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On the Occurence in Romania of *Potentillo albae-Quercetum petraeae* Libbert 1933 Association

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Abstract

The paper presents a plant community of dry-mesic oak forests that is new to Romania, *Potentillo albae-Quercetum petraeae* Libbert 1933. This association belongs to *Quercion petraeae* alliance and its range extends over the subcontinental area of Central Europe. A multivariate analysis (cluster analysis, non-metric multidimensional scaling ordination) of a large phytosociological database was used to identify diagnostic species, interspecific associations and the gradient of species composition. Based on species composition and site parameters, a group of relevees in oak forests that correspond to the diagnosis of *Potentillo-Quercetum* was identified. The Romanian relevees corresponding to this association were previously assigned, pro parte, to *Carici montanae-Quercetum* Gergely 1962 and *Quercetum robori-petraeae* Borza 1959. The relations with these and other potentially related two associations, *Genisto tinctoriae-Quercetum petraeae* Klika 1932 and *Quercetum petraeae-cerris* Soó 1963, are discussed. The vegetation and site conditions of the *Potentillo albae-Quercetum* association in Romania are illustrated in a phytosociological table with 25 relevees and a distribution map is provided.

Keywords: multivariate analysis, oak forests, plant communities, syntaxonomy

Introduction

In 1962 Gergely described the association *Carici montanae-Quercetum petraeae* from Trascau Mountains (western part of Transylvanian basin, Romania). He noticed the resemblance with the Central European association *Potentillo albae-Quercetum* Libbert 1933, but stated that the phytocoenoses from Trascau Mt. are different because of the presence of *Carex montana* and some leguminous species and the absence of spontaneous Turkey oak (considered a specific taxon for the last association, based on the works of Hungarian and Austrian authors). Yet, he asserted that *Potentillo albae-Quercetum* is present in the Transylvanian Plain, in the area of mixed forests with sessile oak (*Quercus petraea*) and Turkey oak (*Quercus cerris*). Since then no other references to this association have been made and no description of the syntaxon was provided for Romania. Forests of sessile oak and *Carex montana,* regarded as association or subassociation to *Genisto tinctoriae-Quercetum petraeae* Klika 1932, were reported in the Huedin basin (Csüros *et al.*, 1969), the mountains around Brasov-south-eastern Transylvania (Danciu, 1972; Kovacs, 1979). Ularu (1972) described a *Carex montana* variant of *Quercetum robori-petraeae* Borza 1959. In the recent Romanian syntaxonomic works (Coldea and Pop, 1996; Kovacs, 2004; Sanda *et al.*, 2001, 2008) neither *Carici montanae-Quercetum* nor *Potentillo-Quercetum* were taken into account.

Potentillo albae-Quercetum petraeae is a zonal association of Central Europe, with subcontinental-sarmatic range, including dry-mesic forests dominated by *Quercus petraea* or *Quercus robur*, developed on soils with imperfect drainage (i.e. stagnosols). It is present in Poland (Libbert, 1933; Matuskiewicz and Kozlowska, 1991), Czech Republic (Mráz, 1958; Neuhäusl and Neuhäuslová, 1968; Chytrý, 1997; Chytrý and Horak, 1997), Slovakia (Chytrý, 1994; Roleček, 2005), Germany (Müller, 1992) and Russia (Mráz, 1958; Morozova, 2003). It is also encountered in France (Treiber and Remmert, 1998). Similar communities may exist in Hungary and Austria, but their relation with *Potentillo-Quercetum* has not been clarified yet (Wallnofer *et al.*, 1993; Chytrý, 1997; Roleček, 2005). In these circumstances the spread of the association southward, in Romania may be questionable.

Considering the phytosociological information gathered since the Gergely's publication (Gergely, 1962) and the statistical tools available nowadays, the aim of this study is to investigate the syntaxonomical position of oak forests with *Carex montana* and the hypothesis regarding the presence of *Potentillo albae-Quercetum* in Romania. This endeavor is also important in the context of the nowadays efforts towards sustainable forest management and conservation of all representative forest ecosystems from Romania (Donita and Biris, 2003; Abrudan *et al.*, 2009; Ioras *et al.*, 2009; Stancioiu *et al.*, 2010).

Materials and methods

This study is based on the analysis of a database for over 1400 relevees stored in TURBOVEG (Hennekens and Schaminée, 2001) corresponding to oak forests from Romania. The relevees were sampled according to Braun-Blanquet methodology and originate partly from literature (801) and partly from our field work (610). In order to have an accurate image of the gradient in species composition, methods of numerical analysis were applied. Firstly, from the entire database only those relevees having the dominants *Quercus petraea*, *Q. robur* or *Q. cerris* were kept. Out of these, dry-mesic oak forests relevees were selected based on the results of the cluster analysis: the clusters with diagnostic species common for oak-hornbeam forests (*Carpinion*) or thermophilous forests (*Quercion frainetto*) were eliminated. Finally 105 relevees were selected. The analysis was performed using: the presence-absence data for species cover (in order to diminish the inconstancy in the assessment of species cover by different authors), the Sørensen coefficient for the similarity between relevees and the linkage method of flexible beta (β = - 0.25, a value verified as giving the best results (McCune *et al.*, 2002)). The optimal number of clusters corresponds to the maximum crispness value (Botta-Dukát *et al.*, 2005). For measuring the species' fidelity the phi coefficient was used, with the cut off value of 0.30 (Chytrý *et al.*, 2002; Willner *et al.*, 2009). To visualize de variation between the clusters identified by the classification, the selected relevees were ordinated by the means of the non-metric multidimensional scaling (NMS) method. The distances between relevees in the floristic space were calculated by the mean of Sørensen dissimilarity, for presence-absence data. The arrangement of phytosociological tables and calculation of species fidelity were performed using the JUICE software (Tichý, 2002), and the classification and ordination of relevees by using PC-ORD (McCune and Mefford, 2006).

The selected Romanian relevees were compared with the original diagnosis of *Potentillo albae-Quercetum* (Libbert, 1933) and with recent descriptions of the association provided in some synthetic phytosociological studies (Mráz, 1958; Matuskiewicz and Kozlowska, 1991; Müller, 1992; Chytrý, 1997; Roleček, 2005, 2007), taking into account the diagnostic species, the site conditions and the similarity of the overall species composition. Other syntaxa accounted for comparison are *Genisto tinctoriae-Quercetum* Klika 1932 and *Quercetum petraeae-cerris* Soó 1963, as these associations were considered in the published literature as being linked with *Carici montanae-Quercetum* and *Potentillo albae-Quercetum* respectively.

The concept of broad species was used in the case of the genera *Quercus* (*Q. petraea* s.l. = *Q. petraea* s.str.*, Q. dalechampii, Q. polycarpa; Q. robur* s.l. = *Q. robur* s.str.*, Q. pedunculiflora*), *Molinia* (*M. caerulea* s.l. = *M. caerulea* s.str.*, M. arundinacea*) and *Dactylis (Dactylis glomerata s.l. = D. glomerata, D. polygama*). The nomenclature of species follows Ciocarlan (2000).

Results and discussion

The cluster analysis of the 105 selected relevees of dry-mesic oak forests from Romania leads to the separation of three clusters, as it is indicated by the crispness function of classification in JUICE. The first ten diagnostic species and their fidelity for each cluster are presented in Tab. 1. The species resulted as diagnostic for clusters are also convergent in the ecological and sociological meanings (verified by interspecific associations in JUICE), therefore the solution could be ecologically accepted (i.e. it is not just a statistical evidence). Two clusters correspond to the well known associations *Genisto tinctoriae-Quercetum petraeae* Klika 1932 (Cluster 2) and *Quercetum petraeae-cerris* Soó 1963 (Cluster 3) respectively.

The Cluster 1 is intuitively similar to *Potentillo albae-Quercetum* Libbert 1933 and the arguments for this classification are given below.

(i) Among the 43 diagnostic species for Cluster 1 almost all of the species found as diagnostic for this association in Central Europe, by different phytosociologists are included. In each region (country) there are some specific taxa, like *Fragaria moschata* in Czech and Slovak relevees, and *Pulmonaria angustifolia* in Polish relevees. Other species, like *Melampyrum nemorosum* or *Galium sylvaticum* are replaced in Romania by their ecologically similar taxa-

Tab. 1. Diagnostic species and the cluster fidelity (Φ x 100) for the dry-mesic oak forests in Romania

Cluster 1	Cluster 2	Cluster 3
Potentilla alba 82.1	*Deschampsia flexuosa* 76.2	*Quercus cerris* 65.3
Stachys officinalis 79.4	*Genista ovata* 54.4	*Silene viridiflora* 44.5
Pulmonaria mollis 72.3	*Vaccinium myrtillus* 53.5	*Fragaria viridis* 43.0
Serratula tinctoria 71.3	*Luzula luzuloides* 49.0	*Helleborus odorus* 36.7
Carex montana 67.7	*Cytisus nigricans* 46.4	*Euphorbia amygdaloides* 35.6
Melittis melissophyllum 63.3	*Hieracium sabaudum* 42.8	*Polygonum convolvulus* 35.0
Convallaria majalis 55.9	*Polypodium vulgare* 37.1	*Carex pairae* 35.0
Trifolium alpestre 55.9	*Fagus sylvatica* 33.2	*Potentilla micrantha* 34.7
Quercus robur 52.0	*Betula pendula* 28.7	*Melica uniflora* 32.6
Ranunculus polyanthemos 36.		*Genista tinctoria* 31.9

Melampyrum bihariense and *Galium schultesii* respectively. The absence of such species does not affect the association's validation. The Romanian relevees include several species with regional distribution: *Iris ruthenica, Phyteuma tetramerum, Crocus banaticus, Melampyrum bihariense, Helleborus purpurascens*, *Lathyrus transsilvanicus*. Considering the concept of association in a broader sense, such elements could eventually represent differential species for a local subassociation.

(ii) There are similarities regarding ecological groups of species. One characteristic of the association is the mixture of xerophytes, mesophytes and acidophytes. The differences compared to acidic oak forests are, firstly, the species of intermittently wet and heavy soils-some of them common in meadows of *Molinion* alliance (*Potentilla alba, Serratula tinctoria, Carex pallescens, Succisa pratensis, Ranunculus polyanthemos, Carex montana, Potentilla erecta*, *Poa angustifolia, Molinia caerulea* agg., etc.). Secondly, the presence of eu-mesotrophic species of oak-hornbeam forests (like *Stellaria holostea, Galium schultesii, Carpinus betulus*) indicates more favorable ionic and mineral properties of the soil as compared to the case of acidic forests. The occurrence of acidophilous species (*Luzula luzuloides, Calamagrostis arundinacea, Pteridium aquilinum, Veronica officinalis, Hieracium murorum, Genista tinctoria, Vaccinium myrtillus* etc.) is in consensus with the descriptions published until now (Matuskiewicz and Kozlowska, 1991; Chytrý, 1997; Roleček, 2005, 2007). For example, *Luzula luzuloides* is also present in the Central European relevees of *Potentillo-Quercetum* with frequencies of up to 47% and cover indices of 3. This species was found to be diagnostic, in the context of dry-mesic forests, for the alliance (Chytrý, 1997) or even for the association (Roleček, 2005). Moreover, the poor development of the moss layer and the higher number of species in phytocoenoses are arguments for not including these forests into *Genisto tinctoriae-Quercetum*. On the other hand, the differences against thermophilous associations consist of the cooler, more humid and poorer sites, located in the area of the mesic forests, thus corresponding with the significance of *Quercion petraeae* alliance-more humid and slightly cooler than *Quercion pubescenti-petraeae* or *Aceri tatarici-Quercion* (Jakucs, 1960; Chytrý and Horak, 1997*)*. The studied forests are located outside of the optimal range of thermophilous oaks, *Q. frainetto*, *Q. pubescens* or *Q. pedunculiflora*, therefore the species of *Quercion frainetto* or *Aceri tatarici-Quercion* are missing.

(iii) The subboreal species (*Vaccinium* sp., *Pyrola* sp.), present in Romanian relevees, are considered (Wallnöfer *et al.*, 1993) as a major trait for *Potentillo-Quercetum*, against peri-pannonian *Quercetum petraeae-cerris*. Even Norway spruce (*Picea abies*) occurs, partly due to natural causes, inside or close to the sessile oak stands in south-eastern Transylvania – reflecting also the continental nuances of the climate.

(iv) The ecological conditions are equivalent with those from the Central European range of the association. The most peculiar is the imperfect drainage of the soil. The higher elevation of Romanian phytocoenoses compensates the southern latitude while the Carpathian arch reduces the submediterranean influences from the south and the continental ones from the east. A curious analogy makes reference to the distribution in the peripheral areas of watersheds (Libbert, 1933; Roleček, 2005).

(v) Certain connections with Central European dry-mesic oak forests on heavy soils are given by some relict species of natural old forests, like *Festuca amethystina* and

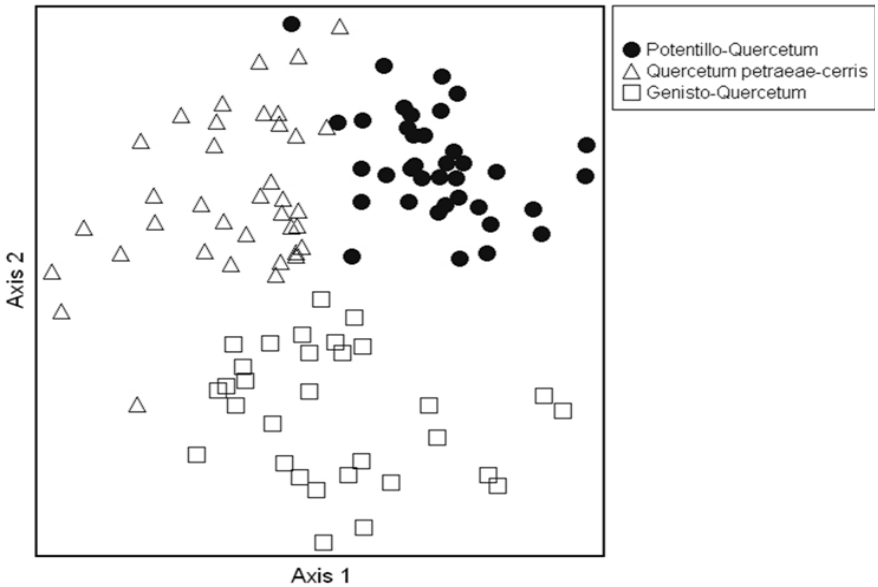

Fig. 1. NMS ordination of dry-mesic oak forests on heavy soils (*Potentillo-Quercetum*), acidic forests (*Genisto-Quercetum*) and Turkey oak forests (*Quercetum petraeae-cerris*) in Romania

Adenophora liliifolia (Wallnöfer, 2003; Roleček, 2004, 2007; Ciosek, 2006; Indreica, 2007).

The NMS ordination of dry-mesic oak forests of Romania shows a clear separation of the three clusters (Fig. 1). The first 2 axes jointly explain 70% of the variation of floristic composition in the original n-dimensional space.

The relevees of the first cluster were originally assigned by their authors either to *Carici montanae-Quercetum* Gergely 1962 (Gergely, 1962; Danciu, 1972), *Quercetum robori-petraeae* Borza (1928, 1959; relevees of Borza, 1959; Ciurchea, 1965; Ularu, 1972; Coldea and Miclaus, 1975), *Melampyro bihariensis-Carpinetum* (Borza, 1941) Soó 1964 em. Coldea (1975) or to *Carpino-Quercetum cerris* Klika (1938), (some of the relevees of Pop and Coldea, 1987). Most of the relevees of oak forests with *Carex montana* fall into the definition of *Potentillo-Quercetum*. In some cases *Carex montana* may reach high cover on xeric-oligotrophic sites, in transitional communities towards *Genisto tinctoriae-Quercetum*, but this syntaxon could be easily recognized by site physiography (moderately to steep slopes, shallow and skeletal soil) and the lower number of species. Another association considerably linked to *Potentillo-Quercetum*, but not identical, is *Quercetum robori-petraeae*. This was originally defined (Borza, 1959; Soó, 1951) as xeric association, but in time its meaning became too heterogeneous: nowadays it is included in *Genisto germanicae-Quercion* Neuhäusl et Neuhäuslová-Novotná (1967), although many relevees correspond to oak-hornbeam forests.

In order to describe the vegetation and site conditions of *Potentillo albae-Quercetum* in Romania, 25 relevees sampled during 2005-2010 were selected and presented in Tab. 2.

Diagnostic species: *Potentilla alba*, *Stachys officinalis*, *Serratula tinctoria*, *Pulmonaria mollis, Carex montana, Carex pallescens, Euphorbia angulata, Hierochloë australis, Laserpitium prutenicum*.

Constant species: *Quercus petraea, Fragaria vesca, Cruciata glabra, Veronica chamaedrys, Carex montana, Potentilla alba, Serratula tinctoria, Luzula luzuloides, Trifolium medium, Viola reichenbachiana, Lathyrus niger, Vincetoxicum hirundinaria, Clinopodium vulgare, Calamagrostis arundinacea* etc.

Dominant species: *Quercus petraea, Carex montana, Quercus robur, Pteridium aquilinum, Pulmonaria mollis*.

The tree layer's coverage is of 50-80%, *Quercus petraea, Q. robur* or, in the western part of Transylvanian basin, *Quercus cerris* prevailing. Trees of *Fagus sylvatica*, *Populus tremula* or *Pinus sylvestris* participate in the stand composition only in rare cases. In the shrub layer, which is rather sparse, the most frequent species are *Crataegus monogyna, Carpinus betulus, Corylus avellana, Pyrus pyraster, Frangula alnus*, *Rosa gallica, R. canina* etc. The herbaceous layer is well developed, covering 40-80%, and is very rich in species. The average number of taxa per relevee is 60-70 and the maximum values reach 90-98 taxa/relevee. The moss layer is absent or very poor, being represented by *Atrichum undulatum, Polytrichum formosum* and *Hypnum cupressiforme*.

These forests are developed on flysh, paleogenic sediments (marls and calcareous sandstones), volcanic sediments, limestone or conglomerates, at altitudes between

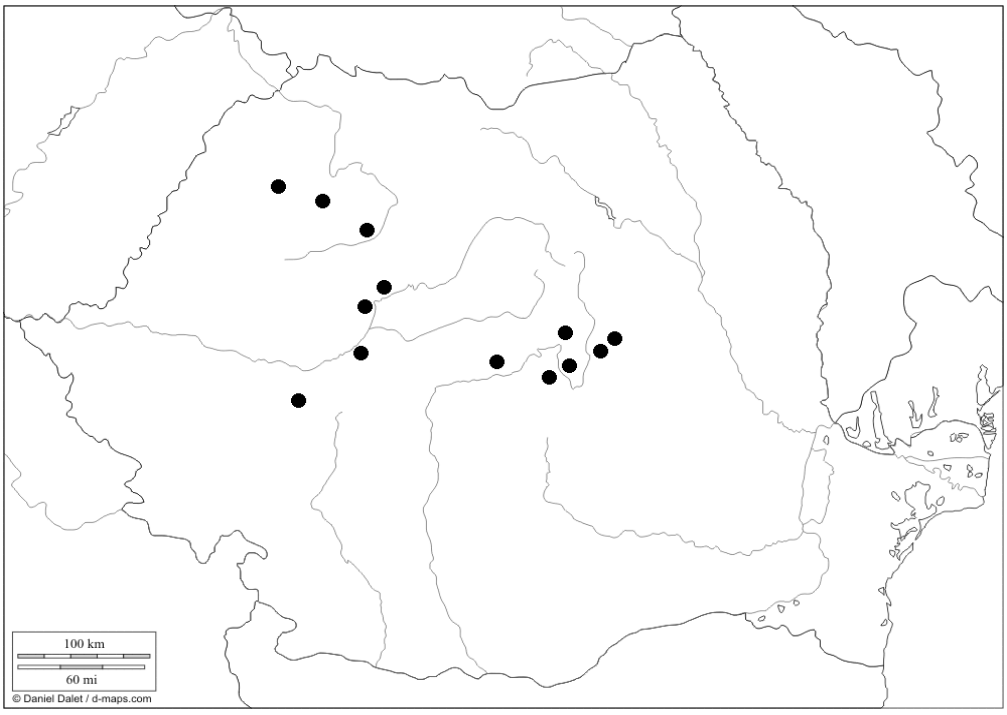

Fig. 2. Distribution of the *Potentillo albae-Quercetum* association in Romania

400-800 m, on the upper part of the slopes, on plane or gently inclined surfaces. The soils are slightly to moderately acidic (pH = 4.6-5.3), with stagnic properties due to the higher proportion of clay in the B horizon. The mean annual temperature is 7-8°C and the mean annual rainfall is 550-650 mm. The continentality index ($I_c = T_{max} - T_{min}$) is between 22 and 23, indicating a subcontinental climate.

The range of the *Potentillo albae-Quercetum* association in Romania extends around the Transylvanian basin, including the peripherial basins of Brasov and Hateg. The respective forests were found in the administrative range of the following localities (Fig. 2): Racas (Salaj county), Cluj-Napoca, Cheia (Cluj county), Aiud, Sebes (Alba county), Hateg (Hunedoara county), Boholt (Brasov county), Aita, Belani, Biborteni, Batani, Doboseni, Haghig, Herculian, Lemnia, Malnas, Petriceni, Racos, Varghis (Covasna county) and Plaiesi (Harghita county).

Conclusions

Both intuitively and by statistical analysis (classification and ordination methods, fidelity measure and interspecific associations) it is demonstrated that *Potentillo albae-Quercetum* Libbert 1933 association is present in Romania. This syntaxon is confined to specific site conditions-the same as in its known range and indicated by the similar group of diagnostic species, it poses a high floristic diversity and could be clearly distinguished from other related associations. Its extent to the south is possible due to the climatic compensations of the higher altitudinal sites and the "shadow" provided by basins. This paper contributes to the knowledge on the distribution and variability of the *Potentillo-Quercetum* association, as a consequence of the valuable formalized classifications initiated by the Czech School of phytosociology. It is expected that the results will contribute to the development of proper strategies for the conservation of the representative forest habitats, that should be implemented in the future at local or regional level.

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Tab. 2. *Potentillo albae-Quercetum petraeae* Libbert 1933

Relevee nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Altitude (x 10 m a.s.l.)	64	62	63	61	62	90	65	59	79	69	66	87	64	59	75	66	74	54	62	63	45	53	55	31	36
Exposition	N	E	S	SE	SW	NW	W	SE	E	E	S	W	S	-	S	N	W	S	SW	W	S	-	W	E	W
Slope (°)	15	5	5	5	5	10	12	5	5	3	10	20	20	0	5	10	20	15	5	5	5	0	2	3	15
Cover (%) – tree layer	50	60	70	75	75	85	70	70	75	65	70	70	60	70	70	65	75	80	60	55	80	70	65	70	70
– shrub layer	1	5	5	45	1	3	5	2	1	5	1	3	10	40	5	5	2	1	2	2	5	40	10	30	50
– herb layer	80	60	90	60	75	80	85	85	85	80	60	60	50	70	65	80	40	50	60	60	60	50	70	40	20
E3 – tree layer																									
Quercus petraea	4	4	5	5	4	5	4	2	5	4	4	4	4	+	4	4	5	5	4	3	4	4	4	4	+
Quercus robur	.	+	+	.	.	.	.	4	.	.	.	.	.	4	.	.	.	.	1	2	.	.	.	.	1
Quercus cerris	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	+	4
E2 – shrub layer																									
Carpinus betulus	+	1	.	2	+	+	+	.	+	+	+	+	1	1	+	1	+	.	.	.	1	+	.	+	.
Corylus avellana	+	+	+	+	+	+	.	+	+	.	+	.	1	.	.	+	+	.	+	+	.	2	.	.	.

Relevee nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Crataegus monogyna	.	+	1	1	+	.	+	+	.	+	+	.	+	2	+	+	.	+	.	.	+	2	+	1	2
Pyrus pyraster	+	+	.	+	+	.	.	+	.	1	+	.	.	+	.	.	.	+	.	.	.	+	+	+	+
Rosa gallica	.	+	+	1	+	+	+	+	+	+	1	.	.	.	.	+	+	+	.	.	.	1	+	+	+
Rosa canina	.	.	+	+	.	.	+	.	.	.	.	.	+	+	.	+	.	+	+	+	+	1	1	.	.
Acer campestre	+	+	.	+	+	.	.	.	.	.	.	.	+	.	.	+	.	+	.	.	+	1	+	.	.
Cornus sanguinea	.	.	+	+	+	.	.	.	+	.	.	.	.	2	.	.	.	.	.	.	+	1	+	+	.
Ligustrum vulgare	.	.	+	.	+	.	.	.	.	.	.	.	.	3	.	.	.	+	.	.	+	2	1	1	2
Sorbus torminalis	.	+	.	1	.	.	.	.	.	.	.	.	1	1	.	+	.	+	.	.	+	+	.	.	.
Frangula alnus	.	.	+	.	.	.	.	+	+	1	+	.	.	.	.	.	.	.	+	+	.	.	.	+	.
Malus sylvestris	.	+	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Viburnum opulus	+	.	+	+	.	+	.	.	.	.	+	.	.	1	.	+	.	.	.	.	.	.	.	.	.
Lonicera xylosteum	.	.	+	+	.	+	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Prunus spinosa	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	2	1	2	2
Juniperus communis	.	+	.	.	1	.	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Populus tremula	.	+	.	.	.	1	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus idaeus	.	.	.	.	.	.	+	.	.	+	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.
Evonymus europaeus	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.
Rhamnus cathartica	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.
Rhamnus saxatilis	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sorbus aucuparia	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Rubus fruticosus	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
E1 – herb layer																									
Diagn. sp.																									
Carex montana	2	2	3	3	3	2	3	2	1	3	2	+	2	+	2	3	1	2	3	1	3	2	2	1	2
Serratula tinctoria	+	1	+	+	+	+	1	1	+	2	1	1	1	.	+	+	+	1	1	1	+	1	+	2	1
Stachys officinalis	.	1	+	+	+	+	1	2	.	2	1	+	+	1	+	1	.	+	1	1	+	+	.	2	1
Pulmonaria mollis	+	.	1	.	+	+	2	+	1	+	2	+	.	2	1	+	.	1	1	1	+	+	.	1	+
Potentilla alba	+	2	1	+	1	1	2	2	+	1	1	.	.	2	+	2	+	+	.	.	+	1	+	1	+
Trifolium alpestre	.	+	.	+	+	+	.	.	.	.	+	+	.	+	.	.	.	.	+	.	+	.	+	.	.
Hypericum montanum	+	+	.	.	.	1	+	.	+	+	1	+	+	.	+	1	.	.	+	+	.	.	.	.	.
Molinia caerulea	.	.	1	1	.	+	.	.	.	.	1	.	.	.	.	1	+	.	+	2	.	+	2	.	.
Carex pallescens	.	1	.	.	+	+	+	.	.	1	+	.	.	1	.	+	.	.	.	+	.	.	.	+	.
Peucedanum carvifolium	.	.	.	.	+	.	.	1	.	+	+	.	+	+	+	.	.	.	+	+	.	.	.	2	.
Euphorbia angulata	.	+	.	+	+	+	+	.	.	+	+	.	.	.	.	1	.	.	.	.	.	.	.	+	.
Melampyrum pratense	.	.	.	.	1	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	2	.	.	.	.
Scorzonera humilis	.	1	.	+	.	.	+	.	.	+	+	.	.	.	.	+	.	.	+	+	.	.	.	.	.
Laserpitium prutenicum	+	+	+	.	+	.	+	.	.	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.
Deschampsia cespitosa	.	.	+	.	.	.	+	.	.	1	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Ranunculus polyanthemos	.	.	.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.
Selinum carvifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	.
Rubus saxatilis	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.
Inula salicina	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	1
Galium boreale	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Dianthus superbus	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia cassubica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Xerophilous sp.																									
Trifolium medium	1	1	+	1	+	1	2	1	1	1	1	1	1	+	1	+	+	+	+	+	1	+	+	.	.
Lathyrus niger	+	+	+	1	+	.	+	+	1	+	1	1	1	.	+	+	.	1	1	1	1	1	1	+	1
Melittis melissophyllum	1	.	+	+	+	1	1	+	1	1	1	.	1	.	1	1	+	+	1	+	+	+	+	+	.
Clinopodium vulgare	.	+	1	+	+	.	+	1	+	+	+	.	+	+	+	.	+	.	.	+	1	+	+	+	+
Vincetoxicum hirundinaria	+	+	1	+	+	.	1	+	+	+	1	1	.	+	+	+	.	.	.	.	1	+	+	+	+
Brachypodium pinnatum	.	.	+	1	.	+	.	.	+	1	1	1	1	.	1	1	+	.	1	+	.	+	3	+	+
Campanula persicifolia	.	.	+	+	+	+	.	+	+	+	.	.	+	+	+	+	.	+	+	.	+	.	.	.	.
Peucedanum oreoselinum	+	+	.	.	.	+	+	.	+	.	1	+	.	.	+	1	.	.	+	+	.	.	.	.	+
Galium pseudaristatum	1	+	.	.	.	.	+	+	.	+	1	.	1	.	.	1	.	.	+	+	.	1	+	.	.
Tanacetum corymbosum	+	+	+	.	.	+	.	.	.	.	+	+	.	.	.	+	.	+	+	.	+	+	+	.	+
Geranium sanguineum	+	+	.	1	.	+	.	.	.	.	+	+	.	.	.	+	+	.	.	.	.	+	.	.	.

Relevee nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sedum maximum	.	.	+	+	.	.	.	+	.	.	+	+	.	.	.	.	+	.	.	.	+	1	.	.	.
Hierochloë australis	.	.	.	1	.	+	+	.	2	.	1	+	.	.	.	1	+	1	.	.	.	.	.	.	.
Digitalis grandiflora	+	.	+	.	.	.	+	.	.	.	.	1	+	.	+	.	+	.	+	.	.	.	.	.	.
Carex michelii	.	.	+	1	+	.	.	.	.	.	1	.	.	2	.	.	.	.	.	.	.	1	1	.	.
Euphorbia cyparissias	.	.	.	+	.	.	.	+	.	.	+	.	.	+	+	.	.	.	.	.	.	.	+	.	+
Peucedanum cervaria	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	+	.	.
Polygonatum odoratum	.	.	.	.	.	.	.	.	+	.	.	2	.	.	.	+	.	+	+	.	+	.	.	.	.
Crepis praemorsa	.	.	.	+	.	.	.	.	.	.	+	.	+	.	.	+	.	.	+	.	.	.	.	.	+
Filipendula vulgaris	.	.	.	.	.	.	.	1	.	+	.	.	.	+	.	.	.	.	.	+	.	+	+	.	+
Laserpitium latifolium	.	.	.	+	.	.	.	.	+	.	+	1	.	.	+	.	.	.	.	.	.	.	.	.	.
Festuca rupicola	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	+
Primula veris	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.	+	.	.	+	.
Carex caryophyllea	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	1	.	.	.
Coronilla varia	.	.	.	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Anthericum ramosum	.	+	.	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+
Carex tomentosa	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Carex praecox	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Fragaria viridis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+
Melampyrum cristatum	.	.	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Mesophilous sp.																									
Mycelis muralis	+	.	1	.	+	+	+	+	.	+	+	.	.	.	+	+	+	.	.	.	.	+	+	+	+
Viola reichenbachiana	+	+	1	+	1	+	.	1	1	+	1	.	.	+	+	+	+	+	+	.	+	+	+	.	.
Neottia nidus-avis	+	.	.	+	+	+	.	.	+	.	.	.	+	.	+	.	+	.	.	+	.	.	.	.	.
Phyteuma tetramerum	+	.	+	+	1	1	+	.	.	.	+	.	.	+	.	1	.	.	1	1	.	.	.	.	.
Poa angustifolia	.	.	+	+	2	.	.	1	2	+	1	.	.	+	+	.	+	.	.	.	+	1	1	+	.
Platanthera bifolia	+	+	.	+	+	+	.	.	.	+	+	.	.	+	.	+	.	+	.	+	+	.	+	.	.
Lathyrus vernus	1	.	+	+	1	+	.	.	+	+	+	.	+	.	1	+	.	+	+	+	.	+	.	+	.
Fagus sylvatica (juv.)	1	+	+	1	+	.	1	1	.	1	1	.	1	+	1	1	.	.	.	.	.	.	.	.	.
Galium schultesii	.	.	2	.	.	.	.	1	1	.	.	.	.	+	1	.	.	+	.	.	+	.	.	.	.
Pulmonaria officinalis	+	+	.	+	+	.	.	+	.	1	1	.	.	1	+	+	.	.	.	.	.	.	.	.	.
Melampyrum bihariense	2	+	2	.	.	.	.	2	2	.	.	.	.	.	1	1	.	.	+	+	.	+	1	.	.
Lysimachia nummularia	.	.	2	.	+	.	.	2	.	.	+	.	.	1	.	.	.	.	.	.	+	.	.	2	+
Dryopteris filix-mas	+	.	+	.	+	.	+	.	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Melica nutans	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	1	+	.	1	+	.	.
Athyrium filix-femina	+	.	+	.	.	.	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Moehringia trinervia	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.
Lilium martagon	.	.	.	+	.	+	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.
Helleborus purpurascens	.	.	.	.	+	.	.	.	.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.	.
Stellaria holostea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	+	.	.
Listera ovata	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Acidophilous sp.																									
Luzula luzuloides	1	.	1	.	1	2	+	.	2	1	+	1	1	+	1	+	2	1	1	+	1	.	.	.	.
Veronica officinalis	.	+	+	.	+	+	+	+	+	+	+	.	.	.	+	.	.	.	+	+	+	+	.	.	.
Calamagrostis arundinacea	1	2	+	1	.	2	+	.	1	.	2	1	2	.	2	2	.	1	+	.	.	2	1	+	.
Hieracium murorum	+	.	.	.	.	+	.	.	1	.	1	.	1	.	1	.	+	+	.	.	.	.	.	.	.
Genista tinctoria	.	+	1	.	.	+	+	+	.	.	+	.	.	+	+	.	+	.	.	.	+	+	+	.	+
Maianthemum bifolium	+	.	+	1	+	1	.	.	+	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Pteridium aquilinum	1	.	+	.	.	+	1	.	.	1	+	.	+	.	.	2	1	.	.	.	.	.	.	.	.
Lychnis viscaria	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	.	.	.	.	.	.	.	+
Pyrola rotundifolia	+	.	.	.	.	1	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Orthilia secunda	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Vaccinium myrtillus	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Vaccinium vitis-idaea	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Variae																									
Quercus petraea (juv.)	1	1	+	1	1	1	1	1	2	2	2	+	1	.	1	2	1	1	1	1	2	2	2	+	+
Fragaria vesca	1	+	2	1	1	2	1	2	1	2	1	1	1	1	1	1	+	1	1	+	+	1	1	1	.
Veronica chamaedrys	1	+	+	+	1	1	1	1	2	+	1	1	+	+	1	+	+	+	1	1	+	+	+	.	.

Relevee nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Dactylis glomerata	1	+	1	+	+	.	1	1	.	1	1	.	1	1	+	+	.	+	1	+	1	2	2	+	.
Cruciata glabra	+	+	+	+	1	2	+	1	1	1	1	1	+	1	1	+	1	1	1	+	2	1	+	+	+
Poa nemoralis	.	1	+	+	+	1	.	.	.	+	.	2	+	+	+	+	+	.	1	1	.	+	.	.	+
Ajuga reptans	1	1	1	1	1	+	1	2	1	1	+	.	+	+	1	+	+	+	1	1	1	+	+	.	.
Luzula pilosa	+	.	+	.	+	+	1	.	.	1	1	.	.	+	.	+	.	.	+	+	.	.	.	.	.
Iris ruthenica	1	.	.	1	.	1	.	.	2	1	1	1	.	.	+	+	1	1	.	.	.	1	2	.	.
Potentilla erecta	+	+	.	.	+	+	+	.	.	1	1	.	+	+	.	1	+	.	+	+	.	.	.	.	.
Ranunculus auricomus	+	.	+	+	+	1	+	+	+	.	+	.	.	+	+	1	.	+	1	+	+	+	.	.	.
Scrophularia nodosa	+	+	+	.	+	.	.	.	.	.	+	.	.	.	.	+	.	.	1	+	.	.	.	.	.
Sanicula europaea	1	+	.	+	+	.	2	+	.	2	1	.	.	+	+	1	.	.	+	.	+	.	.	.	.
Symphytum tuberosum	+	.	+	1	1	2	1	+	+	.	+	.	.	2	+	+	.	+	1	+	.	.	+	.	.
Chamaecytisus hirsutus	+	+	+	1	+	+	+	1	1	+	+	+	.	+	+	+	.	+	+	.	.	.	+	.	.
Solidago virgaurea	+	.	.	.	.	+	+	.	+	.	1	.	+	.	+	+	.	+	+	.	.	+	.	.	.
Festuca heterophylla	1	.	.	.	+	+	+	.	+	+	1	2	.	.	+	+	1	+	+	.	.	1	+	+	.
Geum urbanum	.	.	+	+	+	.	+	+	.	+	.	.	.	1	.	+	.	.	1	+	+	+	+	+	.
Hieracium sabaudum	+	+	.	+	+	.	.	+	+	+	+	.	1	+	+	.	.	+	.	+	1	+	.	+	1
Convallaria majalis	+	+	1	.	.	.	+	.	+	.	.	1	.	+	1	1	.	+	1	2	.	+	.	.	.
Vicia sepium	.	.	1	+	+	+	+	1	+	+	1	.	.	+	+	+	+	.	+	.	.	.	.	.	.
Festuca amethystina	.	.	.	.	.	+	+	.	2	+	+	+	1	.	.	+	.	.	.	.	.	.	.	.	.
Succisa pratensis	+	+	.	.	.	.	1	+	.	+	1	.	.	.	.	+	.	.	+	.	.	.	.	.	.
Hieracium umbellatum	.	.	+	.	.	+	1	+	+	1	1	+	.	.	.	1	+	.	+	.	+	+	+	.	.
Achillea distans	.	.	+	+	+	+	.	.	1	.	+	+	+	.	1	.	1	.	.	.	.	.	.	.	.
Anemone nemorosa	.	+	.	1	1	+	.	.	.	.	.	.	.	+	.	+	.	.	1	.	.	.	.	+	.
Lapsana communis	.	.	+	.	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+
Campanula glomerata	+	+	.	.	+	.	.	.	.	+	+	+	.	+	.	+	.	.	.	.	.	.	.	+	.
Campanula rapunculoides	.	.	.	+	+	.	.	+	1	.	.	.	1	.	+	.	.	+	.	.	1	.	.	.	+
Brachypodium sylvaticum	+	.	1	.	+	.	+	+	.	.	1	.	.	2	.	.	.	.	.	.	1	+	.	.	.
Avenula praeusta	.	+	.	+	.	1	+	+	1	+	+	.	.	.	+	.	+	.	.	.	.	.	+	.	.
Astrantia major	1	.	.	+	.	.	2	.	.	+	.	.	.	.	1	2	.	.	+	1	.	.	.	.	.
Carex umbrosa	.	.	+	.	.	.	1	.	.	1	+	.	.	.	.	+	.	.	.	+	.	.	.	.	.
Cerasus avium	.	.	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+	+	.	.	.
Valeriana wallrothii	.	.	+	.	.	.	+	+	.	.	.	+	.	1	.	.	.	+	.	.	.	.	.	.	.
Trollius europaeus	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.
Pimpinella saxifraga	.	.	.	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.
Crocus banaticus	+	.	.	+	1	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.
Lysimachia vulgaris	.	+	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	.	+	1	.	.	.	.	.
Agrimonia eupatoria	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Tilia cordata (juv.)	.	.	.	.	.	+	.	+	.	.	.	1	.	.	.	.	.	+	.	.	.	+	.	.	.
Bromus ramosus	.	.	1	.	+	+	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Galium aparine	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Gentiana asclepiadea	+	.	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.
Hypericum perforatum	.	.	+	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	+	.	+	.	.
Hieracium lachenalii	+	.	.	.	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis capillaris	.	.	.	.	.	.	.	2	.	1	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Euphorbia amygdaloides	.	.	.	.	1	.	.	1	.	.	.	.	.	.	1	+	.	.	.	.	.	+	.	.	.
Epilobium montanum	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Myosotis scorpioides	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca rubra	.	.	+	.	+	+	.	1	.	.	.	.	.	+	.	.	+	.	+	+	.	.	.	+	.
Festuca gigantea	+	.	2	+	+	.	+	.	.	+	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.
Thalictrum aquilegiifolium	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.
Adenophora liliifolia	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Lysimachia punctata	.	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Quercus robur (juv.)	.	+	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	+	.	.	.	.	.
Fraxinus excelsior (juv.)	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca drymeja	.	.	.	.	+	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Salvia glutinosa	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.
Angelica sylvestris	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.

Relevee nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Cephalanthera longifolia	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hieracium cymosum	.	.	.	.	1	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Dactylorhiza maculata	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.
Calamagrostis epigeios	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
Astragalus glycyphyllos	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.
Carex spicata	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.
Torilis japonica	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Campanula patula	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Taraxacum officinale	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
E0 – Moss layer																									
Atrichum undulatum	+	+	+	.	+	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polytrichum formosum	.	+	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.

Other species: *Eurhynchium striatum* 1: +; *Lamium galeobdolon* 1: +, 16: +; *Lathyrus transsilvanicus* 1: 1, 16: 2; I*nula germanica* 2: +; *Padus avium* 2: +, 7: +; P*lagiomnium undulatum* 2: +, 3: +; *Aegopodium podagraria* 3: 1; *Carex sylvatica* 3: +, 21: +; *Daphne mezereum* 3: +, 9: +; *Epilobium roseum* 3: +, 20: +; *Galeopsis tetrahit* 3: +; *Geranium robertianum* 3: +; *Hieracium racemosum* 3: +; *Inula britannica* 3: +; *Milium effusum* 3: 1; *Polygonatum multiflorum* 3: +; *Rubus nessensis* 3: 1, 7: +; *Trifolium aureum* 3: +; *Urtica dioica* 3: +; *Veratrum album* 3: +, 20: +; *Vicia cracca* 3: +, 20: +; *Acer campestre* 4: +; *Acer pseudoplatanus* 4: +, 18: +; *Campanula cervicaria* 4: +; *Cytisus nigricans* 4: +, 21: 1; *Evonymus verrucosus* 4: +; *Ferulago sylvatica* 4: 1, 12: +; *Galium mollugo* 4: +; *Heracleum sphondylium* 4: +, 16: +; *Hypochaeris maculata* 4: +, 18: +; *Rosa pimpinellifolia* 4: +; *Viburnum lantana* 4: +, 22: 1; *Achillea millefolium* 5: +, 8: +; *Anthoxanthum odoratum* 5: +, 6: +; *Erigeron annuus* 5: +; *Glechoma hederacea* 5: +; *Hypochaeris radicata* 5: +; *Prunella vulgaris* 5: +; *Hieracium aurantiacum* 6: +; *Hieracium bauhinii* 6: +; *Picea abies* (juv.) 6: +; *Rosa tomentosa* 6: +; *Trifolium pannonicum* 6: +; *Veronica urticifolia* 6: +; *Viola odorata* 6: +; *Aconitum variegatum* 7: +, 15: +; *Circaea lutetiana* 7: +; *Galium glaucum* 7: +; *Hepatica transsilvanica* 7: +; *Hieracium caespitosum* 7: +, 11: +; *Centaurea indurata* 8: +; *Clematis recta* 8: +, 24: +; *Lotus corniculatus* 8: +, 10: +; *Stellaria graminea* 8: +, 14: +; *Carex pilosa* 9: 1; *Dryopteris carthusiana* 10: 1, 16: +; *Viola canina* 10: +; *Dicranum scoparium* 11: +; *Hypnum cupressiforme* 11: +, 13: +; *Lathyrus pratensis* 11: +; *Salix caprea* 11: +; *Cardaminopsis arenosa* 12: +; *Dianthus armeria* 12: +; *Pinus sylvestris* 12: +; *Ranunculus oreophilus* 12: 1; *Rosa pendulina* 12: +; *Seseli libanotis* 12: 1; *Silene nutans* 12: +, 13: +; *Silene vulgaris* 12: 1; *Thesium linophyllon* 12: +; *Campanula trachelium* 13: +; *Cephalanthera rubra* 13: +; *Dentaria bulbifera* 13: +, 15: +; *Epipactis helleborine* 13: +; *Hieracium dentatum* 13: +; *Briza media* 14: +; *Galium odoratum* 14: +; *Galium verum* 14: +; *Hypericum hirsutum* 14: +; *Lychnis flos-cuculi* 14: +, 20: +; *Rubus caesius* 14: +; *Rumex acetosella* 14: +; *Polypodium vulgare* 15: +; *Melica picta* 16: +; *Acer tataricum* 18: +, 25: +; *Carex digitata* 18: 1; *Cornus mas* 18: +, 21: +; *Fraxinus ornus* 18: +, 21: +; *Polygonatum latifolium* 18: +; *Dryopteris dilatata* 19: +; *Myosotis sylvatica* 20: +; *Asarum europaeum* 21: +; *Clematis vitalba* 21: +, 22: +; *Galeopsis bifida* 21: +; *Lathyrus hallersteinii* 21: +, 22: +; *Potentilla micrantha* 21: +; *Quercus cerris* (juv.) 21: +; *Rubus canescens* 21: +; *Valeriana officinalis* 21: +; *Inula hirta* 22: 1, 25: +; *Iris graminea* 22: +; *Polygonum dumetorum* 22: +, 25: +; *Seseli annuum* 24: +; *Veratrum nigrum* 24: +; *Viola alba* 24: +; *Ajuga genevensis* 25: +; *Alliaria petiolata* 25: +; *Dictamnus albus* 25: +; *Euphorbia esula* 25: +; *Lithospermum purpureocaeruleum* 25: 1; *Phleum montanum* 25: +; *Rosa arvensis* 25: +; *Silene italica* ssp. *nemoralis* 25: +; *Solanum dulcamara* 25: +; *Stachys recta* 25: +; *Ulmus minor* 25: +; *Verbascum chaixii* 25: +.

Place of relevees: 1, 2 – Doboseni; 3 – Dobolii; 4 – Racosul de Sus; 5 – Haghig; 6 – Belani, 7, 8, 10, 11 – Biborteni; 9 – Petriceni; 12 – Plaiesi; 13 – Hatod; 14 – Aita; 15 – Malnas; 16 – Varghis; 17 – Lemnia; 18 – Cheile Turzii; 19, 20 – Herculian; 21 – Hateg; 22, 23 – Cluj-Napoca; 24, 25 – Racas.