Biodiv. Res. Conserv. 69: 13-53, 2023

BRC
www.brc.amu.edu.pl

DOI 10.14746/biorc.2023.69.1

Submitted 07.11.2022, Accepted 31.03.2023

Ruderal vegetation of Ukraine. Class *Artemisietea vulgaris* Lohmeyer et al. in Tx. ex von Rochow 1951

Dmytro Dubyna[1], Svitlana Iemelianova[1-2], Tetiana Dziuba[1], Denys Davydov[1], Anastasia Davydova[1] & Pavlo Tymoshenko[1]

[1]M. G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Tereschenkivska 2, 01601 Kiev, Ukraine; ORCID: DDu https://orcid.org/0000-0002-5110-7938; SI https://orcid.org/0000-0001-5885-3186; TD https://orcid.org/0000-0001-8621-0890; DDa https://orcid.org/0000-0003-3217-071X; AD https://orcid.org/0000-0001-7839-962X; PT https://orcid.org/0000-0003-4380-7077
[2]Department of Botany and Zoology, Faculty of Science, Masaryk University, Kotlarska 2, 611 37 Brno, Czech Republic
* corresponding author (e-mail: anasta3kz@gmail.com)

Abstract. The syntaxonomical diversity of the ruderal vegetation of the class *Artemisietea vulgaris* in the territory of Ukraine has been studied in 2015-2020. It is established that this class includes 58 associations from six alliances (*Convolvulo arvensis-Agropyrion repentis*, *Arction lappae*, *Dauco-Melilotion*, *Onopordion acanthii*, *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris*) and two orders (*Agropyretalia intermedio-repentis* and *Onopordetalia acanthii*). Based on the results of the DCA-ordination analysis, it was found that the distribution of this type of ruderal vegetation is determined by the concentration of mineral nitrogen, the degree of aeration of the substrate, and the variability of moisture. At the level of high-rank syntaxa we didn't find only vegetation that was specific for sub-Mediterranean and Mediterranean regions as well as for eastern part of European russia. At the same time, we determined specific vegetation on the European scale from the territory of Ukraine. This is Crimean submediterranean xero-mesophytic ruderal vegetation and semiruderal meso-xerophytic vegetation united into two alliances – *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris*. All associations within these alliances are also specific only for the territory of Crimea, characterized by the specific floristic structure and diagnostic species core, and didn't find in other regions of Ukraine.

Keywords: syntaxonomy, ordination, phytoindication, ruderal communities, Ukraine

1. Introduction

The article represents the continuation of the series of publications on the syntaxonomy of ruderal vegetation of Ukraine. In the previous one, we provided a detailed description of the class *Stellarietea mediae* Tx. et al. in Tx. 1950 (Dubyna *et al.* 2022). This one summarized the results of syntaxonomical research of the class *Artemisietea vulgaris* Lohmeyer et al. in Tx. ex von Rochow 1951.

Most common researchers consider within class *Artemisietea vulgaris* thermophilous and xerophilous or subxerophilous ruderal vegetation consisting of biennial and perennial plants mostly nutrient-demanding with R or CR strategy (Mucina 1993; Láníková *et al*. 2009). Plant communities of this vegetation class inhabit mostly man-made or semi-natural sites within urban areas or human settlements and are associated with well-lit nutrient-rich soils, different regarding their moisture and mechanical structure. The stands occur mainly on dumping sites, building rubble, along walls, fences, and water courses in both villages and cities. The *Artemisietea vulgaris* communities are widespread in the temperate and sub-Mediterranean regions of Europe. It is also reported from Mediterranian regions at high altitudes of high precipitation (Loidi *et al.* 1996) and some parts of Eurasia (Mirkin *et al.* 1986, 2008; Korotkov *et al.* 1991; Cherosov *et al.* 2005).

Despite being quite widespread, phytosociological studies on this vegetation are relatively rare. Geobotanical research of the class *Artemisietea vulgaris* based on ecological and floristic classification was mainly concentrated in Europe (Kuzmic *et al.* 2020) where the syntaxonomic structure of the class has been repeatedly revised (Tüxen 1950; Rochow 1951; Oberdorfer 1957; Braun-Blanquet 1967; Rivas-Martínez *et al.* 2001; Borhidi 2003; Dengler *et al.* 2003; Bardat *et al.* 2004; Sanda *et al.* 2008; Láníková *et al.* 2009; Tzonev

et al. 2009; Matuszkiewicz 2013; Biondi *et al.* 2014a). Thus, Romanian scientists considered within this class 7 alliances belonging to *Onopordetalia acanthii* Br.-Bl. et Tx. 1943 (*Onopordion acanthii* Br.-Bl. et Tx. ex Klika et Hadač 1944, *Brachyaction ciliatae* Pop et Vitalariu 1971, *Dauco-Melilotion* Görs 1966, *Tussilaginion* (Szabo 1971) Popescu et Sanda 1988, *Arction lappae* Tx. 1937) and *Agropyretalia repentis* Oberdorfer et al. 1967 (*Convolvulo arvensi-Elytrigion repentis* Görs 1966, *Artemisio absinthii-Agropyrion intermedii* T. Müller et Görs 1969) orders (Sanda *et al.* 1998, 2008). In Poland *Artemisietea vulgaris* according to different authors was represented by the alliances *Onopordion acanthii*, *Convolvulo arvensis-Elytrigion repentis,* and *Arction lappae* (Rahmonov *et al.* 2010; Fornal-Pieniak & Wysocki 2011; Szrama & Brzeg 2011; Matuszkiewicz 2013; Bacieczko *et al.* 2014; Wojterska *et al.* 2016). Czech scientists, in addition to the typical ruderal and semi-natural coenoses representing alliances *Onopordion acanthii, Dauco-Melilotion, Convolvulo arvensis-Elytrigion repentis* and *Arction lappae*, included into the class also degraded steppe vegetation of alliance *Artemisio-Kochion prostratae* Soó 1964 (Láníková *et al.* 2009). In Croatia within the class were mentioned *Dauco-Melilotion* and *Inulo viscosae-Agropyrion repentis* Biondi et Allegrezza 1996 alliances (Jasprica *et al.* 2015). Italian phytosociologists within the class *Artemisietea vulgaris* consider not only the communities of orders *Onopordetalia acanthii*, *Arctio lappae-Artemisietalia vulgaris* and *Agropyretalia intermedii-repentis*, but also specific Atlantic and Mediterranean ones: *Agropyretalia pungentis* Gehu 1968, *Brachypodio ramosi-Dactyletalia hispanicae* Biondi et al. 2001, *Carthametalia lanati* S. Brullo in S. Brullo et Marceno 1985 and *Podospermo laciniati-Elytrigetalia athericae* Biondi, Allegrezza et Pesaresi in Biondi et al. 2014 (Biondi *et al.* 2014a, 2014b). In Spain and Portugal, the class *Artemisietea vulgaris* represented mainly by specific communities of alliances *Bromo-Oryzopsion miliaceae* O. Bolòs 1970, *Agropyrion pungentis* Géhu 1968, *Cirsion richterano-chodati* (Rivas-Martínez in Rivas-Martínez *et al.* 1984) Rivas-Martínez *et al.* 1991, *Carduo carpetani-Cirsion odontolepidis* Rivas-Martínez, Penas & T.E. Díaz 1986 and Mediterranean ones – *Onopordion castellani* Br.-Bl. & O. Bolòs 1958 and *Silybo-Urticion* Sissingh ex Br.-Bl. & O. Bolòs 1958 (Guarino & Mossa 2006; Vagge & Befacchia 2006). Geobotanists from Russia understand the content of the class *Artemisietea vulgaris* widely, so do not recognize it separately *Agropyretea repentis*, and consider its single order *Agropyretalia repentis* and the alliance *Convolvulo arvensis-Elytrigion repentis* in *Artemisietea vulgaris* (Arepyeva 2008; Golovanov & Abramova 2012; Usmanova *et al.* 2013; Golovanov 2017). Some authors consider the alliance *Arction lappae* in the order *Arctio lappae-Artemisietalia vulgaris* Dengler 2002 in the class *Epilobietea angustifolii* (Arepyeva 2019).

The latest results of syntaxonomical research of the class *Artemisietea vulgaris* on pan-European scale were summarized by Mucina *et al.* (2016). Thus, the modern syntaxonomic structure of the *Artemisietea vulgaris* is represented by 5 orders (*Onopordetalia acanthii, Polygono-Artemisietalia austriacae, Agropyretalia intermedio-repentis, Carthametalia lanati* and *Elytrigio repentis-Dittrichietalia viscosae*) and 20 alliances.

In Ukraine, the first publications on ruderal communities belonged to the class *Artemisietea vulgaris* using floristic criteria were published in the second half of the 1980s by Solomakha *et al.* (1986) who presented the description of 7 associations on the territory of the Left Bank Forest-Steppe zone. At the same time, Korzhenevsky and Klyukin (Korzhenevsky 1986; Korzhenevsky & Klyukin 1990) studied synanthropic vegetation across the sea coast zone of Crimea and mentioned several plant communities of the class. Later phytocoenoses of the *Artemisietea vulgaris* were characterized by Kostylev on the Black Sea coast of Ukraine (Kostylev 1990). The first overview of the class in Ukraine was published in the book "Synanthropic Vegetation of Ukraine" (Solomakha *et al*. 1992). Further studies were quite fragmentary, and have been combined with the study of different types of vegetation in some cities or small regions (Levon 1996, 1997; Osypenko 1996, 1997, 1999; Bagrikova 1998, 2004; Osypenko & Shevchyk 2001; Smetana 2002). The latest information about the syntaxonomy structure of the class *Artemisietea vulgaris* was provided by the "Prodrome of the vegetation of Ukraine" (Dubyna *et al.* 2019). But in these studies, all presented results were based mainly on literature sources published before, local data, and the author's experience but not on the big dataset representing all the territory of Ukraine.

The main aims of this study were: *i*) to prepare a revised and unified classification of the class *Artemisietea vulgaris* in Ukraine, *ii*) to evaluate habitat requirements of the plant communities; *iii*) to investigate the distribution of the defined vegetation units.

2. Materials and methods

In the previous article of the cycle, we described in detail the study area, the process of data collection, and data analysis (Dubyna *et al.* 2022). In this article, we will focus only on the most important points.

For classification, we used 2697 relevés of ruderal communities which were identified as the *Artemisietea vulgaris* class according to the results of our initial clustering (Dubyna *et al.* 2022). All these relevés made by the authors between 2015 and 2020 or entered into

the database from the following literature sources: Kostylev (1985), Solomakha *et al*. (1992, 2015, 2016), Levon (1996, 1997), Osypenko (1996, 1997, 1999), Bagrikova (1998, 2004), Korzhenevsky & Klyukin (1990), Osypenko & Shevchyk (2001), Smetana (2002), Chokha (2005), Iakushenko (2005), Homlya (2005), Galchenko (2006), Konishchuk (2006), Tyshchenko (2006), Soroka (2008), Khomyak (2010), Bredikhina (2015), Tokaryuk *et al*. (2018), Kolomiychuk (2020), Lukash & Danko (2020). It should be noted that for the communities of the Southern coast of Crimea, in most cases, we had mainly the nomenclatural types of associations. However, we considered it necessary to include them in the data processing, since they are special in their floristic composition for Ukraine as well as for Europe.

All relevés were made according to Braun-Blanquet's approach of typical selection (Braun-Blanquet 1964) on plot sizes from 10 to 25 m^2. All relevés were entered into a database and sorted by TURBOVEG software version 2.142 (Hennekens & Schaminée 2001). Phytosociological data were analyzed by using Modified TWINSPAN (Roleček *et al.* 2009) and PC-ORD (McCune & Mefford 2006) algorithms in JUICE software (Tichý 2002). "Pseudospecies" cut level was accepted as 0, 5, 15 and 25%. The heterogeneity of clusters was determined using Whittaker's beta (Whittaker 1978), the groups of relevés were conducted by the Sörensen's coefficient (Sörensen 1948) at a "flexible beta" -0.25. The threshold values for the phi coefficient are taken at the level of 0.25. Highly diagnostic species have a *phi*-coefficient exceeding 0.5. Statistical significance of the fidelity prior to the equalization of relevés groups was calculated using the Fisher's exact test ($P < 0.001$) (Chytrý *et al.* 2002). In the synoptic table, highly diagnostic species are highlighted.

Ecological analysis was conducted using DCA-ordination (Hill & Gauch 1980) in the R program operated from JUICE. Indicator values were adopted from Didukh (2011) where Hd – soil humidity, fH – variability of damping, Rc – soil acidity, Sl – salt regime, Ca – carbonate content in the soil, Nt – nitrogen content in the soil, Ae – soil aeration, Tm – termoclimate, Om – ombroregime, Kn – continentality of climate, Cr – cryoclimate, Lc – light regime. In the previous article of the series, we presented a table with the ecological values factors according to Didukh (2011) and their correlation with Ellenberg's indicator values (Dubyna *et al*. 2022). To provide an overview of the ecological requirements of individual vegetation alliances we used basic statistical analysis in the STATISTICA 10.0 program.

The syntaxonomic concept of the class *Artemisietea vulgaris* was accepted according to the recent "Prodrome of the vegetation of Ukraine" (Dubyna *et al*. 2019) with several nomenclatural corrections for high-rank syntaxa by Mucina *et al*. (2016). The nomenclature of taxa is given according to "Vascular plants of Ukraine. A nomenclatural checklist" (Mosyakin & Fedoronchuk 1999).

3. Results

3.1. Vegetation classification

Based on the data analysis we identified that the class *Artemisietea vulgaris* in Ukraine is represented by 58 associations from six alliances and two orders listed in the following syntaxonomic scheme (Appendix 1):

Artemisietea vulgaris Lohmeyer *et al.* in Tx. ex von Rochow 1951

1. *Agropyretalia intermedio-repentis* T. Müller et Görs 1969
   - 1.1. *Convolvulo arvensis-Agropyrion repentis* Görs 1967
     - 1.1.1. *Acachmeno cuspidatae-Artemisietum austriacae* Levon 1997
     - 1.1.2. *Agropyretum repentis* Felföldy 1942
     - 1.1.3. *Anisantho-Artemisietum austriacae* Kostylev 1985
     - 1.1.4. *Atriplici calothecae-Melilotetum officinalis* Korzhenevsky et Klyukin 1990
     - 1.1.5. *Calamagrostietum epigei* Kostylev in Solomakha et al. 1992
     - 1.1.6. *Aristolochio-Convolvuletum arvensis* Ubrizsy 1967
     - 1.1.7. *Cardarietum drabae* Timár 1950
     - 1.1.8. *Cardario-Sonchetum oleracei* Korzhenevsky et Klyukin 1990
     - 1.1.9. *Convolvulo arvensis-Agropyretum repentis* Felföldy 1943
     - 1.1.10. *Convolvulo-Brometum inermis* Eliáš 1979
     - 1.1.11. *Elytrigio repentis-Lycietum barbarum* Kostylev in Solomakha et al. 1992
     - 1.1.12. *Falcario vulgaris-Elytrigietum repentis* T. Müller et Görs 1969
     - 1.1.13. *Geranio tuberosi-Dactyletum glomeratae* Korzhenevsky et Klyukin 1990
     - 1.1.14. *Medicagini lupulinae-Agropyretum repentis* Popescu et al. 1980
     - 1.1.15. *Melico transsilvanicae-Agropyretum repentis* T. Müller in Görs 1966
     - 1.1.16. *Poetum pratensi-compressae* Bornkamm 1974
     - 1.1.17. *Poo compressae-Tussilaginetum farfarae* Tx. 1931
     - 1.1.18. *Poo pratensis-Festucetum orientalis* Levon 1997

1.1.19. *Elytrigio nodosae-Xeranthemetum cylindracei* Levon 1997*

2. *Onopordetalia acanthii* Br.-Bl. et Tx. ex Klika et Hadač 1944
   - 2.1. *Arction lappae* Tx. 1937
     - 2.1.1. *Arctietum lappae* Felföldy 1942
     - 2.1.2. *Arctio lappae-Artemisietum vulgaris* Oberd. ex Seybold et T. Müller 1972
     - 2.1.3. *Hyoscyamo nigri-Conietum maculati* Slavnić 1951
     - 2.1.4. *Leonuro cardiacae-Ballotetum nigrae* Slavnić 1951
     - 2.1.5. *Leonuro-Arctietum tomentosi* Felföldy 1942
   - 2.2. *Dauco-Melilotion* Görs et Rostański et Gutte 1967
     - 2.2.1. *Berteroetum incanae* Sissingh et Tideman ex Sissingh 1950
     - 2.2.2. *Cirsio setosi-Lathyretum tuberosi* Smetana 2002
     - 2.2.3. *Dauco-Centaureetum diffusae* Bagrikova 2002
     - 2.2.4. *Dauco-Crepidetum rhoeadifoliae* Hejný et Grull in Hejný et al. 1979
     - 2.2.5. *Echio-Verbascetum* Sissingh 1950
     - 2.2.6. *Erigeretum canadensi-acris* Smetana 2002
     - 2.2.7. *Melilotetum albo-officinalis* Sissingh 1950
     - 2.2.8. *Pastinaco sativae-Daucetum carotae* Kostylev in Solomakha et al. 1992
     - 2.2.9. *Plantagini lanceolatae-Chondrilletum junceae* Levon 1997
     - 2.2.10. *Raphano maritimi-Rumicetum conglomerati* Levon 1997
     - 2.2.11. *Vicietum cordatae-variae* (Levon 1996) Korzhenevsky *et al.* 2003
     - 2.2.12. *Dauco carotae-Picridetum hieracioidis* Görs ex Seybold et Müller 1972
     - 2.2.13. *Buniadetum orientalis* Fijałkowski ex Láníková in Chytrý 2009
     - 2.2.14. *Asclepiadetum syriacae* Láníková in Chytrý 2009
   - 2.3. *Onopordion acanthii* Br.-Bl. et al. 1936
     - 2.3.1. *Achilleo millefolii-Grindelietum squarrosae* Kostylev in Solomakha *et al.* 1992
     - 2.3.2. *Ambrosio artemisiifoliae-Xanthietum strumariae* Kostylev in Solomakha et al. 1992
     - 2.3.3. *Artemisio absinthii-Salvietum verticillatae* Fijałkowski 1971
     - 2.3.4. *Balloto-Artemisietum absinthii* Schubert et Mahn 1959
     - 2.3.5. *Carduo acanthoidis-Onopordetum acanthii* Soó ex Jarolímek et al. 1997
     - 2.3.6. *Onopordetum acanthii* Br.-Bl. 1926
     - 2.3.7. *Epilobio tetragoni-Achilleetum nobilis* Smetana 2002
     - 2.3.8. *Euphorbio virgultosae-Lathyretum tuberosi* Smetana 2002
     - 2.3.9. *Potentillo argenteae-Artemisietum absinthii* Faliński 1965
     - 2.3.10. *Tanaceto-Artemisietum vulgaris* Br.-Bl. (1931) 1949
     - 2.3.11. *Xanthietum californici-spinosi* Levon 1997
     - 2.3.12. *Xanthietum spinosi* (Paucă 1941) Felföldy 1942
     - 2.3.13. *Xanthietum strumarii* Paucă 1941
     - 2.3.14. *Diplotaxio muralis-Malvetum erectae* Kostylev in Solomakha et al. 1992
   - 2.4. *Medicagini falcatae-Diplotaxion tenuifoliae* Levon 1997
     - 2.4.1. *Bromo squarrosi-Teucrietum chamaedryos* Levon 1997
     - 2.4.2. *Calamintho macrae-Poterietum sanguisorbae* Levon 1997
     - 2.4.3. *Eupatorio cannabini-Verbenetum officinalis* Levon 1997
     - 2.4.4. *Lathyro tuberoso-Ornithogaletum pontici* Levon 1997
   - 2.5. *Rorippo austriacae-Falcarion vulgaris* Levon 1997
     - 2.5.1. *Anthemido ruthenicae-Echietum biebersteinii* Levon 1997
     - 2.5.2. *Inulo asperae-Centaureetum diffusae* Levon 1997

3.2. Description of vegetation units

The order *Agropyretalia intermedio-repentis* includes communities of rhizomatous grasses growing within ruderal and semi-natural habitats with dry soils. The alliance *Convolvulo arvensis-Agropyrion repentis* consists of perennial mostly grass ruderal phytocoenoses on rich soils.

1.1.1. Association *Acachmeno cuspidatae-Artemisietum austriacae* Levon 1997

Diagnostic species: *Aegilops neglecta*, *Atriplex prostrata*, *Bromopsis inermis*, *Bupleurum asperuloides*, *Diplotaxis tenuifolia*, *Elytrigia nodosa*, *Erodium cicutarium*, *Erysimum cuspidatum*, *Scandix stellata*, *Trifolium angustifolium*, *Vulpia ciliata*.

Habitat: slopes with weak denudation processes, areas near roads, paths, and anthropogenic objects.

* We provide this association only based on literature data. It has been described on the territory of Crimea (Levon 1997). Now we are not able to confirm or refute its existence with up-to-date phytosociological data due to the difficulties in organizing and conducting research in the temporarily occupied territory of Crimea.

Distribution in Ukraine: South coast of Crimea.
Structure: The total coverage varies from 40 to 90% and depends on the time of transformation and soil composition. The floristic composition includes 24 species (about 16-18 species per relevé).

1.1.2. Association *Agropyretum repentis* Felföldy 1942
Diagnostic species: *Elytrigia repens*.
Habitat: lawns, abandoned fields, gardens, slopes of dams and irrigation canals, waste dumps on loamy, clay, chernozem, and dark chestnut soils.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer is mainly dense with total coverage of 30 to 100%. Plant communities are characterized by high species richness and include 503 species (from 3 to 38 species in a separate relevé).

1.1.3. Association *Anisantho-Artemisietum austriacae* Kostylev 1985
Diagnostic species: *Artemisia austriaca*, *Lepidium densiflorum*.
Habitat: pastures, fallows, dumps, roadsides, wastelands, lawns, urban areas.
Distribution in Ukraine: The Forest-Steppe (southern regions) and the Steppe zones.
Structure: The total coverage varies from 40 to 90%. The floristic composition includes 170 species (from 4 to 25 species in a separate relevé).

1.1.4. Association *Atriplici calothecae-Melilotetum officinalis* Korzhenevsky et Klyukin 1990
Diagnostic species: *Acroptilon repens*, *Allium firmotunicatum*, *Artemisia taurica*, *Asperugo procumbens*, *Atriplex prostrata*, *Bassia sedoides*, *Brizochloa humilis*, *Bromus japonicus*, *Camelina microcarpa*, *Ecballium elaterium*, *Eremopyrum orientale*, *Erysimum diffusum*, *Galium spurium*, *Hordeum murinum*, *Hyoscyamus niger*, *Lappula barbata*, *Limonium meyeri*, *Milium vernale*, *Petrosimonia oppositifolia*, *Rapistrum rugosum*, *Rochelia retorta*, *Salsola tragus*, *Senecio vernalis*, *Sonchus oleraceus*, *Valerianella pontica*, *Vicia narbonensis*.
Habitat: cliff walls with clayey and loamy soils.
Distribution in Ukraine: Kerch Peninsula of Crimea.
Structure: The total coverage varies from 30 to 55%. In total, 116 species were found in the phytocoenoses, on average 6-32 per relevé.

1.1.5. Association *Calamagrostietum epigei* Kostylev in Solomakha et al. 1992
Diagnostic species: *Calamagrostis epigejos*.
Habitat: eroded slopes, fallows, along roads and railways, near warehouses, factories and other industrial buildings, wastelands on sandy and gravelly soils.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer is dense, with total coverage of 30 to 90%. The floristic composition includes 247 species (from 3 to 26 species per relevé).

1.1.6. Association *Aristolochio-Convolvuletum arvensis* Ubrizsy 1967
Diagnostic species: *Alliaria petiolata*, *Aristolochia clematitis*, *Asparagus officinalis*, *Chaerophyllum temulum*, *Sonchus arvensis*, *Stellaria holostea*.
Habitat: moderately moist open and shaded sites with sod soils.
Distribution in Ukraine: Crimea (mainly in the northern part).
Structure: The total coverage varies from 60 to 100%. The floristic composition includes 93 species (from 7 to 25 species per relevé).

1.1.7. Association *Cardarietum drabae* Timár 1950
Diagnostic species: *Bromus commutatus*, *Cardaria draba*, *Cerastium holosteoides*, *Sclerochloa dura*, *Veronica arvensis*, *V. prostrata*, *Vicia hirsuta*.
Habitat: railway embankments, wastelands, and other disturbed areas with different soil types.
Distribution in Ukraine: Forest-Steppe (southern regions) and Steppe zones, Crimea.
Structure: The total cover of communities is 50 to 100%. The floristic structure consists of 109 species (from 5 to 29 species per relevé).

1.1.8. Association *Cardario-Sonchetum oleracei* Korzhenevsky et Klyukin 1990
Diagnostic species: *Anthriscus cerefolium*, *Atriplex aucheri*, *Calamagrostis epigejos*, *Cardaria draba*, *Crepis sancta*, *Cynanchum acutum*, *Ecballium elaterium*, *Elytrigia elongata*, *Epilobium hirsutum*, *E. tetragonum*, *Galium spurium*, *Limonium gmelinii*, *Myosotis arvensis*, *Odontites glutinosa*, *Poa trivialis*, *Polygonum patulum*, *Rumex stenophyllus*, *Senecio vernalis*, *Sonchus oleraceus*, *Tripolium pannonicum*, *Vicia amphicarpa*.
Habitat: surfaces of modern active cliffs, clays of the Maikop series.
Distribution in Ukraine: Kerch Peninsula of Crimea.
Structure: The total coverage is 60-80%. The floristic composition includes 73 species (from 13 to 26 species in a separate relevé).

1.1.9. Association *Convolvulo arvensis-Agropyretum repentis* Felföldy 1943
Diagnostic species: *Convolvulus arvensis*.
Habitat: marginal areas, abandoned areas, roadsides, railways, and lawns with different soil types.

Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 50 to 100%. The floristic composition includes 284 species (from 5 to 23 species in a separate relevé).

1.1.10. Association *Convolvulo-Brometum inermis* Eliáš 1979
Diagnostic species: *Astragalus onobrychis*, *Bromopsis inermis*, *Plantago urvillei*.
Habitat: fallows, lawns, along roads and railways with loamy, sandy, and gravelly soils.
Distribution in Ukraine: Forest-Steppe (southern regions) and Steppe zones.
Structure: The herb layer is dense, with a total coverage of 65-95%. The floristic composition includes 65 species (from 6 to 18 species in a separate relevé).

1.1.11. Association *Elytrigio repentis-Lycietum barbarum* Kostylev in Solomakha *et al.* 1992
Diagnostic species: *Lycium barbarum*, *Euonymus europaea*.
Habitat: in settlements and villages with a quite articulated terrain (ravines, along field roads, and near housing) on different types of soils. They have also been found in cities and towns on banks of canalized rivers and along roads.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage is 90-100%. The floristic composition includes 53 species (from 4 to 15 species in a separate relevé).

1.1.12. Association *Falcario vulgaris-Elytrigietum repentis* T. Müller et Görs 1969
Diagnostic species: *Agropyron pectinatum*, *Crepis foetida*, *Falcaria vulgaris*, *Salvia nemorosa*.
Habitat: dry areas of fallows, edges of agricultural lands, slopes of dams, dumps, and roadsides.
Distribution in Ukraine: Forest-Steppe and Steppe zones, Crimea.
Structure: The herb layer is dense, with a total coverage of 70 to 95%. The floristic composition includes 51 species (from 6 to 20 species per relevé).

1.1.13. Association *Geranio tuberosi-Dactyletum glomeratae* Korzhenevsky et Klyukin 1990
Diagnostic species: *Achillea setacea*, *Ajuga chia*, *Alyssum hirsutum*, *A. obtusifolium*, *Arabidopsis thaliana*, *Artemisia santonicum*, *A. taurica*, *Bromopsis cappadocica*, *Cardaria draba*, *Cephalaria transylvanica*, *Cerastium tauricum*, *Cynanchum acutum*, *Dactylis glomerata*, *Dianthus marschallii*, *Elytrigia elongata*, *Ephedra distachya*, *Erophila verna*, *Falcaria vulgaris*, *Festuca valesiaca*, *Galatella dracunculoides*, *G. linosyris*, *G. villosa*, *Galium biebersteinii*, *G. tenuissimum*, *G. verum*, *Geranium tuberosum*, *Goniolimon tataricum*, *Holosteum umbellatum*, *Jurinea pseudomollis*, *Knautia arvensis*, *Kochia prostrata*, *Koeleria cristata*, *Lamium amplexicaule*, *Lathyrus aphaca*, *Limonium gmelinii*, *L. meyeri*, *L. platyphyllum*, *Linaria genistifolia*, *Linum euxinum*, *Malabaila graveolens*, *Medicago minima*, *Myosotis arvensis*, *Nepeta parviflora*, *Phlomis tuberosa*, *Potentilla pindicola, Poterium polygamum*, *Scorzonera laciniata*, *S. mollis*, *Senecio vernalis*, *Serratula erucifolia*, *Syrenia cana*, *Thesium arvense*, *Thlaspi perfoliatum*, *Tragopogon dasyrhynchus*, *Trinia hispida*, *Valerianella lasiocarpa*, *V. turgida*, *Veronica arvensis*, *V. cymbalaria*, *V. verna*, *Vicia amphicarpa*, *V. pannonica*, *V. tenuifolia*, *V. tenuissima, V. tetrasperma*.
Habitat: surfaces and walls of old cliffs.
Distribution in Ukraine: Kerch Peninsula of Crimea.
Structure: The total coverage varies from 50 to 95%. The floristic composition includes 184 species (from 19 to 53 species in a separate relevé).

1.1.14. Association *Medicagini lupulinae-Agropyretum repentis* Popescu *et al.* 1980
Diagnostic species: *Agropyron pectinatum*, *Alyssum desertorum*, *Elytrigia repens*, *Medicago lupulina*, *Melica transsilvanica*, *Verbascum densiflorum*, *Vicia cracca*.
Habitat: roadsides, areas near settlements, and farms with different soil types.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage is 60-100%. The floristic composition includes 64 species (from 11 to 22 species in a separate relevé).

1.1.15. Association *Melico transsilvanicae-Agropyretum repentis* T. Müller in Görs 1966
Diagnostic species: *Cirsium setosum*, *Hylotelephium argutum*, *Linaria genistifolia*, *Melica transsilvanica*, *Poa compressa*.
Habitat: disturbed loamy and gravelly substrates along roads, fallows.
Distribution in Ukraine: Steppe zone and Transcarpathia.
Structure: The total coverage varies from 50 to 95%. The floristic composition includes 92 species (from 6 to 23 species in a separate relevé).

1.1.16. Association *Poetum pratensi-compressae* Bornkamm 1974
Diagnostic species: *Agrostis stolonifera*, *Leontodon autumnalis*, *Poa pratensis*, *Trifolium repens*.
Habitat: trampled lawns, industrial areas with rich and moist, loose or chernozem soils, sand dams with a mixture of gravel.

Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage varies from 30 to 100%. The floristic composition includes 107 species (from 4 to 19 species in a separate relevé).

1.1.17. Association *Poo compressae-Tussilaginetum farfarae* Tx. 1931
Diagnostic species: *Ranunculus repens*, *Rorippa sylvestris*, *Trifolium hybridum*, *Tussilago farfara*.
Habitat: soil dumps (mostly gravel), railway embankments, along gravel roads, fallows, and landfills.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 60 to 100%. The floristic composition includes 44 species (from 8 to 16 species in a separate relevé).

1.1.18. Association *Poo pratensis-Festucetum orientalis* Levon 1997
Diagnostic species: *Anisantha sterilis*, *Anthriscus sylvestris*, *Armeria ruscinonensis*, *Atriplex prostrata*, *Bellis perennis*, *Bromopsis inermis*, *Erodium cicutarium*, *Festuca regeliana*, *Melandrium album*, *Papaver rhoeas*, *Thlaspi arvense*, *Vicia sativa*.
Habitat: shaded nitrified sites along trees and shrubs adjacent to the lawns, and flower beds on rich soils in park zones of urban areas.
Distribution in Ukraine: South coast of Crimea.
Structure: The total coverage is 80-90%. The floristic composition includes 24 species (about 18-20 species in a separate relevé).

1.1.19. Association *Elytrigio nodosae-Xeranthemetum cylindracei* Levon 1997*
We provide this association only based on literature data. It has been described on the territory of Crimea (Levon 1997). Now we are not able to confirm or refute its existence with up-to-date phytosociological data due to the difficulties in organizing and conducting research in the temporarily occupied territory of Crimea.

The order *Onopordetalia acanthii* includes mesophytic and xerophytic ruderal communities formed mostly by biennial and perennial plants in different disturbed habitats. The alliance *Arction lappae* comprises mainly biennial nitrophilous plants distributed near houses, animal farms, and garbage dumps on humid or dry soils.

2.1.1. Association *Arctietum lappae* Felföldy 1942
Diagnostic species: *Arctium lappa*, *Viola hirta*.
Habitat: marginal areas in places of former cattle keeping, on compacted moderately humid soils.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 50 to 100%. The floristic composition includes 122 species (from 5 to 23 species per relevé).

2.1.2. Association *Arctio lappae-Artemisietum vulgaris* Oberd. ex Seybold et T. Müller 1972
Diagnostic species: *Artemisia vulgaris*.
Habitat: humid nitrified areas near buildings and farms, abandoned areas, and landfills with different soil types.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 50 to 100%. The floristic composition includes 223 species (from 5 to 31 species per relevé).

2.1.3. Association *Hyoscyamo nigri-Conietum maculati* Slavnić 1951
Diagnostic species: *Angelica archangelica*, *Chenopodium urbicum*, *Conium maculatum*.
Habitat: post-pasture localities, ruins of ancient buildings, ravines, canal banks, roadsides, landfills, and abandoned areas on different humid nitrified soils.
Distribution in Ukraine: within the whole territory.
Structure: The herb layer is dense, with a total coverage of 65 to 100%. The floristic composition includes 72 species (from 7 to 20 species in a separate relevé).

2.1.4. Association *Leonuro cardiacae-Ballotetum nigrae* Slavnić 1951
Diagnostic species: *Ballota nigra*.
Habitat: near landfills, in abandoned areas, along roads as border communities on humid nitrified soils.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 50 to 80-90%. The floristic composition includes 65 species (from 4 to 12 species in a separate relevé).

2.1.5. Association *Leonuro-Arctietum tomentosi* Felföldy 1942
Diagnostic species: *Aegopodium podagraria*, *Arctium tomentosum*, *Chaerophyllum aromaticum*, *Leonurus cardiaca*, *Lolium perenne*, *Ranunculus repens*, *Urtica dioica*.
Habitat: near abandoned houses, farms, industrial areas, on edges, fallows, ancient cemeteries, roadsides, and wastelands on sandy or loose nitrified soils.
Distribution in Ukraine: within the whole territory.

* See page 16.

Structure: The herb layer is dense, with a total coverage of 80-100%. The floristic composition includes 58 species (from 4 to 21 species per relevé).

The alliance *Dauco-Melilotion* includes ruderal communities of perennial plants on dense substrates, as well as semi-natural areas in the second stage of the restoration process with the vegetation optimum development in June-July on different types of soils.

2.2.1. Association *Berteroetum incanae* Sissingh et Tideman ex Sissingh 1950
Diagnostic species: *Berteroa incana*.
Habitat: abandoned areas, roadsides, along railways, and urban areas on dry compacted soils.
Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage varies from 40 to 95%. The floristic composition includes 102 species (from 6 to 29 species in a separate relevé).

2.2.2. Association *Cirsio setosi-Lathyretum tuberosi* Smetana 2002
Diagnostic species: *Campanula sibirica*, *Cirsium setosum*, *Euphorbia seguieriana*, *Lathyrus tuberosus*, *Matricaria recutita, Reseda lutea*, *Silaum silaus*, *Stachys recta*, *Tragopogon major*.
Habitat: dumps of overburden, slopes of sludge dams with loamy stony soils, young fellows.
Distribution in Ukraine: Steppe zone.
Structure: The total coverage varies from 50 to 90%. The floristic composition includes 105 species (from 9 to 31 species in a separate relevé).

2.2.3. Association *Dauco-Centaureetum diffusae* Bagrikova 2002
Diagnostic species: *Centaurea diffusa*, *Scariola viminea.*
Habitat: roadsides, wastelands, abandoned and urbanized areas with degraded soils.
Distribution in Ukraine: South coast of Crimea.
Structure: The herb layer is dense, with a total coverage of 60 to 100%. The floristic composition includes 118 species (from 6 to 27 species per relevé).

2.2.4. Association *Dauco-Crepidetum rhoeadifoliae* Hejný et Grull in Hejný et al. 1979
Diagnostic species: *Crepis rhoeadifolia*, *Gypsophila perfoliata*, *Lactuca tatarica*, *Rumex patientia* subsp. *orientalis.*
Habitat: warm open habitats on railway stations, railway tracks, fallows, landfills, dams, and quarries with shallow, mostly dry soils, which are rich in nitrogen compounds and salts.
Distribution in Ukraine: Crimea.
Structure: The total coverage varies from 40 to 95%. The floristic composition includes 60 species (from 8 to 13 in a separate relevé).

2.2.5. Association *Echio-Verbascetum* Sissingh 1950
Diagnostic species: *Anchusa officinalis*, *Arrhenatherum elatius*, *Daucus carota*, *Echium vulgare*, *Equisetum arvense*, *Euphorbia cyparissias*, *Humulus lupulus*, *Picris hieracioides*, *Plantago arenaria*, *Tragopogon major*.
Habitat: roadsides with gravelly soils.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage is 40-60%. The floristic composition includes 19 species (about 11-13 species in a separate relevé).

2.2.6. Association *Erigeretum canadensi-acris* Smetana 2002
Diagnostic species: *Conyza canadensis*, *Erigeron acris*, *Scabiosa ochroleuca*, *Senecio jacobaea*.
Habitat: marginal areas on disturbed dry brown soils.
Distribution in Ukraine: Steppe zone.
Structure: The total coverage varies from 55 to 90%. The floristic composition includes 88 species (from 7 to 26 species per relevé).

2.2.7. Association *Melilotetum albo-officinalis* Sissingh 1950
Diagnostic species: *Melilotus albus*.
Habitat: open habitats, landfills, and marginal sites, which have not been significantly affected by anthropogenic transformation for a long time.
Distribution in Ukraine: within the whole territory.
Structure: The herb layer is dense, with a total coverage of 50 to 100%. The floristic composition includes 116 species (from 6 to 25 species in a separate relevé).

2.2.8. Association *Pastinaco sativae-Daucetum carotae* Kostylev in Solomakha et al. 1992
Diagnostic species: *Campanula rapunculoides*, *Carduus personata, Crepis biennis*, *Cruciata glabra*, *Daucus carota*, *Equisetum arvense*, *Eryngium planum*, *Geranium sibiricum*, *Geum aleppicum*, *Lotus corniculatus*, *Pastinaca sativa*, *Persicaria hydropiper*, *Potentilla reptans*, *Vicia cracca*, *Viola odorata*.
Habitat: marginal areas on sandy soils.
Distribution in Ukraine: mostly in western regions.
Structure: The total coverage varies from 50 to 100%. The floristic composition includes 152 species (from 8 to 33 species in a separate relevé).

2.2.9. Association *Plantagini lanceolatae-Chondrilletum junceae* Levon 1997

Diagnostic species: *Chondrilla juncea*, *Cuscuta campestris*, *Plantago lanceolata*.

Habitat: open sites on organic-enriched soils: wastelands, early cultivated gardens, fences.

Distribution in Ukraine: South coast of Crimea.

Structure: The total coverage varies from 30 to 100%. The floristic composition includes 71 species (from 6 to 32 species, mainly 7-10 in a separate relevé).

2.2.10. Association *Raphano maritimi-Rumicetum conglomerati* Levon 1997

Diagnostic species: *Anisantha sterilis*, *Anthemis tinctoria* subsp. *subtinctoria*, *Asparagus verticillatus*, *Centaurea sterilis*, *Digitaria sanguinalis*, *Erysimum cuspidatum*, *Lamium purpureum*, *Lepidium graminifolium*, *Linaria ruthenica*, *Onopordum tauricum*, *Papaver dubium*, *Picris pauciflora*, *Poa annua*, *Poterium sanguisorba*, *Pulicaria paludosa*, *Raphanus maritimus*, *Rumex conglomeratus*, *Scleropoa rigida*, *Sisymbrium orientale*, *Sonchus oleraceus*, *Torilis arvensis*.

Habitat: loose substrates, which are slightly disturbed and periodically filled with salty seawater.

Distribution in Ukraine: South coast of Crimea.

Structure: The herb layer is dense, with a total coverage of 90-100%. The floristic composition includes 27 species.

2.2.11. Association *Vicietum cordatae-variae* (Levon 1996) Korzhenevsky *et al.* 2003

Diagnostic species: *Achnatherum bromoides, Alliaria petiolata, Anagallis arvensis, Anisantha sterilis, Arabis auriculata, Arctium minus, Arenaria leptoclados, Ballota nigra, Bromopsis riparia, Carduus arabicus, Chenopodium urbicum, Clinopodium vulgare, Clypeola jonthlaspi, Cuscuta europaea, Erophila praecox, Festuca callieri, Hordeum bulbosum, H. murinum, Inula conyzae, Linum tenuifolium, Lunaria annua, Medicago denticulata, M. minima, Minuartia hybrida agg., Myosotis incrassata, M. ramosissima, Scariola viminea, Sisymbrium officinale, Sonchus arvensis, S. asper, Stellaria media, Taraxacum hybernum, Torilis radiata, Trifolium hirtum, Trigonella gladiata, Veronica hederifolia, Vicia bithynica, V. cordata, V. varia.*

Habitat: nitrified areas on abandoned lawns, flower beds, and front gardens, as well as along the riverbeds and disturbed during construction roadsides.

Distribution in Ukraine: South coast of Crimea.

Structure: The total coverage is 60-90 (100) %. The floristic composition includes 26 species.

The status of this association remains poorly elucidated, as its communities occupy an intermediate position between the classes *Artemisietea vulgaris* and *Stellarietea mediae*. Additional research is currently impossible due to the occupation of Crimea.

2.2.12. Association *Dauco carotae-Picridetum hieracioidis* Görs ex Seybold et Müller 1972

Diagnostic species: *Artemisia vulgaris*, *Centaurea cyanus*, *Cerastium glomeratum*, *Daucus carota*, *Luzula pallescens*, *Myosotis micrantha*, *Picris hieracioides*, *Veronica chamaedrys*, *Viola tricolor*.

Habitat: abandoned fields, disturbed areas in quarries, embankments, and dry slopes in sunny and warm habitats with clayey, loamy, and sandy soils.

Distribution in Ukraine: Zhytomyr Polissya.

Structure: The total coverage varies from 50 to 90%. The floristic composition includes 23 species (6-12 species in a separate relevé).

2.2.13. Association *Buniadetum orientalis* Fijałkowski ex Láníková in Chytrý 2009

Diagnostic species: *Arctium lappa*, *Arenaria serpyllifolia*, *Arrhenatherum elatius*, *Atriplex patula*, *Bromus commutatus*, *Bunias orientalis*, *Capsella bursa-pastoris*, *Chaerophyllum hirsutum*, *Cirsium vulgare*, *Dactylis glomerata*, *Fallopia convolvulus*, *Festuca pratensis*, *Galium aparine*, *Geranium dissectum*, *G. pratense*, *G. pusillum*, *Geum urbanum*, *Glechoma hederacea*, *Heracleum sibiricum*, *Lamium maculatum*, *L. purpureum*, *Myosotis arvensis*, *Neslia paniculata*, *Phalacroloma annuum*, *Ranunculus polyanthemos*, *Stellaria media*, *Urtica dioica*, *Veronica arvensis*, *V. chamaedrys*, *Vicia angustifolia*, *V. sepium*.

Habitat: abandoned fields, ditches along roads, around railways, and in areas of industrial buildings with rich soils.

Distribution in Ukraine: Pre-Carpathian region.

Structure: The herb layer is dense, with a total coverage of 70-90%. The floristic composition includes 46 species (from 21 to 25 species in a separate relevé).

2.2.14. Association *Asclepiadetum syriacae* Láníková in Chytrý 2009

Diagnostic species: *Asclepias syriaca*, *Otites chersonensis*.

Habitat: along roads, railways, in urban areas, fallows, as well as near watercourses in open or slightly shaded disturbed habitats with different soils.

Distribution in Ukraine: within the whole territory.

Structure: The total coverage varies from 30 to 90%. The floristic composition includes 66 species (from 4 to 17 species in a separate relevé).

The alliance *Onopordion acanthii* includes xero-mesophytic thistle-dominated ruderal phytocoenoses on rich soils.

2.3.1. Association *Achilleo millefolii-Grindelietum squarrosae* Kostylev in Solomakha et al. 1992
Diagnostic species: *Grindelia squarrosa*.
Habitat: fallows, wastelands, landfills, roadsides and railways, urban areas, dumps, industrial sites with sandy, degraded chernozem, and agglomerative soils.
Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage varies from 30 to 80-90%. The floristic composition includes 250 species (from 5 to 43 species per relevé).

2.3.2. Association *Ambrosio artemisiifoliae-Xanthietum strumariae* Kostylev in Solomakha *et al.* 1992
Diagnostic species: *Atriplex oblongifolia*, *Bidens radiata*, *Chairturus marrubiastrum*, *Euphorbia stricta*, *Helianthus decapetalus*, *Mentha pulegium*, *Setaria glauca*, *Xanthium strumarium*.
Habitat: marginal areas along roads, communications lines, on slopes of overburden dumps, and abandoned construction sites.
Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage varies from 60 to 90%. The floristic composition includes 60 species (from 5 to 16 species in a separate relevé).

2.3.3. Association *Artemisio absinthii-Salvietum verticillatae* Fijałkowski 1971
Diagnostic species: *Arctium minus*, *Centaurea jacea*, *Deschampsia cespitosa*, *Oberna behen*, *Pimpinella saxifraga*, *Ranunculus acris*, *Salvia verticillata*, *Thymus pulegioides*, *Trifolium pratense*.
Habitat: areas along field roads, on slopes of quarries, deforestation sites.
Distribution in Ukraine: mainly in western regions.
Structure: The total coverage varies from 40 to 90%. The floristic composition includes 31 species (from 4 to 16 species in a separate relevé).

2.3.4. Association *Balloto-Artemisietum absinthii* Schubert et Mahn 1959
Diagnostic species: *Artemisia absinthium*, *Thalictrum minus*.
Habitat: dry open and shaded habitats along roadsides, abandoned areas, near railways.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 30 to 90%. The floristic composition includes 139 species (from 6 to 21 species in a separate relevé).

2.3.5. Association *Carduo acanthoidis-Onopordetum acanthii* Soó ex Jarolímek et al. 1997
Diagnostic species: *Achillea pannonica*, *Carduus acanthoides*, *Ceratocephala testiculata*, *Onobrychis tanaitica*.
Habitat: roadsides, backyards, pastures, fallows.
Distribution in Ukraine: within the whole territory.
Structure: The herb layer is dense, with a total coverage of 40 to 95%. The floristic composition includes 107 species (from 6 to 30 species in a separate relevé).

2.3.6. Association *Onopordetum acanthii* Br.-Bl. 1926
Diagnostic species: *Onopordum acanthium*.
Habitat: xerophytic sites with degraded soils: along roads and railways, on soil dumps, wastelands, and rural pastures.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 60 to 100%. The floristic composition includes 104 species (from 7 to 22 species in a separate relevé).

2.3.7. Association *Epilobio tetragoni-Achilleetum nobilis* Smetana 2002
Diagnostic species: *Achillea nobilis*, *Agropyron pectinatum*, *Cirsium ukranicum*, *Crepis rhoeadifolia*, *Epilobium tetragonum*, *Erigeron acris*, *Hieracium virosum*, *Koeleria cristata*, *Lactuca tatarica*, *Seseli campestre*, *Verbascum lychnitis.*
Habitat: rocky slopes of sludge dams with non-formed soils.
Distribution in Ukraine: Steppe zone.
Structure: The total coverage is 70-75%. The floristic composition includes 42 species (from 4 to 15 species per relevé).

2.3.8. Association *Euphorbio virgultosae-Lathyretum tuberosi* Smetana 2002
Diagnostic species: *Cirsium setosum*, *Crepis rhoeadifolia*, *Euphorbia virgata*, *Lactuca tatarica*, *Lathyrus tuberosus*.
Habitat: reclaimed slopes of sludge dams and industrial sites with loose soils.
Distribution in Ukraine: Steppe zone.
Structure: The total coverage is 75-90%. The floristic composition includes 55 species (from 6 to 18 species in a separate relevé).

2.3.9. Association *Potentillo argenteae-Artemisietum absinthii* Faliński 1965
Diagnostic species: *Artemisia absinthium*.
Habitat: open dry habitats with thick soils: pastures, edges of forest belts, roads and railways, abandoned gardens, fallows, wastelands, lawns, mounds, and industrial sites.
Distribution in Ukraine: within the whole territory.
Structure: The total coverage varies from 30 to 90%. The floristic composition includes 98 species (from 6 to 19 species in a separate relevé).

2.3.10. Association *Tanaceto-Artemisietum vulgaris* Br.-Bl. (1931) 1949
Diagnostic species: *Phleum pratense*, *Tanacetum vulgare*.
Habitat: landfills, along roadsides and railways, wastelands, disturbed adjacent areas of arable land, ancient soil dumps, and rural pastures.
Distribution in Ukraine: within the whole territory.
Structure: The herb layer is dense, with a total coverage of 60 to 80%. The floristic composition includes 194 species (from 4 to 43 species in a separate relevé).

2.3.11. Association *Xanthietum californici-spinosi* Levon 1997
Diagnostic species: *Anthemis altissima*, *A. subtinctoria*, *Arctium tomentosum*, *Asperugo procumbens*, *Ficus carica*, *Hordeum leporinum*, *Lapsana intermedia*, *Melandrium album*, *Pimpinella peregrina*, *Rorippa austriaca*, *Vicia cordata*, *Xanthium californicum*, *X. spinosum*.
Habitat: abandoned gardens on poor dry loose substrates.
Distribution in Ukraine: South coast of Crimea.
Structure: The total coverage usually is 100%. The floristic composition includes 18-21 species.

2.3.12. Association *Xanthietum spinosi* (Paucă 1941) Felföldy 1942
Diagnostic species: *Abutilon theophrasti*, *Amaranthus blitoides*, *A. retroflexus*, *Chenopodium album*, *Cuscuta tinei*, *Cynodon dactylon*, *Datura stramonium*, *Echinochloa crus-galli*, *Heliotropium europaeum*, *Hibiscus trionum*, *Kickxia caucasica*, *Rorippa austriaca*, *Setaria glauca,* *Solanum alatum*, *Xanthium italicum*, *X. spinosum*.
Habitat: areas near livestock farms, plowed and abandoned fields, and landfills.
Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage is 85-90%. The floristic composition includes 13-16 species per relevé.

2.3.13. Association *Xanthietum strumarii* Paucă 1941
Diagnostic species: *Amaranthus caudatus*, *Artemisia abrotanum*, *A. annua*, *Bidens frondosa*, *B. tripartita*, *Carex praecox*, *Chenopodium glaucum*, *Digitaria ischaemum*, *Geranium divaricatum*, *Juncus tenuis*, *Trifolium dubium*, *Xanthium strumarium*.
Habitat: trampled mesic areas along roads.
Distribution in Ukraine: Forest-Steppe and Steppe zones.
Structure: The total coverage is 80-100%. The floristic composition includes 27 species (10-16 species in a separate relevé).

2.3.14. Association *Diplotaxio muralis-Malvetum erectae* Kostylev in Solomakha et al. 1992
Diagnostic species: *Anisantha tectorum*, *Diplotaxis muralis*, *Malva sylvestris*, *Zygophyllum fabago*.
Habitat: marginal areas within different ruderal habitats, mainly in settlements.
Distribution in Ukraine: South coast of Crimea.
Structure: The herb layer is dense, with a total coverage of 75 to 90%. The floristic composition includes 22 species (about 5-10 species in a separate relevé).

The alliance *Medicagini falcatae-Diplotaxion tenuifoliae* is formed by communities of open dry habitats as stages of anthropogenic transformation of natural vegetation.

2.4.1. Association *Bromo squarrosi-Teucrietum chamaedryos* Levon 1997
Diagnostic species: *Anthemis subtinctoria*, *Calamintha parviflora, Carduus arabicus*, *C. nutans*, *Caucalis platycarpos*, *Cirsium sublaniflorum*, *Cistus tauricus*, *Convolvulus cantabrica*, *Cruciata taurica*, *Cynosurus echinatus*, *Eryngium campestre*, *Erysimum cuspidatum*, *Fibigia clypeata*, *Foeniculum vulgare*, *Geranium molle*, *G. rotundifolium*, *Inula oculus-christi*, *Lamium purpureum*, *Lapsana intermedia*, *Lathyrus sphaericus*, *Lepidium graminifolium*, *Malva sylvestris*, *Picris pauciflora*, *Poterium polygamum*, *Stachys iberica*, *S. velata*, *Teucrium chamaedrys*, *T. polium*, *Verbascum marschallianum*, *Veronica hederifolia*.
Habitat: transformed areas of juniper-oak forests.
Distribution in Ukraine: South coast of Crimea.
Structure: The total coverage is 100%. The floristic composition includes 36 species.

2.4.2. Association *Calamintho macrae-Poterietum sanguisorbae* Levon 1997
Diagnostic species: *Calamintha parviflora*, *Carduus arabicus*, *Centaurea salonitana*, *Cruciata*

taurica, *Cynosurus echinatus*, *Eryngium campestre*, *Erysimum cuspidatum*, *Helianthemum stevenii*, *Hordeum bulbosum*, *Lapsana intermedia*, *Medicago orbicularis*, *Onopordum tauricum*, *Picris pauciflora*, *Poa annua*, *Psoralea bituminosa*.

Habitat: dry open areas on roadside slopes with mineralized soils.

Distribution in Ukraine: South coast of Crimea.

Structure: The total coverage is 100%. The floristic composition includes 22 species

2.4.3. Association *Eupatorio cannabini-Verbenetum officinalis* Levon 1997

Diagnostic species: *Anisantha sterilis*, *Atriplex prostrata*, *Buddleja davidii*, *Cirsium sublaniflorum*, *Crepis micrantha*, *Cruciata taurica*, *Diplotaxis tenuifolia*, *Erysimum cuspidatum*, *Eupatorium cannabinum*, *Fumaria schleicheri*, *Inula aspera*, *Lapsana intermedia*, *Lepidium graminifolium*, *Melandrium album*, *Mercurialis annua*, *Onopordum tauricum*, *Papaver hybridum*, *Rhagadiolus edulis*, *Rumex crispus*, *Sisymbrium orientale*, *Torilis nodosa*, *Verbascum marschallianum*, *Verbena officinalis*, *Veronica hederifolia*, *Vicia lathyroides*.

Habitat: different ruderal areas with mineralized substrates: landfills of construction and household waste, disturbing sea slopes, etc.

Distribution in Ukraine: South coast of Crimea.

Structure: The herb layer is dense, with a total coverage of up to 100%. The floristic composition includes 31 species.

2.4.4. Association *Lathyro tuberoso-Ornithogaletum pontici* Levon 1997

Diagnostic species: *Alopecurus vaginatus*, *Arctium tomentosum*, *Atriplex prostrata*, *Brachypodium rupestre*, *Buglossoides arvensis*, *Calamintha parviflora*, *Centaurea sterilis*, *Clematis vitalba*, *Inula aspera*, *Medicago arabica*, *Melandrium album*, *Ornithogalum fimbriatum*, *O. ponticum*, *Poa taurica*, *Poterium polygamum*, *Scutellaria albida*, *Sisymbrium orientale*, *Teucrium polium*, *Thesium arvense*, *Trifolium leucanthum*, *Verbascum marschallianum*, *Veronica triphyllos*, *Vicia dalmatica*, *V. varia*.

Habitat: transformed deforestation areas.

Distribution in Ukraine: South coast of Crimea.

Structure: The herb layer is dense, with total coverage of up to 100%. The floristic composition includes 29 species.

The alliance *Rorippo austriacae-Falcarion vulgaris* includes xeromesophytic ruderal communities of open and moderately shaded habitats. They are formed on border areas near roads, lawns, dooryards, dumps.

2.5.1. Association *Anthemido ruthenicae-Echietum biebersteinii* Levon 1997

Diagnostic species: *Anthemis ruthenica*, *A. subtinctoria*, *Arctium tomentosum*, *Centaurea sterilis*, *Crepis foetida*, *Echium biebersteinii*, *Euphorbia helioscopia*, *Foeniculum vulgare*, *Geranium rotundifolium*, *Helianthemum stevenii*, *Lepidium graminifolium*, *Melandrium album*, *Odontites vulgaris*, *Physocaulis nodosus*, *Poterium polygamum*, *Salvia sibthorpii*, *Sisymbrium orientale*, *Torilis arvensis*, *Veronica persica*, *Xeranthemum cylindraceum*.

Habitat: different open disturbed areas.

Distribution in Ukraine: South coast of Crimea.

Structure: The herb layer is dense, with a total coverage up to 100%. The floristic composition includes 31 species.

2.5.2. Association *Inulo asperae-Centaureetum diffusae* Levon 1997

Diagnostic species: *Avena ludoviciana*, *Calamintha parviflora*, *Carex hallerana*, *Conium maculatum*, *Foeniculum vulgare*, *Hordeum leporinum*, *Inula aspera*, *Lamium purpureum*, *Lepidium graminifolium*, *Physocaulis nodosus*, *Poa bulbosa*, *Salvia sibthorpii*, *Scandix pecten-veneris*, *Stachys iberica*, *Veronica polita*, *Vicia cordata*.

Habitat: ruderal areas along paths, park alleys, marginal areas on agricultural lands (vineyards).

Distribution in Ukraine: South coast of Crimea.

Structure: The herb layer is dense, with a total coverage of up to 100%. The floristic composition includes 24 species.

3. Ecological analysis

The ordination analysis of the class *Artemisietea vulgaris* at the level of alliances (Fig. 1) determined that the main factors of their ecological differentiation are the concentration of nitrogen compounds, degree of soil aeration, and variability of damping. On the ecological separation of *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris* alliances, described and spread in the Crimea, thermoclimate also has a significant impact.

The conducted phytoindication analysis of the class according to the gradient of the water regime of the soils (Fig. 2) showed that the *Artemisietea vulgaris* consists mainly of submesophytic communities. The coenoses of the alliance *Arction lappae*, which ecologically borders on semi-natural nitrophilic coenoses of the class *Galio-Urticetea*, are more demanding to the level of soil moisture. The broadest range of ecological amplitude according to this gradient is characteristic of *Convolvulo arvensis-Agropyrion repentis*.

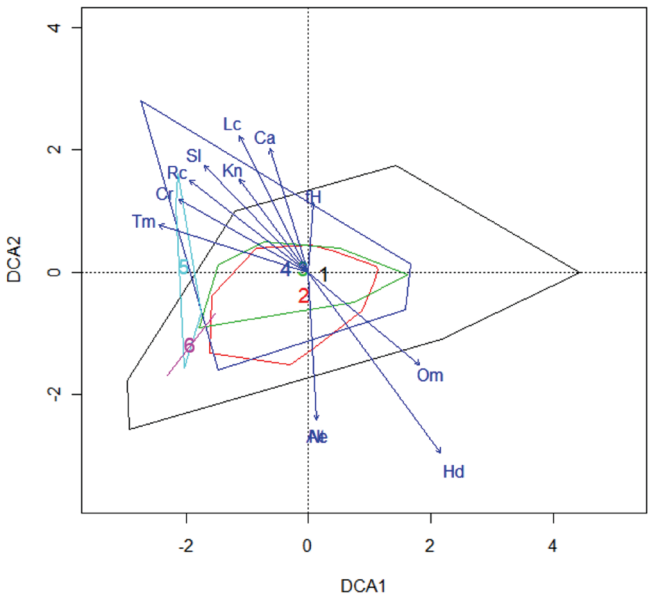

Fig. 1. Results of DCA-ordination of the alliances of the class *Artemisietea vulgaris* by ecological factors

Explanations: Hd – soil humidity, fH – variability of damping, Rc – soil acidity, Sl – salt regime, Ca – carbonate content, Nt – nitrogen content, Ae – soil aeration, Tm – thermoclimate, Om – ombroregime, Kn – continentality of climate, Cr – cryoclimate, Lc – light regime; 1 – *Convolvulo arvensis-Agropyrion repentis*, 2 – *Arction lappae*, 3 – *Dauco-Melilotion*, 4 – *Onopordion acanthii*, 5 – *Medicagini falcatae-Diplotaxion tenuifoliae*, 6 – *Rorippo austriacae-Falcarion vulgaris*

The results of the ecological analysis of the *Artemisietea vulgaris* communities on the variability of damping (Fig. 3) showed their tending to the habitats with irregular soil moisturization. The ecological distribution of alliances according to the degree of soil aeration (Fig. 4) indicates their confinement to well-aerated substrates, particularly disturbed sandy and loamy soils, often with inclusions of gravelly fractions. Under conditions of moderate soil aeration, only mesophytic coenoses of the alliance *Arction lappae* are formed.

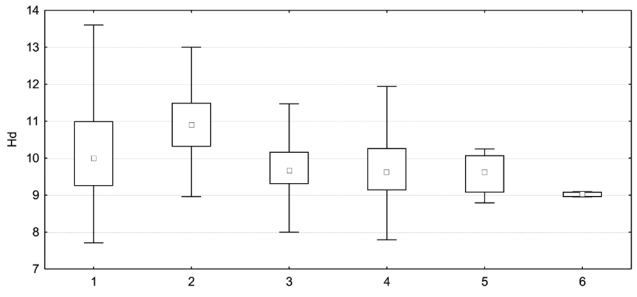

Fig. 2. The arrangement of alliances of the class *Artemisietea vulgaris* by the soil humidity

Explanations: numbers on the abscissa axis in Figs. 2-13 correspond to the number of alliances in Fig. 2, on the ordinate axis – values of ecological factors

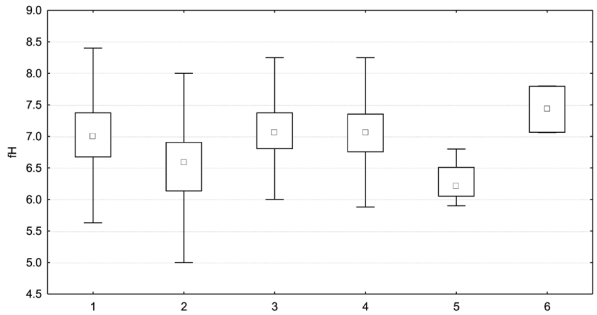

Fig. 3. The arrangement of the alliances of the class *Artemisietea vulgaris* by the variability of damping

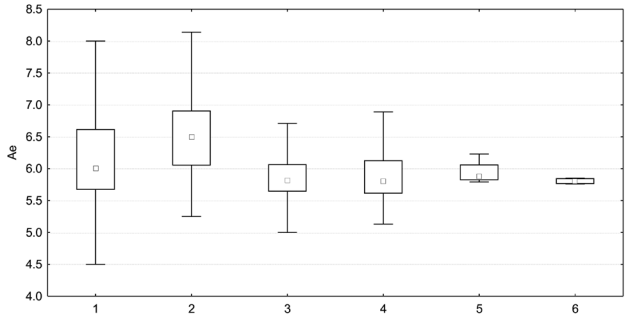

Fig. 4. The arrangement of the alliances of the class *Artemisietea vulgaris* by the soil aeration

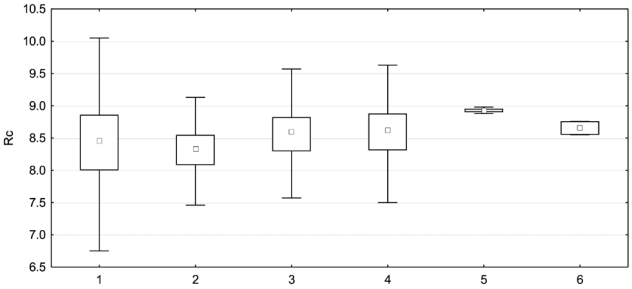

Fig. 5. The arrangement of the alliances of the class *Artemisietea vulgaris* by the soil acidity

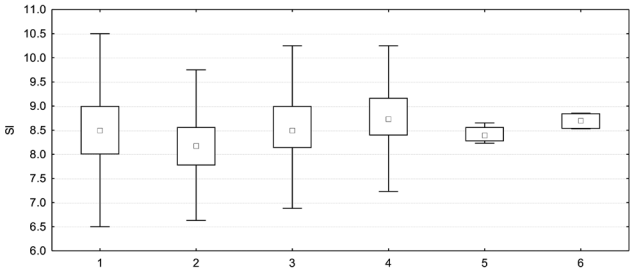

Fig. 6. The arrangement of alliances of the class *Artemisietea vulgaris* by the salt regime

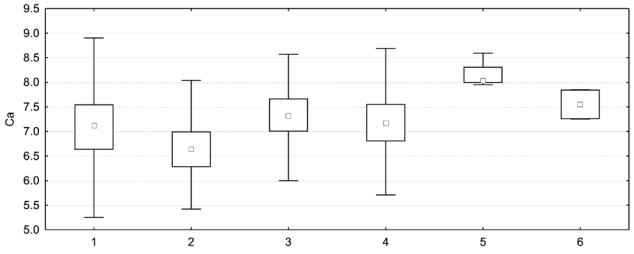

Fig. 7. The arrangement of the alliances of the class *Artemisietea vulgaris* by the carbonate content

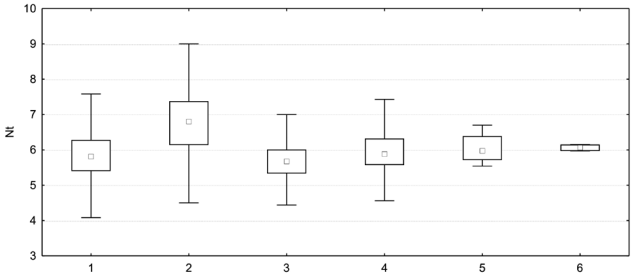

Fig. 8. The arrangement of the alliances of the class *Artemisietea vulgaris* by the nitrogen content

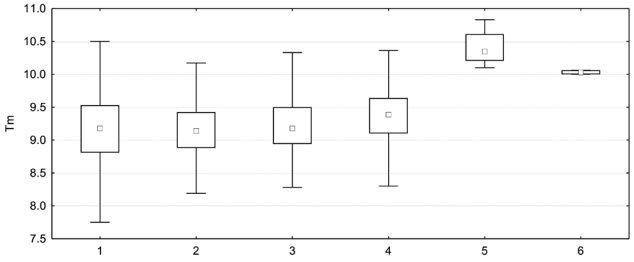

Fig. 9. The arrangement of the alliances of the class *Artemisietea vulgaris* by the thermoregime

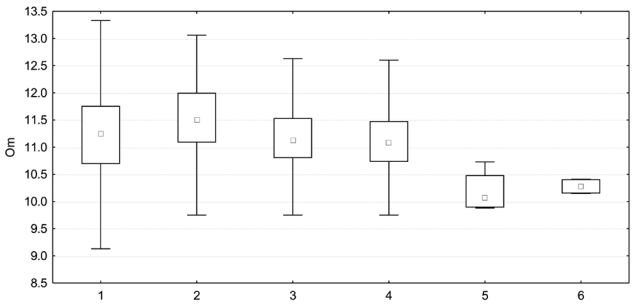

Fig. 10. The arrangement of the alliances of the class *Artemisietea vulgaris* by the ombroregime

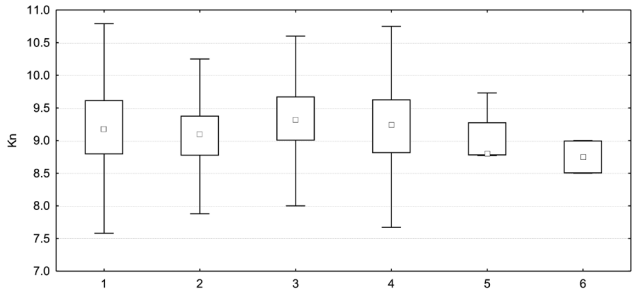

Fig. 11. The arrangement of the alliances of the class *Artemisietea vulgaris* by the continentality of climate

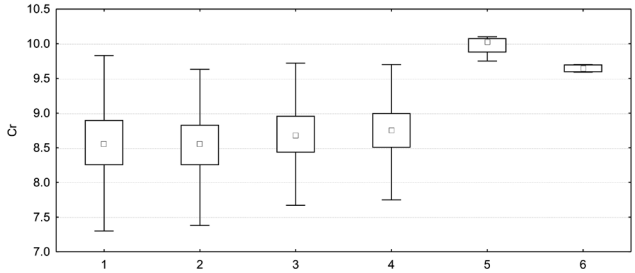

Fig. 12. The arrangement of the alliances of the class *Artemisietea vulgaris* by the cryoregime

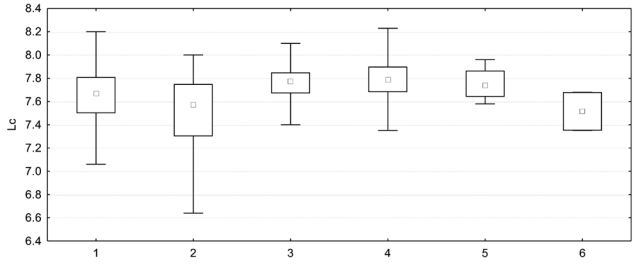

Fig. 13. The arrangement of the alliances of the class *Artemisietea vulgaris* by the light regime of ecotopes

According to the results of ecological analysis relative to the soil acidity (Fig. 5), it was found that most of the coenoses occupy substrates with a neutral reaction of soil solution. The ecological distribution according to the soil salinization gradient (Fig. 6) revealed the eutrophic nature of most coenoses and the prevailing semieutrophic content of the *Arction lappae* alliance. Phytoindication analysis according to the carbonate content of the soil (Fig. 7) showed that the communities of the class can withstand a small concentration of CaO in the substrate. Only *Medicagini falcatae-Diplotaxion tenuifoliae* are confined to soils enriched with carbonate compounds. The ecological distribution of vegetation alliances according to the content of nitrogen compounds in the soil (Fig. 8) showed that almost all of them formed on substrates relatively poor in terms of the content of these compounds. Only coenoses of *Arction lappae* grow in conditions of a sufficient supply of mineral nitrogen.

Ecological differentiation according to the main microclimatic indicators allows us to characterize the

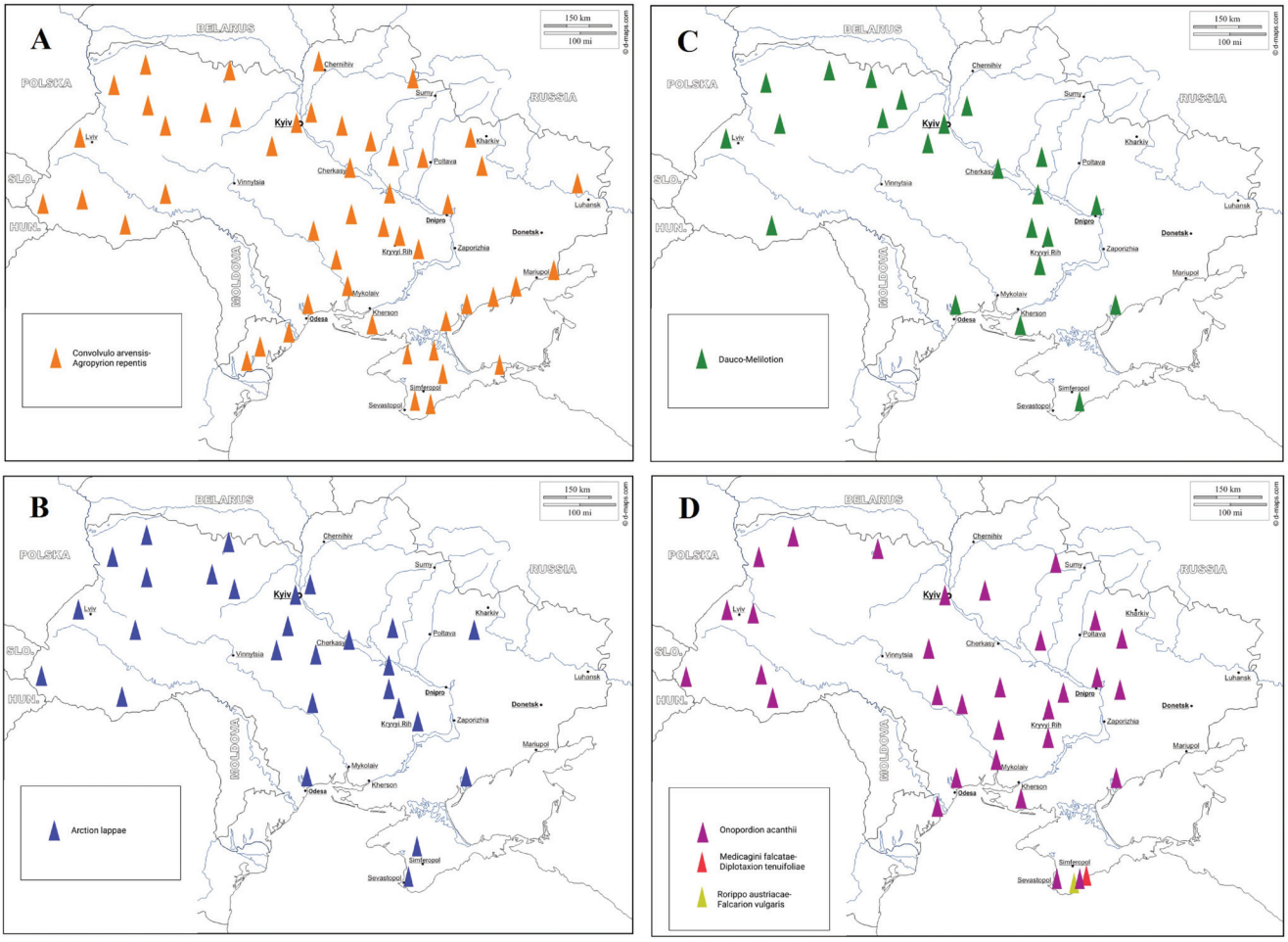

Fig. 14. A distribution map of the localities of the class *Artemisietea vulgaris* in Ukraine

Explanations: A – *Convolvulo arvensis-Agropyrion repentis*, B – *Arction lappae*, C – *Dauco-Melilotion*, D – *Onopordion acanthii*, *Medicagini falcatae-Diplotaxion tenuifoliae*, *Rorippo austriacae-Falcarion vulgaris*

conditions of formation of the *Artemisietea vulgaris* vegetation according to the thermoclimate as submesothermic (with the exception of mesothermal *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris*) (Fig. 9), by ombroregime – as subaridophytic (Fig. 10), according to the degree of the climate continentality – as hemicontinental (Fig. 11), according to the cryoclimate – as hemicryophytic (Fig. 12), according to the light regime of the habitat – as sciogeliophytic (Fig. 13).

3.4. Distributions of communities of the class Artemisietea in Ukraine

We analyzed and established the main features of the territorial distribution of the class *Artemisietea vulgaris* across the territory of Ukraine. We found that this vegetation type is spread in all botanical and geographical zones of the country. The geographical specificity of the class is manifested mainly at the level of the alliances (Fig. 14). Thus, plant communities of the *Arction lappae* are more common in the Forest-Steppe zone. Thermophilic and xerophytic phytocoenoses of *Dauco-Melilotion* and *Onopordion acanthii* are widespread in the Steppe zone. The coenoses of *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris* are characterized by geographical connection only with the Crimea. Among all described phytocoenoses of *Artemisietea vulgaris* on the territory of Ukraine the most common are *Agropyretum repentis, Calamagrostietum epigei, Convolvulo arvensis-Agropyretum repentis, Arctio lappae-Artemisietum vulgaris, Melilotetum albo-officinalis, Achilleo millefolii-Grindelietum squarrosae* and *Tanaceto-Artemisietum vulgaris*. We also found that the degree of human impact and disturbance of habitats as well as the type and mechanical structure of the soils are the leading factors of the territorial distribution of this vegetation in the study area.

4. Discussion

Based on the data analysis we identified 2 orders, 6 alliances, and 58 associations within *Artemisietea vulgaris* class in Ukraine. We accepted the broad conception

of the class included within *Artemisietea vulgaris* the alliance *Arction lappae*. Despite its debatable status we follow some other European phytosociologist (Láníková *et al*. 2009) and consider that the species composition of *Arction lappae* does not differ significantly from the vegetation of *Artemisietea vulgaris* class by prevailing in stands its representatives, species of dry habitats and alien plants (both archaeophytes and neophytes). Having accepted the broad frame conception of the class we consider a narrow interpretation of association in contrast to some vegetation surveys provided in Europe (Sanda *et al.* 1998; Láníková *et al.* 2009). In this context, we assumed *Agropyretum repentis*, *Convolvulo arvensis-Agropyretum repentis,* and *Medicagini lupulinae-Agropyretum repentis* separate association instead broad one *Agropyretum repentis* Felföldy 1942. The same decision we made concerning associations *Arctietum lappae* and *Arctio lappae-Artemisietum vulgaris*; *Carduo acanthoidis-Onopordetum acanthii* and *Onopordetum acanthii* which often put up within *Arctietum lappae* Felföldy 1942 and *Onopordetum acanthii* Br.-Bl. 1926 respectively. In such syntaxonomical resolutions, we are guided by the species composition of phytocoenoses as well as their habitat and ecological requirements.

In Ukraine, the class *Artemisietea vulgaris* is marked by quite high syntaxonomy diversity compared to other European regions. At the level of high-rank syntaxa we didn't find only vegetation that was specific for sub-Mediterranean and Mediterranean regions (belonging to orders *Carthametalia lanati* S. Brullo in S. Brullo et Marcenò 1985 and *Elytrigio repentis-Dittrichietalia viscosae* Mucina 2016) as well as for eastern part of European russia (represented by order *Polygono-Artemisietalia austriacae* Sakhapov et Solomeshch in A. Ishbirdin *et al.* 1988). At the same time, we determined specific vegetation on the European scale from the territory of Ukraine. This is Crimean submediterranean xero-mesophytic ruderal vegetation and semiruderal meso-xerophytic vegetation united into two alliances – *Medicagini falcatae-Diplotaxion tenuifoliae* and *Rorippo austriacae-Falcarion vulgaris* described by A. Levon (1997). All associations within these alliances are also specific only for the territory of Crimea, characterized by the specific floristic structure and diagnostic species core, and didn't find in other regions of Ukraine. Unfortunately, in our analysis, we could dispose of only very limited data from the literature and weren't able to provide our own field sampling due to the occupation of Crimea Peninsulae by russia. But it is obvious that these plant communities are worth better considering, in particular, to complete and update information about this vegetation in the Ukrainian vegetation survey (Dubyna *et al.* 2019) as well as in EuroVegChecklist (Mucina *et al.* 2016).

At the level of associations, the class *Artemisietea vulgaris* in the territory of Ukraine is represented by plant communities that differ in terms of their distribution. We found widespread associations that are typical for all of Europe (*Agropyretum repentis, Calamagrostietum epigei, Arctietum lappae, Melilotetum albo-officinalis*, etc.) as well as local associations described and distributed only in the territory of Ukraine. Such vegetation types differ by their species composition, especially diagnostic and constant species lists. Compared to the widespread vegetation, local associations are characterized by numerous and very specific floristic cores consisting of local ruderal plants. It is especially highlighted by the ruderal vegetation distributed in Crimea located in a sub-Mediterranean zone with a subtropical climate. The specificity of the floristic composition of these syntaxa was reflected in the high values of fidelity coefficient for a large number of species that we recognized as diagnostic ones. We don't exclude that it could be caused by the variation (sometimes significant) of the number of vegetation plots in datasets involved in the analysis that could slightly inflate the number of diagnostic species and quite increase the value of the phi coefficient. But, overall, the specific features of such vegetation types are quite obvious.

In general, the plant communities species composition of the class *Artemisietea vulgaris* in the territory of Ukraine is characterized by the presence of ruderal plants, typical species for neighboring grassland (*Molinio-Arrhenatheretea, Koelerio-Corynephoretea canescentis, Trifolio-Geranietea sanguinei, Festuco-Puccinellietea, Festuco-Brometea*) and ruderal (*Stellarietea mediae, Galio-Urticetea, Polygono-Poetea annuae*) vegetation types and a high proportion of alien species (Dubyna *et al*. 2021). Peculiarities of the vertical structure of plant communities in the study area are manifested by dense species-rich stands, indistinct layer differentiation, and the high dominance ability of some diagnostic species and alien plants with high invasive ability, such as *Ambrosia artemisiifolia, Asclepias syriaca, Bunias orientalis, Cardaria draba, Centaurea diffusa, Grindelia squarrosa, Lycium barbarum, Xanthium strumarium*.

We showed that the ecological differentiation of the *Artemisietea vulgaris* vegetation is determined by the concentration of nitrogen compounds, soil aeration, and variability of damping. The main climatic gradient that has a significant impact on this vegetation type is thermoclimate. We also revealed that distinguished vegetation units demonstrate quite broad ecological amplitude regarding ecological gradients and quite narrow – according to climatic parameters. Above all, studied phytocoenoses can tolerate significant fluctuations of soil moisture and nitrogen content in the soil

and, at the same time, can react rapidly to moisture fluctuation and carbonate content in the soil. Unfortunately, we couldn't sufficiently evaluate the ecological requirements of the vegetation belonging to alliances *Medicagini falcatae-Diplotaxion tenuifoliae* and *Roripo austriacae-Falcarion vulgaris* for the reasons that we mentioned above. Having insufficient data we nevertheless included them in the analysis to demonstrate their specific features compared to other vegetation of the *Artemisietea vulgaris* in the territory of Ukraine. The most significant difference was pointed out according to climatic gradients.

Studies of the class *Artemisietea vulgaris* in the territory of Ukraine need to continue in regard to identifying new vegetation units. Special attention should be paid to the study of spreading plant communities with the participation of alien species, which increases over time and causes significant changes in the composition and structure of the phytocoenoses.

6. Conclusions

The territorial distribution of ruderal vegetation is determined by edapho-climatic, geomorphological conditions and the action of human impact. The communities of the class *Artemisietea vulgaris* differ mostly in regional and local scales. It is established that this class includes 58 associations from six alliances and two orders. It is revealed that the leading factors of the territorial differentiation of the class *Artemisietea vulgaris* are soil moisture and nitrification, as well as the mechanical composition and leaching of substrates. Based on the results of the ordination analysis, it is established that its distribution is influenced by various factors that correlate with the peculiarities of environmental conditions where plant communities develop and the degree of their anthropogenic disturbance. The ecological differentiation of *Artemisietea vulgaris* syntaxa was found to be determined by the concentration of mineral nitrogen, the degree of aeration of the substrate, and the variability of moisture.

Acknowledgments. Authors are grateful for the provided geobotanical relevés by L. Felbaba-Klushyna, V. Datsyuk, B. Baranovsky, I. Ivanko, L. Karmyzova, N. Roshchina, H. Kazarinova, D. Shyriaieva, L. Borsukevych, L. Lysohor, O. Krasova, M. Smetana.

Author Contributions:

Research concept and design: D. Dubyna
Collection and/or assembly of data: T. Dziuba, P. Tymoshenko, D. Davydov, A. Davydova
Data analysis and interpretation: S. Iemelianova, T. Dziuba
Writing the article: S. Iemelianova, T. Dziuba, A. Davydova, D. Davydov
Critical revision of the article: S. Iemelianova, T. Dziuba
Final approval of article: S. Iemelianova, T. Dziuba, D. Dubyna

References

Arepyeva L. A. 2008. Ecological-floristic classification of ruderal vegetation of urbanized territories of the Kursk region. Cand. Sci. Abstract. 22 pp. Bryansk (in Russian).

Arepyeva L. A. 2019. About new syntaxa of synanthropic vegetation of the Bryansk city. Plant diversity 2: 18-37 (in Russian).

Bacieczko W., Borcz A. & Kochanek-Felusiak A. 2014. The synanthropic flora of the roadsides of selected new and modernized highways in Szczecin and its significance for the city. Folia Pomeranae 312(31): 7-38.

Bagrikova N. A. 1998. Syntaxonomy of weeds of industrial perennial crops of the Crimea. Ukrainian Phytosociological Collection. Series A 2 (11): 3-14 (in Russian).

Bagrikova N. A. 2004. Weed-field vegetation of Crimea. Ukrainian Phytosociological Collection. Series A 1 (21): 1-188 (in Russian).

Bardat J., Bioret F., Botineau M., Boullet V., Delpech R., Géhu J.-M., Haury J., Lacoste A., Rameau J.-C., Royer J.-M., Roux G. & Touffet J. 2004. Prodrome des végétations de France. 180 pp. Muséum national d'Histoire naturelle, Paris (in French).

Biondi E., Allegrezza M., Casavecchia S., Galdenzi D., Gasparri R., Pesaresi S., Vagge I. & Blasi C. 2014a. New and validated syntaxa for the checklist of Italian vegetation, Plant Biosystems – An International Journal Dealing with all Aspects of Plant Biology: Official Journal of the Societa Botanica Italiana 148(2): 318-332.

Biondi E., Blasi C., Allegrezza M. Anzellotti I., Azzella M. M., Carli E., Casavecchia S., Copiz R., Del Vico E., Facioni L., Galdenzi D., Gasparri R., Lasen C., Pesaresi S., Poldini L., Sburlino G., Taffetani F., Vagge I., Zitti S. & Zivkovic L. 2014b. Plant communities of Italy: The Vegetation Prodrome. Plant Biosystems 148(4): 728-814.

Borhidi A. 2003. Magyarorszag növćnytársulásai. 610 pp. Budapest (in Hungarian).

Braun-Blanquet J. 1964. Pflanzensoziologie. Grundzuge der Vegetationskunde. 3 Aufl. 865 pp. Springer-Verlag, Wien-New York.

Braun-Blanquet J. 1967. Vegetationsskizzen aus dem Baskenland mit Ausblicken auf das weitere Ibero-Atlantikum. II. Teil. Vegetatio 14: 1-126 (in German).

Bredikhina Yu. L. 2015. Spontaneous vegetation of Melitopol: syntaxonomy, phytomelorative meaning and optimization goals. Cand. Sci. Diss. Abstract. 18 pp. Lviv (in Ukrainian).

Cherosov M. M., Sleptsova N. P., Mironova S. I., Gogoleva P. A., Pestryakov B. N. & Gavrilieva L. D. 2005. Syntaxonomy of synanthropic vegetation in Yakutia. 575 pp. YaF publishing house SO RAN, Yakutsk (in Russian).

Chokha O. V. 2005. Lawn coverings of Kyiv. 288 pp. Phytosociocentre, Kyiv (in Ukrainian).

Chytrý M., Tichý L., Holt J. & Botta-Dukát Z. 2002. Determination of diagnostic species with statistical fidelity measures. Journal of Vegetation Science 13: 79-90.

Dengler J., Berg C., Eisenberg M., Isermann M., Jansen F., Koska I., Löbel S., Manthey M., Päzolt J., Spangenberg A., Timmermann T. & Wollert H. 2003. New descriptions and typifications of syntaxa within the project "Plant communities of Mecklenburg Vorpommern and their vulnerability" – Part I. Feddes Repertorium 114(7-8): 587-631.

Didukh Ya. P. 2011. The ecological scales for the species of Ukrainian flora and their use in synphytoindication. 176 pp. Phytosociocentre, Kyiv.

Dubyna D. V., Dziuba T. P., Iemelianova S. M., Bahrikova N. O., Borysova O. V., Borsukevych L. M., Vynokurov D. S., Hapon S. V., Hapon Yu. V., Davydov D. A., Dvoretskyi T. V., Didukh Ya. P., Zhmud O. I., Kozyr M. S., Konishchuk V. V., Kuzemko A. A., Pashkevych N. A., Ryff L. E., Solomakha V. A., Felbaba-Klushyna L. M., Fitsaylo T. V., Chorna H. A., Chorney I. I., Shelyah-Sosonko Yu. R. & Iakushenko D. M. 2019. Prodrome of the Vegetation of Ukraine. 782 pp. Naukova Dumka, Kyiv (in Ukrainian).

Dubyna D. V., Iemelianova S. M., Dziuba T. P., Tymoshenko P. A., Protopopova V. V. & Shevera M. V. 2021. Alien plant invasion in the ruderal vegetation of Ukraine. Environmental & Socio-economic Studies 9: 57-70.

Dubyna D., Iemelianova S., Dziuba T., Davydova A., Davydov D. & Tymoshenko P. 2022. Ruderal vegetation of Ukraine: *Stellarietea mediae* Tx. et al. in Tx. 1950. Biodiv. Res. Conserv. 66: 11-38.

Fornal-Pieniak B. & Wysocki C. 2011. Vegetation on the railway-line embankment at Tarnów. Ekológia (Bratislava) 30(4): 414-421.

Galchenko N. P. 2006. Regional landscape park "Kremenchug floodplains". Flora. 176 pp. Phytosociocentre, Kyiv (in Ukrainian).

Golovanov Ya. M. & Abramova L. M. 2012. Vegetation of the city of Salavat (Republic of Bashkortostan). III. Synanthropic vegetation (classes *Bidentetea tripartitae*, *Stellarietea mediae* and *Artemisietea vulgaris*). Vegetation of Russia 21: 34-65 (in Ukrainian).

Golovanov Ya. M. 2017. New associations of synanthropic vegetation classes *Artemisietea vulgaris* and *Galio-Urticetea* in the Republic of Bashkortostan. Vegetation of Russia 30: 35-54 (in Russian).

Guarino R. & Mossa L. 2006. Floristic, phenologic and chorological differences in the therophytic vegetation-types of Sardinia. Bocconea 19: 177-193.

Hennekens S. M. & Schaminée J. 2001. TURBOVEG, a comprehensive data base management system for vegetation data. Journal of Vegetation Science 12: 589-591.

Hill M. O. & Gauch H. 1980. Detrended correspondence analysis, an improved ordination technique. Vegetatio 42: 47-58.

Homlya L. M. 2005. Vegetation of the Khorol river valley. Ukrainian Phytosociological Collection. Series A 1 (22): 1-187 (in Ukrainian).

Jasprica N., Milovic M. & Pandža M. 2015. *Picrido hieracioidis-Cirsietum candelabri* Jasprica et al. 2015 – a ruderal association new to Croatia. Glasnik Hrvatskog botanickog društva 3(2): 4-14.

Khomyak I. V. 2010. Classification and anthropogenic transformation of Slovechansko-Ovruchsky ridge ecosystems. Cand. Sci. Abstract. 24 pp. Kyiv (in Ukrainian).

Kolomiychuk V. P. 2020. Structure, dynamics and protection of phytodiversity of coastal ecosystems of the Sea of Azov Dr. Biol. Science. Abstract. 44 pp. Kyiv (in Ukrainian).

Konishchuk V. V. 2006. Assessment of the diversity of ecosystems of the Cheremsky Nature Reserve on the basis of cartographic modeling. Cand. Sci. Diss. Abstract. 20 pp. Kyiv (in Ukrainian).

Korotkov K. O., Morozova O. V. & Belonovskaya E. A. 1991. The USSR vegetation syntaxa prodromus. 346 pp. G. E. Vilchek, Moscow (in Russian).

Korzhenevsky V. V. 1986. Anthropogenic associations of quarries of the Kerch Peninsula. Syntaxonomy and dynamics of anthropogenic vegetation: scientific collection 40-49, BSU, Ufa (in Russian).

Korzhenevsky V. V. & Klyukin A. A. 1990. Vegetation of abrasion and accumulative landforms of the sea coasts and lakes of the Crimea. Biological Sciences, Moscow, 108 pp. Dep. at VINITI 10.07.90, № 3822-B90 (in Russian).

Kostylev O. V. 1985. About two associations of ruderal vegetation of the North-Western Black Sea region. Phytocenology of anthropogenic vegetation 1: 91-97 (in Russian).

Kostylev O. V. 1990. Ruderal vegetation of Ukraine. Ukr. Bot. J. 47(1): 70-74 (in Ukrainian).

Kuzmic F., Silc U., Lososová Z., Mucina L., Chytrý M., Knollová I., Hennekens S., Berg C., Bergmeier E., Biurrun I., Fanfarillo E., Castell X. F., Iakushenko D., Kovacevic Z., Meyer S., Nagy K., Pinke G., Poranen E. & Tereshenko S. 2020. European Weed Vegetation Database – a gap-focused vegetation-plot database. Phytocoenologia 50(1): 93-100.

Láníková D., Chytrý M. & Lososová Z. 2009. Suchomilná ruderální vegetace s dvouletými a vytrvalými druhy (*Artemisietea vulgaris*). In: Vegetace České republiky. 2. Ruderální, plevelová, skalní a suťová vegetace. (Ed. M. Chytrý). 207-288 pp. Academia, Praha (in Czech).

Levon A. F. 1996. Syntaxonomy of ruderal vegetation of Yalta. 2: Class *Chenopodietea*. Ukrainian Phytosociological Collection. Series A 2 (2): 93-107 (in Russian).

Levon A. F. 1997. Syntaxonomy of ruderal vegetation of Yalta. 4: Class *Artemisietea vulgaris*. Ukrainian Phytosociological Collection. Series A 1 (6): 57-75 (in Russian).

Loidi J., Berastegi A., Biurrun I., Garcí´a-Mijangos I. & Herrera M. 1996. Perennial nitrophilous vegetation

of the northern Iberian Peninsula. Journal of Vegetation Science 7: 575-584.

Lukash O. & Danko H. 2020. The vegetation of sands in the Chernihiv city (Ukraine). Studia Quaternaria 37(1): 31-44.

Matuszkiewicz W. 2013. Przewodnik do oznaczania zbiorowisk roślinnych Polski. 540 pp. PWN, Wyd. Nauk., Warszawa (in Polish).

McCune B. & Mefford M. J. 2006. PC-ORD. Multivariate analysis of ecological data. Version 5. 24 pp. MjM Software, Gleneden Beach, Oregon, U.S.A.

Mirkin B. M., Alimbekova L. M., Naumova L. G. & Onischenko L. I. 1986. Second approach to the floristic classification of river floodplains of the Mongolian National Republic. Biologicheskie Nauki 9: 83-91 (in Russian).

Mirkin B. M., Solomešč A. I., Išbirdin A. R. & Sachapov M. T. 1989. Ruderal vegetation of Bashkiria. II. Classes *Artemisietea vulgaris*, *Agropyretea repentis*, *Plantaginetea majoris* and *Polygono-Artemisietea austriacae*. Feddes Repertorium 100: 493-529.

Mirkin B. M., Suyundukov Ya. T., Yamalov S. M., Khasanova G. R., Suyundukova G. Ya., Khasanova R. F., Saifullina N. M., Salmanova E. F., Abdullin M R., Naumova L. G., Yunusbaev U. B. & Bashirova E. V. 2008. Synanthropic vegetation of the Trans-Urals and the mountain-forest zone of the Bashkortostan Republic: phytoremediation effect, syntaxonomy, dynamics. 512 pp. Gilem, Ufa (in Russian).

Mosyakin S. & Fedoronchuk M. 1999. Vascular plants of Ukraine. A nomenclatural checklist. 345 pp. Kiev.

Mucina L. 1993. *Artemisietea vulgaris*. In: Die Pflanzengesellschaften Österreichs. Teil I: Anthropogene Vegetation. (Eds. L. Mucina, G. Grabherr, T. Ellmauer). 169-202 pp. Gustav Fischer Verlag, Jena (in German).

Mucina L., Bültmann H., Dierssen K. Theurillat J.-P., Raus T., Čarni A., Šumberová K., Willner W., Dengler J., Gavilán García R., Chytrý M., Hájek M., Di Pietro R., Iakushenko D., Pallas J., Daniëls F. J. A., Bergmeier E., Santos Guerra A., Ermakov N., Valachovič M., Schaminée J. H. J., Lysenko T., Didukh Y. P., Pignatti S., Rodwell J. S., Capelo J., Weber H. E., Solomeshch A., Dimopoulos P., Aguiar C., Hennekens S. M. & Tichý L. 2016. Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. Applied Vegetation Science 19(1): 1-783.

Oberdorfer E. 1957. Süddeusche Pflazengesellschaften. 564 pp. Gustav Ficher Verlag, Jena (in German).

Osypenko V. V. & Shevchyk V. L. 2001. Spontaneous vegetation of Cherkasy. 6: Ruderal vegetation of the coastal part of Cherkasy. Ukrainian Phytosociological Collection. Series A 1 (17): 104-121 (in Ukrainian).

Osypenko V. V. 1996. Spontaneous vegetation of Cherkasy. 1: Vegetation of flower beds. Ukrainian Phytosociological Collection. Series A 2 (2): 88-92 (in Ukrainian).

Osypenko V. V. 1997. Spontaneous vegetation of Cherkasy. 3: Communities of residential areas. Ukrainian Phytosociological Collection. Series A 2 (7): 89-95 (in Ukrainian).

Osypenko V. V. 1999. Spontaneous vegetation of Cherkasy. 5: Communities of ruderal vegetation. Ukrainian Phytosociological Collection. Series A 3 (14): 107-122 (in Ukrainian).

Rahmonov O., Jedrzejko K. & Majgier L. 2010. The secondary succession in the area of abandoned cemeteries in northern Poland. Landscape Ecology-Methods, Applications and Interdisciplinary Approach. 647-657. Inst. Landscape Ecol., Bratislava.

Rivas-Martínez S., Fernández-González F., Loidi J., Lousã M. & Penas A. 2001. Syntaxonomical checklist of vascular plant communities of Spain and Portugal to association level. Itinera Geobotanica 14: 5-341.

Rochow von M. 1951. Die Pflanzengesellschaften des Kaiserstuhls. Vol. 8. 160 pp. Pflanzensoziologie. Fischer, Jena (in German).

Roleček J., Tichý L., Zelený D. & Chytrý M. 2009. Modified TWINSPAN classification in which the hierarchy respects cluster heterogeneity. J Veg Sci 20: 596-602.

Sanda V., Öllerer K. & Burescu P. 2008. Fitocenozele din România. Sintaxonomia, structură, dinamică şi evoluţie. 576 pp. Universitatea din Bucureşti, Bucureşti (in Romanian).

Sanda V., Popescu A. & Barabaş N. 1998. Cenotaxonomia şi caracterizarea grupărilor vegetale din România. Studii şi cercetări de biologie. Seria biologie vegetală 14: 1-365 (in Romanian).

Smetana M. G. 2002. Syntaxonomy of steppe and ruderal vegetation of Kryvyi Rih. 132 pp. I.B.I., Kryvyi Rih (in Ukrainian).

Solomakha I. V., Vorobyov Ye. O. & Moysienko I. I. 2015. Vegetation of forests and shrubs of the Northern Black Sea Coast. 387 pp. Phytosociocentre, Kyiv (in Ukrainian).

Solomakha T. D., Solomakha V. A. & Shelyag-Sosonko Yu. R. 1986. The main associations of ruderal vegetation of the Left-Bank Forest-Steppe. Ukrainian Botanical Journal 43(3): 70-75 (in Ukrainian).

Solomakha V. A., Kostylev O. V. & Shelyag-Sosonko Yu. R. 1992. Synanthropic vegetation of Ukraine. 252 pp. Naukova Dumka, Kyiv (in Ukrainian).

Solomakha V. A., Vorobyov E. O., Derbak M. Y., Tyukh Y. Y., Solomakha I. V., Senchylo O. O., Shevchyk V. L. & Iakushenko D. M. 2016. National Natural Park "Synevyr". Plant World. Natural protected areas of Ukraine. Iss. 10. 332 pp. Phytosociocentre, Kyiv (in Ukrainian).

Soroka M. I. 2008. Vegetation of the Ukrainian Roztochia. 434 pp. Svit, Lviv (in Ukrainian).

Sörensen T. A. 1948. A method of establishing groups of equal amplitude inplant sociology based on similary of species content, and its application to analyses of the vegetation Danish commons. Kongelige Danske Videnskabernes Selskabs Biologiske Skrifter 5: 1-34.

Szrama K. & Brzeg A. 2011. Zbiorowiska ruderalnych ziołoi traworośli z rzędu *Onopordetalia acanthii* Br.-Bl. et R.Tx. 1943 em. R.Tx. 1950. Słupcy i okolic. Bad. Fizjogr., Seria B – Botanika 60: 103-135 (in Polish).

Tokaryuk A. I., Chorney I. I., Budzhak V. V., Protopopova V. V., Shevera M. V., Korzhan K. V. & Volutsa O.

D. 2018. Invasive plants in the Bukovynian Precarpathians. 180 pp. DrukArt, Chernivtsi (in Ukrainian).

Tüxen J. 1950. Grundriß einer Systematik der nitrophilen Unkrautgesellschaften in der Eurosibirischen Region Europas. Mitteilungen der Floristisch-soziologischen Arbeitsgemeinschaft 2: 94-175 (in German).

Tichý L. 2002. JUICE, software for vegetation classification. Journal of vegetation science, 13: 451-453. https://doi.org/10.1111/j.1654-1103.2002.tb02069.x

Tyshchenko O. V. 2006. Vegetation of spits of the Northern coast of the Azov Sea. 156 pp. Phytosociocentre, Kyiv (in Ukrainian).

Tzonev R. T., Dimitrov M. A. & Roussakova V. H. 2009. Syntaxa according to the Braun-Blanquet approach in Bulgaria. Phytologia Balcanica 15 (2): 209-233.

Usmanova L. S., Golovanov Ya. M. & Abramova L. M. 2013. Synanthropic vegetation of the class *Bidentetea tripartitae* in the central part of the Republic of Bashkortostan. Bulletin of the Samara Scientific Center of the RAS 3-5: 1470-1474 (in Russian).

Vagge I. & Befacchia A. 2006. Gli orli nitrofili della classe *Galio-Urticetea* Passarge ex Kopecky 1969 nelle Prealpi lombarde (Italia settentrionale). Fitosociologia 43(1): 177-186.

Whittaker R. H. 1978. Approaches to classifying vegetation on classification of plant communities (Ed. R.H. Whittaker). 2nd ed. 31 pp. Junk, The Hague.

Wojterska M., Brzeg A. & Jasińska K. 2016. Importance of old rural areas of Lubuskie Lakeland and central Pomerania for maintenance of vegetation diversity. Biodiv. Res. Conserv. 43: 53-66.

Iakushenko D. M. 2005. Ecosystems of Zhytomyr Polissya: classification, territorial differentiation, protection. Cand. Sci. Diss. 211 pp. Kyiv (in Ukrainian).

Appendix

Appendix 1. Synoptic table of *Artemisietea vulgaris* communities

Number of association	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.1.8	1.1.9	1.1.10
Numbers of relevés	2	461	68	20	189	14	20	10	265	18
Vulpia ciliata	100.0	-	-	-	-	-	-	-	-	-
Bupleurum asperuloides	100.0	-	-	-	-	-	-	-	-	-
Trifolium angustifolium	100.0	-	-	-	-	-	-	-	-	-
Elytrigia nodosa	100.0	-	-	-	-	-	-	-	-	-
Scandix stellata	100.0	-	-	-	-	-	-	-	-	-
Aegilops neglecta	97.4	-	-	-	-	-	-	-	-	-
Diplotaxis tenuifolia	61.3	-	-	-	-	-	-	-	-	-
Erysimum cuspidatum	43.1	-	-	-	-	-	-	-	-	-
Artemisia austriaca	-	-	50.1	-	-	-	-	-	-	-
Lepidium densiflorum	-	-	25.3	-	-	-	-	-	-	-
Vicia narbonensis	-	-	-	50.1	-	-	-	-	-	-
Rapistrum rugosum	-	-	-	49.9	-	-	-	-	-	-
Lappula barbata	-	-	-	46.2	-	-	-	-	-	-
Bromus japonicus	-	-	-	44.4	-	-	-	-	-	-
Petrosimonia oppositifolia	-	-	-	38.4	-	-	-	-	-	-
Acroptilon repens	-	-	-	36.9	-	-	-	-	-	-
Salsola tragus	-	-	-	36.1	-	-	-	-	-	-
Brizochloa humilis	-	-	-	35.6	-	-	-	-	-	-
Valerianella pontica	-	-	-	32.9	-	-	-	-	-	-
Allium firmotunicatum	-	-	-	32.9	-	-	-	-	-	-
Erysimum diffusum	-	-	4.0	32.8	-	-	-	-	-	-
Hordeum murinum	-	-	-	31.4	-	-	-	-	-	-
Eremopyrum orientale	-	-	-	31.4	-	-	-	-	-	-
Rochelia retorta	-	-	-	29.8	-	-	-	23.5	-	-
Camelina microcarpa	-	-	-	29.0	-	-	-	-	-	-
Bassia sedoides	-	-	-	28.7	-	-	-	-	-	-
Hyoscyamus niger	-	1.1	-	27.3	-	-	-	-	-	-
Milium vernale	-	-	-	26.3	-	-	-	-	-	-
Aristolochia clematitis	-	-	-	-	-	97.9	-	-	-	-
Chaerophyllum temulum	-	-	-	-	-	37.5	-	-	-	-
Sonchus arvensis	-	-	-	-	-	31.5	-	-	-	-
Alliaria petiolata	-	-	-	-	-	29.1	-	-	-	-
Asparagus officinalis	-	-	-	-	-	25.5	-	-	-	-
Stellaria holostea	-	-	-	-	-	25.0	-	-	-	-
Bromus commutatus	-	-	-	-	-	-	33.5	-	-	-
Sclerochloa dura	-	-	-	-	-	-	31.4	-	-	-
Veronica prostrata	-	-	-	-	-	-	31.4	-	-	-
Cerastium holosteoides	-	-	-	-	-	-	30.7	-	-	-
Vicia hirsuta	-	-	-	-	3.0	-	26.9	17.6	-	-
Rumex stenophyllus	-	-	-	16.0	-	-	-	68.5	-	-
Epilobium hirsutum	-	-	-	-	-	-	-	51.4	-	-
Tripolium pannonicum	-	-	-	17.3	-	-	-	35.6	-	-
Anthriscus cerefolium	-	-	-	-	-	-	-	31.0	-	-
Polygonum patulum	-	-	-	-	-	-	-	30.9	-	-
Atriplex aucheri	-	2.1	-	-	-	-	-	30.0	-	-
Poa trivialis	-	-	-	-	-	-	-	28.0	-	-
Odontites glutinosa	-	-	-	-	-	-	-	25.2	-	-

1.1.11	1.1.12	1.1.13	1.1.14	1.1.15	1.1.16	1.1.17
30	9	19	9	24	120	36
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	3.4	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	20.3	19.0	-	-	-	-
-	-	-	-	-	-	-
-	-	7.9	-	-	-	-
-	-	-	-	-	-	-
-	-	15.5	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	18.3	-	-	-	-
-	-	11.0	-	-	-	-
-	-	11.0	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	24.8	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	21.8	-	-	-	-
-	-	12.9	-	-	-	-

Plantago urvillei	-	-	-	-	-	-	-	-	-	39.5
Astragalus onobrychis	-	-	-	-	-	-	-	-	2.0	25.9
Lycium barbarum	-	-	-	-	-	-	-	-	-	-
Euonymus europaea	-	-	-	-	-	-	-	-	-	-
Salvia nemorosa	-	2.1	-	-	-	-	-	-	-	-
Crepis foetida	-	2.7	-	-	-	-	-	-	-	-
Geranium tuberosum	-	-	-	12.7	-	-	-	-	-	-
Koeleria cristata	-	-	-	-	-	-	-	17.2	-	-
Achillea setacea	-	-	-	-	-	-	-	-	-	-
Galatella villosa	-	-	-	-	-	-	-	-	-	-
Cerastium tauricum	-	-	-	-	-	-	-	-	-	-
Galium verum	-	-	-	-	-	-	-	-	-	-
Festuca valesiaca	-	-	-	-	-	-	-	-	-	-
Vicia tenuifolia	-	-	-	-	-	-	-	-	-	-
Kochia prostrata	-	-	-	9.9	-	-	-	-	-	-
Alyssum hirsutum	-	-	-	23.7	-	-	-	-	-	-
Valerianella turgida	-	-	-	-	-	-	-	-	-	-
Tragopogon dasyrhynchus	-	-	-	-	-	-	-	14.6	-	-
Malabaila graveolens	-	-	-	-	-	-	-	-	-	-
Lathyrus aphaca	-	-	-	-	-	-	-	24.4	-	-
Linaria genistifolia	-	-	-	-	-	-	-	-	-	-
Galium tenuissimum	-	-	-	-	-	-	-	-	-	-
Phlomis tuberosa	-	-	-	-	-	-	-	-	-	-
Vicia tetrasperma	-	-	-	-	-	-	-	-	-	-
Bromopsis cappadocica	-	-	-	9.0	-	-	-	-	-	-
Medicago minima	-	-	-	-	-	-	-	-	-	-
Galatella dracunculoides	-	-	-	-	-	-	-	-	-	-
Trinia hispida	-	-	-	-	-	-	-	-	-	-
Jurinea pseudomollis	-	-	-	-	-	-	-	-	-	-
Galatella linosyris	-	-	-	-	-	-	-	-	-	-
Ephedra distachya	-	-	-	-	-	-	-	-	-	-
Valerianella lasiocarpa	-	-	-	-	-	-	-	-	-	-
Arabidopsis thaliana	-	-	-	-	-	-	-	-	-	-
Scorzonera laciniata	-	-	-	-	-	-	-	-	-	-
Thlaspi perfoliatum	-	1.3	-	-	-	-	-	-	-	-
Scorzonera mollis	-	-	-	24.1	-	-	-	-	-	-
Lamium amplexicaule	-	1.9	-	-	-	-	-	-	-	-
Galium biebersteinii	-	-	-	-	-	-	-	-	-	-
Vicia tenuissima	-	-	-	-	-	-	-	-	-	-
Cephalaria transylvanica	-	-	-	-	-	-	-	-	-	-
Vicia pannonica	-	-	-	-	-	-	-	-	-	-
Potentilla pindicola	-	-	-	-	-	-	-	-	-	-
Nepeta parviflora	-	-	-	-	-	-	-	-	-	-
Poterium polygamum	-	-	-	-	-	-	-	-	-	-
Veronica cymbalaria	-	-	-	-	-	-	-	-	-	-
Serratula erucifolia	-	-	-	-	-	-	-	-	-	-
Alyssum obtusifolium	-	-	-	-	-	-	-	-	-	-
Goniolimon tataricum	-	-	-	-	-	-	-	-	-	-
Veronica verna	-	-	-	-	-	-	-	19.0	-	-
Dianthus marschallii	-	-	-	19.0	-	-	-	-	-	-
Artemisia santonicum	-	-	-	19.0	-	-	-	-	-	-

-	-	-	-	-	-	-
-	-	11.9	-	-	-	-
99.9	-	-	-	-	-	-
31.4	-	-	-	-	-	-
-	49.2	-	-	-	-	-
-	28.6	-	-	-	-	-
-	-	90.3	-	-	-	-
-	-	83.5	-	-	-	-
-	-	73.2	-	-	-	-
-	-	68.4	-	-	-	-
-	-	64.6	-	-	-	-
-	-	61.9	-	10.8	-	-
-	-	61.3	-	-	-	-
-	-	60.4	-	-	-	-
6.1	-	52.9	-	-	-	-
-	-	51.5	-	-	-	-
-	-	50.7	-	-	-	-
-	-	48.4	-	-	-	-
-	-	46.4	-	-	-	-
-	-	46.1	-	-	-	-
-	-	45.6	-	-	-	-
-	-	44.9	-	-	-	-
-	-	44.6	-	-	-	-
-	-	44.4	-	-	-	-
-	-	40.8	-	-	-	-
-	-	40.4	-	-	-	-
-	-	39.7	-	-	-	-
-	-	39.4	-	-	-	-
-	-	39.4	-	-	-	-
-	-	39.4	-	-	-	-
-	-	39.4	-	-	-	-
-	-	39.4	-	-	-	-
-	-	39.2	-	-	-	-
-	-	38.2	-	-	-	-
-	-	36.7	-	-	-	-
-	-	34.3	-	-	-	-
-	-	32.8	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	32.2	-	-	-	-
-	-	31.9	-	-	-	-
-	-	30.5	-	-	-	-
-	-	30.5	-	-	-	-
-	-	30.5	-	-	-	-

Ajuga chia	-	-	-	-	-	-	-	-	-	-
Limonium platyphyllum	-	-	-	-	-	-	-	18.9	-	-
Knautia arvensis	-	-	-	-	-	-	-	-	-	-
Linum euxinum	-	-	-	12.1	-	-	-	-	-	-
Syrenia cana	-	-	-	12.1	-	-	-	-	-	-
Erophila verna	-	-	-	-	-	-	12.0	-	-	-
Holosteum umbellatum	-	-	-	15.9	-	-	15.9	-	-	-
Verbascum densiflorum	-	2.0	-	-	-	-	-	-	-	-
Medicago lupulina	-	-	-	-	-	-	-	-	-	-
Alyssum desertorum	-	-	13.2	-	-	-	-	-	-	-
Poa compressa	-	-	-	-	-	-	-	-	12.2	10.8
Hylotelephium argutum	-	-	-	-	4.5	-	-	-	-	-
Linaria genistifolia	-	-	-	-	-	-	-	-	-	-
Leontodon autumnalis	-	-	-	-	-	-	-	-	-	-
Poa pratensis	-	-	-	-	-	-	-	-	-	-
Agrostis stolonifera	-	-	-	-	-	-	-	-	-	-
Trifolium repens	-	-	-	-	-	-	-	-	-	-
Tussilago farfara	-	-	-	-	-	-	-	-	-	-
Rorippa sylvestris	-	-	-	-	-	-	-	-	-	-
Trifolium hybridum	-	-	-	-	-	-	-	-	-	-
Ranunculus repens	-	-	-	-	-	-	-	-	-	-
Atriplex prostrata	65.9	-	-	62.5	-	-	-	17.9	-	-
Erodium cicutarium	63.4	-	5.0	-	-	-	3.8	-	-	-
Ecballium elaterium	-	-	-	51.2	-	-	-	33.6	-	-
Galium spurium	-	-	-	42.4	-	-	-	54.6	-	-
Artemisia taurica	-	1.1	-	33.8	-	-	-	-	-	-
Limonium meyeri	-	-	-	28.8	1.1	-	-	-	-	-
Asperugo procumbens	-	-	-	26.2	-	-	-	-	-	-
Calamagrostis epigejos	-	-	-	14.9	49.4	-	-	33.5	-	-
Elytrigia elongata	-	0.3	-	-	1.6	-	-	50.8	-	-
Cynanchum acutum	-	0.4	-	11.1	3.0	-	-	42.0	-	-
Vicia sativa s. amphicarpa	-	-	-	-	-	-	-	41.3	-	-
Epilobium tetragonum	-	-	-	-	-	-	-	40.8	-	-
Limonium gmelinii	-	2.7	-	-	2.9	-	-	38.9	-	-
Crepis sancta	-	-	-	9.4	-	-	-	29.0	-	-
Agropyron pectinatum	-	-	4.1	10.6	-	-	-	10.6	-	-
Falcaria vulgaris	-	-	-	-	-	-	-	-	-	5.0
Dactylis glomerata	-	-	-	4.4	-	8.6	8.3	18.0	-	-
Thesium arvense	-	-	-	-	-	-	-	-	-	-
Melica transsilvanica	-	-	-	-	-	-	-	-	-	-
Vicia cracca	-	-	-	-	-	-	-	-	3.6	11.4
Cirsium setosum	-	-	-	-	-	-	-	-	7.6	-
Bromopsis inermis	44.5	-	-	17.8	-	-	-	10.5	-	44.5
Sonchus oleraceus	-	-	-	38.6	-	-	-	38.6	-	-
Senecio vernalis	-	-	-	31.5	-	-	-	42.9	-	-
Cardaria draba	-	-	-	18.6	-	-	37.8	33.5	-	-
Veronica arvensis	-	-	-	-	-	-	28.3	-	-	-
Myosotis arvensis	-	-	-	7.1	-	-	-	34.3	-	-

Numbers of associations correspond to those given in the classification scheme

-	-	30.5	-	-	-	-
-	-	30.4	-	-	-	-
-	-	26.7	-	-	-	-
-	-	26.3	-	-	-	-
-	-	26.3	-	-	-	-
-	-	26.1	-	-	-	-
-	-	25.6	-	-	-	-
-	-	-	47.9	-	-	-
-	-	-	35.5	-	8.8	-
-	-	-	25.6	-	-	-
-	-	-	-	40.9	-	-
-	-	-	-	26.2	-	-
-	-	-	-	25.5	-	-
-	-	-	-	-	54.6	-
-	-	21.3	-	-	36.3	-
-	-	-	-	-	34.6	-
-	-	-	-	-	26.0	-
-	-	-	-	-	-	72.3
-	-	-	-	-	-	38.7
-	-	-	-	-	-	35.6
-	-	-	-	-	-	35.3
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
5.9	-	14.8	-	-	-	-
-	-	51.7	-	-	-	-
-	-	49.6	-	-	-	-
3.2	-	-	-	-	-	-
-	-	21.5	-	-	-	-
-	-	37.0	-	-	-	-
-	-	44.3	-	-	-	-
-	-	28.6	-	-	-	-
-	-	-	-	-	-	-
-	-	26.9	-	-	-	-
-	-	5.9	-	-	-	-
-	56.6	21.8	26.9	-	-	-
-	38.8	34.2	-	2.6	-	-
-	-	33.5	-	-	4.4	-
-	-	25.9	-	-	-	-
-	-	-	33.6	78.5	-	-
-	-	-	25.1	-	-	6.9
-	-	-	-	39.1	-	-
-	-	24.1	-	-	-	-
-	-	15.9	-	-	-	-
-	-	29.4	-	-	-	-
-	-	26.6	-	7.7	-	-
-	-	29.8	-	-	-	-
-	-	31.4	-	-	-	-

Continuation of table 1

Number of association	1.1.18	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.2.1	2.2.2
Numbers of relevés	4	49	103	19	81	12	49	27
Armeria ruscinonensis	100.0	-	-	-	-	-	-	-
Bellis perennis	96.2	-	-	-	-	-	-	-
Festuca regeliana	94.9	-	-	-	-	-	-	-
Thlaspi arvense	91.4	-	-	-	-	-	-	5.0
Anthriscus sylvestris	90.7	-	-	7.8	-	-	-	-
Vicia sativa	90.7	-	-	-	-	-	-	-
Papaver rhoeas	87.3	-	3.2	-	-	-	-	-
Erodium cicutarium	63.4	-	-	-	-	-	-	-
Viola hirta	-	30.0	-	-	7.2	-	-	-
Chenopodium urbicum	-	-	-	39.2	-	-	-	-
Angelica archangelica	-	-	-	25.7	-	-	-	-
Ballota nigra	-	13.3	-	10.5	29.1	11.5	-	-
Leonurus cardiaca	-	7.4	-	23.3	3.4	50.1	-	-
Aegopodium podagraria	-	-	-	-	-	37.1	-	-
Lolium perenne	-	-	-	-	3.6	37.0	5.5	-
Chaerophyllum aromaticum	-	-	-	-	-	29.1	-	-
Berteroa incana	-	-	-	-	-	-	37.3	-
Tragopogon major	-	-	-	-	-	-	-	36.3
Stachys recta	-	-	-	-	-	-	-	32.3
Euphorbia seguierana	-	-	-	-	-	-	-	31.0
Reseda lutea	-	-	3.9	-	-	-	-	30.2
Matricaria recutita	-	-	5.0	-	-	-	-	28.7
Silaum silaus	-	-	-	-	-	-	-	25.9
Campanula sibirica	-	-	-	-	-	-	-	25.1
Scariola viminea	-	-	-	-	-	-	-	-
Rumex patientia s. orientalis	-	-	-	-	-	-	-	-
Gypsophila perfoliata	-	-	-	-	-	-	-	-
Tragopogon major	-	-	-	-	-	-	-	-
Plantago arenaria	-	-	-	-	-	-	-	-
Anchusa officinalis	-	-	-	-	-	-	-	-
Humulus lupulus	-	-	-	-	-	-	-	-
Echium vulgare	-	-	-	-	-	-	15.7	-
Euphorbia cyparissias	-	-	-	-	-	-	-	-
Scabiosa ochroleuca	-	-	-	-	-	-	-	-
Conyza canadensis	-	-	-	-	-	-	11.0	15.9
Senecio jacobaea	-	-	-	-	-	-	-	-
Melilotus albus	-	-	-	-	-	-	-	-
Pastinaca sativa	-	-	-	-	-	-	-	-
Geranium sibiricum	-	-	-	-	-	-	-	-
Geum aleppicum	-	-	-	-	-	-	-	-
Crepis setosa	-	-	-	-	-	-	-	-
Carduus personata	-	-	-	-	-	-	-	-
Viola odorata	-	-	-	-	-	-	-	-
Lotus corniculatus	-	-	-	-	-	-	-	-
Persicaria hydropiper	-	-	-	-	-	14.5	-	-
Crepis biennis	-	-	-	-	-	-	-	-
Campanula rapunculoides	-	-	-	-	-	-	-	-

2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
41	30	2	35	219	23	16	2
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	22.5	-	-
-	-	-	-	-	11.7	-	-
-	-	-	8.8	-	-	-	-
-	-	-	8.2	3.1	-	-	-
-	-	-	12.6	6.5	-	-	-
-	-	-	20.8	3.2	-	-	-
-	-	-	-	8.0	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
31.0	-	-	-	-	-	-	-
-	31.4	-	-	-	-	-	-
-	31.0	-	12.4	15.8	-	-	-
-	-	70.0	-	-	-	11.1	-
-	-	56.6	-	-	-	13.0	-
-	-	52.1	-	-	-	-	-
-	-	50.9	-	-	-	-	-
-	-	42.2	13.0	11.5	-	-	-
-	-	41.1	-	-	5.4	-	-
-	-	-	27.8	-	-	-	-
-	12.5	-	25.8	5.2	10.6	-	-
-	9.4	-	25.1	-	-	-	-
9.6	-	-	-	34.2	-	-	-
-	-	-	-	-	71.5	-	-
-	-	-	-	-	49.1	-	-
-	-	-	-	-	46.3	-	-
-	-	-	-	-	45.3	-	-
-	-	-	-	-	39.4	-	-
-	-	-	-	-	35.5	-	-
7.2	-	-	-	-	32.6	-	-
-	-	-	-	-	31.3	-	-
-	-	-	-	-	29.3	-	-
-	-	-	-	-	29.3	-	-

Cruciata glabra	-	-	-	-	-	-	-	-
Eryngium planum	-	-	-	-	-	-	-	-
Acer negundo	-	9.3	-	-	8.3	-	-	-
Potentilla reptans	-	-	-	-	-	-	-	-
Cuscuta campestris	-	-	-	-	-	-	-	-
Chondrilla juncea	-	-	-	-	-	-	-	5.1
Plantago lanceolata	-	-	-	-	-	-	8.9	-
Raphanus maritimus	-	-	-	-	-	-	-	-
Rumex conglomeratus	-	-	-	-	-	-	-	-
Scleropoa rigida	-	-	-	-	-	-	-	-
Pulicaria paludosa	-	-	-	-	-	-	-	-
Linaria ruthenica	-	-	-	-	-	-	-	-
Poterium sanguisorba	-	-	-	-	-	-	-	-
Digitaria sanguinalis	-	-	-	-	-	-	-	-
Asparagus verticillatus	-	-	-	-	-	-	-	-
Papaver dubium	-	-	-	-	-	-	-	-
Vicia cracca	-	-	-	-	-	-	-	-
Cirsium setosum	-	-	-	-	-	-	-	40.3
Ranunculus repens	-	-	-	-	-	32.5	-	-
Arctium lappa	-	48.7	14.1	15.6	-	-	-	-
Artemisia vulgaris	-	-	25.0	-	-	16.0	5.2	-
Conium maculatum	-	-	-	59.5	1.6	-	-	-
Urtica dioica	-	2.1	4.0	14.7	4.6	25.9	-	-
Lathyrus tuberosus	-	-	-	-	-	-	-	39.8
Centaurea diffusa	-	-	-	-	-	-	-	-
Equisetum arvense	-	-	-	-	-	-	-	-
Picris hieracioides	-	-	-	-	-	-	-	5.2
Arrhenatherum elatius	-	-	-	-	-	-	-	-
Erigeron acris	-	-	-	-	-	-	-	8.0
Torilis arvensis	-	-	-	-	-	-	-	-
Poa annua	-	-	-	-	-	-	-	-
Bromopsis inermis	44.5	-	-	-	-	-	-	-
Sonchus oleraceus	-	-	-	-	-	-	-	-
Atriplex prostrata	48.2	-	-	-	0.1	-	-	-
Crepis rhoeadifolia	-	-	-	-	-	-	-	-
Lactuca tatarica	-	-	-	-	-	-	-	-
Picris pauciflora	-	-	-	-	-	-	-	-
Onopordum tauricum	-	-	-	-	-	-	-	-
Centaurea sterilis	-	-	-	-	-	-	-	-
Anisantha sterilis	43.9	-	0.6	-	-	-	-	-
Arctium tomentosum	-	-	0.5	-	-	33.6	-	-
Daucus carota	-	-	0.8	-	-	9.2	-	-
Sisymbrium orientale	-	-	-	-	-	-	-	-
Lamium purpureum	-	-	-	11.1	-	-	-	-
Erysimum cuspidatum	-	-	-	-	-	-	-	-
Melandrium album	37.6	-	-	-	-	-	0.4	-
Lepidium graminifolium	-	-	-	-	-	-	-	-
Anthemis tinctoria subsp. *subtinctoria*	-	-	-	-	-	-	-	-

-	-	-	-	-	28.3	-	-
-	-	-	-	-	27.4	-	-
-	-	-	-	4.0	27.0	-	-
-	-	-	-	-	26.7	-	-
-	-	-	-	-	-	48.0	-
-	-	-	-	0.6	-	39.1	-
15.6	-	-	-	-	10.7	25.2	-
-	-	-	-	-	-	-	100.0
-	-	-	-	-	-	-	100.0
-	-	-	-	-	-	-	100.0
-	-	-	-	-	-	4.3	97.0
-	-	-	-	-	-	4.3	96.5
-	-	-	-	-	6.6	-	95.8
-	-	-	-	-	-	-	90.5
-	-	-	-	-	-	-	86.4
-	-	-	-	-	-	-	84.9
-	-	-	-	3.0	33.4	-	-
-	-	-	19.5	11.2	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	7.7	-	-
-	-	-	-	-	5.2	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	9.5	-	-
-	-	-	7.3	3.7	-	-	-
26.1	-	-	4.4	-	-	-	-
-	-	66.6	-	-	30.5	-	-
-	-	45.2	17.1	1.9	-	-	-
-	-	43.2	-	-	17.6	-	-
-	6.9	-	55.3	5.4	-	-	-
-	-	-	-	-	3.5	-	68.0
-	-	-	-	-	-	-	56.5
-	-	-	-	-	-	-	-
-	-	-	-	-	2.1	-	43.4
-	-	-	-	-	-	-	-
4.4	50.8	-	12.0	7.6	-	-	-
-	40.9	-	21.4	-	-	-	-
-	-	-	-	-	-	-	56.7
-	-	-	-	-	-	-	56.4
-	-	-	-	-	-	0.5	55.6
8.8	-	-	-	-	-	-	43.9
-	-	-	-	-	-	-	-
16.2	-	30.3	2.4	-	28.7	-	-
-	-	-	-	-	-	-	48.2
-	-	-	-	-	0.1	-	43.9
-	-	-	-	-	-	-	43.1
-	-	-	-	-	-	3.2	-
-	-	-	-	-	-	-	42.8
7.8	-	-	-	-	-	-	40.9

Continuation of table 1

Number of association	2.2.11	2.2.12	2.2.13	2.2.14	2.3.1	2.3.2	2.3.3
Numbers of relevés	5	9	3	35	350	22	5
Myosotis ramosissima	61.9	-	-	-	-	-	-
Scariola viminea	44.4	-	-	-	-	-	-
Minuartia hybrida aggr.	44.4	-	-	-	-	-	-
Linum tenuifolium	44.4	-	-	-	-	-	-
Achnatherum bromoides	44.4	-	-	-	-	-	-
Erophila praecox	44.4	-	-	-	-	-	-
Medicago denticulata	44.4	-	-	-	-	-	-
Torilis radiata	44.4	-	-	-	-	-	-
Taraxacum hybernum	44.4	-	-	-	-	-	-
Clypeola jonthlaspi	44.4	-	-	-	-	-	-
Ballota nigra	44.4	-	-	-	-	-	-
Festuca callieri	44.4	-	-	-	-	-	-
Trigonella gladiata	44.4	-	-	-	-	-	-
Arabis auriculata	44.4	-	-	-	-	-	-
Trifolium hirtum	44.4	-	-	-	-	-	-
Myosotis incrassata	44.4	-	-	-	-	-	-
Vicia bithynica	44.4	-	-	-	-	-	-
Lunaria annua	44.4	-	-	-	-	-	-
Cuscuta europaea	44.4	-	-	-	-	-	-
Bromopsis riparia	43.8	-	-	-	-	-	-
Inula conyzae	43.3	-	-	-	-	-	-
Clinopodium vulgare	40.5	-	-	5.0	-	-	-
Sisymbrium officinale	39.0	-	-	-	0.8	-	-
Hordeum murinum	36.0	-	-	-	-	-	-
Anagallis arvensis	33.1	-	-	-	-	-	-
Sonchus asper	33.0	-	-	-	-	-	-
Arenaria leptoclados	32.0	-	-	0.3	0.5	-	-
Alliaria petiolata	29.6	-	-	-	-	-	-
Viola tricolor	-	67.6	-	-	-	-	-
Myosotis micrantha	-	49.8	-	-	-	-	-
Centaurea cyanus	-	32.4	-	-	-	-	-
Luzula pallescens	-	30.7	-	-	-	-	-
Cerastium glomeratum	-	30.2	-	-	-	-	-
Bunias orientalis	-	-	89.0	-	-	-	-
Ranunculus polyanthemos	-	-	71.6	-	-	-	-
Vicia sepium	-	-	71.5	-	-	-	-
Heracleum sibiricum	-	-	71.2	-	-	-	-
Vicia angustifolia	15.9	-	57.8	-	-	-	-
Neslia paniculata	-	-	57.4	-	-	-	-
Lamium maculatum	-	-	57.2	-	-	-	-
Glechoma hederacea	-	-	56.0	-	-	-	-
Chaerophyllum hirsutum	-	-	55.9	-	-	-	-
Geranium pratense	-	-	48.3	-	-	-	-
Atriplex patula	-	-	45.3	-	-	-	-
Geranium dissectum	-	-	42.3	-	-	-	-
Arenaria serpyllifolia	21.5	-	36.9	-	-	-	-
Cirsium vulgare	-	-	35.5	-	-	13.6	-

2.3.4	2.3.5	2.3.6	2.3.7	2.3.8
43	39	25	10	19
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	14.5	-	-
-	-	-	-	-
6.9	-	-	-	-
-	-	-	-	-
-	4.4	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	16.2	-
-	-	-	-	-
-	1.2	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	2.9	1.6	-	-
-	-	-	-	-
-	-	-	-	-
2.0	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	2.8	-	-

Phalacroloma annuum	-	-	34.1	-	-	11.9	-
Fallopia convolvulus	-	-	32.8	1.2	-	-	-
Geum urbanum	-	-	31.1	-	-	-	-
Festuca pratensis	-	-	29.6	-	-	-	-
Capsella bursa-pastoris	-	1.7	29.6	-	-	9.8	-
Geranium pusillum	-	-	29.0	-	-	-	-
Asclepias syriaca	-	-	-	98.5	-	-	-
Otites chersonensis	-	-	-	33.5	-	-	-
Grindelia squarrosa	-	-	-	2.0	39.5	-	-
Helianthus decapetalus	-	-	-	-	-	51.9	-
Bidens radiata	-	-	-	-	-	42.3	-
Atriplex oblongifolia	-	-	-	-	-	36.6	-
Euphorbia stricta	-	-	-	-	-	36.6	-
Mentha pulegium	-	-	-	-	-	35.9	-
Chaiturus marrubiastrum	-	-	-	-	-	29.9	-
Salvia verticillata	-	-	-	0.1	-	-	79.0
Oberna behen	-	-	-	-	-	-	67.4
Deschampsia cespitosa	-	-	-	-	-	-	53.7
Ranunculus acris	-	-	-	-	-	-	53.3
Centaurea jacea	-	-	-	-	-	-	48.9
Thymus pulegioides	-	-	-	-	-	-	40.3
Trifolium pratense	-	-	-	6.6	-	-	36.7
Pimpinella saxifraga	-	-	-	3.8	-	-	32.7
Thalictrum minus	-	-	-	-	-	-	-
Ceratocephala testiculata	-	-	-	-	-	-	-
Achillea pannonica	-	-	-	-	7.6	-	-
Onobrychis tanaitica	-	-	-	-	-	-	-
Onopordum acanthium	-	-	-	-	0.6	-	-
Achillea nobilis	-	-	-	-	0.1	-	-
Koeleria cristata	-	-	-	7.0	1.6	-	-
Hieracium virosum	-	-	-	-	-	-	-
Seseli campestre	-	-	-	-	-	-	-
Agropyron pectinatum	-	-	-	-	1.8	-	-
Cirsium ukranicum	-	-	-	-	-	-	-
Euphorbia virgata	19.6	-	-	-	-	-	-
Cirsium setosum	4.5	0.5	-	-	-	-	-
Sonchus arvensis	25.9	-	-	1.5	3.1	-	-
Bromus commutatus	-	-	65.5	-	-	-	-
Epilobium tetragonum	-	-	-	-	-	-	-
Medicago minima	28.5	-	-	-	0.1	-	-
Arctium lappa	-	-	31.3	-	-	-	-
Conium maculatum	-	-	-	-	-	-	-
Chenopodium urbicum	32.7	-	-	-	-	-	-
Equisetum arvense	-	-	-	1.3	-	-	-
Picris hieracioides	-	39.8	-	-	-	-	-
Arrhenatherum elatius	-	-	28.1	-	-	-	-
Verbascum lychnitis	-	-	-	-	0.7	-	-
Erigeron acris	-	-	-	-	-	-	-
Galium aparine	-	-	34.4	1.5	3.9	-	-
Vicia varia	54.9	-	-	-	-	-	-
Stellaria media	33.3	-	27.4	-	-	-	-

8.4	-	-	-	-
0.7	-	2.4	-	-
-	-	6.1	-	-
13.5	-	-	-	-
-	6.4	4.2	-	-
-	-	5.5	-	-
-	-	-	-	-
-	-	-	-	-
-	-	6.4	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	3.0	-	-
-	2.2	-	-	-
-	-	-	-	-
-	-	3.6	-	-
-	-	-	-	-
-	10.7	-	-	-
-	-	-	-	-
26.2	-	-	-	-
-	32.6	-	-	-
-	29.1	-	-	-
-	25.7	-	-	-
3.9	18.9	67.4	-	-
-	1.4	-	72.7	9.4
-	-	-	42.1	6.4
-	-	-	31.0	-
-	-	-	30.0	-
-	6.2	-	29.2	-
1.9	12.9	-	26.3	-
-	-	-	8.9	31.9
-	-	-	-	30.9
-	1.0	-	-	1.1
-	-	-	-	-
-	6.7	-	57.9	-
-	-	-	-	-
7.3	4.4	-	-	-
-	-	2.0	-	-
-	-	-	-	-
-	-	2.9	-	-
4.1	2.4	-	-	11.6
-	-	-	-	-
0.2	7.3	-	36.5	0.6
-	7.7	-	39.0	6.4
-	-	12.5	-	-
-	-	-	-	-
-	-	1.5	-	-

Hordeum bulbosum	30.1	-	-	-	-	-	-
Arctium minus	25.1	-	-	-	-	-	25.1
Veronica chamaedrys	-	25.9	25.9	0.2	-	-	-
Xanthium strumarium	-	-	-	-	-	68.1	-
Setaria glauca	-	-	-	-	-	35.4	-
Carduus acanthoides	-	-	-	2.1	3.1	-	9.7
Dactylis glomerata	-	-	34.8	-	-	-	10.9
Veronica arvensis	-	-	31.6	-	-	-	-
Myosotis arvensis	-	-	28.2	-	-	-	-
Urtica dioica	4.5	-	25.3	3.2	-	-	-
Lathyrus tuberosus	-	-	-	1.7	-	-	-
Crepis rhoeadifolia	-	-	-	-	-	-	-
Lactuca tatarica	-	-	-	-	-	-	-
Vicia cordata	45.6	-	-	-	-	-	-
Veronica hederifolia	34.8	-	-	-	-	-	-
Carduus arabicus	31.4	-	-	-	-	-	-
Artemisia vulgaris	0.1	27.0	-	4.9	-	-	6.8
Artemisia absinthium	-	-	14.8	3.3	0.7	-	6.1
Anisantha sterilis	26.1	-	-	-	-	-	-
Daucus carota	-	32.4	-	-	-	6.6	2.1
Lamium purpureum	-	-	43.9	-	-	-	-

Continuation of table 1

Number of association	2.3.9	2.3.10	2.3.11	2.3.12	2.3.13	2.3.14	2.4.1
Numbers of relevés	35	57	2	2	6	7	2
Artemisia absinthium	25.7	-	-	-	-	-	-
Tanacetum vulgare	-	55.1	-	-	-	-	-
Phleum pratense	-	25.1	-	-	-	-	-
Ficus carica	-	-	100.0	-	-	-	-
Anthemis altissima	-	-	92.2	-	-	-	-
Pimpinella peregrina	-	-	87.2	-	-	-	-
Hibiscus trionum	-	-	-	100.0	-	-	-
Solanum alatum	-	-	-	100.0	-	-	-
Chenopodium album	-	-	-	100.0	-	-	-
Datura stramonium	-	-	-	97.6	-	-	-
Cynodon dactylon	-	-	-	90.6	-	-	-
Abutilon theophrasti	-	-	-	70.4	-	-	-
Kickxia caucasica	-	-	-	70.4	-	-	-
Amaranthus blitoides	-	-	-	70.4	-	-	-
Cuscuta tinei	-	-	-	70.4	-	-	-
Heliotropium europaeum	-	-	-	70.0	-	-	-
Amaranthus retroflexus	-	2.8	-	54.5	16.0	-	-
Echinochloa crus-galli	-	-	-	46.5	-	-	-
Juncus tenuis	-	-	-	-	53.3	-	-
Carex praecox	-	-	-	-	50.3	-	-
Bidens tripartita	-	-	-	-	47.6	-	-
Verbascum species	-	-	-	-	40.5	-	-
Trifolium dubium	-	-	-	-	40.5	-	-
Digitaria ischaemum	-	-	-	-	39.6	-	-

-	-	-	-	-
1.7	-	3.9	-	-
-	-	7.9	-	-
-	-	-	-	-
-	-	-	-	-
-	32.5	6.7	-	-
2.3	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	2.4	4.5	-	-
-	4.9	-	-	45.3
0.3	-	-	50.8	30.8
-	-	-	37.0	33.1
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
0.4	-	5.5	-	7.5
25.7	9.8	-	15.9	10.2
-	-	-	-	-
0.7	-	-	-	-
-	-	-	-	-

2.4.2	2.4.3	2.4.4	2.5.1	2.5.2
2	2	2	2	2
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Amaranthus caudatus	-	-	-	-	39.4	-	-
Chenopodium glaucum	-	-	-	-	38.6	-	-
Bidens frondosa	-	-	-	-	38.0	-	-
Geranium divaricatum	-	-	-	-	35.2	-	-
Artemisia abrotanum	-	-	-	-	35.1	-	-
Artemisia annua	-	-	-	-	28.3	-	-
Zygophyllum fabago	-	-	-	-	-	75.2	-
Diplotaxis muralis	-	-	-	-	-	57.6	-
Anisantha tectorum	6.4	-	-	-	-	27.0	-
Cistus tauricus	-	-	-	-	-	-	100.0
Fibigia clypeata	-	-	-	-	-	-	100.0
Carduus nutans	-	-	-	-	-	-	100.0
Stachys velata	-	-	-	-	-	-	100.0
Convolvulus cantabrica	-	-	-	-	-	-	98.6
Lathyrus sphaericus	-	-	-	-	-	-	97.4
Geranium molle	-	-	-	-	-	-	97.4
Caucalis platycarpos	-	-	-	-	-	-	94.4
Inula oculus-christi	-	-	-	-	-	-	92.8
Teucrium chamaedrys	-	-	-	-	-	-	85.3
Medicago orbicularis	-	-	-	-	-	-	-
Psoralea bituminosa	-	-	-	-	-	-	-
Centaurea salonitana	-	-	-	-	-	-	-
Rhagadiolus edulis	-	-	-	-	-	-	-
Papaver hybridum	-	-	-	-	-	-	-
Mercurialis annua	-	-	-	-	-	-	-
Vicia lathyroides	-	-	-	-	-	-	-
Verbena officinalis	-	-	-	-	-	-	-
Torilis nodosa	-	-	-	-	-	-	-
Fumaria schleicheri	-	-	-	-	-	-	-
Eupatorium cannabinum	-	3.2	-	-	-	-	-
Ornithogalum ponticum	-	-	-	-	-	-	-
Alopecurus vaginatus	-	-	-	-	-	-	-
Scutellaria albida	-	-	-	-	-	-	-
Ornithogalum fimbriatum	-	-	-	-	-	-	-
Vicia dalmatica	-	-	-	-	-	-	-
Brachypodium rupestre	-	-	-	-	-	-	-
Poa taurica	-	-	-	-	-	-	-
Medicago arabica	-	-	-	-	-	-	-
Trifolium leucanthum	-	-	-	-	-	-	-
Veronica triphyllos	-	-	-	-	-	-	-
Buglossoides arvensis	-	-	-	-	-	-	-
Crepis foetida	-	-	-	-	-	-	-
Xeranthemum cylindraceum	-	-	-	-	-	-	-
Echium biebersteinii	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-
Veronica persica	-	-	-	-	-	-	-
Anthemis ruthenica	-	-	-	-	-	-	-
Odontites vulgaris	-	-	-	-	-	-	-
Scandix pecten-veneris	-	-	-	-	-	-	-
Avena ludoviciana	-	-	-	-	-	-	-
Carex hallerana	-	-	-	-	-	-	-

-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
100.0	-	-	-	-
100.0	-	-	-	-
95.0	-	-	-	-
-	100.0	-	-	-
-	99.8	-	-	-
-	98.2	-	-	-
-	97.4	-	-	-
-	96.9	-	-	-
-	95.3	-	-	-
-	94.6	-	-	-
-	94.3	-	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	100.0	-	-
-	-	99.5	-	-
-	-	89.1	-	-
-	-	-	100.0	-
-	-	-	99.9	-
-	-	-	97.8	-
-	-	-	97.3	-
-	-	-	96.9	-
-	-	-	85.6	-
-	-	-	78.7	-
-	-	-	-	100.0
-	-	-	-	100.0
-	-	-	-	100.0

Veronica polita	-	-	-	-	-	-	-
Poa bulbosa	-	-	-	-	-	-	-
Diplotaxis tenuifolia	0.8	-	-	-	-	-	-
Asperugo procumbens	-	-	79.2	-	-	-	-
Thesium arvense	-	-	-	-	-	-	-
Conium maculatum	-	-	-	-	-	-	-
Torilis arvensis	-	-	-	-	-	-	-
Poa annua	-	-	-	-	-	-	-
Vicia varia	-	-	-	-	-	-	-
Clematis vitalba	-	-	-	-	-	-	-
Crepis micrantha	-	-	-	-	-	-	-
Hordeum bulbosum	-	-	-	-	-	8.9	-
Rumex crispus	-	3.8	-	-	-	-	-
Xanthium strumarium	-	-	-	-	68.1	-	-
Setaria glauca	-	-	-	39.2	-	-	-
Rorippa austriaca	-	-	79.3	38.5	-	-	-
Xanthium californicum	-	-	71.0	34.3	-	-	-
Xanthium spinosum	-	-	67.0	67.0	-	-	-
Malva sylvestris	-	-	-	-	-	66.7	66.7
Cynosurus echinatus	-	-	-	-	-	-	70.1
Stachys iberica	-	-	-	-	-	-	70.1
Geranium rotundifolium	-	-	-	-	-	-	70.0
Veronica hederifolia	-	-	-	-	-	-	68.3
Teucrium polium	-	-	-	-	-	-	67.9
Carduus arabicus	-	-	-	-	-	24.3	60.6
Eryngium campestre	-	-	-	-	-	-	46.5
Helianthemum stevenii	-	-	-	-	-	-	-
Physocaulis nodosus	-	-	-	-	-	-	-
Salvia sibthorpii	-	-	-	-	-	-	-
Atriplex prostrata	-	-	-	-	-	-	-
Picris pauciflora	-	-	-	-	-	-	56.7
Onopordum tauricum	-	-	-	-	-	-	-
Centaurea sterilis	-	-	-	-	-	-	-
Vicia cordata	-	-	55.7	-	-	-	-
Cirsium sublaniflorum	-	-	-	-	-	-	61.0
Hordeum leporinum	-	-	58.4	-	-	-	-
Verbascum marschallianum	-	-	-	-	-	-	56.7
Cruciata taurica	-	-	-	-	-	-	56.5
Poterium polygamum	-	-	-	-	-	-	56.5
Inula aspera	-	-	-	-	-	-	-
Anisantha sterilis	-	-	-	-	-	-	-
Arctium tomentosum	-	0.5	41.2	-	-	-	-
Sisymbrium orientale	-	-	-	-	-	-	-
Lamium purpureum	-	-	-	-	-	-	43.9
Foeniculum vulgare	-	-	-	-	-	-	47.3
Lapsana intermedia	-	-	48.2	-	-	-	48.2
Calamintha parviflora	-	-	-	-	-	-	48.6
Erysimum cuspidatum	-	-	-	-	-	-	43.1
Melandrium album	-	-	37.6	-	-	-	-
Lepidium graminifolium	-	-	-	-	-	-	42.8
Anthemis subtinctoria	-	-	40.9	-	-	-	40.9

-	-	-	-	97.5
-	-	-	-	73.1
-	61.3	-	-	-
-	-	-	-	-
-	-	86.4	-	-
-	-	-	-	59.5
-	-	-	68.0	-
56.5	-	-	-	-
-	-	66.0	-	-
-	-	63.2	-	-
-	62.4	-	-	-
76.2	-	-	-	-
-	61.3	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
70.1	-	-	-	-
-	-	-	-	70.1
-	-	-	70.0	-
-	68.3	-	-	-
-	-	67.9	-	-
60.6	-	-	-	-
46.5	-	-	-	-
70.1	-	-	70.1	-
-	-	-	70.1	70.1
-	-	-	70.1	70.1
-	48.2	48.2	-	-
56.7	-	-	-	-
56.4	56.4	-	-	-
-	-	55.6	55.6	-
-	-	-	-	55.7
-	61.0	-	-	-
-	-	-	-	58.4
-	56.7	56.7	-	-
56.5	56.5	-	-	-
-	-	56.5	56.5	-
-	56.7	56.7	-	56.7
-	43.9	-	-	-
-	-	41.2	41.2	-
-	48.2	48.2	48.2	-
-	-	-	-	43.9
-	-	-	47.3	47.3
48.2	48.2	-	-	-
48.6	-	48.6	-	48.6
43.1	43.1	-	-	-
-	37.6	37.6	37.6	-
-	42.8	-	42.8	42.8
-	-	-	40.9	-