Thaiszia - J. Bot., Košice, 6: 49-66, 1996

THAISZIA
Journal of Botany

Distribution and plant communities of *Daphne cneorum* and *Daphne sophia* in Ukraine

VICTOR MELNIK

Central Botanic Garden, Ukrainian Academy of Sciences, Timiryazevska str. 1, Kiev, 252014 Ukraine; phone: +7 044 2955475

MELNIK V. (1996): Distribution and plant communities of *Daphne cneorum* and *Daphne sophia* in Ukraine. – Thaiszia - J. Bot., Košice, 6: 49-66. – ISSN 1210-0420.

ABSTRACT: On the basis of the analysis of plant communities with two relict species of the flora of Ukraine, *Daphne cneorum* L. and *Daphne sophia* KALENICZ. *(Thymelaeaceae)* ecological and sociological character of their habitats was determined. Four types of *Daphne cneorum* habitats in Ukraine were chosen; they are oak-pine and pine forests of Polesye, beech-pine forests of Rostochia, pine cretaceous forests and extrazonal petrophilous steppes of Volhynia-Podolia. It was found that Daphne sophia grows in an ecotone between pine, oak-pine forests and steppe slopes vegetations of cretaceous rocks. In the connection with substitution of natural forests by secondary and with terracing of slopes, populations of *Daphne cneorum* and *Daphne sophia* are in decline. Recommendations on improving nature-reserve network of Ukraine by organizing reserves for two relict species of Daphne are proposed.

KEYWORDS: rare and endangered species, relict, endemic, populations, habitat, community, ecotone.

Introduction

Two of the three species of the genus *Daphne* in natural flora of Ukraine are rare relicts: *Daphne cneorum* L. and *Daphne sophia* KALENICZ. The third species - *Daphne mezereum* L. is a common forest species in Ukraine. *Daphne cneorum* and *Daphne sophia* are rare species not only for Ukraine, but for the whole of Europe, the first included into the list of species protected in 15 countries of Europe (MELNIK 1991a), the second (endemic of Middle Russian upland) is protected in Russia too (Krasnaja Kniga 1984, 1988). But no country of Europe provides protection of the whole of species, germplasm diversity. An obstacle for the protection is insufficiently studied species

ecology. In Ukraine, where most of the species habitats in East Europe are concentrated, only the data of species chorology (MELNIK 1986) and a partial information about ecological-coenotic pecularities of the species in different parts of area are summarized (DIDUKH 1974; TEMCHENKO et. al. 1986; MELNIK 1991b, 1993, 1994). The data about *Daphne sophia* growing in Ukraine are also fragmentary (SMOLKO 1967; ERMOLENKO et. al. 1981; TKACHENKO & PARACHONSKA 1987).

The purpose of our investigation was the study of distribution and plant communities of relict species from genus *Daphne* in the flora of Ukraine and to establish scientific basis for their protection.

Methods

Field studies were carried out in the period 1978-1994 at *Daphne cneorum* habitats (Lvov, Volhynia, Rivne, Kiev and Tcherkasy regions) and in *Daphne sophia* habitat (Kharkiv region). Phytocoenological descriptions of plant formations and associations were performed in accordance with the methods and principles of the Russian geobotanical school.

Results

Daphne cneorum

Daphne cneorum is a European species, its dispersion range involving Atlantic and Middle Europe, West Mediterranean, the Balkans, South-West part of East European Plain, where the species grows in three distant parts of area in Volhynia-Podolia and in the West of Ukrainian Polesye; Pridneprovye; Middle Russian upland and remote local habitats of Gomel region in Belarus and in Bryansk region of Russia (MELNIK 1986). Pridneprovian fragment of area outlined in the West by the line joined towns Bila Tserkwa, Korsun Shevchenkovskij, Smila, Tcherkassy, in the South the line of area goes along lower streams of the rivers Ros and Tyasmin and in the East almost coincides with the Dnieper valley. On the left banks of Dnieper *Daphne cneorum* in habits coniferous terrace on the line of villages Kijlov - Stare - Soshnikovo of Borispol district in Kiev region and village Liplyava, Zolotonosha district in Tcherkassy region. Single Polesian habitat in this fragment of area preserved till now is in the Vovcha plain between villages Vieta and Kozin near Kiev.

Volhynian-Podolian fragment of area is limited by settlements in the North of village Verchy Kamin - Kashyrski district of Volhynia region to village Troyanivka Manevichi district of Volhynia region and town Derazhno Kostopol district Rivne region, then the limit turns to the South till town Malynsk Berezne district, the same region and further till town Gorodnitsa Zhytomir region, town Slavuta Kchmelnitzki region and town Kremenetz Ternopil region, then it turns to the South-West. South boundary goes from Kremenetz to town Zolotchiv and village Zavadiv (Zolotchiv district, Lvov region), settlement Frankove near Lvov. Volhynian-Podolian fragment of area forms a single whole with Polish habitats on Lublin an Kracow-Wielun (BROWICZ & GOSTYNSKA-JAKUSZEWSKA 1967; BROWICZ 1968). Since in the environs of towns Gorodnitsa and Kremenetz the species was not found in this century and the last herbaceous selections in

environs of Slawuta belongs to 1904 (Herbarium LWS), we must state that the eastern boundary of Volhynian-Podolian part of area retreated to Rivne region.

Most of *Daphne cneorum* habitats in Ukraina are in pine and oak-pine forests. The basic tracts of pine and oak-pine forests tracts in Ukraine are mainly concentrated in Polesye. *Daphne cneorum* habitats are adjoined to pine and oak-pine forests of West Polesye, where species grows on the area about 2000 ha in Manevichy, Sofiyanivka, Cherevacha forestries, Manevichy timber enterprise, in Borovsk and Troyanovsk forestries of Gorodok timber enterprise in Manevichy district of Volhynia region. Around this compact massif *Daphne cneorum* is found in separate locations.

Pine and oak-pine forests are found as separate remote localities in forest-steppes. The largest one is on coniferous forest terraces of Dnieper including famous Big Tcherkasy Forest. In this part of area the main massif of *Daphne cneorum* concentrates in Ruska-Polyana, Dubiji, Bilozirja, Swidivok, Dachny, Tjasmin forestries of Tcherkasy timber enterprise, where species occupies area about 1000 ha. In Kumejki, Jasnoosersk forestries, Korsun-Schevczenkovsij timber enterprise, in Mogilyany forestry of Tcherkasy timber enterprise and Michaylovsky forestry of Kaniv forest station the species are found as separate localities.

Daphne cneorum habitats in Polesye and Pridneprovye are on sandy and sandy-loam depositions of water-glacial nature, which lie on carbonate rock (chalks, limestones). Soils are fresh, turt-middle podzol. According to heterogeneity of edaphic conditions in habitats a differentiation is observed of pine and oak-pine forests with *Daphne cneorum* into associations of *Pinetum varioherboso-hylocomiosum, Pinetum vaccinioso-hylocomiosum, Querceto-Pinetum cytiso herbosum, Querceto-Pinetum pteridioso-herbosum, Querceto-Pinetum daphnosum* (DIDUKH 1974; MELNIK 1986; TEMCHENKO et.al 1986). Any significant differences were not observed in the character of plant cover in *Daphne cneorum* habitats forest of Polysye and Pridneprovye (Tab. 1). But *Acer tataricum* and *Centaurea sumensis* (endemic of the East-European plain) are absent in forests of Polesye, and middle European species *Lembotropis nigricans* and *Melittis melisophyllum* are absent in forests of Pridneprovye.

Daphne cneorum habitat in beech-pine forests in Stradchansk forestry near Lvov is unique. Forest communities formed by *Fagus sylvatica* and *Pinus sylvestris* are very rare in East Europe. Their distribution is limited by north-west of Podolia upland, known under the name Roztochja in the extreme west of plain part of Ukraine by the bounds of Lvov region. In spite of unique character of beech-pine forests of Roztochja, they are close to oak-pine forests of West Polesye by floristic and coenotic features. They localize to the height forms of relief and fresh turf-podzol soils, that on the depth of 40-15 cm lies upon carbonate rocks. Exept *Fagus sylvatica* floristic composition of these forest was formed by typical species of Polessian pine and subpine forests *Pinus sylvestris, Vaccinum myrtillus, Vaccinum vitis-idaea, Lycopodium annotinum, Maiantemum bifolium, Trientalis europaea, Pteridium aquilinum* and some other species. *Daphne cneorum* grows there as two small clones. Steppe communities with *Daphne cneorum* preserved on extreme North of Lvov region on the hills of mountains Bila near villages Pidhaya, Lysa between villages Czervone and Majdan, Svjata near villages Bilij Camin, Zolotchiv district, Julicka near town Zolochiv), Makitra near villages Suhovola and Buchino, Brody district and on hills of the mountains Lysa and Kvitucza in the environs

of Mylcza village in Dubno district, Rivne region in the South of Volhynia upland. In spite of the narrow strip of Male Polesye dividing Podolian upland from Volhynia, steppe communities of both regions represent essentially a single whole in respect to phytocenology, the conditions of *Daphne cneorum* habitats in steppe groups are similar too (Podolia and Volhynia upland). Mountains of both uplands consist of cretaceous rocks in the base of mountains covered by loess loams with thickness of 0,1-0,5 m. Soils are turf-carbonate. Vegetation cover slopes of south-east expositions is a meadow steppe with communities of *Cariceta humilis, Festuceta valesiacae, Stipeta capillatae* (MELNIK 1991, 1993). Phytocoenotic character of steppe communities with *Daphne cneorum* in the North-West of Podolia and in the South of Volhynia uplands are cited in Tab. 2.

Daphne sophia

In the single Ukrainian locality of *Daphne sophia* as the environs of Jefremovka (sq. 20-21 of Jefremovka forestry) the species grows on slope of gully near valley of river Vovchia. The slope has South-West exposition with steepness 10-15°. Soils are turf-carbonate. *Daphne sophia* habitat is closed to brushwoods on joint of forests, steppe and cretaceous individuals of *Quercus robus, Acer tataricum, Pyrus communis, Tilia cordata.* The dense shrub layer is formed by forest shrubs *Corylus avellana, Euonymus verrucosa, E. europaea, Viburnum opulus,* steppe bushes *Cerasus fruticosa, Caragana frutex, Genista tanaitica* and *Daphne sophia.*

Herb layer (projective cover age 20-30%) is represented by forest herbs: *Brachypodium pinnatum, Pteridium aquilinium, Polygonatum odoratum, Melampyrum arvense, Asarum europeum, Galium boreale, Epipactis helleborine,* meadow-steppe plants - *Bupleurum falcatum, Carex humilis, Silene latifolia, Anthemis tinctoria, Helictotrichon pubescens, Carlina biebersteinii, Anemone sylvestris, Iris hungarica, Stipa pennata, Pedicularis kaufmanii, Ornithogalum kochii, Vinca herbacea* and cretaceous species *Rhinanthus cretaceus. Polygala cretacea.*

Discussion

Daphne cneorum

PACZOSKI (1910), SZAFER (1923, 1929), KOCZWARA (1925), KORNAŚ (1948) and WALTER (1974) attributed *Daphne cneorum* among tertiary relicts of Volhynia-Podolia, and WULF (1944) regarded then as relicts of Middle-Russian upland. KOZO-POLYANSKY (1931) and KLEOPOV (1928) considered it glacial relict of Middle Russian upland. DOROFEEW (1986) found fossil seeds of *Daphne cneorum* in sediments of upper pliocene and in depositions of lower pleistocene accompanied by fossil remainders of *Betula humilis.* Therefore it seems evident that this tertiary relict later belonged to vegetation of Pleistocene. Besides Middle-Russion and Volhynia-Podolia uplands after glaciations the species was preserved in the Carpathians (except Ukrainian Carpathians), Balkans, Alps and Pyrenees. From these refuges it settled in adjacent territories in Mindel-Ris interglacial and in postglacial periods. From the Pyrenees it penetrates to South-West of France from the Carpathians into plains of Roumania and South of Poland, from

Volhynia-Podolia to Polesye and Pridniprovye in Ukraine, to Lublin and Kracow-Wielun uplands, Sandomir hollow in Poland (AYMONIN 1952a,b; GLASEK 1969; MELNIK 1986, 1991; WITSCHEL, SEYBOLD 1986 and other). Thus, *Daphne cneorum* is a typical migratory relict.

Long ago RACIBORSKI (1910) considered relict pine forests in North-West of Podolia upland between towns Zolochiv (Lvov region) and Kremenetz (Ternopol region) as initial habitats of *Daphne cneorum*. KOCZWARA (1925) described two plots of relict pine forests in Podolia with *Daphne cneorum* in grass-shrubby layer in mountains Sviata and Zulitska. Now these sites plots are lack. Steppe communities with *Daphne cneorum* (Tab. 2) are retained till now. Vegetative cover is not very different from vegetation of grass-shrubby layer in relict pine forests described by KOCZWARA (1925).

Relict cretaceous pine-forest of 300 ha preserved near village Krupetz (Radivilon district, Rivne region) in Volhynia upland. Here *Daphne cneorum* grows together with species characteristic of Volhynian steppe communities of *Lembotropis nigricans, Linum flavum, Helianthenum nummularium, Adonis vernalis* and other species (ANDRIENKO 1987).

KOCZWARA (1925) comes to the conclusion about relict character of meadow-steppe vegetation in Podolia and noted relations with neogenic pine forests. SHELYAG-SOSONKO et.al. (1975) elaborates this opinion in more detail and showed that initial Podolian steppes were formed after decumbation of woody layer in submediterranean forests. These forests were distributed in Podolia in the end of neogene. For this, in particular, is the fact that *Daphne cneorum* is characteristic species among submediterranean forest (JAKUCZ 1961).

Phytogeografical and paleontological data show that not only on the territory of Volhynia-Podolia, but in the whole Europe extrazonal steppes are derivatives of relict pine forests. WITSCHEL (1980) studied in detail meadow steppes of Baden-Würteberg region in Germany. Initial sites of South exposure with rocks on the soil surface are represented by communities where *Carex humilis* pre dominates.

According to WITSCHEL (1980, 1984), WITSCHEL & SEYBOLD (1986) *Daphne cneorum* does not grow on cultivated meadows, and in secondary steppe communities, it is indicator of primary communities in central Europe. This species and *Pulsatilla vulgaris* with leafstem mosses *Hylocomium splendens* and *Pleurozium schreberi* indicate relation of meadowsteppe with relict-pine forests *Cytiso-Pinetum*, that preserved in Baden-Württemberg from neogene. Such site of extrazonal steppe vegetation with *Daphne cneorum* and relict pine forests are known on the territory on France, Switzerland, Italy, Yugoslavia, Romania (GAJEWSKI 1937; AYMONIN 1959; HEGI 1975; WITSCHEL & SEYBOLD 1986).

Relict pine forests are related to meadow-steppes of Middle Europe and Volhynia-Podolia and to so called "Lower Alps" Middle-Russian upland - calciphilous-steppe communities. The main edificators are *Carex humilis* with *Daphne cneorum* and other relict species (VASILCZENKO 1977, 1981a,b). Now it was formed that the "Lower Alps" region is not a relict of glacial period as Kozo-Polyansky thought (1931), but derivate of neogene pine forests and periglacial steppes. This is corroborated by fossil seeds of *Daphne cneorum* (DOROFEEV 1986) found in the sediments of upper pliocene near Middle-Russian upland.

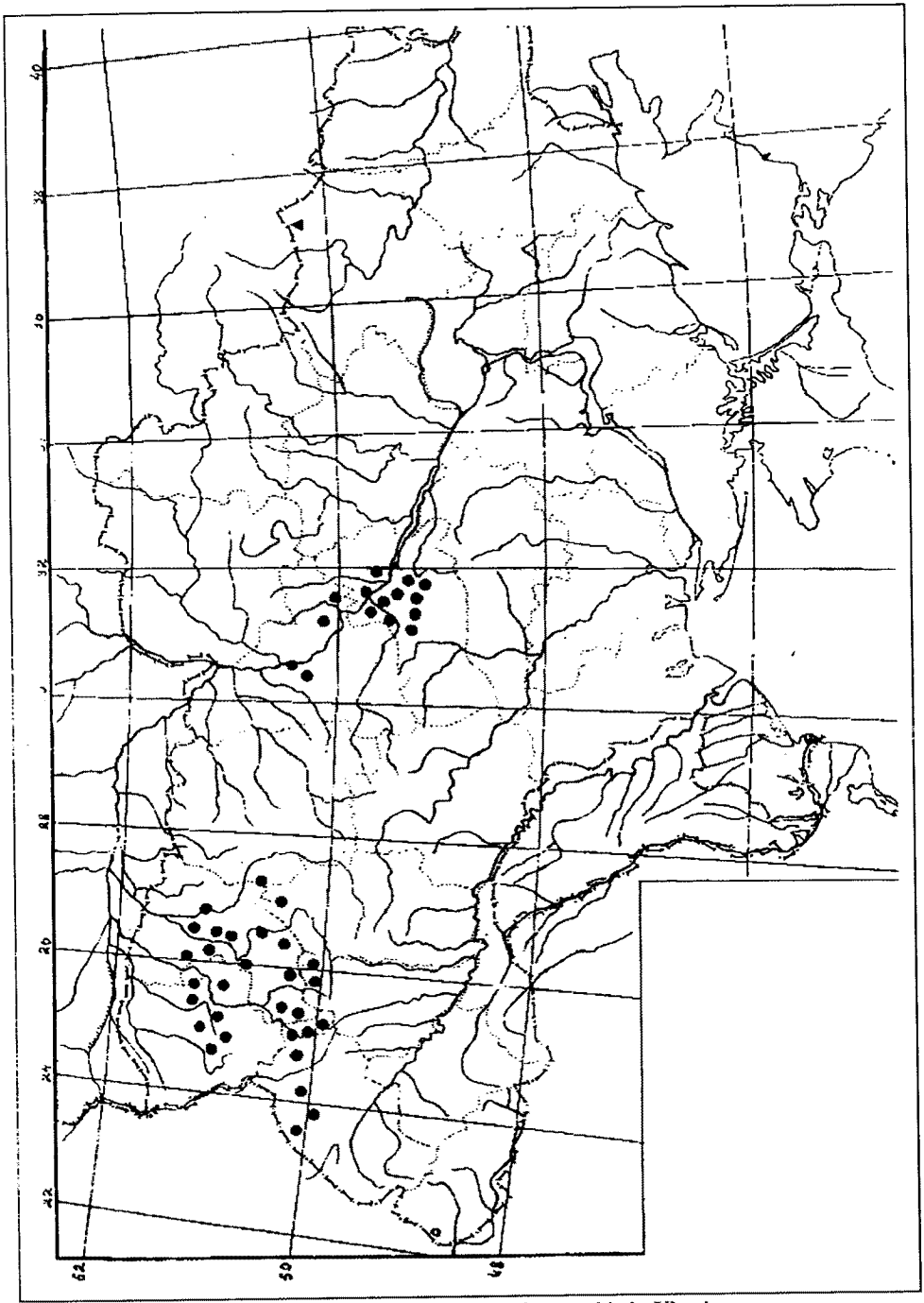


Fig. 1. Distribution of the *Daphne cneorum* and *Daphne sophia* in Ukraine.

As cited above, area of *Daphne cneorum* decreases intensively through out the whole Europe. In Ukrainian populations old plants dominate, they are able to produce seeds, but young plants and seedlings are very rarely found. The reason is low seed productivity caused by low quantity of poor pollen (GORB 1988). As a result even after abandoned multiple flowering fruits are formed very seldom.

Because of low reproductive potencial any anthropogenic changes of habitats are fatal for *Daphne cneorum.* Extremely dangerous for forest populations of *Daphne cneorum* is substitution of primary forests by an artificial one, for steppe populations, the terracing of slopes is critical. When forests are cut down, density of *Daphne cneorum* populations firstly increases sharply, but after soil treatment for other forest plants, *Daphne* individuals died. Probability of seed germination is very low. *Daphne cneorum* is known by ornamental quality and medicinal properties. Collecting of medicinal raw materials and bouquets exhausts resources. During the last decades eight populations of *Daphne cneorum* in Ukraine were wiped, including populations in Kiev environs. Regressive changes take place in other parts of area (LIEUTUGHI 1972; AYMONIN 1981; ŠOMŠÁK 1981; CZAPODY 1982; SWIEBODA & KALEMBA 1982; MELNIK 1986, 1991; WITSCHEL & SEYBOLD 1986 and other). In Ukraine *Daphne cneorum* is preserved in the reserve Rostochia, the Russka-Polyana reserve in Cherkassy region, the Susk reserve in Rivne region, and reserves on mountains Bila-Lysa and Makitra in Lviv region. Unfortunately, only few populations of *Daphne cneorum* belong to the network of reserves in Pridneprovie and in the left bank, Volynian Polyesye reserves are absent. Needs to organize reserves for protection of species germplasm in Borispol district of Kiev region, Cherkassy and Smila districts of Cherkassy region, Manevichy district of Volynia region.

Daphne sophia

Daphne sophia is endemic to Middle-Russian upland, species vicarious to *Daphne altaica* PALL., *Daphne taurica* KOTOV, *Daphne caucasica* PALL. Some investigators (GOLENKIN 1899; SUKACHOV 1900; MESHKOV 1951; ALYANSKAYA 1985) consider the name *Daphne sophia* as a synonym of *Daphne altaica.* It seems that *Daphne sophia* is a separate race, but very close to other *Daphne* species of the series Alpina as TALIEV (1911) thought. Distribution area of the species is limited to the river basin of Siverskij Donez in the South of Middle Russia upland, where MILKOV & BERESZNOJ (1990) found four regions of species location: Belgorodsko-Shebekinskij, Valujsko-Voloconovskij, Rovenkowskij and Novooskolskij. LITVINOV (1890), PACHOSKY (1912), KOZO-POLYANSKY (1931), WULF (1944), WALTER (1974), MESHKOV (1951), SMOLKO (1967), ALYANSKAYA (1985), MILKOV & BEREZHNOJ (1990) and others attributed *Daphne sophia* to tertiary relicts. Limited distribution of the species in the South of Middle-Russian upland, where glaciers were absent and a number of fossilseeds in Pliocene sediments (DOROFEEV 1986) are good proof of the species relict nature.

There are two opinions about habitats of *Daphne sophia.* KALENICZENKO (1849, 1873), LITVINOV (1890), KOZO-POLANSKI (1931), WULF (1944), SMOLKO (1967), MILKOV & BEREZNOJ (1990) considered *Daphne sophia* as a satellite of relict pine and oak forests of Middle-Russian upland.

Alternative point of view about nature of *Daphne sophia* habitats was suggested by SUKACHOV (1990) and TALIEV (1911, 1913), who thought that *Daphne sophia* was an element of bushwood of secondary origin not connected with pine forests and complex cretaceous vegetation. MESHKOV (1951) suggested a compromise point of view, according to it *Daphne sophia* now grows among bushwoods of forest and steppe shrubs on the steppe slopes of river vales or gorges, the modern conditions of species habitat is secondary and the primary coenoses where species grow before the impact of human activities influenced the environment more intensively.

However as TALIEV (1911) noted, some habitats of the species are adjacent to pine forests, but *Daphne sophia* is absent from them.

The whole habitats are adjacent to borders of forest on slopes of gorges or river terraces in bushwoods on joint of forest vegetation and steppe slopes and cretaceous vegetation (KALENICZENKO 1849, 1873; SUKACHOV 1910; TALIEV 1911, 1931; KOZHEVNIKOV 1931; MESHKOV 1951; SMOLKO 1967; EROMENKO et.al. 1981; TKACHENKO & PARAKHONSKA 1987; MILKOV & BEREZHNOJ 1990 and others). According MESHKOV (1951) vegetation of *Daphne sophia* habitats is a mixture of forest, meadow, steppe and weed plants. Because the species avoids both sunny and very shady places, it grows on the borders of forest, avoiding pure forests, and steppe and cretaceous habitats. Hence, ecological amplitude of the species is not extremely wide, as MESHKOV thought (1951), but alternately it is very narrow on the ecotone between forest, steppe and cretaceous vegetation. Thus, *Daphne sophia* habitats are ecotonal among three vegetation communities. All ecotone characters i.e. intermediate position between different biocenoses, linear shape typical species for communities characteristic exclusively of this ecotone (ODUM 1986) are inherent in *Daphne sophia* habitats.

It s interesting to note that a vicarious species, *Daphne altaica,* with area covering West and South Altai, Saur and Tarbagataj, also grows in ecotone between forests and grasslands and shrubs communities, on pastures, flood-lands, stony slopes of mountains and steppes (TALIEV 1911; KOROPACHINSKY 1983 and others).

Undoubtedly, species area used to be wider than now, but since ecotope *Daphne sophia* habitats adjacent to rivers and gorge-gullies in the river basin of Siverskij Donez it was ribbon area. Modern distribution of the species habitats in basin of Siverskij Dones (SUKACHOV 1900; TALIEV 1911; MESHKOV 1951; SMOLKO 1967; MILKOV & BEREZHNOJ 1990) caused fragmentation of area.

Total and selective fellings, forest planting on the slopes, chalk mine working are dangerous for existence of the remaining habitats. But sometimes conditions in the ecotone is favourable for the species populations. In the environs of Rovenki on the right bank of the river Ajdar KOZHEVNIKOV (1931) found population of *Daphne sophia* on the area 25x15m. After the second observation of this habitat by Milkov and Berezhnoj (1990) it was determined that this population at present covers the plot of 180-200 m long, 15-20 m wide. About one thousand stems of *Daphne sophia* are counted here. In other locations the species quantity is critical. In Valujsk district Belgorod region in environs of v. Jablokovo 200 individuals were counted, in the environs of v. Borki 150, v. Staraya Simonovka 50, Thirov Log 60-80 (SMOLKO 1967; MILKOV & BEREZHNOI 1990). In the sole Ukrainian habitat in the environs of Efremovka, according to Jeremenko (1981) flowering stems counted by TKACHENKO & PARACHONSKAYA (1987)

amounted to about 200, according to our data it was about 150. Thus, it is needs to organize conservation of eight remained habitats of the species.

Summary

On the basis of study of plant communities with two rare species of tertiary relicts in flora of Ukraine *Daphne cneorum* L. and *Daphne sophia* Kalenicz. *(Thymelaeaceae)*. Ecological-coenotic characters of their habitats were determined. Four types of *Daphne cneorum* habitats in Ukraine were marked. They are: pine and oak-pine forests in Polesye and Pridneprovie; beech-pine forests in Roztoscia pine cretaceous forests and extrazonal steppes in Volhynia-Podolia. Original habitats of *Daphne cneorum* in Ukraine were pine forests in Volhynia-Podolia, extrazonal meadow steppes are their derivatives. In forest and steppe communities of Volhynia-Podolia *Daphne cneoorum* preserved as neogenis relict, whence after glaciation it came into pine and oak-pine forests in Polysesye and Pridneprovie, in beech-pine new forests of Rostochia. *Daphne sophia* habitats are represented by an ecotone between forest, steppe and cretaceous vegetations. Degradation of *Daphne cneorum* and *Daphne sophia* populations in Ukraine is in progres due to substitution of natural forests by secondary ones and terracing of slopes.

References

ALANSKAYA N. S. (1985): Volcznik altajskij - Daphne altaica Pall. – In: Biologia rastenij Sibiri nuzdajusezishsa v ochrane. – Novosibirsk, Nauka, p. 16-27.

ANDRIJENKO T. I. (1987): Melovoj bor. In: Perspectivnaja set zapovednich objectov Ukraini. – Kiev, Naukowa dumka, p. 234-236.

AYMONIN G. G. (1958a): Quelgues aspects des phytocénoses a Daphne cneorum en particulier en Pays basque français. – Bull. Centr. Etud. Rech. Sci. Biarritz, 2(1): 51-91.

AYMONIN G. G. (1958b): Quelques particularités de la repartition géographique de Daphne cneorum. – G. R. Somm. Soc. Biogéogr. 308: 82-88.

AYMONIN G. G. (1959): Essai d'une monographie écologique du Daphne cneorum. – Rev. Gén. Bot. 784: 281-328.

AYMONIN G. G. (1981): Sur quelques especes de compelex boisés de Bourgogne et leur situation de regression en Europe. – Bull. Soc. Bot. Fr., 128. Actualités botaniques 3-4: 95-100.

BROWICZ K. (1968): Wawczynek glowkowy w Polsce. – Ochrona przyrody 33: 51-68.

BROWICZ K. & GOSTYNSKA-JAKUSZEWSKA M. (1967): Atlas rozmieszczenia drzew i krzewów w Polsce 6, 27 pp.

CHEREPANOV S. K. (1981): Sosudistije rastenija SSSR. – Leningrad, Nauka, 510 pp.

CSAPODY J. (1982): Védett növéneik. – Budapest, Gondolat, 349 pp.

DIDUCH J. P. (1974): Sosnovij lis z uczastu Daphne cheorum L. na pivdni Volinskogo Polyssa. – Ukr. Bot. Zhurn. 26(2): 242-245.

DOROFEEV P. J. (1986): Poznepliocenovaja flora sela Moisejevo na juge Tambovskoj oblasti. – Bot. Zhurn. 71(1): 361-364.

ERMOLENKO E. D., GORELOVA Z. N. & KUSHNAREVA J. I. (1981): K flore i rastitelnosti melovich obnajenij rek Volczej i Oskol v Charkowskoj oblasti. – Vestnik Charkovskogo Universiteta 211: 6-11.

GAJEWSKI W. (1931): Elementy flory polskiego Podola (Materialy do flory polskiej). – Warszawa, 210 pp.

GLASZEK T. (1969): Wstepne badania nad ekologia Daphne cneorum L. – Rocznik sekcjii dendrologicznej Polskiego towarzystwa botanicznego 23: 63-84.
GOLITZIN S. V. (1965): "Snijenije alpijzi" i melovije timjanniki Sredneruskoj vozvishennosti. – Voronez, 16 p.
GORB Z. K. (1988): Razvitije pilzi i zarodychevogo meska u Daphne cneorum. – Ochrana, izyczenije i obogashezenije rastitelnogo mira 15: 86-89.
GROSSET G. E. (1964): Materialy po istojiji flory i rastitelnosti. 1. Sistematiczeskoje polozenie, ecologia i genezis areala Daphne julia K.-Pol. (=D. cneorum L.). – Bulletin MOIP. Seria biologia. 69(5): 86-102.
HEGI G. (1975): Illustrierte Flora von Mitteleuropa. – Berlin und Hamburg: Verlag Paul Parey, 1975. 5/2: 1584 P.S.
JAKUCZ P. (1961): Die phytozönologischen Verhältnisse der Flaumeichen Buschwälder Südostmitteleuropas. – Budapest: Akadémiai Kiadó. 314 S.
KALENICZENKO J. (1849): Les Daphnés russe et descripton d'une nouvelle espece. – Bull. Soc. Imper. Natur. Mosk. 2(1): 293-317.
KALENICZENKO J. (1873): Encore quelques mots sur la Daphne sophia. – Bull. Soc. Imper. Natur. Mosk. 48(1): 152-157.
KLEOPOV D. (1928): Pro vidovu samostijnisc Daphne julia K.-Pol. – Visnik Kiiwskogo Botanicznogo Sadu 7: 74-77.
KOCZWARA M. (1925): Granice florystyczne Podola. – Kosmos 50: 1285-1322.
KORNAŚ J. (1948): Polski gatunki Daphne. – Chronmy Przyrade Ojczysta 4(11/12): 7-13.
KOROPACZYNSKIJ I. J. (1983): Drevesnije rastenija Sibiri. – Novosibirsk, Nauka, 384 pp.
KOZEVNIKOV A. V. (1931): Daphne sophia u sela Rovenkov Voronejskoj gubernii. – In: 25 let nauczno-pedagogiczeskoj dejatelnosti academika B.A. Kellera. Voronez., Kommuna, p. 191-301.
KOZO-POLANSKIJ B. M. (1931): V strane jivich iskopajemich. – Moskva, Uczpedgiz, 184 pp.
LIEUTAGHI P. L. (1972): Environment vegetal. Flore, vegetation et civilization. – Neuchatel: Delacheux et Niestlé, 320 pp.
LITVINOV D. I. (1890): Geobotaniczeskije zametki o flore Evropejskoj Rossii. Bull. Soc. Imper. Natur. Mosk. 3: 322-434.
MELNIK V. I. (1986): Rasprostranenije i sovremennoje sostojanije Daphne cneorum (Thymeleaceae) na Ukraine. – Bot. Zhurn. 77(1): 52-57.
MELNIK V. I. (1991a): Volczeyagodnik borovoj - relict evropelskoj flori. – Priroda 9: 49-51.
MELNIK V. I. (1991b): A comparative phytogeographic essay of extrazonal steppe vegetation of Volhynia (Ukraine) and Lublin Uplands (Poland) and other regions of Europe. – Veröff. Geobot. Inst. ETH, Stiftung Rübel, Zürich 106: 66-79.
MELNIK V. I. (1993): Exstrazonalnaja stepnaja rastitelnost Volinskoj vozvishennosti i jejo botaniko-geographiczeskije svjazi s lugovimi stepjami Zapadnoj i Vostocznoj Evropi. – Bot. Zhurn. 84(2): 28-38.
MELNIK V. I. (1994): Zaliczki korinnych dubovo-sosnovych lisiv na livoberejji Serednogo pridniprovia. – Ukr. Bot. Zhurn. 36(3): 249-157.
MESHKOV A. R. (1951): Rajon flory melovich i izvestnjakovych obnazenij Sredneruskoj vozvishennosti. – Bot. Zhurn. 36(3): 249-154.
MILKOV R. N. & BEREZNOJ A. V. (1990): Volczejagodnik sophii na juge Sredneruskoj vozvichennosti. – In: Geographiczeskije aspekti ochrani prirody. Voronez, p. 54-65.
MOTYKA J. (1947): Rozmieszczenie i ekologia roslin naczyniowych na polnocnej krawedzi zachodniego Podola. – Lublin, 400 pp.
ODUM J. (1986): Ekologia. – Moskva, Mir. – T. 2, 376 pp.
PACZOSKIJ J. K. (1910): Osnovnije czerty razvitija flory jugo-vostocznoj Rossiji. – Cherson, 430 pp.

PACZOSKIJ J. K. (1912): V. I. Taliev o Daphne sophia Kalen. – Trudy Bot. Sada Imperat. Jurjevsk. Univ. 13(314): 225-228 [review].
RACIBORSKI M. (1910): O sosnie. – Kosmos, 36(3/6): 321-329.
SHELAG.SOSONKO I. R., JIJIN M. P. & KUKOVITZA G. S. (1975): Stepova roslinnist Lvivskoji oblasti. – Ukr. Bot. Zhurn. 32(5): 630-638.
SMOLKO S. S. (1967): Tretinnij relict - wowczi jagody sophii na Serednorosijskij vysoczyni ta jogo suczasne poshirennja. – Ukr. Bot. Zhurn. 24(1): 69-75.
ŠOMŠÁK L. (1981): Chránené rastliny Slovenska. – Bratislava, Pressfoto.
SUKACHOV V. N. (1900): Neskolko slov o kurskoj Daphne sophia Kalen. – Trudy Bot. Sada Jurjevsk. Univ. 1(3): 137-138.
ŚWIEBODA M. & KALEMBA A. (1982): Chronione w Polsce gatunki roslin najbardziej zagrozone Zniszeniem. – Studie osrodka dokumentacji fiziograficznej 10: 11-44.
TALIEV V. I. (1912): Neskolko slow o kurskoj Daphne altaica (Daphne sophia Kalen.). – Trudy Charkovskogo obsczestwa estestwoispitatelej. 45: 95-152.
TALIEV V. I. (1931): K voprosu o vzaimoonoshenijach Daphne altaica, D. sophia i D. julia. – In: 25 let nauczno-pedagogiczeskoj dejatelnosti academika B.A. Kellera. – Voronez: Communa. p. 13-20.
TEMCZENKO A. M., DIDUCH J. P. & LUBCZENKO V. M. (1986): Fitocenotyczna charakteristyka Daphne cneorum L. (Thymelaceae Juss) u Pridniprovji. – Ukr. Bot. Zhurn. 43(3): 53-57.
TKACHENKO V. S. & PARACHONSKA N. O. (1987): Obgruntuvannia neobchidnosti organizacii botanicznyh pamjatok prirody na Charkivsczyni. – Ukr. Bot. Zhurn. 43(1): 83-88.
VASILCZENKO T. J. (1977): Morphogenez Daphne julia K. - Pol. (Thymelaceae) v uslovijach pastbisznogo i zapovednogo regimow. – Bot. Zhurn. 62(11):
VASILCZENKO T. J. (1981a): Bolczoj ziznennij zikl Daphne cneorum (Thymelaceae) v uslovijach pastbisznogo i zapovednogo regimow. Bot. Zhurn. 66(8): 1266-1275.
VASILCZENKO T. J. (1981b): Cenopopulaciji Daphne cneorum (Thymelaceae) v uslovijach pastbisznogo i zapovednogo regimow. Bot. Zhurn. 66(11): 1561-1569.
WALTER H. (1974): Vegetation Osteuropas, Nord-und-Zentralasiens. – Stutgart: Gustav Fisher Verlag, 452 pp.
WITSCHEL M. (1980): Xerothermvegetation und dealpine Vegetationskomplexe in Südbaden. – Beih. Veröff. Natursch. Landschaftspflege Baden-Württemberg 17: 1-212.
WITSCHEL M. (1984): Zur Ökologie, Verbreitung und Vergesselsaftung der Reckholderle (Daphne cneorum) auf der Baar. – Schr. Ver. Geschih. Naturgesch. Baar, 35: 119-139.
WITSCHEL M., & SEYBOLD S. (1986): Zur Ökologie, Verbeitung und Vergesellsehaftung von Daphne cneorum L. in Baden-Württemberg, unter Berücksichtung der Zönologischen Verhaltnisse in der anderen Teilarealen. – Jh. Ges. Naturk. Württemberg, 141: 157-200.
WULF E. V. (1944): Istoriczeskaya geographija rastenij. – Moskva: Izd. Acad. Nauk SSSR. 549 pp.

Received: 28 March 1995
Revised: 10 April 1996
Accepted: 31 October 1996

Tab. 1 & 2 on p. 60-66

Tab. 1. *Daphne cneorum* in pine and pine oak forests of Pridneprovye and Polesye.

Species	Pridniprovye	Polesye
Stand of trees		
Acer campestre L.	+	-
Acer platanoides L.	+	+
Betula pendula ROTH	+	+
Carpinus betulus L.	+	+
Fraxinus excelsior L.	+	+
Malus sylvestris L.	+	+
Pinus sylvestris L.	0.5-0.9	0.5-0.9
Populus tremula L.	+	+
Pyrus communis L.	+	+
Sorbus aucuparia L.	+	+
Tilia cordata MILL.	+	+
Quercus robur L.	0.3-0.5	0.3-0.5
Undergrowth		
Acer tataricum L.	+	+
Carpinus betulus L.	+	+-10
Fraxinus excelsior L.	+	+
Pinus sylvestris L.	+-20	+-20
Populus tremula L.	+	+
Tilia cordata MILL.	+	+
Quercus robur L.	+-50	+-50
Shrub layer		
Corylus avellana L.	+	+
Crataegus monogyna JACK.	+	+
Euonymus europeae L.	+	+
Euonymus verrucosa SCOP.	+	+
Frangula alnus MILL.	+	+
Juniperus communis L.	+	+
Rubus caesius L.	+	+
Rubus idaeus L.	+	+
Sambucus nigra L.	+	+
Viburnum opulus L.	+	+
Grassy and small shrub layer		
Achillea millefolium L.	+	+
Agrostis gigantea ROTH	+	+
Ajuga genevensis L.	+	+
Anemone sylvestris L.	+	+
Anthericum ramosum L.	+	+
Arctostaphylos uva-ursii (L.) SPRENG	-	+
Asparagus officinalis L.	+	+
Betonica officinalis L.	+	+
Calamagrostis arundinacea (L.) ROTH	+	+
Calluna vulgaris (L.) HULL.	+	+
Campanula persicifolia L.	+	+
Campanula rotundifolia L.	+	+
Carex supina WAHLHEB.	+	+
Carlina biebersteinii BERNH.	+	+

Tab. 1 - continued

Species	Pridniprovye	Polesye
Centaurea scabiosa L.	+	+
Centaurea sumensis KALEN.	+	-
Chamaecytisus ruthenicus FISCH. KLASKOWA	10-20	10-20
Chimaphilla umbellata (L.) W. BARTON	+	+
Convallaria majalis L.	+-20	+-20
Coronilla varia L.	+	+
Cruciata glabra (L.) EHREND.	+	+
Dactylis glomerata L.	+	+
Daphne cneorum L.	+-60	+-60
Dianthus pseudosquarrosus (NOVAK.) KLOK.	+	+
Dracocephalus ruyschiana L.	+	+
Dryopteris fillis-mas SCHOTT	+	+
Euphorbia cyparissias L.	+	+
Filipendula hexapetala GILIB.	+	+
Fragaria vesca L.	+	+
Galium boreale L.	+	+
Galium verum L.	+	+
Genista tinctoria L.	+	+
Gentiana cruciata L.	+	+
Geranium robertianum L.	+	+
Geranium sanguineum L.	+	+
Glechoma hederacea L.	+	+
Helictotrichon pratense (REICHENB.) TRID.	+	+
Hieracium pilosella L.	+	+
Hypericum perforatum L.	+	+
Inula ensifolia L.	+	+
Iris hungarica WALDST. et KIT.	+	+
Lilium martagon L.	+	+
Linaria vulgaris MILL.	+	+
Lembotropis nigricans (L.) GRISEB.	-	+
Luzula pilosa (L.) WILLD.	+	+
Lycopodium clavatum L.	+	+
Majanthemum bifolium (L.) F. W. SCHMIDT	+	+
Medicago falcata L.	+	+
Melampyrum cristatum L.	+	+
Melampyrum nemorosum L.	+	+
Melica nutans L.	+	+
Melilotus albus DERS.	+	+
Melittis melissophyllum L.	-	+
Mycelis muralis L.	+	+
Origanum vulgare L.	+	+
Orthilia secunda (L.) HOUSSE	+	+
Peucedanum oreoselinum (L.) MOENCH	+	+
Pimpinella saxifraga L.	+	+
Plantago lanceolata L.	+	+
Plantago media L.	+	+
Platanthera bifolia (L.) RICH.	+	+

Tab. 1. - continued

Species	Pridniprovye	Polesye
Poa nemoralis L.	+	+
Polygala comosa SCHKUHR	+	+
Polygonatum multiflorum (L.) ALL.	+	+
Polygonatum odoratum (MILL.) DRUCE	+	+
Polypodium vulgare L.	+	-
Potentilla alba L.	+	+
Potentilla arenaria BORKH.	+	+
Primula veris L.	+	+
Pteridium aquilinum L.	10-50	10-30
Pulsatilla nigricans STOERK	+	+
Pulsatilla patens (L.) MILL.	+	+
Pyretrum corymbosum (L.) SCOP.	+	+
Pyrola media L.	+	+
Pyrola minor L.	+	+
Pyrola rotundifolia MAXIM.	+	+
Ranunculus acer L.	+	+
Ranunculus polyanthemos L.	+	+
Salvia pratensis L.	+	+
Scrophularia nodosa L.	+	+
Scorzonera purpurea L.	+	+
Scutellaria altissima L.	+	+
Sedum maximum SUTER.	+	+
Sempervivum ruthenicum SCHNITTSP et G. B. LEHM.	+	+
Silene nutans L.	+	+
Stachys recta L.	+	+
Stipa pennata L.	+	+
Taraxacum officinale WEB. et WIGG.	+	+
Teucrium chamaedrys L.	+	+
Thalictrum simplex L.	+	+
Thesium ebracteatum HAYNE	+	+
Thymus serpyllum L.	+	+
Trientalis europaea L.	+	+
Trifolium alpestre L.	+	+
Vaccinium myrtillus L.	+	80
Veronica chamaedrys L.	+	+
Veronica spicata L.	+	+
Vincetoxicum hirundinaria MEDIK.	+	+
Viola hirta L.	+	+
Viola mirabilis L.	+	+
Moss and lichen layer		
Abietinella abietina (HEDW.) FLEIXH.	+	+
Brachythecium salebrosum (WEB. et MOHR.) B.S.G.	+	+
Cladonia rangiferina (L.) WEB.	+	+
Hylocomium splendens (HEDW.) B.S.G.	20-50	20-50
Pleurozium schreberi (BRID.) MITT.	+	+
Rhytidiadelpus triquerus (HEDW.) WARNST.	+	+

Tab. 2. *Daphne cneorum* in steppe communities of Volhynia-Podolia upland

Species	Name of the erosion forewell rocks						
	Podolia					Volhynia	
	Bila	Zulicka	Lisa	Makitra	Svjata	Lisa	Kvitucza
1	2	3	4	5	6	7	8
Achillea pannonica L.	+	+	+	+	+	+	+
Aconitum moldavicum HACQ.	-	-	-	+	-	-	-
Adonis vernalis L.	+	+	+	+	+	+	+
Allium montanum F. W. SCHMIDT	+	+	+	+	+	+	-
Allium oleraceum L.	-	-	-	-	-	-	+
Allium sphaerocephalon L.	-	-	-	-	-	+	+
Alyssum calycinum L.	+	-	+	+	+	+	+
Anchusa barrelieri (ALL.) VITM.	-	-	-	+	-	-	-
Anemone narcissiflora L.	-	-	+	+	-	-	-
Anemone sylvestris L.	+	+	+	+	+	+	+
Anthemis tinctoria L.	+	+	+	+	+	+	+
Anthericum ramosum L.	5-10	+	+	+	+	+	+
Anthoxantum odoratum L.	-	-	-	-	-	+	+
Anthyllis macrocephala WEND.	+	+	+	+	+	-	-
Asparagus officinalis L.	-	-	-	-	-	+	+
Asperula cynanchica L.	+	+	+	+	+	+	+
Aster amellus L.	+	+	+	+	+	-	-
Astragalus austriacus JACK.	-	-	+	+	-	-	-
Astragalus onobrychis L.	+	+	+	-	+	+	-
Botrychium lunaria (L.) SW.	-	-	-	+	-	-	-
Brachypodium pinnatum (L.) BEUV.	15-20	+	+	+	+	+	+
Briza media L.	+	+	5-30	+	+	+	+
Bromopsis benekenii (LANGE) HOLUB	-	-	-	+	-	-	-
Bupleurum falcatum L.	+	+	+	+	+	+	+
Campanula bononiensis L.	+	+	+	+	+	+	+
Campanula sibirica L.	+	+	+	+	+	+	+
Cardus glaucus BAUMG.	-	+	-	+	-	-	-
Carex humilis LEYS.	20-30	10-20	45-70	20-50	30-50	10-20	10-20
Carex michelii HOST.	+	+	+	-	-	-	-
Carex montana L.	+	+	-	+	-	-	-
Carlina cirsoides KLOK.	-	-	-	+	-	-	-
Carlina onopordifolia BESS., KULCZ. et PAWL.	+	+	-	+	+	-	-
Centaurea jacea L.	+	+	+	+	+	+	+
Centaurea rhenana BOREAU	+	+	+	+	+	+	+
Centaurea scabiosa L.	+	+	+	+	+	+	+
Centaurea ternopoliensis DOBROCZ.	-	-	-	+	-	-	-
Cerastium arvense L.	+	+	-	+	-	-	-
Cerinthe minor L.	+	+	+	+	+	-	+
Chamaecytisus austriacus (L.) LINK.	+	+	+	+	+	+	
Chamaecytisus rathenicus (FISCH.) KLASKOVA	+	+	+	+	+	+	+
Cirsium pannonicum L.	+	+	-	+	+	-	-
Clematis recta L.	+	-	-	+	-	+	-

Tab. 2. - continued

1	2	3	4	5	6	7	8
Clinopodium vulgare L.	+	-	+	+	+	-	-
Coeloglossum viride (L.) HARTM.	-	-	-	+	-	-	-
Convallaria majalis L.	-	-	-	+	-	-	-
Coronilla coronata L.	-	+	-	+	-	-	-
Crepis praemorsa (L.) TAUSCH.	+	+	-	+	-	-	-
Crinitaria linosyris (L.) LESS.	+	-	+	+	-	-	-
Cuscuta epithymum L.	-	-	+	+	-	-	-
Cynoglossum officinale L.	+	-	-	+	-	-	-
Daphne cneorum L.	+	+	+	+	+	+	+
Dianthus carthusianorum L.	+	+	+	+	+	+	+
Dianthus membronaceus BORB.	+	+	+	+	+	+	+
Dianthus pseudoserotinus BOCKI	+	+					
Dracocephalum ruyshiana L.	-	-	+	+	-	-	-
Echium vulgare L.	+	+	+	+	+	+	+
Elytrigia intermedia (HOST.) NEVSKI	+	+	+	+	+	+	+
Elytrigia repens (L.) NEVSKI	+	+	-	+	+	+	+
Eryngium campestre L.	+	+	+	+	+	+	+
Erysimum odoratum EHRH.	+	+	-	+	+	-	-
Euphorbia angulata JASK.	+	-	-	-	-	-	-
Euphorbia cyparissias L.	+	+	+	+	+	+	+
Euphorbia sequieriana NECK.	+	+	+	+	+	+	+
Euphorbia stricta L.	+	+	+	+	+	+	+
Festuca makutrensis ZAPAL.	-	-	-	+	-	+	+
Festuca valesiaca GAUD.	20-50	20-50	20-30	20-30	20-50	20-50	20-50
Filipendula vulgaris MOENCH.	+	+	+	+	+	+	+
Fragaria viridis DUCK	+	+	+	+	+	-	-
Galium boreale L.	+	+	+	+	+	+	+
Galium campanulatum VILL.	+	-	+	+	+	+	+
Galium verum L.	+	+	+	+	+	+	+
Genista tinctoria L.	+	+	+	+	+	+	+
Gentiana cruciata L.	+	-	+	+	-	+	-
Gentianella amarella (L.) BOERN.	+	-	-	+	-	-	-
Geranium sanguineum L.	+	-	-	+	+	-	-
Gymnadenia odoratissima (L.) RICH.	-	-	-	+	-	-	-
Gypsophilla fastigiata L.	+	+	+	+	+	+	-
Helianthemum nammularium (L.) MILL.	+	+	+	+	+	+	+
Helianthemum ovatum (VIV.) DUN.	-	-	-	+	+	-	-
Helictotrichon desertorum (LESS.) NEVSKI	-	-	+	-	-	-	-
Hieracium echinoides ZUMM.	+	+	-	-	-	-	-
Hieracium pilosella L.	+	+	+	+	+	+	+
Hypericum elegans STEPH.	+	+	+	+	+	+	+
Hypericum perforatum L.	+	+	+	+	+	+	+
Inula ensifolia L.	+	+	5-30	+	+	+	+
Inula hirta L.	+	-	-	+	+	+	+
Iris hungarica WALDST. et KIT.	+	+	+	+	+	+	+

Tab. 2. - continued

1	2	3	4	5	6	7	8
Jurinea arachnoidea BUNGE	+	-	+	+	+	-	+
Jurinea calcarea KLOK.	+	+	+	-	+	-	-
Knautia arvensis (L.) COULT.	+	+	+	+	+	+	+
Koeleria cristata (L.) PERS.	+	+	+	+	+	+	+
Lathyrus pannonicus (JACK.) CARCKE	+	+	+	+	-	+	-
Lembotropis nigricans (L.) GRIS.	+	-	+	+	+	+	+
Leucanthemum vulgare LAM.	+	+	+	+	+	-	-
Lilium martagon L.	-	-	-	+	-	-	-
Linum catharticum L.	-	-	+	-	-	-	-
Linum flavum L.	+	+	-	+	+	+	-
Lonicera carpinifolium L.	-	-	-	-	-	+	-
Lotus corniculatus L.	+	-	-	-	+	-	+
Matricaria perforata MERAT	-	-	-	-	-	-	+
Medicago falcata L.	+	+	10-15	+	+	+	+
Melampyrum cristatum L.	+	-	+	-	-	-	-
Molinia caerulea (L.) MOENCH	+	-	-	+	+	-	-
Onobrychis viciifolia SCOP.	+	-	-	+	+	+	-
Orobanche elatior SUFF.	+	-	-	+	-	-	-
Orobanche lutea BAUMG.	+	+	+	-	-	-	-
Peucedanum cervaria (L.) LAPEYR.	+	+	+	+	+	+	+
Phleum phleoides (L.) KARST.	+	+	+	+	+	+	+
Phyteuma orbiculare L.	-	-	-	+	-	-	-
Pinus sylvestris L.	+	+	+	+	+	+	+
Pimpinella saxifraga L.	+	+	+	+	+	+	+
Plantago media L.	+	+	+	+	+	+	+
Poa compressa L.	+	+	+	+	+	+	+
Polygala comosa SHKUHR	+	+	+	+	+	+	+
Polygonatum odoratum (MILL.) DRUCE	-	-	-	+	-	-	-
Potentilla arenaria BORKH.	+-5	+	+	+	+	+	+
Potentilla erecta (L.) RAUSCH.	+	+	+	+	+	-	-
Primula veris L.	+	+	+	+	-	+	-
Prunella grandiflora (L.) SCHOLL.	+	+	+	+	+	-	+
Pulsatilla grandis WEND.	+	+	+	+	+	-	-
Pulsatilla patens (L.) MILL.	+	+	+	+	+	-	-
Ranunculus auricomus L.	5-10	+	+	+	+	+	+
Ranunculus zapalowiczii PACZ.	+	+	+	-	-	+	-
Reseda lutea L.	+	+	+	+	+	+	+
Rosa spinosissima L.	+	-	-	+	-	+	+
Salvia pratensis L.	+	+	+	+	+	+	+
Salvia verticilata L.	+	+	+	+	+	+	+
Scabiosa columbaria L.	+	-	-	+	-	-	-
Scabiosa ochroleuca L.	+	+	+	+	+	+	+
Scorzonera purpurea L.	+	+	+	+	+	+	+
Senecio czernjaevii MINDER.	+	+	+	+	+	+	+
Silene nutans L.	+	+	+	+	+	+	+
Stachys germanica L.	-	-	-	-	-	+	-
Stachys recta L.	+	+	+	+	+	+	+

Tab. 2. - continued

1	2	3	4	5	6	7	8
Stipa pennata L.	-	-	+	+	+	-	-
Teucrium chamaedrys L.	5-10	+	+	+	+	+	+
Teucrium montanum L.	+	+	+	+	+	+	1-10
Thalictrum simplex	+	+	+	+	+	+	+
Thesium linophyllon L.	+	+	+	+	+	-	-
Thymus marschallianus WILLD.	+	+	5-10	+	+	+	+
Thymus pulegioides L.	+	+	+	+	+	+	+
Tragopogon orientalis L.	+	+	+	+	+	+	+
Trifolium alpestre L.	-	-	-	-	-	+	-
Trifolium pannonicum JACK.	+	+	+	+	+	-	-
Trifolium montanum L.	-	-	-	-	-	+	+
Trifolium pratense L.	+	+	+	+	+	+	+
Trinia kitaibelii BIEB.	-	-	-	-	-	+	-
Trinia multicaulis SCHISCHK.	+	+	+	+	-	+	+
Trolius europaeus L.	-	-	-	+	-	-	-
Valeriana collina WALLR.	-	-	-	+	-	-	-
Veratrum nigrum L.	+	-	-	+	-	-	-
Veronica austriaca L.	+	-	-	+	+	-	-
Veronica prostrata L.	+	-	+	-	-	-	-
Veronica spicata L.	+	+	+	+	+	-	-
Vincetoxicum hirundinaria MEDIK	+	+	-	+	+	+	+
Viola collina BESS	-	-	-	+	-	+	+
Viola rupestris F. W. SCHMIDT	-	-	+	-	-	-	-