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Centaurea ruthenica Lam. (Asteraceae) in the forest-steppe of the Transylvanian Basin

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Introduction

Centaurea ruthenica Lam. is one of the rarest species of the flora of Romania and of Central Europe as well. It belongs to subgenus *Centaurea* s. str. (WAGENITZ 1975) which comprises a controversial number of species which inhabit the steppes, forest steppes and mesoxerophytic bushy submediterranean habitats from western Palaearctis. The species is known from only three localities in the entire Transylvania and Romania, which are at the same time the westernmost ones in the range of this species. Here we analyse the three Transylvanian localities of this rare and precious element that needs urgent protective measures.

The taxonomic and biogeographic context of the species

The place of the subgenus *Centaurea* s.str. within the genus *Centaurea* L. and even more largely within the entire tribe of *Cardueae* was investigated by SUSSANNA – JACAS – SOLTIS - SOLTIS (1995). They have concluded that *Centaurea* L. can be paraphyletic and that subgenus *Centaurea* s. str. is a primitive, isolated branch that seems to be more related with other genera like *Cheirolophus* Cass. Therefore, the unity of the genus should be questioned in the future and a serious revision based upon the phylogenetic relations inferred from genetical, biochemical and morphological studies is further needed.

The taxonomy of the subgenus *Centaurea* s. str. was recently investigated by AGABABYAN (1991, 1992), AGABABYAN - FAJVUSH (1991), AGABABYAN – GOUKASIAN (1994). They divided the subgenus into several sections and subsections, as follows (nomenclature of the biogeographic regions after MEUSEL - JÄGER - WEINERT 1976).

Sect. *Centaurea* s. str. (purple flowers)

Subsect. Erectes Agababyan: *C. centarium* L. (central Apenninic element), C. *amplifolia* Boiss. et Heldr. (eastern Macedonian -Thracian).

Subsect. Procumbentes Agababyan: *C. fraylensis* Schultz-Bip. (southern Lusitanic).

Sect. *Ruthenicae* Dobrocz. (yellow flowers)

Subsect. Ruthenicae s. str.: *C. ruthenica* Lam., Pontic-South Siberian-Soongorian), *C. linaresii* Laz.-Ibiza (north Iberian), *C. alpina* L. (central Submediterranean), *C. modestii* Fed. (Pamiric), *C. bipinnatifida* (Trautv.) Gamajunova (central Aralo-Caspian), *C. tamanianae* Agababyan (south-western Caucasian), *C. iconiensis* Hub.-Mor. (southern Anatolian), *C. amasiensis* Bornm. (central Anatolian), *C. pythiae* Azrav. et Bornm. (Armenian – north west Iranic), *C. mykalea* Hub. – Mor. (Kurdistanic), *C. bachtiarica* Hayek et Bornm. (central Iranic), *C. alaica* Iljin (Pamiric), *C. taliewii* Kleop. (western and central Pontic), *C. gubanovii* R. Kam. (central Pontic).

Subsect. Africanae Agababyan: *C. africana* Lam. western submediteranean, C. *eriosiphon* Emb. et Maire (north-western Maroccan).

Subsect. Microcephalae Agababyan: *C. kasakorum* Iljin (Aralo-Caspian), *C. phyllopoda* Iljin (western Tian Shanian - Karatau mts.), *C. razdorskii* Karjag. (Araxian), *C. lasiopoda* M. Pop et Kult (western Tian Shanian).

Subsect. Macrocephalae Agababyan: *C. hajastana* Tzvel. (south/western Caucasian), *C. androssovii* Recht. (Turkmenistanic - Kopet Dag mts.), *C. gontscharovii* (south-eastern Turanian), *C. lachnopus* Rech (central Iranic - Alborz mts), *C. schmidii* Wagenitz (southern Turkmenistanic - Kopet Dag mts).

The species from the section *Ruthenicae* are not in all the cases well differentiated from *C. ruthenica* Lam which has the largest range in the entire subgenus. Especially the taxa described from the former Soviet Union are very doubtful and likely to represent local populations of *C. ruthenica* Lam. which were described as good species on the basis of a few quantitative characters. Also *C. linaresii* Laz-Ibiza from northwestern Spain is considered a doubtful taxa and treated as a synonym of *C. alpina* L. (SUSANNA1988) or as a possible subspecies of *C. ruthenica* Lam. (DOSTAL 1976). By the contrast, the species described from Iran, Turkey and Marrocco seems to be well outlined – they can belong to older isolated populations which survived in

isolated patches of forest-steppe at southern latitudes, surrounded by vast deserts and arid steppes.

AGABABYAN - FAJVUSH (1991) hypothesise that the origin of the species of subgenus *Centaurea* s. str. must be in the Mediterranean Basin, within the mesoxerophytic submediterranean – supramediterranean habitats, from where they spread over the western Palaearctic forest-steppes and steppes. This is in accord to the larger biogeographical theory of VULF (1944) that many steppe elements from western Palaearctis („Eurokazahstanian", Pontic – south Siberian elements) originated in xeric rocky habitats of the mediterranean and submediterranean areas (and especially of the Balkan Peninsula).

Obviously, the most primitive species of the subgenus *Centaurea* s. str. are the three ones from section *Centaurea* s. str. which seem to have a relictual status and are well distinguishable one from each other. All the three are submediterranean and every one inhabit a small area in one of the three peninsulas of southern Europe. The species from section *Ruthenicae* s. str., most of them from western Palaearctic steppes, are more numerous and closely related one to each other. The evolution of this group seems to be more recent and still in progress.

Therefore, the assertion of HAYEK (1930) and SUSANNA (1993) that the genetic centre of the subgenus is to be found in the Pontic - south Siberian, Soongorian, Irano-Turanian and Anatolian steppes and forest--steppes is not acceptable in our opinion.

Researches upon *Centaurea ruthenica* Lam. from the Transylvanian Basin – a brief history

Curiously, for the first time this species was erroneously mentioned from Transylvania by BAUMGARTEN (1816) from „Cluj's meadows" („Fânațele Clujului", „Kolozsvári szénafű"). He mistook „*Centaurea ruthenica* L." for another very rare species from the Transylvanian forest-steppe, *Serratula wolffii* Andrae, being misled by the relative resemblance of the leaves and involucral bracts of these two species.

In 1853, during his excursion through Transylvania, F. Schur discovered the true *Centaurea ruthenica* Lam. on the western border of the Transylvanian forest-steppe area („auf sonniger grassiger Anhöhe auf der Mezőség oberhalb des dorfes Apahida auf dem Wege nach Kolozs der 17 Juli 1853 in schönster Blüthe gesammelt", see SCHUR 1855).

This locality placed between Apahida and Cojocna (the actual Cluj County) rapidly became famous among the botanists of the former Austro-Hungarian Empire, who visited it frequently.

We assume that oversampling of the species was the main cause which led to the destruction of the local population. Fifteen years after it was discovered, JANKA (1868) wrote that it was in a very bad status and that the inhabitants remembered the plant as being abundant on that place „30 years ago". He appreciated that in the next 10 years the species will go extinct there. WOLFF was the last who collected the plant from this place in 1888 (CL[1]). Twenty-two years later, WAGNER (1910) indicated the species as extinct for the Transylvanian flora.

In 1923 NYÁRÁDY luckily rediscovered the plant in the region, not far away from Boju railway station, between villages Boju (Kolozsbós) and Luriu de Câmpie (Mezőőr). Actually he accidentally saw two individuals from the train (see NYÁRÁDY 1923). He turned back to that place with C. GÜRTLER and discovered a consistent population including hundreds of individuals. Seventy plants were completely extracted at the same date (that means with their entire rhisome) for editing no. 493 of the „Flora Romaniae Exsiccata" herbarium collection (BORZA 1923).

Since then this second locality was visited once more by PRODAN and A. NYÁRÁDY in 1948 (CL). After the four botanists who knew the exact place of the locality have been died no other researcher was able to find again the plant in Transylvania.

After nine years (1987-1996) of unsuccessful field investigations, BĂDĂRĂU - GROZA - PEȘTINA (1996) declared the species as being extinct for the Transylvanian flora again. They were unable to rediscover the population between Boju and Iuriu de Câmpie during this time, due to the scarce and controversial indications in the extant literature (PRODAN 1931, PRODAN 1939, NYÁRÁDY – SOÓ 1941, PRODAN - NYÁRÁDY 1964). However, two years later after combining the few viable information available and as a result of the extensive knowledge about the topographic details of the area, Al. S. BĂDĂRĂU finally found again the small population in 1998. It is in a certain bad status at this moment and consists of only 35 individuals grouped into three small patches – this indicates that the plant is about to get extinct in this area (COLDEA - BĂDĂRĂU - PENDEA 1998).

When we read a publication written by WOLFF (1877), we realized that this author could be the one who actually discovered for the first time *Centaurea ruthenica* Lam. near Boju railway station. In fact he briefly

[1] CL – international index of "Babes-Bolyai" University's Herbarium

mentioned it from „Cojocna's meadows", which are even today placed exactly north from the station, including the small area occupied by the plant. Moreover, he wrote in the same paper that he made extensive floristic research around the tunnels near Boju station where he found also *Serratula coronata* L. = *S. wolffii* Andrae [which in fact seems to be mistaken for *S. lycopifolia* (Vill.) Wettst., a rare forest-steppe species which was collected also by E. J. NYÁRÁDY in 1923 (CL) and until 1987 (when the crop fields expanded in the area) was still frequent there].

In 1929, a geomorphologist, H. WACHNER informed I. PRODAN that he discovered *C. ruthenica* Lam. in the southern part of Transylvania at Bărcut-Bárányкút within Hârtibaciu - Hortobágy Tableland. The information was considered reliable and since then published in all Romanian botanical books (PRODAN 1930, PRODAN 1939, PRODAN - NYÁRÁDY 1964, BELDIE 1979, CIOCÂRLAN 1991). The place was investigated in 1996 and it was concluded that another species with large yellow anthodia, *C. orientalis* L., was wrongly referred as *C. ruthenica* Lam. (BĂDĂRĂU – GROZA - PEŞTINA 1996).

On April the 12th, 2000, Al. S. BĂDĂRĂU and N. DURA, while investigating the steppe vegetation between Bonțida (Bonchida) and Jucu (Zsuk) at the western border of the Transylvanian forest-steppe, discovered a third population of this species consisting of about 250 individuals. A short note about this new locality was published (BĂDĂRĂU - DEZSI - COMES 2000).

Ecological and phytocenological considerations

The comprehensive description of the Transylvanian localities with *Centaurea ruthenica* Lam. from the Transylvanian Basin is the following:

1. Apahida-Cojocna (*Kolozs*) GS 18, over Apahida village, along the road to Cojocna. In this locality the species went extinct before the beginning of the XXth century. Details and the precise position of the site remained unknown.

2. Boju (*Kolozsbós*) – *Iuriu de Câmpie* (*Mezőőr*) GS 17, in the perimeter of the Straja village, 250 m north-eastwards from Boju railway station, basal area of Straja Mare (Akasztófa) hill below the railway, 400 m asl. Here there are 35 individuals.

3. Bonțida (*Bonchida*) – *Jucu* (*Zsuk*) GS 19, on the hilly ridge called „Urieşelul" or „Csergés", 380 m asl. A population of around 250 individuals (including the juveniles) still occurs here. It is located along the summit over a distance of 200 m in larger or smaller patches.

All these localities are situated on the western border of the Transylvanian forest-steppe and of the Transylvanian Lowland (Câmpia Transilvaniei / Erdélyi Mezőség) as well (fig. 1). At the same time they are the westernmost localities of this species, sheltering peripatric populations. They are outstanding posts and are totally isolated from the main range of *Centaurea ruthenica* Lam., that lies north from the Black Sea up to western Altai, Tarbagatai Mountains, Dzungarskii Ala-Tau, Tien-Shan Mountains (western part), Pamiro-Alai Mountains. Actually, the species is distributed along almost all the forest-steppe areas from western Palaearctis but this large area consists in fact of „many small islands", according to TZVELEV (1963).

Centaurea ruthenica Lam. is not a steppe element as it was described by the Central European botanists (e.g. WALTER 1968, PRODAN - NYÁRÁDY 1964 etc) but certainly a forest-steppe one as can be seen from the relevés taken from different regions. It prefers rocky or gravelly soils rich in calcium carbonate. ARIFHANOVA (1967) published some relevés including this species from the mountains around the Ferghana Basin. Over there it occurs mostly in the mountainous forest steppe belt between 1000 and 2500 m asl. The populations are concentrated in the bushes dominated by *Crataegus songorica*, *C. turkestnanica*, *Malus kirghisorum*, *Prunus sogdiana*, *Rhamnus cathartica*, *Berberis oblonga*, *Lonicera karellinii*, *L. nummulariifolia*, *Rosa fedtshenkoana*, *R. kokanica*.

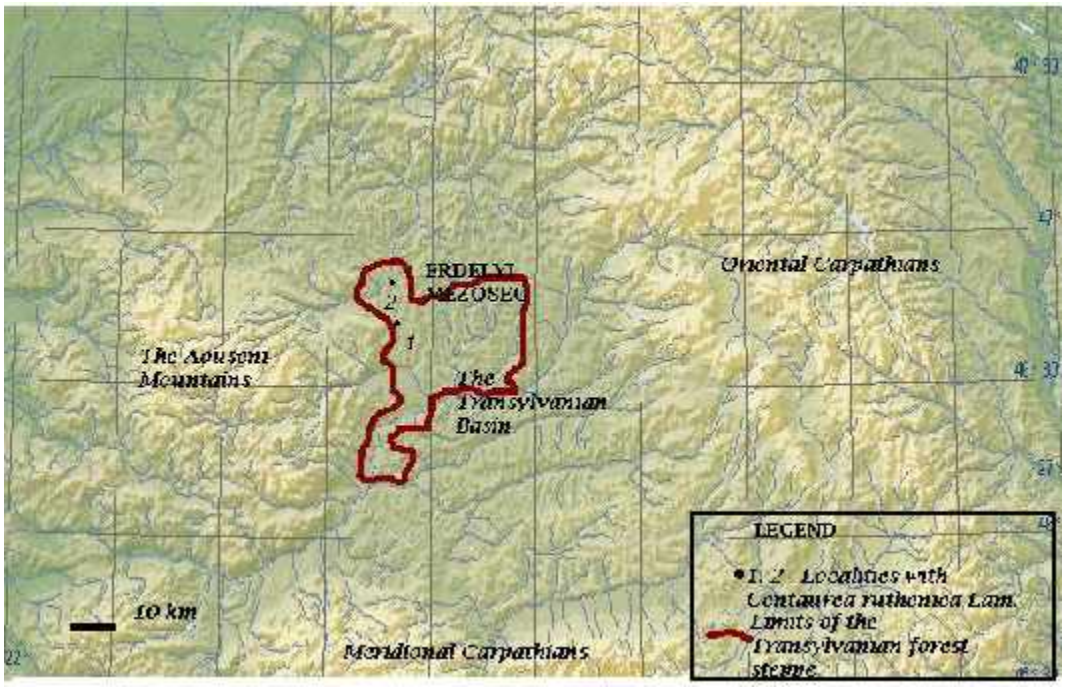
In Bashkiristan, within the easternmost European forest steppes *Centaurea ruthenica* Lam. grows in bushy forestassociations with *Rhamnus cathartica*, *Rosa majalis*, *Caragana frutex* (AVDEEV 1979).

In Transylvania for Boju locality COLDEA - BĂDĂRĂU - PENDEA (1998) underlined that almost the entire population occurs in forest-steppe bushes dominated by *Amygdalus nana* or *Prunus spinosa*, *Rhamnus cathartica*, *Cornus sanguinea* respectively.

The closely related species *Centaurea alpina* L. occurs also predominantly in bushy mesoxerophytic associations on superficial gravelly rocky slopes solils rich in carbonate (*Orno-Ostryon*) – see PROSSER 1995.

Table 1 contains some relevés taken from the two, still existing Transylvanian localities with *Centaurea ruthenica*.

Fig. 1. The localities with *Centaurea ruthenica* Lam. within the context of the Transylvanian forest-steppe area.



In both localities the visitor can easily see that the most vigorous and numerous plants are inside the bushy associations (at Boju within *Amygdaletum nanae* Soó (27) 59, *Pruno spinosae-Crataegetum* Soó (27)31, at Bonțida-Jucu within *Amygdaletum nanae* Soó (27) 59. Especially in the second locality is it clear that where *the shepherds burned out Amygdalus nana*, the plants are not able to flourish. Both localities are now overgrazed by sheep flocks, the one near Boju only in spring and sometimes during winter while the one from between Bonțida and Jucu is grazed all over the year. It is clear that within a few years the species shall disappear from Transylvania unless protective measures will be implemented in both areas.

Összefoglalás

A rutén imola (*Centaurea ruthenica* Lam., Asteraceae) az erdélyi erdőssztyeppben

BĂDĂRĂU, A. – DEZSI, Șt. – PENDEA, F. – DURA, N.

A rutén imola (*Centaurea ruthenica* Lam.) az egyik legritkább növényfaj Erdélyben. Pontikus – délszibériai – szongáriai erdőssztyepp elem, melynek három peripátrikus populációja van az Erdélyi Mezőségen. Ezek az antropogén behatások következtében igen veszélyeztetettek, az egyik közülük már el is tűnt. A populációk biogeográfiai jelentősége abban rejlik, hogy ezek alkotják a faj elterjedésének legnyugatibb térségét.

References

AGABABYAN, M.V. - FAJVUSH, G.M. (1991): *Centaurea* section *Centaurea* in the Caucasus – Thaiszia **1**: 49 – 53.

AGABABYAN, M.V. – GOUKASIAN , A.V. (1994): On the karyology of the Armenian representatives of the *Centaurea* subgenus *Centaurea* (*Asteraceae*) – Thaiszia **4**: 171 – 173.

AGABABYAN, M. V. (1991): A new section of *Centaurea* subgenus (in Russian) – in V. TRINASHTZATII (ed.): Flora, Vegetation and Vegetational Resources of Armenia (in Russian): 73 – 84.

AGABABYAN, M.V. (1992): Monography of subgenus *Centaurea*, doctoral dissertation (in Russian) – Botanical Institute of the Academy of sciences of Armenia, Erevan.

ARIFHANOVA, M. M. (1967): The Vegetation of the Ferghana Basin (in Russian) – Izdatelistvo Fan Uzbekskoi SSR, Tashkent.

AVDEEV, V. D. (1979): The Preuralian rocky steppes

– Botaniceskii Žurnal 7, **64**: 928 – 942.

BĂDĂRĂU, A. – GROZA, Gh. – PEŞTINA, C. (1996): *Centaurea ruthenica* Lam. and *Centaurea orientalis* L. in the Flora of the Transsylvanian Tableland (in Romanian) – Contribuţii Botanice **33**: 13 – 20.

BAUMGARTEN, J. Ch. (1816): Enumeratio Stirpium Magno Transsilvaniae Principatui – Vindobona.

BELDIE, Al. (1979): The Flora of Romania. Illustrated determinator of vascular plants, vol. 2 (in Romanian) – Ed. Academiei Republicii Socialiste România, Bucureşti.

BORZA, A. (1923): Schedae ad Floram Romaniae Exsiccatam a Museo Botanico Universitatis Clusiensis editam, centuria IV et V - Buletinul Grădinii Botanice şi al Muzeului Botanic de la Universitatea din Cluj 2-3, **4**: 38 – 77.

CIOCÂRLAN, V. (1990): The illustrated Flora of Romania. Identification and description of the vascular plants, vol. 2 (in Romanian) – Ed. Ceres, Bucureşti.

COLDEA, Gh. – BĂDĂRĂU, A. – PENDEA, F. (1998): *Centaurea ruthenica* has not disappeared from the Transylvanian Flora – Contribuţii Botanice 2, **34**: 51 – 62.

DOSTÁL, J. (1976): *Centaurea* L. – in T. G. TUTIN et al. (eds.): Flora Europaea vol. 4, Cambridge University Press: 254 – 301.

HAYEK, A. (1930): Die Arten der Gattung *Centaurea* L. Sect. *Centaurium* Cass. – in A. HANNIG – H. WINKLER (eds.): Die Pflanzenareale, Band 1, Leipzig: 54 – 57.

JANKA V. (1868): Correspondenz, Szt. Gothard in Siebenburgen, am 2. Juni 1868 – Österreichische Botanische Zeitung **18**: 231 – 232.

MEUSEL, H. – JÄGER, E. – WEINERT, E. (1965): Vergleichende Chorologie der Zentraleuropaische Flora, band 1 - Veb Gustav Fischer Verlag, Jena.

NYÁRÁDY E. Gy. – SOÓ R. (1941): Kolozsvár és környékének flórája – Kolozsvár.

NYÁRÁDY E. Gy. (1923): *Centaurea ruthenica* Lam. has not disappeared from the flora of Transylvania (in Romanian) – Buletinul Grădinii Botanice şi al Muzeului Botanic de la Universitatea din Cluj 2, **19**: 85 – 87.

PRODAN, I. – NYÁRÁDY E. Gy. (1964): *Centaurea* L. – in T. SĂVULESCU (ed.): Flora Reipublicae Popularis Romanicae vol. 9, Cluj: 785 – 951.

PRODAN, I. (1930): Centaureae Romaniae – Buletinul Academiei de Înalte Studii Agronomice Cluj, Memorii **1**: 1 – 256.

PRODAN, I. (1931): Flora der Siebenbürger Câmpia, eine floristiche, oekologische und landwirtshaftlische studie – Buletinul Academiei de Agricultură **2**: 1 – 286.

PRODAN, I. (1939): Flora for the identification and description of the plants from Romania (in Romanian), vol. 2, Cluj.

PROSSER, F. (1995): Il rinvenimento di *Centaurea alpina* L. nella bassa Valle dell'Adige (Province di Trento e Verona) – Studi Trentini di Scienze Naturali, Acta Biologica **70**: 29 – 38.

SCHUR, F. (1855): Seine Durchlaucht der Herr k.k. Feld-Zeugmeister Militair – und Civil Gouverneur v. Siebenburgen etc.etc., fürst Carl zu Schwarzenberg, 1. *Plantago Schwarzenbergiana* Schur, 2. *Centaurea schwarzenbergiana* Schur – Verhandlungen und Mittheilungen des siebenbürgischen Vereins für Naturwissenschaften, **6**: 3-4.

SUSANNA, A. – JACAS, N. G. – SOLTIS, D. E. – SOLTIS, P.S. (1995): Phylogenetic relationships in tribe *Cardueae* (Asteraceae) based on ITS sequences – American Journal of Botany 8, **82**: 1056 – 1068.

SUSANNA, A. (1988): Mapa 64. *Centaurea alpina* L. – in F. CASAS (ed.): Asientos para un Atlas corologico de la flora occidental – Fontqueria **17**: 17 – 20.

SUSANNA, A. (1993): Mapa 510: *Centaurea africana* Lam. – in F. CASAS (ed.): Asientos para un Atlas corologico de la flora occidental – Fontqueria **36**: 206 – 208.

VULF, E.V. (1944): Historical Geography of Vegetation (in Russian) – Moskva.

WAGENITZ, G. (1975): *Centaurea* L. – in: P. H. DAVIS (ed.): Flora of Turkey. vol. 5, University Press, Edinburgh: 465 – 585.

WAGNER J. (1910): Centaureae Hungaricae – Budapest.

WALTER, H. (1968): Die vegetation der Erde in ökophysiologischer Betrachtung, Band 2 – Gustav Fischer, Jena.

WOLFF G. (1877): Jegyzéke néhány Torda környékén előforduló ritkább növénynek melyet saját észeletei alapján összeállitott. – Magyar Növenytani Lapok **1**: 56 – 71.

Table 1. Relevés with *Centaurea ruthenica* Lam. from Transsylvania

Relevée	1	2	3	4	5	6	7
Altitude (m)	380	380	375	380	380	375	400
Exposure	SE	SE	SE	SE	SE	SW	SE
Incline (°)	10	7	7	35	40	5	5
Covering (%)	95	100	100	10	70	70	100
Surface (m^2)	5	5	10	10	10	10	10
Diff. ass.							
Brachypodium pinnatum	+	1.3	+	-	+	+	-
Bromus inermis	1.5	3.5	2.4	1.3	+	+	-
Amygdalus nana	-	-	-	-	2.5	3	-
Prunus spinosa	+	+	-	-	-	-	2.5
Cirsio-Brachypodion et Festucetalia valesiacae							
Scabiosa ochroleuca	-	+	+	-	+	-	-
Asparagus officinalis	+	-	+	1.2	+	+	+
Campanula glomerata	-	-	+	-	-	-	+
Linum flavum	-	-	+	-	+	-	-
Rosa gallica	+	+	+	-	+	+	-
Coronilla varia	-	+	-	+	+	-	+
Centaurea spinulosa	+	+	+	+	-	+	+
Reseda lutea	+	-	+	+	+	-	-
Festuca rupicola	-	-	+	-	+	+	-
Dorycnium herbaceum	-	2.3	+	+	+	-	-
Carduus hamulosus	1.5	1.3	+	+	+	+	-
Anchusa barellierii	-	-	-	-	+	+	-
Achillea millefolium	1.5	1.3	+	-	+	+	+
Ajuga laxmanii	+	+	-	+	+	+	-
Melica ciliata	-	-	-	+	+	+	-
Iris pumila	-	-	-	+	-	+	-
Potentilla arenaria	-	-	-	-	+	+	-
Cytisus albus	-	-	-	-	+	-	-
Salvia nutans	-	-	-	+	+	+	-
Thymus pannonicus	-	-	-	-	+	-	-
Thymus glabrescens	-	-	+	-	-	+	-
Centaurea stricta	-	-	+	-	-	-	-
Teucrium montanum	-	-	-	-	+	-	-
Festucion valesiacae							
Peucedanum tauricum	-	-	-	+	+	-	-
Muscari comosum	-	-	+	-	-	+	+
Galium glaucum	-	+	+	+.3	+	+	-
Linum hirsutum	+	+	+	+	+	+	-
Tragopogon dubius	-	+	-	+	+	+	-
Dictamnus albus	-	-	-	+.3	+	+	-
Stipa lessingiana	-	-	-	-	+	+	-
Cephalaria uralensis	-	-	-	+	+	+	-
Scorzonera hispanica	-	-	-	-	+	+	-
Festuco-Brometea							
Galium verum	+	+	+	-	+	+	-
Thalictrum minus	2.5	2.5	+	+	+	+	-
Stachys recta	+	+	+	+	+	+	-
Eryngium campestre	-	-	-	+	+	-	-

Relevée	1.	2.	3.	4.	5.	6.	7.
Teucrium chamaedrys	1.3	+	-	1.5	+	+	-
Asperula cynanchica	-	+	-	-	+	-	-
Fragaria viridis	+	-	-	1.3	+	-	+
Allium flavum	-	-	-	+	+	-	-
Diplachne serotina	-	-	-	1.2	+	+	-
Nepeta pannonica	-	+	+	-	+	-	-
Galium boreale	-	-	+	-	+	-	-
Plantago lanceolata	-	-	-	-	+	-	-
Poa angustifolia	-	-	+	-	+	+	-
Medicago lupulina	-	-	-	-	+	+	-
Brassica elongata	-	-	-	+	+	+	-
Inula bifrons	-	-	-	-	+	-	-
Viola hirta	-	-	+	-	+	-	-
Aster linosyris	-	-	-	-	+	+	-
Phleum phleoides	-	-	+	-	-	-	+
Falcaria sioides	+	1.5	-	+	-	-	-
Euphorbia cyparissias	+.2	+	-	+	+	+	-
Ajuga genevensis	-	-	-	+	+	-	-
Anthericum ramosum	+	-	-	-	+	-	-
Helianthemum canum	-	-	-	-	+	-	-
Inula ensifolia	-	-	-	-	+	-	-
Origanetalia s.l.							
Centaurea ruthenica	1.2	+.3	+	+	+	2	+.3
Salvia nemorosa	1.5	+	+	1.5	+	+	+
Leontodon hispidus	-	-	+	1.5	+	-	+
Agrimonia eupatoria	-	1.3	+	+	+	+	+
Knautia arvensis	1.3	-	+	-	-	-	+
Dactylis glomerata	+	+	+	-	-	-	+
Geranium sanguineum	-	-	+	-	+	-	+
Galium mollugo	-	-	+	-	-	-	+
Inula salicina	-	+	+	1.3	+	-	-
Melilotus officinallis	-	-	+	+	+	-	+
Euphorbia salicifolia	-	-	-	-	-	-	+
Geum urbanum	-	-	-	-	+	-	+
Agropyron intermedium	-	2.5	-	1.5	+	-	-
Secalietea							
Sinapis arvensis	+	-	-	-	+	-	-
Convolvulus arvensis	+	-	-	-	+	-	-
Melampyrum arvense	-	+	-	+	+	-	-
Lappula echinata	-	-	-	-	+	-	-
Asperugo procumbens	-	-	-	-	+	-	-
Cuscuta europaea	-	-	-	-	+	-	-
Rubus caesius	-	-	-	-	+	-	+
Artemisietea							
Salvia verticillata	2.5	2.5	-	+	+	-	-
Artemisia absinthium	-	-	-	+	+	-	-
Artemisia vulgaris	-	-	+	-	+	-	-
Hieracium bauhinii	-	-	+	-	+	-	-
Lamium album	-	-	-	-	+	-	-
Erigeron canadensis	-	-	-	+	+	-	-
Xanthium strumarium	-	-	-	+	+	-	-
Setaria viridis	1.3	-	-	1.5	+	-	-
Ballota nigra	-	-	-	-	+	-	-
Althaea cannabina	-	-	-	-	+	-	+

Relevée	1.	2.	3.	4.	5.	6.	7.
Echium vulgare	+	+	-	-	+	-	-
Chenopodietea							
Urtica dioica	-	-	-	+	+	-	-
Chenopodium album	-	-	-	-	+	-	-
Plantaginetea majoris							
Taraxacum officinale	-	-	+	-	+	-	+
Variae							
Phragmites australis	+.3	+	+	+	+	-	+
Picris hieracioides	+	1.3	-	-	-	-	-
Rhamnus cathartica	-	-	-	-	+	-	-

Time and place of the relevés: 1,2,3 - ***Festuco rupicolae-Brachypodietum pinnati*** Mahn 65 ***brometosum inermi*** nova subass., 16.VI., 5.VII.1998, Boju – Iuriu de Campie, Dl. Straja Mare. 4 - ***Thymus-Salvia sp.***, cfrm. Csűrös et al. 61, 16.VI, 5.VII.1998, 5 - ***Amygdaletum nanae*** Soó (27)59, 16.VI, 5.VII. 1998, Boju – Iuriu de Campie, Dl. Straja Mare. 6 – *Amygdaletum nanae* Soó (27)59, 21. IV, 17. V., 1. VI. 2000, Bonțida – Jucu, Dl. Ureieselul. 7 - ***Pruno spinosae-Crataegetum*** Soó (27)31, 16.VI.1998, Boju-Iuriu de Câmpie, Dl. Straja Mare.