THE ASSOCIATION *Cirsio waldsteinii-heracleetum transsilvanici* PAWL. et WALAS 1949 *petasitetosum hybridi* SUBASS. NOVA IN THE SOUTHERN CARPATHIANS

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Abstract. In this paper are presented the results of the personal study researches regarding the *Cirsio-Heracleetum transsilvanici* association performed in the Southern Carpathians between 2005 and 2009. During these researches the *petasitetosum hybridi* subass. nova subassocition was discovered in the Cibin Mountains. Although the existence of some transgresive species from other vegetation classes and order was noticed, the floristic composition is dominated by species characteristic to the Adenostyletalia order and Mulgedio-Aconitetea class. Though the dendrogram seems homogenous, the flora elements could differentiate clusters which gathered surveys with similar features, conformable to the geographical distribution of the mountains.

Keywords: megaforbs, *petasitetosum hybridi*, the Southern Carpathians.

Rezumat. Asociaţia *Cirsio waldsteinii-Heracleetum transsilvanici* PAWL. et WALAS 1949 *petasitetosum hybridi* subass. nova în Carpaţii Meridionali. În această lucrare sunt prezentate rezultatele cercetărilor personale referitoare la asociaţia *Cirsio-Heracleetum transsilvanici* efectuate în Carpaţii Meridionali în perioada 2005-2009. Cu acest prilej a fost identificată şi subasociaţia *petasitetosum hybridi* subass. nova în Munţii Cibinului. Deşi se constată existenţa unor specii transgresive din alte clase şi ordine de vegetaţie, compoziţia floristică este dominată de specii caracteristice ordinului Adenostyletalia şi clasei Mulgedio-Aconitetea. Deşi dendrograma pare omogenă, elementele de floră pot diferenţia clustere care grupează relevee cu afinităţi apropiate, în concordanţă cu distribuţia geografică a masivelor muntoase.

Cuvinte cheie: megaforbiete, *petasitetosum hybridi*, Carpaţii Meridionali.

INTRODUCTION

Physical and geographical setting

The Southern Carpathians are the highest area of our country. These mountains are situated in central Romania, in the south of the Transylvanian Depression. Prahova Valley (East), Timiş-Cerna Passage (West) and hilly regions (North & South) are framing these mountains. The following groups are forming the Southern Carpathians: Bucegi Group, Făgăraş Group, Parâng Group, Retezat-Godeanu Group.

Unlike in the Eastern Carpathians, in Southern Carpathians the metamorphic rocks and the magmatic ones are prevalent, which control the massiveness of these mountains, being more resistant to erosion (PELIN *et al.,* 1969).

The climate is a typically mountain one (1,000 and 1,800 - 2,000 m), even with alpine influences (over 1,800 - 2,000 m). The annual average temperature decreases as the height increases, from 6^{o}C (at 1,000 m) to 2^{o}C (1,800 m) and 0^{o}C (2,200 m); the average temperature of the warmest and the coldest months decreases proportionally. The rainfalls increase from 800 mm to 1,200 mm-1,400 mm/year. The winds are on western domination, while into the depressions bordering these mountains they have föen-like feathures; in Haţeg, Petroşani and Loviştea depressions such phenomena of thermo inversion had been reported (CRISTEA & DIMITRIU, 1961; VELCEA & SAVU, 1982).

Because of the rich rainfalls, the hydrographical net has continuous supply and rich flows. The main rivers are: Sebeş, Mureş's tributaries; Bistra and Rece rivers, Cerna, Jiu; Cibin, Lotru, Topolog, Olteţ, Argeş, Ialomiţa. The Southern Carpathians have numerous lakes of glacial origin (over 150) and men-made lakes (Vidra, Vidraru, Gura Apei and other smaller fitting outs). All the mineral springs, exept the geothermal spring from Băile Herculane, are situated in the coterminous areas.

MATERIAL AND METHODS

All the surveys presented in the tables are the results of the personal researches in the field between 2005 and 2009 in the following mountains: Retezat and Lotrului and Iezer-Păpuşa and Bucegi.

For the study or the vegetal carpet we have used methods of phyto-sociologic research characteristic to the Central European phytosociologic School, which was based on the principles and methods elaborated by BRAUN-BLANQUET (1926).

The distribution of this association in the Southern Carpathians was achieved using the dendrogram of similarity using the Bray-Curtis index of similarity from the program BioDiversityPro.

The names of the species are conformable to Flora ilustrată a României (CIOCÂRLAN, 2009).

The syntaxonomic nomenclature was adopted according to the stipulations of the International Code of the Phyto-sociological Nomenclature elaborated by WEBER *et al.* (2000).

RESULTS AND DISCUSSIONS

Cirsio waldsteinii-Heracleetum transsilvanici PAWL. et WALAS 1949 association (Adenostyletalia alliariae BR.-BL. 1931 Order, Mulgedio-Aconitetea HADAČ et KLIKA in KLIKA 1948 Class) has the folowing correspondences:

R3703

Natura 2000: 6430 Hydrophilous tall herb fringe communities of plain and of the montane to alpine levels

EMERALD:

CORINE: 37.8 Subalpine and alpine tall herbs communities

PAL. HAB 1999: 37.814 Carpathian tall herb communities

EUNIS: E5.514 Carpathian tall herb communities (DONIŢĂ *et al*., 2005; GAFTA & MOUNTFORD, 2008).

We remarked the association in a few massifs from the Southern Carpathians: Retezat Mountain (Tăul Negru), Lotru Mountain (Lotru Gorges, Vidra Lake), Bucegi Mountain (Scropoasa, Horoaba Valley, Urşilor Gorges), Cibin Mountain (Sadu Valley, Cibin Gorges: Gura Văii, Râul Mare Gorges, Dăneasa Valley), Făgăraş Mountain (Iezer-Păpuşa).

The coenosis of the association are found along the steep valleys of the spring and rivulets of the subalpine floor, on alluvial and coluvial deposits and wet and rich in humus soils. From the viewpoint of the vegetation succession, in the stations where the anthropic and zoogenous impact is not present, the phytocoenosis of this association evolve toward phytocoenosis of the *Salici-Alnetum viridis* association (SANDA *et al.,* 2001).

At smaller altitudes, at Gura Văii, downstream of Cibin Gorges (Cibin Mountain), I found phytocoenosis of more reduced dimensions, with a floristicaly composition a little different from that of the typical association.

Beside the edifying species, in these coenoses characteristical species of the order and class are frequently met (Table 1). The remarkable abundance of the species *Petasites hybridus* (L.) P. GAERTN. *et al.* (the relevés 1, 2 and 3), as well as the characteristical species of the *Petasito-Cicerbitetum* TX. 1937 association show the existence of a subassociation ***petasitetosum hybridi*** **subass. nova** holotypus hoc loco (Table 2), the relevé 1 (described by us in Cibin Mountains, in Gura Văii, downstream Cibin Gorges). This subassociation represents a succesional stage to or from *Petasito-Cicerbitetum* association. Although some certain transgressive species exist (belonging to Molinio-Arrhenatheretea, Galio-Urticetea, Querco-Fagetea classes with a few little exceptions) the transgressive species present a reduced constancy compared to the characteristic species to Adenostyletalia order and Mulgedio-Aconitetea class.

The spectre of the bioforms highlights a high percentage of the hemicryptophytes (66.89%), followed by the geophytes (11.03%) and megaphanerophytes (11.03%), while the other cathegories of bioforms are less represented in these phytocoenosis (Fig. 1).

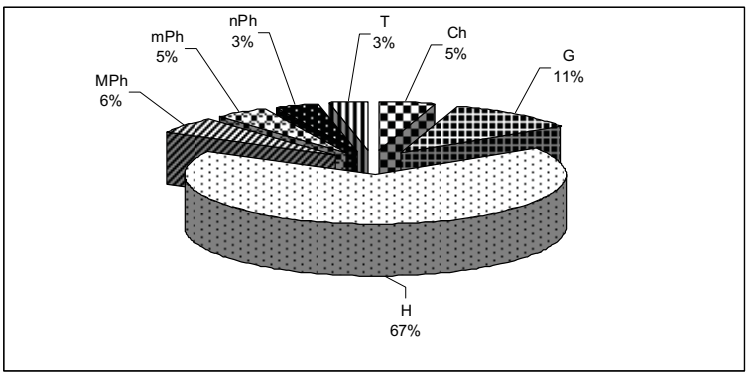

Figure 1. The spectrum of the bioforms (percentages) of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.
Figura 1. Spectrul bioformelor (procente) asociaţiei *C. waldsteinii-Heracleetum transsilvanici.*

The floristic elements that form the basic substance of chormoflora are Eurasiatic (32.41%), European (14.48%) and Central-Europaen (13.1%). The presence of the Alps elements (5.51%) stresses the florogenetical links with the Alps' flora. The regional character of this association is shown by the presence of the Carpathian-Balkan (8.27%) and Carpathian-endemic (3.44%) species (Fig. 2).

By analyzing the ecologic indexes we found out that regarding the humidity (U), the majority of the studied megaforbs are mesophytes ($U_{3-3.5}$=53.79%) and meso-hygrophytes ($U_{4-4.5}$=26.89%), while the xero-mesophytes species ($U_{2-2.5}$=13.1%) and the hygrophytes ($U_{5-5.5}$=2.75%) are but few. Regarding the temperature factor (T): the microthermic ($T_{2-2.5}$=47.58%) and micro-mesothermic ($T_{3-3.5}$=33.79%) are the best represented, that indicating a cold climate specific for the superior mountain and subalpine floors.

The criophytes species ($T_{1-1.5}$=4.13%), the moderate-thermophytes ($T_{4-4.5}$=1.37%) and the euritherm species (T_0=13.1%) are poorely represented, while the thermophytes ($T_{5-5.5}$) are not present. The index that regards the soil reaction (R), highlights the presence of the acid-neutrophilous ($R_{3-3.5}$=28.27%) and low-acid-neutrophilous ($R_{4-4.5}$=24.82%), joined by the euriionic species (R_0=33.1%). The acidopyhilous species are found in big percentage ($R_{2-2.5}$=9.65%), to the edification of the mountain high weed, while the neutro-basiphilous ($R_{5-5.5}$=1.37%) and the strong-acidophilous ones ($R_{1-1.5}$=2.75%) are poorely represented (Fig. 3).

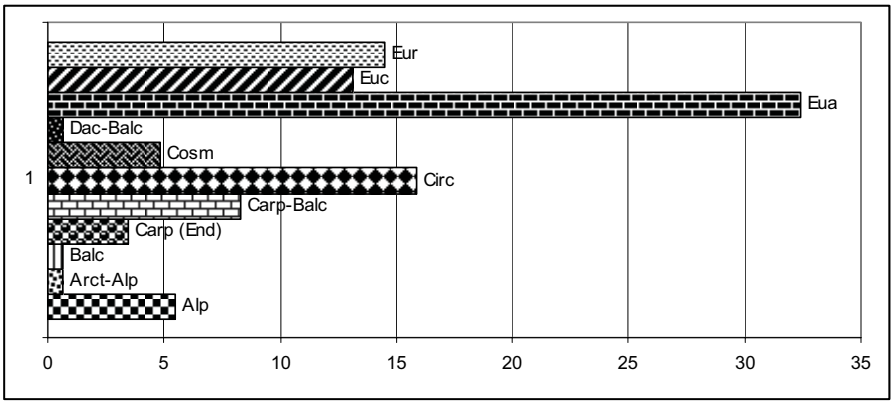

Figure 2. The spectrum of the floristics elements (percentages) of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.
Figura 2. Spectrul elementelor floristice (procente) pentru asociaţia *C. waldsteinii-Heracleetum transsilvanici.*

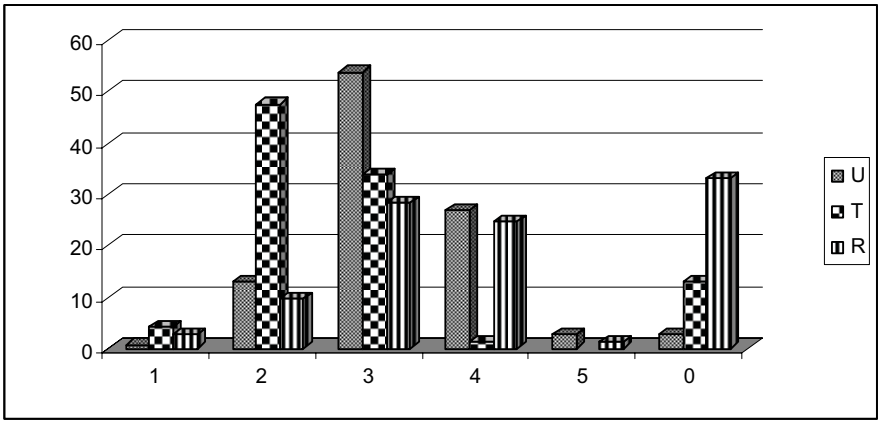

Figure 3. The spectrum of the ecological indexes (percentages) of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.
Figura 3. Spectrul indicilor ecologici (procente) pentru asociaţia *C. waldsteinii-Heracleetum transsilvanici.*

The diploid species (46.89%) dominate the floristic composition of this coenosis, while the polyploides represent only 37.24% from the total amount of the species (Fig. 4).

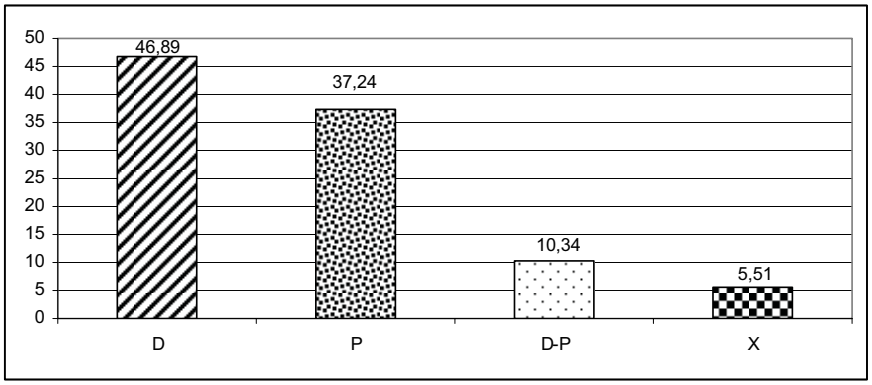

Figure 4. The spectrum of the karyological index (percentages) of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.
Figura 4. Spectrul cariologic (procente) al asociaţiei *C. waldsteinii-Heracleetum transsilvanici.*

The diploid index is supraunitary (1.25), suggesting the climax state of the vegetal groups and the relative age of that flora. The diploides are old species (differentiated during Pleistocene) which provide the genetic potential for the evolution (CRISTEA *et al*., 2004).

The dendrogram of similarity of the *Cirsio-Heracleetum transsilvanici* association shows a homogenous repartition of the surveys. The grouping in clusters is done in conformity with the geographical distribution in the various massifs, underlining the geographical differentials of the stational, of the edaphoclimaxes typical for the studied massifs (Fig. 5).

The Phytocoenologic table is compacted, the surveys being grouped according to their belonging to the mountains (Table 1), except the surveys from the Cibin Mountains (Table 2).

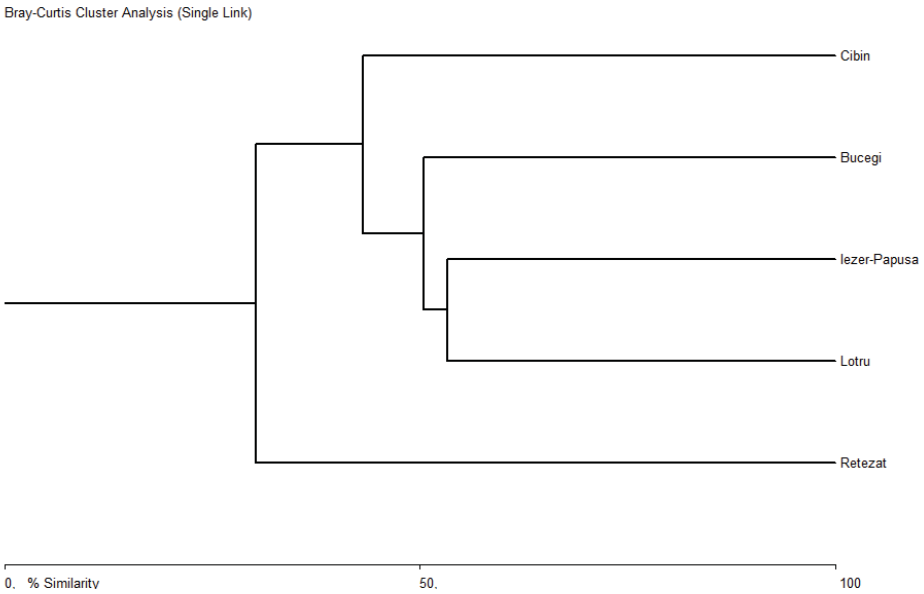

Figure 5. The dendrogram of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.
Figura 5. Dendrograma asociaţiei *C. waldsteinii-Heracleetum transsilvanici.*

CONCLUSIONS

The megaforbs species which belong to *Cirsio-Heracleetum transsilvanici* association are prevalent hemicryptophytes. The prevalent floristic elements are the Eurasiatic, the European and the Central-European ones, while the regional character is underlined by the Carpathian and the Carpathian-endemic taxa.

By analyzing the ecological indexes I found out that the mountain tall weeds are mesophilous and meso-hygrophilous, micro-termophilous and meso-termophilous, acid-neutrophilous and low-acid-neutrophilous.

The dendrogram shows a unitary repartion of the surveys of the *Cirsio-Heracleetum transsilvanici* association in the Southern Carpathians. Although the dendrogram seems to be homogeneous, the grouping by clusters is achieved in conformity with the geographical distribution of the massifs, thus resulting geographical differentials of the stational circumstances of some specific edaphoclimaxes of the mountain massifs.

Cirsio waldsteinii-Heracleetum transsilvanici PAWL. et WALAS 1949 *petasitetosum hybridi* nova subass. is a new subassociation described from Cibin Gorges (the Cibin Mountains).

The floristic composition of the phytocoenosis is dominated by characteristic species of the Adenostyletalia Order and Mulgedio-Aconitetea Class.

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Table 1. *Cirsio waldsteinii-Heracleetum transsilvanici* PAWL. et WALAS 1949. / Tabel 1. *C. waldsteinii-Heracleetum transsilvanici* PAWL. et WALAS 1949.

The massif No. relevée Altitude (m x 10)	Retezat 14 170-200	Lotru 14 120-130	Iezer 13 90-130	Bucegi 10 155-180	Cibin 16 90-140	The massif No. relevée Altitude (m x 10)	Retezat 14 170-200	Lotru 14 120-130	Iezer 13 90-130	Bucegi 10 155-180	Cibin 16 90-140
Char. ass.						*Campanula abietina*	.	II	.	IV	II
Cirsium waldsteinii	V	V	V	V	V	*Clematis alpina*	.	IV	.	IV	I
Heracleum palmatum	V	V	V	V	V	*Doronicum carpaticum*	.	.	.	III	I
Adenostylion alliariae et Adenostyletalia						*Fragaria vesca*	III	IV	III	III	II
Adenostyles alliariae	III	.	.	IV	II	*Galium album*	III	III	II	III	I
Senecio germanicus	IV	V	V	IV	V	*Polystichum lonchitis*	.	.	.	II	.
Aconitum tauricum	IV	.	.	.	.	*Cirsium oleraceum*	II	II	.	I	I
Veratrum album	IV	.	.	.	I	*Scirpus sylvaticus*	.	.	.	.	I
Rumex arifolius	IV	.	.	III	.	*Caltha palustris*	III	.	.	III	III
Doronicum austriacum	III	III	V	IV	II	*Pulmonaria rubra*	.	IV	III	II	III
Leucanthemum waldsteinii	II	IV	.	V	IV	*Dentaria glandulosa*	III	IV	IV	II	.
Stellaria nemorum	IV	V	V	IV	IV	*Luzula sylvatica*	.	.	II	III	I
Alnus viridis	.	.	.	II	.	*Primula officinalis*	III	IV	III	IV	I
Chaerophyllum hirsutum	.	III	IV	III	III	*Prunella vulgaris*	.	V	II	.	I
Salix silesiaca	.	IV	III	IV	.	*Poa nemoralis*	.	.	.	II	I
Geranium phaeum	.	III	.	III	V	*Aegopodium podagraria*	III	V	III	V	I
Valeriana montana	.	.	III	IV	IV	*Saxifraga cuneifolia*	.	.	.	I	I
Petasites hybridus	.	III	III	.	III	*Silene pusilla*	.	.	.	V	.
Aconitum degenii	.	IV	.	III	IV	*Silene vulgaris*	IV	III	IV	II	II
Delphinium elatum	.	.	.	I	.	*Streptopus amplexifolius*	.	.	.	.	I
Thalictrum aquilegiifolium	.	IV	.	III	IV	*Picea abies*	.	III	II	III	I
Angelica archangelica	IV	III	.	V	III	*Sorbus aucuparia*	.	III	.	III	II
Cortusa matthioli	.	III	III	IV	IV	*Soldanella hungarica*	.	II	.	III	.
Rumex alpinus	IV	.	.	II	.	*Lonicera nigra*	.	.	.	.	I
Petasites albus	.	.	.	.	III	*Valeriana tripteris*	III	V	.	IV	I
Gentiana asclepiadea	.	.	.	II	IV	*Pinus mugo*	III	III	.	.	.
Geum rivale	.	IV	.	IV	III	*Geranium robertianum*	.	V	IV	III	II
Rosa pendulina	.	.	.	I	I	*Salvia glutinosa*	.	III	.	.	.
Gymnocarpium dryopteris	.	V	III	II	IV	*Galeopsis speciosa*	IV	III	III	III	II
Knautia dipsacifolia	.	.	.	I	IV	*Lamiastrum galeobdolon*	.	III	V	IV	II
Mulgedio-Aconitetea						*Lamium maculatum*	.	IV	V	IV	II
Milium effusum	.	.	V	III	.	*Impatiens noli-tangere*	.	IV	.	IV	II
Myosotis sylvatica	.	V	V	V	III	*Ulmus glabra*	.	II	.	.	.
Ranunculus platanifolius	IV	.	.	IV	I	*Fagus sylvatica*	.	II	.	.	.
Cicerbita alpina	.	.	.	.	III	*Digitalis grandiflora*	.	II	.	.	.
Athyrium distentifolium	IV	V	V	IV	IV	*Bruckenthalia spiculifolia*	.	II	.	.	.
Polygonatum verticillatum	.	.	.	II	I	*Vaccinium vitis-idaea*	.	II	.	.	.
Ribes petraeum	.	.	.	II	.	*Hieracium aurantiacum*	.	II	.	.	.
Geranium sylvaticum	V	IV	III	V	I	*Acer pseudoplatanus*	.	.	II	.	.
Oxalis acetosella	.	III	V	V	V	*Cardamine amara*	.	.	III	.	.
Gentiana lutea	.	.	.	I	.	*Euphorbia carniolica*	.	.	III	.	.
Calamagrostis arundinacea	.	.	III	.	I	*Laserpitium latifolium*	.	.	.	I	.
Variae Syntaxa						*Dentaria bulbifera*	.	.	.	I	.
Aconitum anthora	.	.	.	I	.	*Dianthus spiculifolius*	.	.	.	I	.
Telekia speciosa	.	IV	III	I	III	*Aquilegia nigricans*	.	.	.	I	.

Urtica dioica	.	IV	III	IV	IV	*Ligularia sibirica*	.	.	.	I	.
Filipendula ulmaria	.	.	III	III	V	*Scrophularia heterophylla*	.	.	.	I	.
Gymnadenia conopsea	.	III	.	.	I	*Angelica sylvestris*	.	.	.	.	I
Deschampsia caespitosa	IV	II	III	II	II	*Centaurea phrygia*	.	.	.	.	I
Epilobium angustifolium	.	.	IV	III	II	*Carduus kerneri*	.	.	.	.	I
Glechoma hederacea	.	IV	.	III	I	*Silene nutans ssp. dubia*	.	.	.	.	I
Veronica urticifolia	.	.	.	IV	II	*Jovibarba heuffelii*	.	.	.	.	I
Abies alba	.	.	.	.	I	*Lycopodium clavatum*	.	.	.	.	I
Sambucus racemosa	.	II	.	II	I	*Lycopodium selago*	.	.	.	.	I
Veronica bachofenii	.	.	.	.	I	*Campanula rapunculoides*	.	.	.	.	I
Cirsium erisithales	.	.	.	IV	III	*Prenanthes purpurea*	.	.	.	.	I
Daphne mezereum	.	.	III	I	II	*Solidago virgaurea*	.	.	.	.	I
Epilobium montanum	II	.	III	IV	III	*Stachys sylvatica*	.	.	.	.	I
Circaea lutetiana	.	IV	.	III	I	*Campanula persicifolia*	.	.	.	.	I
Chrysosplenium alternifolium	.	IV	.	I	I	*Campanula cervicaria*	.	.	.	.	I
Rubus idaeus	III	IV	III	.	IV	*Campanula trachelium*	.	.	.	.	I
Astrantia major	III	.	.	II	I	*Dryopteris carthusiana*	.	.	.	.	I
Salix caprea	.	.	.	.	III	*Sorbus torminalis*	.	.	.	.	I
Dianthus trifasciculatus	.	.	.	.	I	*Dianthus giganteus*	.	.	.	.	I
Spiraea chamaedrifolia	.	.	IV	III	IV	*Agrostis stolonifera*	.	.	.	.	I
Asplenium viride	.	.	III	II	I	*Taraxacum officinale*	.	.	.	.	I
Cystopteris fragilis	.	.	.	II	I	*Lamium album*	.	.	.	.	I
Polypodium vulgare	.	.	.	.	I	*Ribes nigrum*	.	.	.	.	I
Hieracium transsylvanicum	.	.	III	IV	I	*Lunaria rediviva*	.	.	.	.	I
Rumex obtusifolius	.	.	.	.	II	*Equisetum hyemale*	.	.	.	.	I
Valeriana officinalis	IV	II	III	II	III	*Equisetum sylvaticum*	.	.	.	.	I
Anthriscus sylvestris	.	V	III	III	II	*Epilobium palustre*	.	.	.	.	I
Ranunculus repens	.	III	.	III	II	*Actaea spicata*	.	.	.	.	I
Alchemilla xanthochlora	.	.	.	III	I	*Paris quadrifolia*	.	.	.	.	I
Hypericum maculatum	III	IV	.	III	II						

Data and place of relevés: 4 relevée Retezat Mountain (11.08.2005); 4 relevée Lotrului Mountain (1.08.2006); 3 relevée Făgăraş Mountain (Iezer-Păpuşa) (25.07.2009); 10 relevée Bucegi Mountain (28.07.2006; 04.08.2007); 16 relevée Cibin Mountain (16-17.08.2007).

Table 2. *Cirsio waldsteinii-Heracleetum transsilvanici* PAWL. et WALAS 1949 *petasitetosum hybridi* subass. nova. / Tabel 2. *Cirsio waldsteinii-Heracleetum transsilvanici* PAWL. et WALAS 1949. *petasitetosum hybridi* subass. nova.* = holotypus hoc loco relevé

Biof.	**Geoelem.**	**Cyt.**	**The relevé** **Altitude (m x 10)** **Exposure** **Inclination (in grades)** **Area (m^2)** **Coverage (%)**	**1*** **75** **NE** **5** **30** **80**	**2** **80** **NE** **5** **25** **80**	**3** **100** **NE** **7-8** **50** **50**	**4** **90** **NE** **5** **40** **40**	**5** **110** **NE** **30** **25** **45**	**6** **110** **NE** **2-3** **100** **70**	**7** **110** **NE** **5** **100** **60**	**8** **125** **S** **5** **100** **50**	**9** **140** **S** **10** **100** **50**	**10** **90** **E** **10** **100** **30**	**11** **92** **E** **5** **100** **40**	**12** **120** **NE** **60** **100** **60**	**13** **130** **N** **4** **100** **45**	**14** **125** **S** **4** **100** **60**	**15** **120** **N** **40** **100** **40**	**16** **110** **N** **50** **100** **40**	
			Char. ass.																		
H	Alp-Carp-Balc	P	*Cirsium waldsteinii*	+	+	1	+	2	2	+	+	2	+	+	1	1	1	+	2	V
H	End-Carp	D	*Heracleum palmatum*	2	2	1	2	1	3	3	3	2	1	1	+	+	+	1	1	V
G	Eua	P	*Petasites hybridus*	3	2	2	-	+	+	+	+	-	1	-	-	-	-	-	-	III
			Adenostylion et Adenostyletalia																		
H (G)	Eur (Alp)	D	*Adensotyles alliariae*	-	-	-	-	-	-	-	-	-	+	+	-	+	-	+	-	II
H	Eua	D-P	*Senecio germanicus*	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	V
H	Euc (Mont)	P	*Doronicum austriacum*	-	-	-	-	+	-	-	-	+	+	-	+	+	-	-	1	II

H	Carp (End)	D	*Leucanthemum waldsteinii*	-	-	+	+	-	+	-	-	+	+	+	+	+	+	+	+	IV
H	Eur	D	*Stellaria nemorum*	-	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	IV
H	Ec	D	*Chaerophyllum hirsutum*	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	III
H	Euc	D-P	*Geranium phaeum*	-	-	+	+	+	-	+	+	+	+	+	+	+	+	+	+	V
H	Eur (Alp)	P	*Valeriana montana*	+	-	-	+	+	-	-	-	+	+	+	+	+	+	+	+	IV
H	Alp-Carp-Balc	D-P	*Aconitum degenii*	+	3	+	+	-	+	-	+	+	+	+	-	+	+	-	+	IV
H	Eur	D	*Thalictrum aquilegiifolium*	-	-	+	-	+	+	-	+	+	+	+	+	+	+	+	+	IV
TH-H	Eua	D	*Angelica archangelica*	-	-	1	+	1	-	+	-	-	+	-	-	-	+	+	-	III
H	Eua (Mont)	D	*Cortusa matthioli*	+	-	-	+	-	-	-	+	+	+	+	+	+	+	+	+	IV
G	Eua	P	*Petasites albus*	-	-	-	-	-	-	-	-	+	+	2	+	+	3	1	+	III
H	Eur	P	*Gentiana asclepiadea*	+	-	+	+	-	-	+	-	+	+	+	+	+	-	-	+	IV
H	Circ	P	*Geum rivale*	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	III
nPh	Euc-Mont	P	*Rosa pendulina*	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	I
G	Circ	P	*Gymnocarpium dryopteris*	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	IV
G	Circ	P	*Streptopus amplexifolius*	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	+	I
			Calamagrostietalia vilosae																	
H	Euc	P	*Knautia dipsacifolia*	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	IV
H	Cosm	D-P	*Deschampsia caespitosa*	-	-	+	-	-	-	-	+	-	-	-	-	-	+	+	-	II
			Rumicion et Rumicetalia alpini																	
H	Eua (Med)	P	*Ranunculus repens*	+	-	+	-	+	-	-	-	-	-	-	+	+	-	+	-	II
H (G)	Cosm	P	*Urtica dioica*	+	+	+	+	-	-	+	+	+	+	-	-	+	+	+	-	IV
H	Eur	P	*Rumex obtusifolius*	-	-	-	-	+	+	+	+	-	-	-	-	-	+	1	-	II
			Mulgedio-Aconitetea																	
H	Eur	P	*Myosotis sylvatica*	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	-	III
H	Eur (Mont)	D	*Ranunculus platanifolius*	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Eur (Mont)	D	*Cicerbita alpina*	-	-	-	-	+	+	-	-	-	+	+	2	+	-	-	+	III
H	Circ (Arct-Alp)	D-P	*Athyrium distentifolium*	-	-	-	-	+	-	-	+	+	+	+	+	+	+	+	+	IV
G	Eua		*Polygonatum verticillatum*	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	+	I
H	Eua (Alp-Bor)	P	*Geranium sylvaticum*	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	I
H-G	Circ	D	*Oxalis acetosella*	+	-	+	+	+	+	-	+	+	+	+	+	+	-	+	+	V
H	Eua (Cont)	P	*Calamagrostis arundinacea*	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
mPh	Alp (Eur)	D	*Lonicera nigra*	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	+	I
TH	Carp-Balc	P	*Campanula abietina*	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	II
H	Eua	D	*Hypericum maculatum*	+	-	+	+	-	-	-	-	-	-	-	-	+	+	-	-	II
			Molinio-Arrhenatheretea																	
H	Circ	P	*Caltha palustris*	-	-	+	-	-	-	+	-	+	-	-	+	+	-	+	+	III
H	Eua	D-P	*Filipendula ulmaria*	+	+	+	-	+	1	1	+	+	-	+	+	+	+	1	-	V
H	Eua (Med)	D	*Valeriana officinalis*	+	-	+	+	+	+	-	-	-	-	-	+	+	-	-	-	III
H	Eua (Med)	D	*Anthriscus sylvestris*	-	-	+	+	-	-	+	-	-	-	-	-	+	+	-	-	II
H (Ch)	Eua	D	*Silene vulgaris*	+	-	-	+	-	-	-	-	-	-	-	-	+	-	+	-	II
HH-G	Circ	D-P	*Scirpus sylvaticus*	-	-	-	-	-	-	-	+	-	-	+	+	-	-	-	-	I
H	Eua	D	*Primula officinalis*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	I
H	Eua	D	*Cirsium oleraceum*	-	-	-	-	-	-	-	-	-	+	+	-	-	-	+	-	I
			Galio-Urticetea																	
H	Carp-Balc-Cauc-Anat	D	*Telekia speciosa*	1	+	+	+	-	+	-	+	-	-	+	-	+	+	-	-	III
H (G)	Eua	D-P	*Aegopodium podagraria*	+	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	I
H-Ch	Eua	P	*Glechoma hederacea*	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Euc (Mont)	D-P	*Veronica urticifolia*	+	-	+	+	+	-	-	-	-	-	-	-	+	-	-	-	II

			Epilobietea angustifolii																	
nPh	Circ	D-P	*Rubus idaeus*	+	+	+	-	+	-	+	+	+	-	+	+	+	-	+	+	IV
H	Eua	D	*Fragaria vesca*	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	-	II
H	Circ	P	*Epilobium angustifolium*	+	-	-	+	-	-	-	-	+	-	-	-	+	-	-	-	II
			Querco-Fagetea																	
H	Euc (Mont)	D	*Cirsium erisithales*	+	-	+	-	+	-	-	-	-	-	+	-	+	+	+	-	III
H	Eua	P	*Epilobium montanum*	-	-	+	+	+	-	-	+	+	-	-	-	+	-	+	-	III
Th-TH	Cosm	P	*Geranium robertianum*	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	II
H (Ch)	Eua	D	*Lamium maculatum*	+	-	+	+	+	-	-	-	+	-	-	-	+	-	-	-	II
H-Ch	Euc	D-P	*Lamiastrum galeobdolon*	+	-	-	-	-	-	-	+	-	-	-	-	+	-	+	-	II
Ch	Euc (Mont)	D	*Saxifraga cuneifolia*	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
H	Euc (Mont)	D-P	*Astrantia major*	-	-	+	-	-	-	-	-	-	-	-	-	+	-	+	-	I
H	Carp-Balc	D	*Pulmonaria rubra*	+	+	-	-	-	-	+	-	-	+	+	+	+	-	+	+	III
MPh	Euc	D	*Abies alba*	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
nPh	Eua	D	*Daphne mezereum*	-	-	-	+	-	-	-	-	-	-	+	+	+	-	+	+	II
			Vaccinio-Piceetea																	
MPh	Eur	D	*Picea abies*	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
MPh	Eua	D	*Sorbus aucuparia*	-	+	+	-	+	+		-	-	+	-	+	-	-	-	-	II
H	Euc (Mont)	D	*Valeriana tripteris*	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
			Asplenietea et Thlaspietea																	
mPh	Eua (cont)	P	*Spiraea chamaedrifolia*	-	-	+	-	+	-	-	+	+	+	+	+	+	-	+	+	IV
G	Alp-Carp-Balc	P	*Doronicum carpaticum*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	I
G	Circ	D	*Polypodium vulgare*	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	I
			Variae Syntaxa																	
H	Carp-Balc-Anat		*Veronica bachofenii*	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
mPh	Eua	D-P	*Salix caprea*	-	+	-	+	+	+	-	+	-	-	+	-	-	+	+	+	III
H	Dac-Balc		*Dianthus trifasciculatus*	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Carp-Balc	D	*Hieracium transsilvanicum*	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eua	D	*Galeopsis speciosa*	-	-	-	-	-	-	+	-	-	-	-	-	+	+	+	-	II
Th	Eua	P	*Impatiens noli-tangere*	-	-	-	+	-	-	1	+	+	-	-	-	+	-	1	-	II

Species in a single relevé: *Sambucus racemosa* (1): mPh, Circ, P; *Chrysosplenium alternifolium* (1): H, Circ, P; *Centaurea phrygia* (1): H, Euc, D; *Carduus kerneri* (1): H, Carp-Balc; *Silene *dubia* (1): H, Carp-End, D; *Jovibarba heuffelii* (1): Ch, Carp-Balc, D; *Lycopodium clavatum* (1): Ch, Cosm, P; *Lycopodium selago* (1): Ch, Cosm, P; *Campanula rapunculoides* (1): H, Eua, P; *Prenanthes purpurea* (1): G, Euc (Mont), D; *Angelica sylvestris* (2): H, Eua, D; *Solidago virgaurea* (2): H, Circ, D; *Stachys sylvatica* (2): H, Eua, P; *Campanula persicifolia* (3): H, Eua, D; *Campanula cervicaria* (3): H, Eua, P; *Campanula trachelium* (3): H, Eua (Med), D; *Poa nemoralis* (4): H, Circ, P; *Dryopteris carthusiana* (4): H, Circ, P; *Sorbus torminalis* (4): MPh, Eur (Med), D; *Dianthus giganteus* (4): H, Balc, D; *Prunella vulgaris* (7): H, Cosm, P; *Agrostis stolonifera* (8): H, Circ, P; *Taraxacum officinale* (8): H, Eua, P; *Lamium album* (8): H, Eua, D; *Ribes nigrum* (9): mPh, Eua, D; *Lunaria rediviva* (10): H, Eur; *Equisetum hyemale* (11): G, Circ, P; *Veratrum album* (12): G, Eua, D; *Equisetum sylvaticum* (12): G, Circ, P; *Epilobium palustre* (12): H, Circ, P; *Gymnadenia conopsea* (13): G, Eur, P; *Circaea lutetiana* (13): G, Eua (Med), D; *Asplenium viride* (13): H, Circ, D; *Cystopteris fragilis* (13): H, Cosm, P; *Alchemilla *xanthochlora* (13): H, Eur, P; *Clematis alpina* (13): nPh, Arct-Alp-Eur, D; *Galium album* (15): H, Eur, P; *Luzula sylvatica* (15): H, Euc, D; *Actaea spicata* (16): H, Eua, D; *Paris quadrifolia* (16): G, Eua, P.

Data and place of relevés: 1 – Cibin Mountain, Cibin Gorges (16.08.2007); 2 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 3 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 4 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 5 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 6 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 7 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 8 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 9 – Cibin Mountain, Cibin Gorges (Râul Mare Gorges) (16.08.2007); 10 – Cibin Mountain, Sadu Valley (17.08.2007); 11 – Cibin Mountain, Sadu Valley (17.08.2007); 12 – Cibin Mountain, Sadu Valley, Rozdeşti (17.08.2007); 13 – Cibin Mountain, Sadul Valley, Bătrâna Mică Valley (17.08.2007); 14 – Cibin Mountain, Sadu Valley, Bătrâna Mare Valley (17.08.2007); 15 – Cibin Mountain, Sadu Valley (17.08.2007); 16 – Cibin Mountain, Sadu Valley, Dudaş (17.08.2007).