Continued: **I** – *Gymnospermium odessanum*; **J** – *Crambe tataria*; **K** – *Paeonia tenuifolia*; **L** – *Adonis vernalis*; **M** – *A. volgensis*; **N** – *Delphinium sergii*; **O** – *Pulsatilla pratensis*; **P** – *P. pratensis* (fruiting).

plants. These are mostly steppic (e.g., *Bromus inermis* Leyss., *Carex praecox* Schreb., *Echium vulgare* L., *Gagea transversalis* Steven, *Malva thuringiaca* (L.) Vis., *Medicago falcata* L. and others), marginal (e.g., *Allium oleraceum* L., *Artemisia vulgaris* L., *Falcaria vulgaris* Bernh., *Fragaria viridis* Weston subsp. *viridis*, *Gagea minima* (L.) Ker Gawl., *Origanum vulgare* L., *Ranunculus polyanthemos* L., *Rosa canina* L., *Salvia verticillata* L., *Tanacetum vulgare* L., *Tragopogon orientalis* L., *Veronica chamaedrys* L. and others) and meadow plants (e.g., *Achillea collina* J. Becker ex Rchb., *Calamagrostis epigejos* (L.) Roth., *Carex hirta* L., *C. leporine* L., *Centaurea jacea* L., *Dactylis glomerata* L., *Knautia arvensis* (L.) Coult., *Phleum pretense* L., *Plantago lanceolata* L., *Poa pratensis* L., *Taraxacum officinale* F.H. Wigg. agg. and others). Other ecological groups are much less represented in the plot.

A minor part of native plants (46 taxa) are not representatives of the flora of the steppes of Ukraine. These are mostly forestal (e.g., *Acer campestre* L., *A. platanoides* L., *Alliaria petiolata* (M. Bieb.) Cavara & Grande, *Anemonoides ranunculoides* (L.) Holub, *Anthriscus sylvestris* (L.) Hoffm., *Betula pendula* L., *Corydalis solida* (L.) Clairv., *Corylus avellana* L., *Lathyrus sylvestris* L., *Myosotis sparsiflora* J.C. Mikan ex Pohl, *Poa nemoralis* L., *Quercus robur* L., *Ranunculus ficaria* L. subsp. *ficaria*, *Sambucus nigra* L., *Scilla bifolia* L., *Ulmus minor* Mill., *Viola odorata* L., *V. suavis* M. Bieb. and others) and synanthropic plants (e.g., *Berteroa incana* (L.) DC., *Chelidonium majus* L., *Chenopodium album* L., *Convolvulus arvensis* L., *Galium aparine* L., *Leonurus quinquelobatus* Gilib., *Polygonum aviculare* L. subsp. *aviculare*, *Stellaria media* (L.) Vill., *Urtica dioica* L., *Veronica sublobata* M. Fischer and others). There are present even some wetland plants (i.e., *Populus canescens* and *Salix caprea*), which enter the plot "Steppes of Ukraine" from adjacent forest phytocoenoses. The penetration of trees into the plot poses a threat. To prevent the plot from overgrowing by arboreal plants and to maintain its steppe appearance, self-seeding of trees and non-steppic shrubs should be regularly removed.

Alien plants

In the vegetation cover of the plot "Steppes of Ukraine", a very diverse and collective fraction of alien plants combines several different groups of plants with different origins (Table 2).

The presence of ergasiophygophytes (45 taxa), which spread mainly from other plots of the NBG, is significant (Table 2). The following taxa escaped from various botanical-geographical plots of the NBG. In particular, from the sections "Maple-oak forest" and "Beech-oak forest" of the plot "Forests of the plain part of Ukraine" (*Corydalis cava* subsp. *marschalliana* (Willd.) Hayek and *Isopyrum thalictroides* L.). From the plots "Ukrainian Carpathians" (*Centaurea mollis*, *Crocus heuffelianus* Herb.), "Caucasus" (*Corydalis caucasica* DC., *Cornus sanguinea* L. subsp. *australis* (C.A. Mey.) Jáv., *Crambe cordifolia* Steven., *Galega orientalis* Lam., *Heracleum sosnowskyi* Manden., *Papaver orientale* L, *Puschkinia scilloides* Adams.), "Central Asia" (*Allium caeruleum* Pall.), and "Far East" (*Lonicera ruprechtiana* Regel). Besides this, there are taxa that escaped from other plots of the NBG: *Ailanthus altissima* (Mill.) Swingle., *Allium tuberosum* Rottler ex Spreng., *Berberis aquifolium* Pursh, *Celastrus orbiculatus* Thunb., *Celtis occidentalis* L., *Clematis vitalba* L., *Mirabilis nyctaginea* (Michx.) Mac Mill., *Rumex patientia* L. subsp. *patientia*, *Solidago canadensis* L., and *Vitis riparia* Michx.

Many ergasiophygophytes entered the NBG territory from outside, and before that were previously introduced in other centers of acclimatization or privately in Ukraine. Among such taxa are *Anthriscus cerefolium* (L.) Hoffm., *Asclepias syriaca* L., *Brassica napus* L., *Medicago sativa* L., and *Prunus cerasifera* Ehrh. Some ergasiophygophytes (i.e., *Acer negundo* L., *Arrhenatherum elatius* (L.) P. Beauv. ex J. Presl & C. Presl., *Vicia sativa* L. subsp. *sativa*) had been naturalized on the territory of the NBG even before its creation. There were rural settlements in the XIX and the first half of the XX centuries. Moreover, a thousand-year-old Vydubytskyi monastery was active here too.

The spontaneous hybridization of closely related ergasiophytes of different origins in the NBG is also an interesting question. In particular, *Cornus sanguinea* subsp. *hungarica* (Kárpáti) Soó. and *Lonicera ×notha* Zabel having hybridogenic origin, were registered in the plot "Steppes of Ukraine" (Shynder et al., 2020).

In the plot "Steppes of Ukraine", among alien plants, there are invasive ones (i.e., *Acer negundo*, *Arrhenatherum elatius*, *Asclepias*

syriaca L., *Bromus tectorum* L., *Erigeron annuus* (L.) Pers. var. *annuus*, *Heracleum sosnowskyi*, *Robinia pseudoacacia* L., and *Solidago canadensis* – Protopopova & Shevera, 2019). Some of them are dangerous adventive plants and therefore were studied in this plot precisely (Maryushkina, 2003). In particular, methods of phytocoenotic control of Solidago canadensis were proposed and tested (Maryushkina & Gritsenko, 2002).

Research conducted earlier at the botanical-geographical plot "Caucasus" of the NBG confirmed that the more stable artificial phytocoenoses are those in which the presence of ergasiophytes (introduced plants) significantly exceeds 50 % (Didenko & Shynder, 2020). The higher percentage of ergasiophytes, the less impact will alien invasive plants have on the plantings of introduced plants.

Prospects and development trends

Modern studies of the flora and phytocenoses of natural steppe areas of the Forest-Steppe of Ukraine (Parnikoza et al., 2009; Kuzemko et al., 2014, 2021) allow in the future to adjust the scientific program of monitoring the vegetation of the plot "Steppes of Ukraine" and further introduction of new taxa.

In the future, attention should be paid to increasing the range of introduced plants and the number of rare steppe plants in the plot "Steppes of Ukraine". It is worth trying to introduce there the following typical steppic subshrubs as *Chamaecytisus austriacus* (L.) Link, *Teucrium chamaedrys* L., *T. polium* L., and *Thymus pannonicus* All. Further spontaneous penetration of new native non-steppic and alien taxa into the territory of the plot is likely. Such penetration can lead to specific changes in the structure of the flora of the plot "Steppes of Ukraine" in the future. Therefore, in *ex situ* conditions, it is important to increase the dominance of steppic plants in this plot by introducing new species.

Conclusions

The flora of the botanical-geographical plot "Steppes of Ukraine" of the NBG was formed over 70 years and now represents a complex of introduced, native and alien plants joined in the meadow-steppe artificial phytocoenosis. Currently, 347 species and infraspecific taxa of higher vascular plants from 196 genera and 53 families have been recorded in the plot "Steppes of Ukraine". The steppe essence of this plot is reflected by the collection fund of living plants, which comprises 213 species and infraspecific taxa (61.38 %) of the flora of the steppes of Ukraine, including 126 taxa (36.31 %) of introduced plants and 87 taxa (25.07 %) of native plants. Native non-steppic plants belong to 46 species and infraspecific taxa (13.26 %); alien plants – to 88 taxa (25.36 %), including ergasiophygophytes (45 taxa, 12.97 %) and xenophytes (43 taxa, 12.39 %).

The plants of the collection fund prevail on the plot and dominate in its vegetation cover. Currently, the systematic composition of the flora of the plot is similar to the regional meadow-steppes. In the biomorphological structure of the flora of the plot, perennials dominate (63.69 %), which is characteristic of steppe phytocoenoses. The forest communities surrounding the plot and the associated active formation of self-sowing trees explain a significant number of tree species (5.48 %) in the plot. In general, hemicryptophytes prevail (60.52 %) in the plot. However, the core-forming collection fund of the plot is distinguished by the absence of trees and a higher number of perennials (79.34 %) and hemicryptophytes (72.77 %). In the collection fund, steppic (33.33 %) and marginal (33.33 %) plants prevail, but the number of meadows plants (18.78 %) is still significant. Most of the rare introduced plants formed stable homeostatic introduction coenopopulations in the plot "Steppes of Ukraine".

Fifteen rare taxa that occurred in the plot are included in the Red Book of Ukraine (Decree, 2021). However, at the same time, many ergasiophygophytes spread here from other plots of the NBG. Therefore, to protect this plot from degradation, it is necessary to regularly remove self-sowing trees and non-steppic bushes and control the number of aggressive alien plants.

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Appendix. Cheklist of flora of the botanical-geographical plot "Steppes of Ukraine" (M.M. Gryshko National Botanical Garden of the National Academy of Sciences of Ukraine, Kyiv, Ukraine).

Applied terms and abbreviations

***The origin of plants (immigration groups)*:**
Collection fund:
Introd. steppe – introduced steppic plants;
Native – native steppic plants.

Native non-steppic plants:
Native (non-steppic).

Alien plants:
Ergasioph. – ergasiophygophyte;
Xen. (arch.) – xenophytes (archeophytes);
Xen. (ken.) – xenophytes (kenophytes).

***Hab. – Habitats*:**
Clay
Forests
Marginal (plants grow in bushes and along the forest edges)
Meadows
Mountain meadows
Salted meadows
Sands
Steppes
Stony
Synanthropic
Wetlands

***L.f. – Plant life forms*:**
According to Clements (1920) and Sokolov & Svyazeva (1965):
Trees
Shrubs
Subhrubs
Halfshrubs
Lianas
Perennials
Biennials
Annuals

According to Raunkiaer (1934):
Phanerophytes
Chamaephytes
Hemicryptophytes
Cryptophytes
Therophytes

***Numbering*:**
1–347 (1–213) – entire flora of the plot "Steppes of Ukraine" (collection fund);
(I–VIII) – units that are not considered as independent species (i.e., hybrids, forms, microspecies).

GYMNOSPERMS. GNETOPSIDA

1. EPHEDRACEAE
1(1). *Ephedra distachya* L. – Introd. steppe. – L.f.: Subshrub; Phanerophyte. – Hab.: Sands.

ANGIOSPERMS. MONOCOTS

2. AMARYLLIDACEAE
2. *Allium caeruleum* Pall. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Marginal. – Note. Escaped plant from the "Central Asia" plot.
3(2). *Allium decipiens* Fisch. ex Schult. & Schult. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced from Donetsk region.
4(3). *Allium flavum* L. subsp. *tauricum* (Besser ex Rchb.) K. Richt. (= A. *paczoskianum* Tuzs.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.

4 (I). *Allium sphaeropodum* Klokov (syn. of A. *flavum* subsp. *tauricum*). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Stony.
5(4). *Allium oleraceum* L. – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Marginal.
6. *Allium tuberosum* Rottler ex Spreng. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Synanthropic. – Note. Escaped plant from the "Central Asia" plot.
7(5). *Allium rotundum* L. (= A. *waldsteinii* G. Don). – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Marginal.
8. *Allium scorodoprasum* L. – Xen. (arch.). – L.f.: Perennial; Cryptophyte. – Hab.: Marginal.
9(6). *Allium sphaerocephalon* L. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
10(7). *Sternbergia colchiciflora* Waldst. & Kit. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 2011 from the Odesa region.

3. ASPARAGACEAE
11(8). *Asparagus officinalis* L. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Meadows.
12(9). *Bellevalia speciosa* Woronow ex Grossh. (= *B. sarmatica* (Pall. ex Georgi) Woronow). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
13(10). *Hyacinthella leucophaea* (K. Koch) Schur. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 and 2007 from the Luhansk region.
14(11). *Muscari comosum* (L.) Mill. (= *Leopoldia comosa* (L.) Parl.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
15(12). *Muscari neglectum* Guss. ex Ten. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Poltava region and in 2007 – from the outskirts of Odesa.
16(13). *Ornithogalum boucheanum* (Kunth) Asch. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Meadows. – Note. Introduced in 2007 from the Poltava region.
17(14). *Ornithogalum fimbriatum* Willd. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Odesa region.
18(15). *Ornithogalum fischerianum* Krasch. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
19(16). *Ornithogalum orthophyllum* Ten. subsp. *kochii* (Parl.) C. Zahariadi (= *O. gussonii* Ten.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 2003 from the Kyiv region (the outskirts of Obukhiv).
20. *Puschkinia scilloides* Adams. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Meadows. – Note. Escaped plant from the "Caucasus" plot.
21. *Scilla bifolia* L. – Native (non-steppic). – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
22(17). *Scilla siberica* Andrews. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Forests. – Note. Introduced in 1960 and 1963 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).

4. COLCHICACEAE
23(18). *Colchicum bulbocodium* Ker Gawl. subsp. versicolor (Ker Gawl.) K. Perss. (= *Bulbocodium versicolor* (Ker Gawl.) Spreng.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 from the Kyiv region ("Shandriv Forest" in the vicinity of the Shandra village).

5. CYPERACEAE
24(19). *Carex hirta* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
25(20). *Carex leporina* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
26(21). *Carex melanostachya* M. Bieb. ex Willd. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
27(22). *Carex praecox* Schreb. – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.

6. IRIDACEAE
28. *Crocus heuffelianus* Herb. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Forests. – Note. Escaped plant from the "Ukrainian Carpathians" plot.
29(23). *Crocus reticulatus* Steven ex Adams. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 from the Luhansk region and in 2003 from the Kyiv region (the vicinity of the Centralne village).
30(24). *Iris aphylla* L. (= *I. hungarica* Waldst. & Kit.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1953 from the Sumy region (Michael's Virgin Land Nature Reserve), also in 2002 from the Khmelnytskyi region (Podilsky Tovtry) and Kyiv region.
31(25). *Iris graminea* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
32(26). *Iris halophila* Pall. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
33(27). *Iris pontica* Zapał. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
34(28). *Iris pumila* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 from the Mykolaiv region (the vicinity of the Tashyno village, Berezan district).

7. LILIACEAE
35(29). *Gagea fragifera* (Vill.) Ehr. Bayer & G. López (= *G. erubescens* (Besser) Schult. & Schult.f.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Marginal.
36(30). *Gagea minima* (L.) Ker Gawl. – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Marginal.
31/37(31). *Gagea pusilla* (F.W. Schmidt) Sweet. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
38(32). *Gagea transversalis* Steven (= *G. paczoskii* (Zapal.) Grossh). – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.

39(33). *Tulipa suaveolens* Roth (= *T. schrenkii* Regel). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1952 from the Kherson region (Kuyuk-Tuk island).
40(34). *Tulipa sylvestris* L. subsp. *australis* (Link) Pamp. (= *T. ophiophylla* Klokov & Zoz; *T. biebersteiniana* Schult. & Schult.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Stony. – Note. Introduced in 2002 from the Luhansk region (the outskirts of the villages of Pervozvanivka and Verkhnya Orihivka, Luhansk district).
40 (II). *Tulipa quercetorum* Klokov & Zoz. (= *T. sylvestris* subsp. *australis*). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Forests. – Note. Escaped plant from the "Forests of the plain part of Ukraine" plot ("Maple oak" section).

8. POACEAE
41(35). *Agropyron cristatum* (L.) Gaertn. (= *A. pectinatum* (M. Bieb.) P. Beauv). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1949 from the Donetsk region (Ukrainian Steppe Nature Reserve).
42(36). *Agrostis capillaris* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
43(37). *Alopecurus vaginatus* (Willd.) Pall. ex Kunth. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
44. *Arrhenatherum elatius* (L.) P. Beauv. ex J. Presl & C. Presl. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
45(38). *Bromus inermis* Leyss. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
46(39). *Bromus riparius* Rehmann. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
47. *Bromus tectorum* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
48(40). *Calamagrostis epigejos* (L.) Roth. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
49(41). *Dactylis glomerata* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
50. *Digitaria ischaemum* (Schreb.) Muehl. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
51. *Digitaria sanguinalis* (L.) Scop. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
52. *Echinochloa crus-galli* (L.) P. Beauv. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
53(42). *Elymus repens* (L.) Gould (= *Agropyrum repens* (L.) P. Beauv.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
54. *Eragrostis minor* Host. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
55(43). *Festuca valesiaca* Schleich. ex Gaudin. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1949 and 2007 from the Poltava region.
56. *Hordeum murinum* L. subsp. *murinum*. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
57(44). *Lolium perenne* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
58(45). *Lolium pratense* (Huds.) Darbysh. (= *Festuca pratensis* Huds.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
59(46). *Melica transsilvanica* Schur. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
60(47). *Phleum pratense* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
61(48). *Poa angustifolia* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced 1949 from the Donetsk region (Ukrainian Steppe Nature Reserve).
62. *Poa annua* L. – Native (non-steppic). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
63(49). *Poa bulbosa* L. – Native. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
64. *Poa nemoralis* L. – Native (non-steppic). – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
65(50). *Poa pratensis* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
66. *Setaria viridis* (L.) P. Beauv. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
67(51). *Stipa capillata* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1952 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve) and in 2002–2007 from the Kyiv region.
68(52). *Stipa pennata* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 2002–2006 from the Kyiv region (the outskirts of Tulyntsi and Shandra villages).
69(53). *Thinopyrum intermedium* (Host) Barkworth & D.R. Dewey (= *Agropyrum intermedium* (Host) P.B.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1954 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).

ANGIOSPERMS. EUDICOTS

9. ACERACEAE
70. *Acer campestre* L. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.
71. *Acer negundo* L. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.
72. *Acer platanoides* L. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.
73. *Acer tataricum* L. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Marginal.

10. AMARANTHACEAE
74(54). *Atriplex oblongifolia* Waldst. & Kit. – Native. – L.f.: Annual; Therophyte. – Hab.: Clay.
75. *Chenopodium album* L. – Native (non-steppic) – L.f.: Annual; Therophyte. – Hab.: Synanthropic.

11. APIACEAE
76. *Anthriscus cerefolium* (L.) Hoffm. – Ergasioph. – L.f.: Annual; Therophyte. – Hab.: Forests.
77. *Anthriscus sylvestris* (L.) Hoffm. – Native (non-steppic) – L.f.: Biennial; Hemicryptophyte. – Hab.: Forests.
78(55). *Daucus carota* L. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Meadows.
79(56). *Eryngium campestre* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
80(57). *Eryngium planum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands. – Note. Introduced in 1960 from the Poltava region.
81(58). *Falcaria vulgaris* Bernh. – Native. – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Marginal.
82. *Heracleum sosnowskyi* Manden. – Ergasioph. – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Meadows. – Note. Escaped plant from the "Caucasus" plot.
83(59). *Pimpinella saxifraga* L. subsp. *saxifraga*. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
84(60). *Pimpinella saxifraga* subsp. *nigra* (Mill.) Gaudin (= *P. nigra* Mill.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
85(61). *Seseli annuum* L. – Introd. steppe. – L.f.: Annual; Therophyte. – Hab.: Marginal.
86(62). *Seseli campestre* Besser. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
87(63). *Seseli libanotis* (L.) W.D.J. Koch. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Marginal.
88(64). *Xanthoselinum alsaticum* (L.) Schur (= Peucedanum lubimenkoanum Kotov). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

12. APOCYNACEAE
89. *Asclepias syriaca* L. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Meadows.
90(65). *Vinca herbacea* Waldst. & Kit. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1950–1960th from the Luhansk region (Striltsivskyi Steppe Nature Reserve) and the Poltava region.
91(66). *Vincetoxicum hirundinaria* Medik. subsp. *hirundinaria* (= *V. hirundinaria* subsp. *laxum* (Bartl.) Poldini.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

13. ASTERACEAE
92(67). *Achillea millefolium* L. subsp. *collina* (Wirtg.) Oborný (= *A. collina* J. Becker ex Rchb., *A. submillefolium* Klokov & Kritzka). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
93(68). *Achillea nobilis* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
94(69). *Achillea pannonica* Scheele. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
95(70). *Achillea setacea* Waldst. & Kit. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
96. *Ambrosia artemisiifolia* L. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
97. *Artemisia absinthium* L. – Xen. (arch.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
98(71). *Artemisia austriaca* Jacq. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 from the Cherkasy region.
99(72). *Artemisia marschalliana* Spreng. – Introd. steppe. – L.f.: Halfshrubs; Chamaephyte. – Hab.: Steppes.
99 (III). *Artemisia marschalliana* f. dniproica (Klokov) ined. (= *A. dniproica* Klokov). – Introd. steppe. – L.f.: Halfshrubs; Chamaephyte. – Hab.: Sands.
100(73). *Artemisia vulgaris* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
101. *Centaurea cyanus* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
102. *Centaurea diffusa* Lam. – Xen. (ken.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Steppes.
103(74). *Centaurea jacea* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
104. *Centaurea mollis* Waldst. & Kit. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Mountain meadows. – Note. Escaped plant from the plot "Ukrainian Carpathian".
105(75). *Centaurea scabiosa* L. subsp. *apiculata* (Ledeb.) Mikheev. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
106(76). *Centaurea stoebe* L. subsp. *stoebe* (= *C. micranthos* Gmel. – *C. pseudomaculosa* Dobrocz.). – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Sands.
107(77). *Chondrilla juncea* L. – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Sands, Steppes, Stony.
108. *Cichorium intybus* L. – Xen. (arch.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
109(78). *Cirsium arvense* (L.) Scop. var. *arvense* – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
110. *Cirsium arvense* var. *integrifolium* Wimm. & Grab. (= *C. setosum* M. Bieb.). – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
111(79). *Cirsium vulgare* (Savi) Ten. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Marginal.
112(80). *Cota tinctoria* (L.) J. Gay (= *Anthemis subtinctoria* Dobrocz.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Clay.
113(81). *Crepis tectorum* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Sands.
114(82). *Echinops ritro* L. subsp. *ruthenicus* (M. Bieb.) Nyman. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1960 from the Luhansk region (Striltsivskyi Steppe Nature Reserve).
115(83). *Echinops sphaerocephalus* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
116. *Erigeron annuus* (L.) Desf (= *Stenactis annua* (L.) Nees.). – Xen. (ken.). – L.f.: Annual; Hemicryptophyte. – Hab.: Synanthropic.
117. *Erigeron canadensis* L. (= *Conyza canadensis* (L.) Cronquist). – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.

118(84). *Galatella sedifolia* (L.) Greuter subsp. *dracunculoides* (Lam.) Greuter (= *Galatella dracunculoides* (Lam.) Nees). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1950–1960th.
119(85). *Helichrysum arenarium* (L.) Moench. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands. – Note. Introduced in 2007 from the Poltava region ("Lyznyana Balka" zakaznyk).
120(86). *Hieracium umbellatum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 2005-2007 from the Kyiv region.
121(87). *Jacobaea vulgaris* Gaertn. (= *Senecio jacobaea* L.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
122(88). *Klasea lycopifolia* (Vill.) Á. Löve & D. Löve (= *Serratula lycopifolia* (Vill.) A.Kern.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
123. *Lactuca serriola* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
124(89). *Leucanthemum vulgare* Lam. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
125(90). *Picris hieracioides* L. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic.
126(91). *Rhaponticoides ruthenica* (Lam.) M.V. Agab. & Greuter (= *Centaurea ruthenica* Lam.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1952 and 1960 from the Luhansk region (Striltsivskyi Steppe Nature Reserve).
127. *Solidago canadensis* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
128(92). *Solidago virgaurea* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
129. *Tanacetum corymbosum* (L.) Sch.Bip. (= *Pyrethrum corymbosum* (L.) Scop.). – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
130(93). *Tanacetum vulgare* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
131(94). *Taraxacum officinale* F.H. Wigg. aggr. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
132(95). *Taraxacum proximum* (Dahlst.) Dahlst. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands.
133(96). *Tragopogon dubius* Scop. subsp. *major* (Jacq.) Vollm. (= *T. major* Jacq.). – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Steppes.
134(97). *Tragopogon orientalis* L. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Marginal.
135. *Tripleurospermum inodorum* (L.) Sch. Bip. (= *Matricaria perforata* Mérat). – Xen. (arch.). – L.f.: Annual; Hemicryptophyte. – Hab.: Synanthropic.

14. BERBERIDACEAE
136. *Berberis aquifolium* Pursh (= *Mahonia aquifolium* (Pursh) Nutt.). – Ergasioph. – L.f.: Subshrub; Phanerophyte. – Hab.: Forests.
137(98). *Berberis vulgaris* L. – Native. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
138(99). *Gymnospermium odessanum* (DC.) Takht. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 and 1964 from the outskirts of Odesa and in 2002 from the Mykolaiv region (the vicinity of the Tashyno village, Berezan district).

15. BETULACEAE
139. *Betula pendula* Roth. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.
140. *Corylus avellana* L. – Native (non-steppic) – L.f.: Shrub; Phanerophyte. – Hab.: Forests.

16. BORAGINACEAE
141. *Anchusa officinalis* L. – Xen. (arch.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic.
142. *Cynoglossum officinale* L. – Xen. (arch.). – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Synanthropic.
143(100). *Echium vulgare* L. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Steppes.
144. *Myosotis arvensis* (L.) Hill. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
145. *Myosotis sparsiflora* J.C. Mikan ex Pohl (= *Strophiostoma sparsiflorum* (J.C. Mikan ex Pohl) Turcz.). – Native (non-steppic) – L.f.: Annual; Therophyte. – Hab.: Forests.

17. BRASSICACEAE
146. *Alliaria petiolata* (M. Bieb.) Cavara & Grande. – Native (non-steppic) – L.f.: Annual; Hemicryptophyte. – Hab.: Forests.
147(101). *Arabidopsis thaliana* (L.) Heynh. – Native. – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
148. *Berteroa incana* (L.) DC. – Native (non-steppic) – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Synanthropic.
149. *Brassica napus* L. – Ergasioph. – L.f.: Annual; Hemicryptophyte. – Hab.: Synanthropic.
150. *Capsella bursa-pastoris* (L.) Medik. – Xen. (arch.). – L.f.: Annual; Hemicryptophyte. – Hab.: Synanthropic.
151. *Crambe cordifolia* Steven. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Escaped plant from the plot "Caucasus".
152(102). *Crambe tataria* Sebeok. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Kherson region (Byriuchyi Island spit).
153. *Descurainia sophia* (L.) Webb ex Prantl. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
154. *Diplotaxis tenuifolia* (L.) DC. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
155(103). *Draba nemorosa* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
156. *Erysimum cheiranthoides* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.

157. *Erysimum cuspidatum* (M. Bieb.) DC. – Xen. (ken.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Steppes.
158. *Lepidium densiflorum* Schrad. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
159. *Lepidium draba* L. (= *Cardaria draba* (L.) Desv.). – Xen. (ken.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
160. *Lepidium ruderale* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
161. *Sisymbrium loeselii* L. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
162. *Sisymbrium volgense* M. Bieb. ex E. Fourn. – Xen. (ken.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
163. *Thlaspi arvense* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
164(104). *Turritis glabra* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

18. CAMPANULACEAE
165(105). *Campanula patula* L. – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Meadows.
166(106). *Campanula rapunculoides* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
167(107). *Campanula sibirica* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.

19. CANNABACEAE
168. Celtis occidentalis L. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.
169. *Humulus lupulus* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.

20. CAPRIFOLIACEAE
170(108). *Knautia arvensis* (L.) Coult. – Native. – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Meadows.
171. *Lonicera* × *notha* Zabel (= *L. ruprechtiana* × *L. tatarica*). – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal. – Note. This species is incorrectly listed as a synonym of *L.* × *muendeniensis* Rehder (POWO, 2022), but *L. morrowii* A. Gray also participates in the formation of the last one.
172. *Lonicera ruprechtiana* Regel. – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
173. *Lonicera tatarica* L. – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
174(109). *Sambucus ebulus* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
175. *Sambucus nigra* L. – Native (non-steppic) – L.f.: Shrub; Phanerophyte. – Hab.: Forests.
176(110). *Scabiosa ochroleuca* L. – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Steppes.
177(111). *Valeriana tuberosa* L. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Salted meadows.

21. CARYOPHYLLACEAE
178(112). *Arenaria serpyllifolia* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
179(113). *Cerastium semidecandrum* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Sands.
180(114). *Dianthus armeria* L. – Introd. steppe. – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Meadows.
181(115). *Dianthus capitatus* DC. subsp. *andrzejowskianus* Zapał. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
182(116). *Dianthus deltoides* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
183(117). *Dianthus membranaceus* Borbás. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows. – Note. Introduced in 2002–2006 from the Kyiv region.
184(118). *Gypsophila paniculata* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
185. *Saponaria officinalis* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
186(119). *Silene latifolia* Poir. subsp. *alba* (Miller) Greuter & Burdet (= *Melandrium album* (Mill.) Garcke). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
187(120). *Stellaria graminea* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
188(121). *Stellaria hippoctona* (Czern.) Klokov. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows. – Note. The independence of this species is not consolidly recognized and it is often not distinguished from *S. graminea* (POWO, 2022).
189. *Stellaria media* (L.) Vill. – Native (non-steppic) – L.f.: Biennial, short-lived perennials; Hemicryptophyte. – Hab.: Synanthropic.

22. CELASTRACEAE
190. *Celastrus orbiculatus* Thunb. – Ergasioph. – L.f.: Liana; Phanerophyte. – Hab.: Marginal.

23. CONVOLVULACEAE
191. *Convolvulus arvensis* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.

24. CORNACEAE
192. *Cornus sanguinea* L. subsp. *australis* (C.A. Mey.) Jáv. (= *Swida australis* (C.A. Mey.) Pojark. ex Grossh.). – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
193. *Cornus sanguinea* subsp. *hungarica* (Kárpáti) Soó. – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.

25. CRASSULACEAE
194. *Hylotelephium maximum* (L.) Holub subsp. *maximum*. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.

26. EUPHORBIACEAE
195(122). *Euphorbia cyparissias* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic. – Note. Introduced in 1953 and 1966 from the Donetsk and Luhansk regions.
196(123). *Euphorbia saratoi* Ardoino (= *E. virgata* Waldst. & Kit.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
197(124). *Euphorbia seguieriana* Neck. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands.
198(125). *Euphorbia semivillosa* (Prokh.) Krylov. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

27. FABACEAE
199(126). *Astragalus cicer* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows. – Note. Introduced in 1953 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
200(127). *Astragalus onobrychis* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
201(128). *Caragana frutex* (L.) K. Koch. – Introd. steppe. – L.f.: Subshrub; Phanerophyte. – Hab.: Steppes.
202(129). *Chamaecytisus ruthenicus* (Fisch. ex Woł.) Klásk. – Introd. steppe. – L.f.: Subshrub; Phanerophyte. – Hab.: Marginal.
203. *Galega orientalis* Lam. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
204(130). *Genista tinctoria* L. – Introd. steppe. – L.f.: Subshrub; Phanerophyte. – Hab.: Forests. – Note. Introduced in 1952 from the Sumy region (Michael’s Virgin Land Nature Reserve).
205(131). *Lathyrus pratensis* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
206. *Lathyrus sylvestris* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
207. *Lathyrus tuberosus* L. – Xen. (arch.). – L.f.: Perennial; Cryptophyte. – Hab.: Steppes.
208(132). *Lotus corniculatus* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
209(133). *Medicago falcata* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
209 (IV). *Medicago romanica* Prodan (= *M. falcata*). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
210(134). *Medicago lupulina* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Marginal.
211. *Medicago sativa* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
212(135). *Melilotus albus* Medik. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Sands.
213(136). *Melilotus officinalis* (L.) Lam. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Marginal.
214(137). *Onobrychis arenaria* (Kit.) DC. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
215(138). *Ononis arvensis* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
216. *Robinia pseudoacacia* L. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Forests.
217(139). *Securigera varia* (L.) Lassen. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
218(140). *Trifolium alpestre* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 2002 from the Cherkasy region.
219(141). *Trifolium arvense* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Sands.
220(142). *Trifolium medium* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
221(143). *Trifolium montanum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1953 from the Luhansk region (Striltsivskyi Steppe Nature Reserve) and in 2002 from the Cherkasy region.
222(144). *Trifolium pratense* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
223(145). *Trifolium repens* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
224(146). *Vicia cracca* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
225. *Vicia hirsuta* (L.) Gray. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
226. *Vicia sativa* L. subsp. *sativa*. – Ergasioph. – L.f.: Annual; Therophyte. – Hab.: Meadows.
227(147). *Vicia sepium* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
228(148). *Vicia tenuifolia* Roth. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
229. *Vicia villosa* Roth. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Marginal.

28 FAGACEAE
230. *Quercus robur* L. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.

29. GERANIACEAE
231. *Geranium pusillum* L. – Xen. (arch.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.

30. HYPERICACEAE
232(149). *Hypericum perforatum* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

31. LAMIACEAE
233(150). *Ajuga genevensis* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1960, also in 2002–2006 from the Cherkasy region (Kaniv district).
234. *Ballota nigra* L. – Xen. (arch.). – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
235(151). *Clinopodium vulgare* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
236. *Glechoma hederaceae* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
237(152). *Lamium amplexicaule* L. var. *orientale* (Pacz.) Mennema (= *L. paczoskianum* Worosch.). – Introd. steppe. – L.f.: Annual; Therophyte. – Hab.: Steppes.

238. *Lamium maculatum* (L.) L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
239. *Lamium purpureum* L. – Xen. (arch.). – L.f.: Annual; Hemicryptophyte. – Hab.: Synanthropic.
240. *Leonurus quinquelobatus* Gilib. (= *L. villosus* Desf. ex D'Urv.). – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
241. *Nepeta cataria* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
242(153). *Origanum vulgare* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
243(154). *Phlomis herba-venti* L. subsp. *pungens* (Willd.) Maire ex DeFilipps (= *P. pungens* Willd.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
244(155). *Phlomoides tuberosa* (L.) Moench (= *Phlomis tuberosa* L.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Luhansk region (Striltsivskyi Steppe Nature Reserve) and in 2002 from the Kyiv region.
245. *Prunella vulgaris* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
246(156). *Salvia nemorosa* L. (= *S. illuminata* Klokov). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
247(157). *Salvia nutans* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1950–1960th from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
248(158). *Salvia pratensis* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Sumy region (Michael's Virgin Land Nature Reserve) and in 2002 from the Kyiv region.
249(159). *Salvia verticillata* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
249 (V). *Salvia nemorosa* × *S. dumetorum* Andrz. ex Besser. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
250(160). *Stachys germanica* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
251(161). *Stachys recta* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1959 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).

32. LINACEAE
252(162). *Linum austriacum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1952 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
253(163). *Linum nervosum* Waldst. & Kit. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).

33. MALVACEAE
254(164). *Alcea rugosa* Alef. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
255. *Malva neglecta* Wallr. – Xen. (arch.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic.
256(165). *Malva thuringiaca* (L.) Vis. (= *Lavatera thuringiaca* L.). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.

34. NYCTAGINACEAE
257. *Mirabilis nyctaginea* (Michx.) Mac Mill. (= *Oxybaphus nyctagineus* (Michx.) Sweet). – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.

35. ONAGRACEAE
258. *Oenothera biennis* L. – Xen. (ken.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic.
259. *Oenothera rubricaulis* Kleb. – Xen. (ken.). – L.f.: Biennial; Hemicryptophyte. – Hab.: Synanthropic. – Note. The independence of *O. rubricaulis* as a species is questioned by some researchers and therefore it is synonymized with *O. biennis* (POWO, 2022).

36. OROBANCHACEAE
260(166). *Melampyrum arvense* L. – Native. – L.f.: Annual; Therophyte. – Hab.: Meadows.
261(167). *Odontites vulgaris* Moench. – Introd. steppe. – L.f.: Annual; Therophyte. – Hab.: Meadows.

37. PAEONIACEAE
262(168). *Paeonia tenuifolia* L. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Luhansk region (Striltsivskyi Steppe Nature Reserve).

38. PAPAVERACEAE
263. *Chelidonium majus* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
264. *Corydalis caucasica* DC. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
265. *Corydalis cava* (L.) Schweigg. & Körte. subsp. *cava*. – Native (non-steppic) – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
266. *Corydalis cava* subsp. *marschalliana* (Willd.) Hayek (= *C. marschalliana* (Pall. ex Willd.) Pers.). – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Forests. – Note. Escaped plant from the "Forests of the plain part of Ukraine" plot.
267. *Corydalis solida* (L.) Clairv. – Native (non-steppic) – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
268. *Papaver dubium* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
268 (VI). *Papaver dubium* f. *albiflorum* (Besser) ined. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Sinantropic.

269. *Papaver orientale* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic. – Note. Escaped plant from the plot "Caucasus".

39. PLANTAGINACEAE
270(169). *Linaria vulgaris* Mill. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
271(170). *Plantago lanceolata* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
272(171). *Plantago major* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
273(172). *Plantago media* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
274. *Veronica arvensis* L. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
275(173). *Veronica austriaca* L. subsp. *austriaca*. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 2007 from the Poltava region ("Lyznyana Balka" zakaznyk).
276(174). *Veronica chamaedrys* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
277. *Veronica filiformis* Sm. – Ergasioph. – L.f.: Annual, short-lived perennials; Hemicryptophyte. – Hab.: Synanthropic.
278(175). *Veronica incana* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands. – Note. Introduced in 1953 from Sumy region (Michael's Virgin Land Nature Reserve).
279. *Veronica persica* Poir. – Xen. (ken.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
280. *Veronica polita* Fr. – Xen. (arch.). – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
281(176). *Veronica prostrata* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
282(177). *Veronica spicata* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
283. *Veronica sublobata* M. Fischer (= *V. hederifolia* auct., non L.). – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
284(178). *Veronica teucrium* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

40. PLUMBAGINACEAE
285(179). *Limonium platyphyllum* Lincz. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.

41. POLYGONACEAE
286(180). *Fallopia dumetorum* (L.) Holub. – Native. – L.f.: Annual; Therophyte. – Hab.: Marginal.
287. *Polygonum aviculare* L. subsp. *aviculare*. – Native (non-steppic) – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
288. *Rumex patientia* L. subsp. *patientia*. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
289(181). *Rumex thyrsiflorus* Fingerh. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.

42. RANUNCULACEAE
290(182). *Adonis vernalis* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1952 from the Sumy region (Michael's Virgin Land Nature Reserve) and in 2022 from the Kyiv region (former Myronivka district).
291(183). *Adonis volgensis* Steven ex DC. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 1953 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve), in 2002 from the Luhansk region, and in 2007 from the Poltava region.
292. *Anemonoides ranunculoides* (L.) Holub (= *Anemone ranunculoides* L.). – Native (non-steppic) – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
293(184). *Anemonoides sylvestris* (L.) Galasso, Banfi & Soldano (= *Anemone sylvestris* L.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1953 from the Luhansk region (Striltsivskyi Steppe Nature Reserve).
294(185). *Clematis integrifolia* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1953 and 1960 from the Luhansk region (Striltsivskyi Steppe Nature Reserve) and in 2007 from the Poltava region.
295(186). *Clematis lathyrifolia* Besser ex Trautv. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1960 from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
296(187). *Clematis recta* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
297. *Clematis vitalba* L. – Ergasioph. – L.f.: Liana; Phanerophyte. – Hab.: Synanthropic.
298(188). *Delphinium sergei* O.D. Wissjul. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced from the Donetsk region. This taxon is synonymized with *D. schmalhausenii* Albov by POWO (2022), but here we consider it as an independent species.
299. *Hepatica nobilis* Schreb. – Ergasioph. – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
300. *Isopyrum thalictroides* L. – Ergasioph. – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests. – Note. Escaped plant from the "Forests of the plain part of Ukraine" plot.
301(189). *Pulsatilla pratensis* (L.) Mill. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1953, 2002, and 2006 from the Poltava, Kharkiv, Luhansk and Kyiv regions.
302. *Ranunculus ficaria* L. subsp. *ficaria* (= *Ficaria verna* Huds.). – Native (non-steppic) – L.f.: Perennial; Cryptophyte. – Hab.: Forests.
303(190). *Ranunculus ficaria* subsp. *calthifolius* (Rchb.) Arcang. (= *Ficaria calthifolia* Rchb.). – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Meadows.
304(191). *Ranunculus illyricus* L. – Introd. steppe. – L.f.: Perennial; Cryptophyte. – Hab.: Steppes. – Note. Introduced in 1953, 2002, and 2003 from the Luhansk and Kyiv regions.

305(192). *Ranunculus polyanthemos* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
306(193). *Thalictrum minus* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1950–1960th from Luhansk region (Striltsivskyi Steppe Nature Reserve), also introduced from the Poltava region.
307(194). *Thalictrum simplex* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.

43. ROSACEAE
308. *Agrimonia eupatoria* L. subsp. *eupatoria*. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
309. *Crataegus* × *kyrtostyla* Fingerh. (= *C. monogyna* × *C. rhipidophylla*). – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Marginal.
310. *Crataegus monogyna* Jacq. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Marginal.
311. *Crataegus rhipidophylla* Gand. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Marginal.
312(195). *Filipendula vulgaris* Moench. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
313(196). *Fragaria viridis* Weston subsp. *viridis*. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
314. *Geum urbanum* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
315(197). *Potentilla argentea* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.
315 (VII). *Potentilla neglecta* Baumg. (= *P. argentea*). – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
316(198). *Potentilla incana* P. Gaertn., B. Mey. & Scherb. (= *P. arenaria* Borkh.). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Sands.
317(199). *Potentilla recta* L. subsp. *recta*. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.
318. *Prunus avium* (L.) L. (= *Cerasus avium* (L.) Moench). – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.
319. *Prunus cerasifera* Ehrh. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.
320. *Prunus cerasus* L. (= *Cerasus vulgaris* Mill.). – Ergasioph. – L.f.: Shrub; Phanerophyte. – Hab.: Synanthropic.
321. *Prunus persica* (L.) Batsch (= *Persica vulgaris* Mill.). – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.
322(200). *Prunus spinosa* L. subsp. *dasyphylla* (Schur) Domin (= *P. stepposa* Kotov). – Native. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal. – Note. The independence of this subspecies is questionable (POWO, 2022).
323(201). *Prunus tenella* Batsch. (= *Amygdalus nana* L.). – Introd. steppe. – L.f.: Subshrub; Phanerophyte. – Hab.: Steppes. – Note. Introduced in 1952 from the Luhansk region (Striltsivskyi Steppe Nature Reserve), also introduced from the Donetsk region (Khomutovsky Steppe branch of the Ukrainian Steppe Nature Reserve).
324. *Pyrus communis* L. subsp. *communis*. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.
325(202). *Rosa canina* L. – Native. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
326(203). *Rosa corymbifera* Borkh. – Native. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
327(204). *Rosa rubiginosa* L. – Introd. steppe. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.
328(205). *Rosa villosa* L. – Introd. steppe. – L.f.: Shrub; Phanerophyte. – Hab.: Marginal.

44. RUBIACEAE
329. *Galium aparine* L. – Native (non-steppic) – L.f.: Annual; Therophyte. – Hab.: Synanthropic.
330(206). *Galium mollugo* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Meadows.
331(207). *Galium verum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal. – Note. Introduced in 1960 from the Sumy region (Michael's Virgin Land Nature Reserve).
331 (VIII). *Galium ruthenicum* Willd. (= *G. verum*). – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes.

45. RUTACEAE
332(208). *Dictamnus albus* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.

46. SALICACEAE
333. *Populus* × *canescens* (Aiton) Sm. (= *P. alba* L. × *P. tremula* L.). – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Wetlands.
334. *Salix caprea* L. – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Wetlands.

47. SCROPHULARIACEAE
335(209). *Verbascum lychnitis* L. – Native. – L.f.: Biennial; Hemicryptophyte. – Hab.: Sands.
336(210). *Verbascum phlomoides* L. – Introd. steppe. – L.f.: Biennial; Hemicryptophyte. – Hab.: Sands.
337(211). *Verbascum phoeniceum* L. – Introd. steppe. – L.f.: Perennial; Hemicryptophyte. – Hab.: Steppes. – Note. Introduced in 2002 from the Luhansk region (the outskirts of the Pervozvanivka village, Luhansk district).

48. SIMAROUBACEAE
338. Ailanthus altissima (Mill.) Swingle. – Ergasioph. – L.f.: Tree; Phanerophyte. – Hab.: Synanthropic.

49. SOLANACEAE
339. *Lycium barbatum* L. – Ergasioph. – L.f.: Subshrub; Phanerophyte. – Hab.: Synanthropic.

50. ULMACEAE
340. *Ulmus minor* Mill. (= *U. carpinifolia* Suckow). – Native (non-steppic) – L.f.: Tree; Phanerophyte. – Hab.: Forests.

51. URTICACEAE
341. *Urtica dioica* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Synanthropic.

52. VIOLACEAE
342(212). *Viola hirta* L. – Native. – L.f.: Perennial; Hemicryptophyte. – Hab.: Marginal.
343. *Viola odorata* L. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
344. *Viola suavis* M. Bieb. – Native (non-steppic) – L.f.: Perennial; Hemicryptophyte. – Hab.: Forests.
345(213). *Viola tricolor* L. subsp. *matutina* (Klokov) Valentine (= *V. matutina* Klokov). – Native. – L.f.: Annual; Therophyte. – Hab.: Synanthropic.

53. VITACEAE
346. *Vitis amurensis* Rupr. – Ergasioph. – L.f.: Liana; Phanerophyte. – Hab.: Forests.
347. *Vitis riparia* Michx. – Ergasioph. – L.f.: Liana; Phanerophyte. – Hab.: Marginal.

Флора ботаніко-географічної ділянки “Степи України” у Національному ботанічному саду імені М.М. Гришка НАН України

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У 2020–2022 рр. на ботаніко-географічній ділянці “Степи України” Національного ботанічного саду імені М.М. Гришка НАН України (НБС) було вивчено повний таксономічний склад флори та проведено його аналіз. Ця ділянка була заснована у 1949 р. для демонстрації флористичного різноманіття Українських Степів *ex situ*. За результатами досліджень у флорі ділянки було зафіксовано 347 видів та внутрішньовидових таксонів вищих судинних рослин із 196 родів та 53 родин. Степову сутність цієї ділянки відображає колекційний фонд живих рослин, який об’єднує 213 видів та внутрішньовидових таксонів (61,38 %) флори Степів України, із яких 126 таксонів (36,31 %) інтродуковані рослини та 87 таксонів (25,07 %) місцеві рослини. В ході повної інвентаризації було детально вивчено спонтанно зростаючі рослини, які не входять до колекційного фонду. Місцевими не степовими рослинами є 46 видів та внутрішньовидових таксонів (13,26 %); чужорідними рослинами є 88 видів та внутрішньовидових таксонів (25,36 %), у їх числі ергазіофігофіти (45 таксонів, 12,97 %) та ксенофіти (43 таксони, 12,39 %). Рослини колекційного фонду кількісно переважають на ділянці і саме вони домінують у її рослинному покриві.

Таксономічний склад флори ділянки нині подібний до характеристик регіональних лучних степів. У біоморфологічній структурі флори ділянки переважають трав’янисті багаторічники (63,69 %), що характерно для степових фітоценозів. Значна кількість дерев (5,48 %), що присутні тут, пояснюється оточенням ділянки лісовими угрупованнями та пов’язаним з цим активним формуванням тут самосіву дерев. Тут переважають гемікриптофіти (60,52 %). Втім, колекційний фонд ділянки відрізняється відсутністю дерев, більшою кількістю трав’янистих багаторічників (79,34 %) та гемікриптофітів (72,77 %). В еколого-ценотичному відношенні у колекційному фонді переважають степові (33,33 %) та узлісні (33,33 %) рослини, а також значною є присутність лучних рослин (18,78 %). Більшість рідкісних інтродукованих рослин сформували на ділянці “Степи України” стійкі гомеостатичні інтродукційні ценопопуляції. П’ятнадцять раритетних видів та внутрішньовидових таксонів внесені до Червоної книги України.

Ключові слова: штучно створений фітоценоз, структура флори, інтродукція рослин, місцеві рослини, чужорідні рослини, рідкісні таксони