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THE CHARACTERIZATION OF THE ASSOCIATIONS OF MEGAFORBS FROM THE CIBIN MOUNTAINS

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ABSTRACT. In this paper are presented the results of our own researches in the field as well as those present in the literature about the associations of megaforbs identified in the Cibin Mountains until now. Thus seven associations have been reported and a subassociation, i.e. *petasitetosum hybridi* Chirițoiu (Alexe) 2012, of the association *Cirsio-Heracleetum transsilvanici* have been identified.

Key words: megaforbs, *petasitetosum hybridi*, Cibin Mountains.

REZUMAT. Caracterizarea asociațiilor de megaforbiete din Munții Cibin. În această lucrare sunt prezentate rezultatele cercetărilor proprii precum şi cele din literatura de specialitate referitoare la asociațiile de megaforbiete identificate în Munții Cibin până în prezent. Astfel, au fost raportate şapte asociații şi a fost identificată o subasociație nouă *petasitetosum hybridi* Chirițoiu (Alexe) 2012 a asociației *Cirsio-Heracleetum transsilvanici*.

Cuvinte cheie: megaforbiete, *petasitetosum hybridi*, Munții Cibin.

INTRODUCTION

The Cibin Mountains belong to the group of the Parângului Mountains (the Southern Carpthians) having as borders the Sebeş River, the Sadu River and the Transylvania Depression.

From a geo-morphological point of view it is characterized by the huge presence of the crystalline schists. They belonged to the Gaetic overfloing mass represented by metamorphic rocks.

In these mountains the glaciations left traces on not very large surfaces, especially on the northern slopes (Velcea & Savu, 1982).

The main glacial lakes are Iezerul Mare (13 m deep) and Iezerul Mic (1.7 m deep).

The hydrographic net is dense and consists in three big rivers (Sadu, Cibin, and Sebeş) which are tributary for the Olt and the Mureş. Basins were built on the

main rivers (Ştefănescu, 1998). The predominant soils are those belonging to the cambisoils class (Blaga et al., 1996).

The clime is concordant to the altitude, the thermo variation being directly proportional to the increasing altitude. At the weather station Sadu (1896-1955) the annual average temperature recorded was 8.41^0C, the lowest temperature was recorded in January (-5^0C), while the highest was recorded in August: 19 ^{0}C. The most abundant rainfall was recorded in June and July (100 mm), and the annual average was 63.33 mm/an (Atlasul climatologic al R.S.R., 1966).

MATERIALS AND METHODS

The conspectus of taxa was drawn upon the individual field researches as well as upon the study of the scientific materials. The syntaxonomic nomenclature was adopted according to the stipulations of the International Code of the Phyto-sociological Nomenclature elaborated by Weber (Weber et al., 2000).

RESULTS AND DISCUSSIONS

In the Cibinului Mountains, as a result of our own field researches two megaforbs associations were identified: *Adenostylo alliariae-Doronicetum austriaci* Horvat 1956, *Cirsio waldsteinii-Heracleetum transsilvanici* Pawl. et Walas 1949. There are other associations added to them which Constantin Drăgulescu (Drăgulescu, 1995) described: *Cicerbitetum alpinae* Bolleter 1921, *Salici-Alnetum viridis* Colič et al. 1962, *Phleo alpini-Deschampsietum caespitosae* (Krajina 1933) Coldea 1983, *Rumicetum alpini* Beger 1922, *Veratretum albi* Puşcaru et al. 1956.

The described associations are cenotaxonomically included in three orders (Mucina et al., 1993):

MULGEDIO-ACONITETEA Hadač et Klika in Klika 1948

ADENOSTYLETALIA ALLIARIAE G. et J. Br.-Bl. 1931

Adenostylion alliariae Br.-Bl. 1926

-*Adenostylo-Doronicetum austriaci* Horv. 1956

-*Cirsio waldsteinii-Heracleetum transsilvanici* Pawl. et Walas 1949

-*Cicerbitetum alpinae* Bolleter 1921

-*Salici-Alnetum viridis* Colič et al. 1962

CALAMAGROSTIETALIA VILLOSAE Pawl. et al. 1928

Calamagrostion villosae Pawl. et al. 1928

-*Phleo alpini-Deschampsietum caespitosae* (Krajina 1933) Coldea 1983

RUMICETALIA ALPINI Rübel ex Klika in Klika et Hadač 1944

Rumicion alpini Rübel ex Klika in Klika et Hadač 1944

-*Rumicetum alpini* Beger 1922

-*Veratretum albi* Puşc. et al. 1956

We identified the association *Adenostylo-Doronicetum austriaci* Horvat 1956 (Syn: *Adenostyletum alliariae banaticum* Borza 1946) on Sadului Valley (the

Hill Grosu, the Valley of the River Bătrâna Mică, Dudaş area). It vegetates along the sharp slopes of the mountain springs and rivulets, and the floristic composition is dominated by plant species which prefer a wet soil and rich in nutrients.

The spectrum of the bioforms shows a high percentage of the hemicryptophytes (63%), followed by the geophytes (16%) and phanerophytes (16%), while the other categories of bioforms are being less represented in these phytocoenoses (Fig. 1).

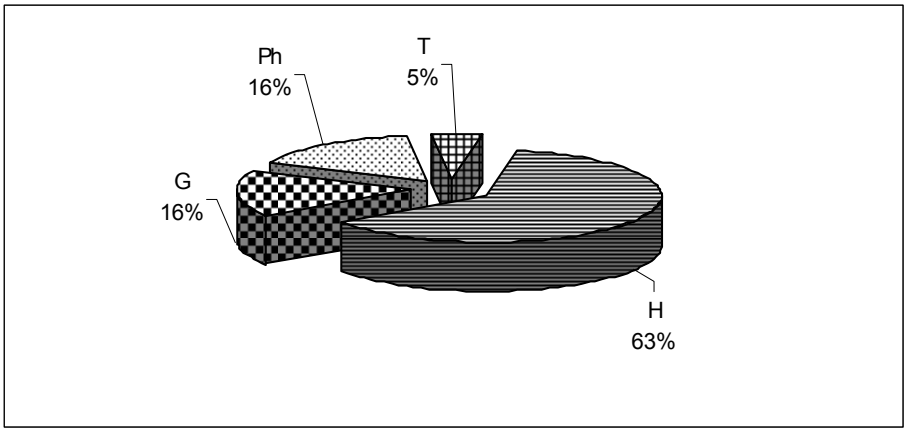

Figure 1 - The spectrum of the bioforms of the *Adenostylo-Doronicetum austriaci* association.

The floristical elements which forms the basic fundaments of the cormoflora are the Eurasian species (46.51%), followed by the European ones (11.62%) and the Central-European ones (4.65%). The Alps elements (6.97%) underline the floristic and genetic connexions with the Alps flora, while the regional character of this association is shown by the presence of the Carpathians (46.5%) and endemic species (4.65%) (Fig. 2).

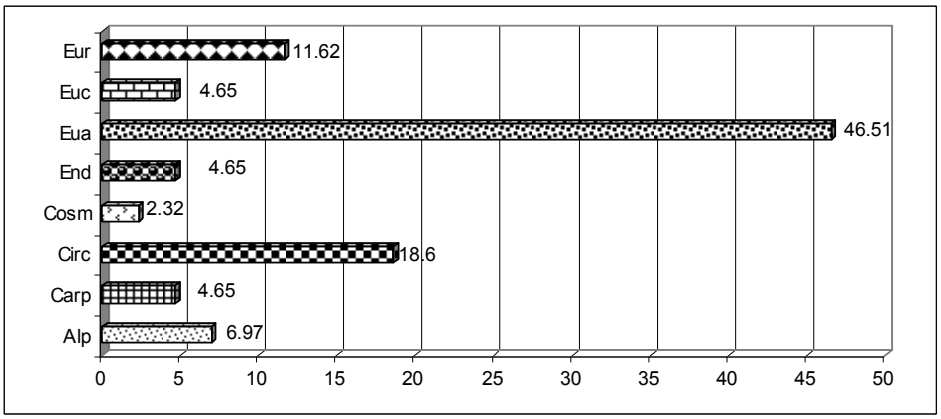

Figure 2 - The spectrum of the floristic elements of the *Adenostylo-Doronicetum austriaci* association.

Analyzing the ecological indexes we find out the following:

-regarding the humidity (U) that the most of the studied megforbs are mesophilous, ($U_{3-3.5}$=55.83%) and meso-hygrophilous ($U_{4-4.5}$=28.33%), indicating a constantly moist but not swampy soil;

-regarding the temperature (T), the micro-termophilous ($T_{2-2.5}$=50.83%) and micro-meso-termophilous ($T_{3-3.5}$=28.33%) are best represented, indicating a cold climate, characterized by low temperatures of the water and of the soil during the entire vegetative season, specific to the upper mountain and sub alpine stand;

-the index regarding the soil reaction (R) shows the existence of the acid-neutrophilous ($R_{3-3,5}$=32.5%) and low-acid-neutrophilous ($R_{4-4.5}$=22.5%). The megaforbs phytocoenoses are also edified by the acidophilous species ($R_{2-2.5}$=12.5%) (Fig. 3).

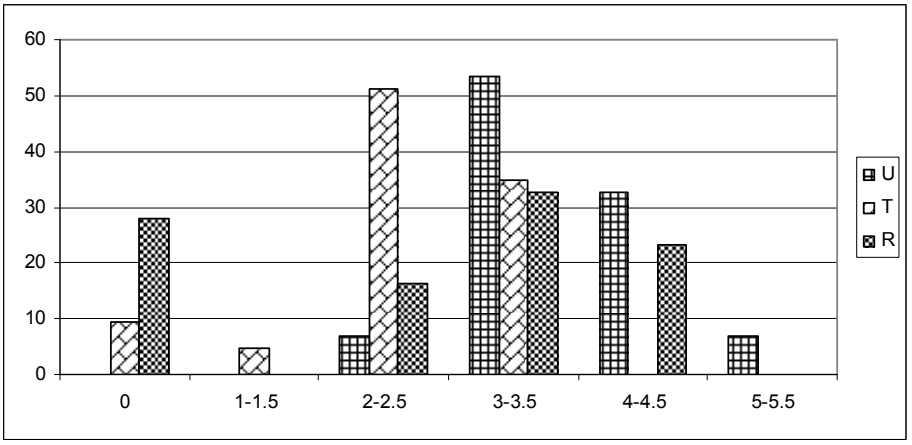

Figure 3 - The spectrum of the ecological indexes of the *Adenostylo-Doronicetum austriaci* association.

We met the association *Cirsio waldsteinii-Heracleetum transsilvanici* Pawl. et Walas 1949 (Syn: *Cardueto-Heracleetum palmati* Beldie 1967; *Heracleetum palmati* auct. roman) on Sadului Valley, described by Drăgulescu (Drăgulescu, 1995) and in Cibinului Gorges. The characteristic coenosis Cenoze of the association are met on the sharp valleys of the mountain rivulets, on soils rich in nutrients and on sunnier slopes by comparison to the previous one. Drăgulescu (Drăgulescu, 1995) mentions that sometimes in certain coenosis the species *Angelica archangelica* forms well individualized facies.

At smaller altitudes, at Gura Văii, downstream of Cibin Gorges (Cibin Mountain), I found phytocoenosis of more reduced dimensions, with a floristically 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. The remarkable abundance of the species *Petasites hybridus*, as well as the characteristical species of the *Petasito-Cicerbitetum* Tx. 1937 association show the existence of a subassociation

petasitetosum hybridi Chirițoiu (Alexe) 2012 (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 spectrum of the bioforms shows a high percentage of the hemicryptophytes (71%), followed by the geophytes (11%) and phanerophytes (10%), while the other categories of bioforms are being less represented in these phytocoenoses (Fig. 4).

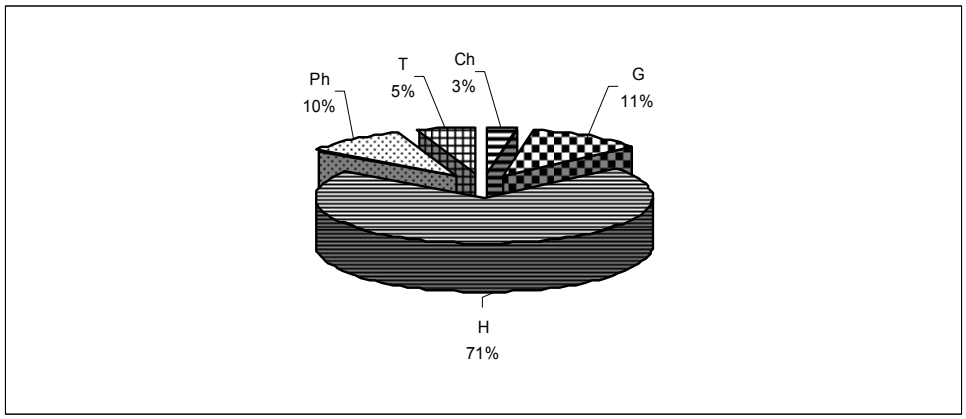

Figure 4 - The spectrum of the bioforms of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.

The floristical elements which forms the basis fundaments of the cormoflora are the Eurasian species (34.88%), followed by the European ones (12.4%) and the Central-European ones (3.95%). The Alps elements (3.87%) underline the floristic and genetic connexions with the Alps flora, while the regional character of this association is shown by the presence of the Carpathians (6.97%) and endemic species (2.32%) (Fig. 5).

Analyzing the ecological indexes we find out the following:

-regarding the humidity (U) that the most of the studied megforbs are mesophilous, ($U_{3-3.5}$=51.93%) and meso-hygrophilous ($U_{4-4.5}$=29.45%), indicating a constantly moist but not swampy soil;

-regarding the temperature (T), the micro-termophilous ($T_{2-2.5}$=44,18%) and micro-meso-termophilous ($T_{3-3.5}$=36.43%) are best represented, indicating a cold climate, characterized by low temperatures of the water and of the soil during the entire vegetative season, specific to the upper mountain and sub alpine stand;

-the index regarding the soil reaction (R) shows the existence of the acid-neutrophilous ($R_{3-3.5}$=26.35%) and low-acid-neutrophilous ($R_{4-4.5}$=22.48%). The megaforbs phytocoenoses are also edified by the acidophilous species ($R_{2-2.5}$=10.85%) (Fig. 6).

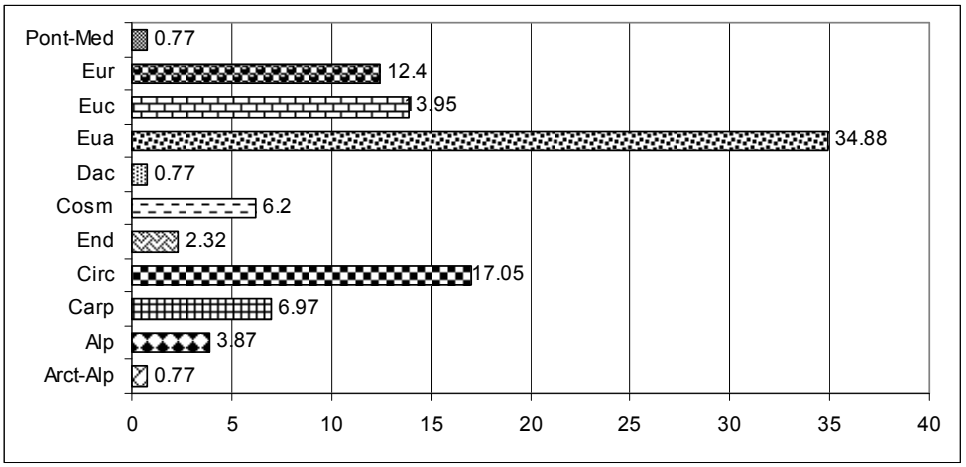

Figure 5 - The spectrum of the floristic elements of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.

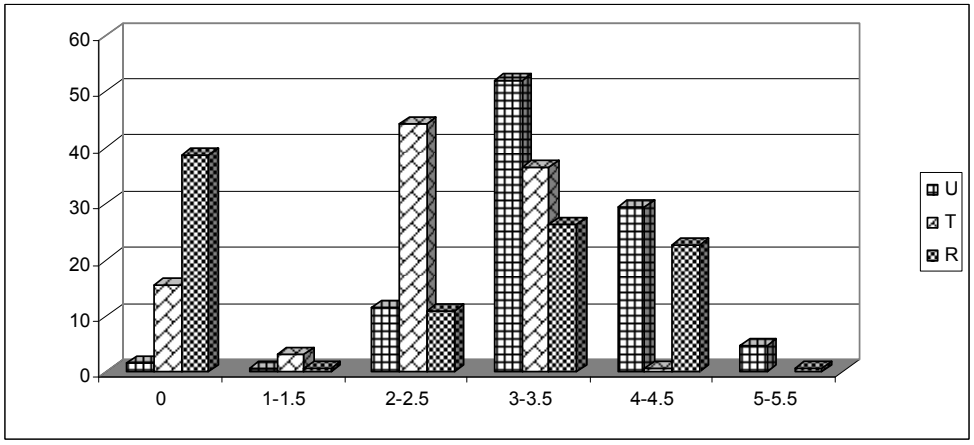

Figure 6 - The spectrum of the ecological indexes of the *Cirsio waldsteinii-Heracleetum transsilvanici* association.

The association *Cicerbitetum alpinae* Bolleter 1921 (Syn: *Adenostylo-Cicerbitetum alpinae* Br.-Bl. 1950, *Petasito-Cicerbitetum* Tx. 1937, *Cicerbitetum alpinae* Beger 1922) was described on the Sădurelului Valley and the Sadului Valley middle flow.

The spectrum of the bioforms shows a high percentage of the hemicryptophytes (92.9%).

The floristical elements which forms the basis fundaments of the cormophlora are the Eurasian species (28.6%), followed by the European ones (17.9%) and the Central-European ones (17.9%).

Analyzing the ecological indexes we find out the following:

-regarding the humidity (U) that the most of the studied megforbs are meso-hygrophilous ($U_{4-4.5}$=43%);

-regarding the temperature (T), the micro-termophilous ($T_{2-2.5}$=39.3%) and micro-meso-termophilous ($T_{3-3.5}$=21.4%) are best represented, indicating a cold climate, characterized by low temperatures of the water and of the soil during the entire vegetative season, specific to the upper mountain and sub alpine stand;

-the index regarding the soil reaction (R) shows the existence of the acid-neutrophilous ($R_{3-3.5}$=32.1%) (Drăgulescu, 1995).

The association *Salici-Alnetum viridis* Colič et al. 1962 (Syn: *Alnetum viridis austro-carpaticum* Borza 1959) was identified on the Iujbea Cacovei and Iujbea Răşinariului (Cibin Mountains) on the small areas.

The floristic composition includes species which manifests some ecologic exigency regarding the humidity and the soil troficity. Thus, the coenosis of this association installs in valleys and dales, on cleared deforested slopes, along the torrents from the subalpine floor, on skeletcal and superficial soils. Because of the floristic structure of some Carpathian elements (*Cirsium waldsteinii, Leucanthemum waldsteinii, Dentaria glandulosa*), this association is a Balkan-South-Carpathian variant of the association *Alnetum viridis* Br.-Bl. 1918 from the Alps, noticed in the Southern Carpathians through the subassociation *austro-carpaticum* Borza 1918 (Doniță et al., 2005).

The spectrum of the bioforms shows a high percentage of the hemicryptophytes (56.5%) followed by the phanerophytes (34.8%).

The floristical elements which forms the basis fundaments of the cormophlora are the Eurasian species (12.5%), followed by the Alps ones (41.7%).

Analyzing the ecological indexes we find out the following:

-regarding the humidity (U) that the most of the studied megforbs are meso-hygrophilous ($U_{4-4.5}$=50%);

-regarding the temperature (T), predominate species micro-termophilous ($T_{2-2.5}$=77.3%);

-the index regarding the soil reaction (R) shows the existence of the acid-neutrophilous ($R_{3-3.5}$=40.9%) (Drăgulescu, 1995).

Because of the elastic branches of the species *Alnus viridis*, the coenosis of this association pray an important eco-protector role against the avalanches.

The association *Phleo alpini-Deschampsietum caespitosae* (Krajina 1933) Coldea 1983 (Syn: *Deschampsietum caespitosae montanum* Buia et al. 1962; *Deschampsietum caespitosae alpinum* Csűrös 1957; *Deschampsietum caespitosae subalpinum* Morariu 1939; *Rumici-Deschampsietum caespitosae* Csűrös et al. 1985; *Geeto montani-Deschampsietum caespitosae* Csűrös et al. 1985) was described by Drăgulescu (Drăgulescu, 1995) as *Rumici-Deschampsietum caespitosae* Csűrös *et al*. 1985 *aconitetosum* Drg. (1987) 1989.

In the basin of the Sadului Valley, Drăgulescu (Drăgulescu, 1995) noticed that in the coenosis of this association the species *Aconitum tauricum* is frequent. This fact determined him to say that, at least in the region where the researches were performed, the denomination and the inclusion of the fitocoenosis in the association *Aconito-Deschampsietum caespitosae* is more proper. Although, until the performing of some comparative studies, he proposes that the respective coenosis as belonging to the subassociation *aconitetosum* Drg. 1989. He is the one who, based on the performed researches, sustains the the coenosis of the association *Rumici-Deschampsietum caespitosae* represents an evolution stage toward those of the subassociation *Campanulo abietinae-Festucetum rubrae deschampsietosum caespitosae.*

The spectrum of the bioforms shows a high percentage of the hemicryptophytes (76%) followed by the phanerophytes (8%) and therophytes (8%) (Fig. 7).

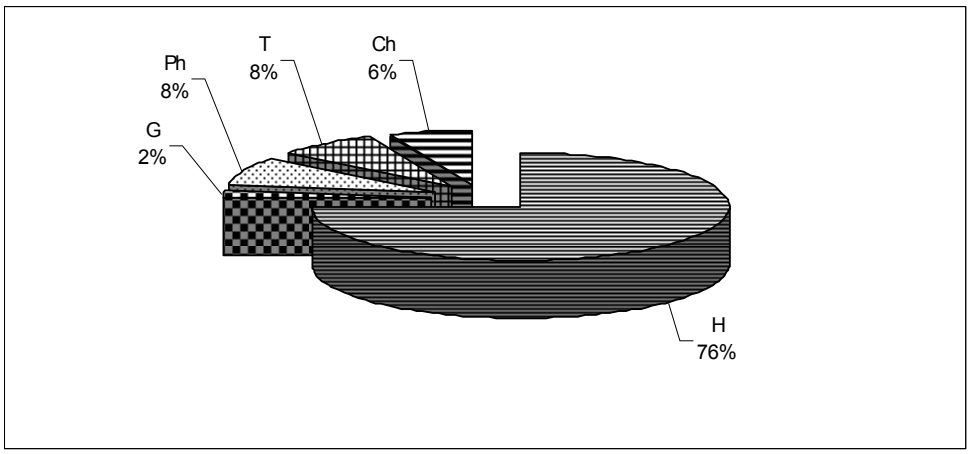

Figure 7 - The spectrum of the bioforms of the *Phleo alpini-Deschampsietum caespitosae* association.

The floristical elements which forms the basis fundaments of the cormophlora are the Eurasian species (39.58%) (Fig. 8).

Analyzing the ecological indexes we find out the following:

-regarding the humidity (U) that the most of the studied megforbs are mesophilous ($U_{3-3.5}$=39.58%) and meso-hygrophilous ($U_{4-4.5}$=18.75%);

-regarding the temperature (T), species micro-termophilous ($T_{2-2.5}$=33.33%) and micro-meso-termophilous ($T_{3-3.5}$=25%) are best represented;

-the index regarding the soil reaction (R) shows the existence of the the acidophilous species ($R_{2-2.5}$=18.75%) and the acid-neutrophilous ($R_{3-3.5}$=14.58%) (Drăgulescu, 1995) (Fig. 9).

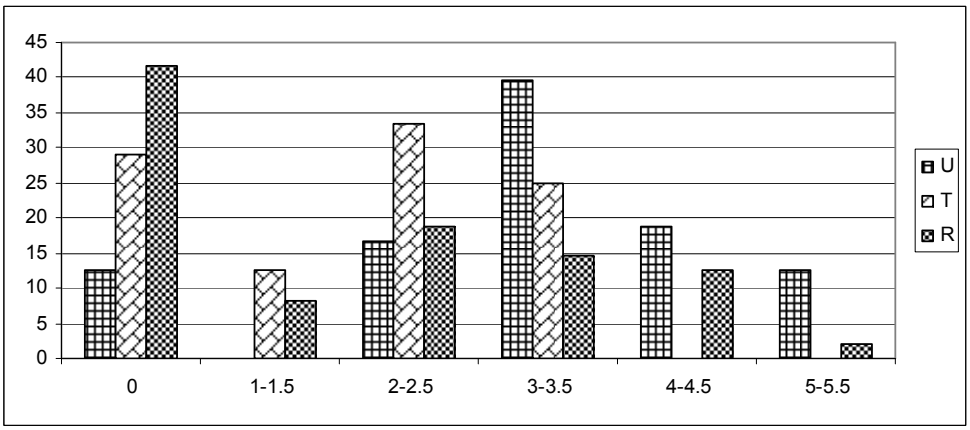

Figure 8 - The spectrum of the floristic elements of the *Phleo alpini-Deschampsietum caespitosae* association.

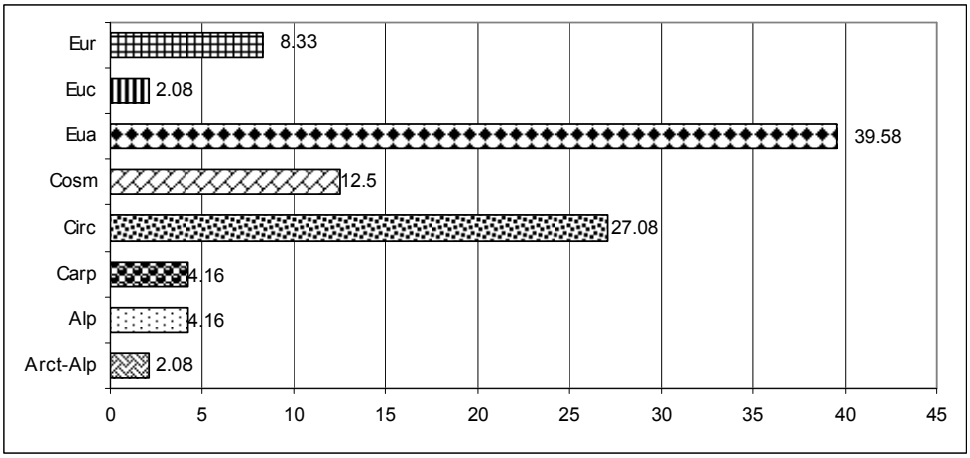

Figure 9 - The spectrum of the ecological indexes of the *Phleo alpini-Deschampsietum caespitosae* association.

In the associatin *Rumicetum alpini* Beger 1922 (Syn: *Rumicetum alpini carpaticum* Szafer et al. 1925; *Senecioni-Rumicetum alpini* Horv. 1949 em. Coldea (1986) 1990; *Rumicetum alpini* (Dihoru 1957) Zanoschi 1969; Syntax. Syn: *Rumicetum alpini-Aconitetum napelli* Aichinger 1933) the number of species is small, and the fitocoenosis on small surfaces (exception the coenosis from the Reteazat Mountains were spread over large surfaces, probably because the big ship turme in the area). Ferdinand Pax (Pax, 1898) drew attention on the groups of plants in the proximity of the stânelor using the term „Stinenflora" (the flora from around the shipfolds).

Beside *Rumex alpinus*, the floristic composition includes *Deschampsia caespitosa*, *Trifolium repens*, *Urtica dioica*, *Poa supina* etc.

Some ceonosis of the association were identified by Drăgulescu (Drăgulescu, 1995) on the mountain upper floor of the Cibinului Mountain (Bătrâna Mountain, saddleback Cindrel-Şteflești, Sădurelului Valley, Prejba Mountain etc.)

Analyzing the data we find out that predominant are the hemicriptofite (91.5%) and the Eurasian species (36.4%). From the point of view of the ecologic indexes: predominant are the mesophilous, micro-termophilous and micro-meso-termophilous, acid-neutrophilous and low-acid-neutrophilous species.

The association *Veratretum albi* Puşc. et al. 1956 (Syn: *Poëto-Veratretum lobeliani* Borza 1933 n. n.) presents fitocoenosis which are not always individualised, the only criteria to differentiate them being the abundance of the species *Veratrum album*. This species is found in the *Festuca rubra* şi *Festuca ovina* ssp. *sudetica* edified meadows. As a consequence of this fact, Drăgulescu (Drăgulescu, 1995) considers that would be more appropriate to consider the steregoaie coenosis as facies of the association where they grow.

The fitocoenosis grow well at high altitudes, on northern slopes, which are wetter, at the border of the meadow and in the vicinity of the forest, fact that determine the existence of an important number of microtherme species. The floristic analyse also revealed the fact that the spectra of the bioforms, geoelements, and ecologic indexes presents the same characteristics as those of the other megaforbs associations.

To the floristic composition belong the following species: *Veratrum album, Festuca rubra, Nardus stricta, Deschampsia caespitosa, Anthoxantum odoratum, Cynosurus cristatus, Agrostis tenuis, Trifolium repens, Trifolium dubium, Leucanthemum waldsteinii, Lotus corniculatus, Achillea milefolium, Centaurea phrygia, Polygala vulgaris, Plantago media, Euphrasia stricta, Veronica officinalis, Stellaria graminea, Urtica dioica, Potentilla erecta, Potentilla ternata, Geum montanum, Alchemilla vulgaris, Campanula patula* ssp. *abietina, Viola declinata, Carex leporina* (Drăgulescu, 1995).

The edified species presents a big stability; sometimes it vegetates even a half of a century after the pasturage was interrupted.

CONCLUSIONS

Based on our own researches and on the data from the literature seven megaforbs associations included in three orders belonging to the class *Mulgedio-Aconitetea* (*Adenostyletalia, Calamagrostietalia, Rumicetalia*) were found in the Cibinului Mountains.

For the association *Cirsio waldsteinii-Heracleetum transsilvanici* a new subassociation was described, *petasitetosum hybridi* Chirițoiu (Alexe) 2012.

Analyzing the bioforms and the floristic elements we found out that the analyzed megaforbs are hemicryptophytes, Eurasian and European in their majority. The alpine elements attest their relationship with the flora of the Alps, and the endemic and Carpathian ones confer them some regional characteristics.

The spectra of the ecologic index indicate the fact that the megaforbs are predominant mesophilous and meso-hygrophilous, micro-termophilous and micro-meso-termophilous, acido-neutrophilous and low-acid-neutrophilous.

REFERENCES

BLAGA GH., RUSU I., UDRESCU S., VASILE D., 1996 - *Pedologie*. Ed. Didactică şi Pedagogică, Bucureşti; p. 175-272.

CHIRIȚOIU (ALEXE) MAGDALENA ANDREIA, 2012 - *The association Cirsio waldsteinii-Heracleetum transilvanici Pawl. et Walas 1949 petasitetosum hybridi subass. nova in the Southern Carpathians*. Oltenia. Studii şi comunicări. Ştiințele Naturii, Craiova; **28 (1)**: p. 29-36.

CIOCÂRLAN V., 2009 - *Flora ilustrată a României*, Ed. Ceres, Bucureşti; p. 1-1141.

DONIȚĂ N., POPESCU A., PAUCĂ-COMĂNESCU MIHAELA, MIHĂILESCU SIMONA, BIRIŞ I. A., 2005 - *Habitatele din România*, Ed. Tehnică Silvică, Bucureşti; p. 89-90.

DRĂGULESCU C., 1995 - *Flora şi vegetația Văii Sadului*, Ed. Constant, Sibiu; p. 267-275.

MUCINA L., GRABHERR G., ELLMAUER TH., 1993 - *Die Pflanzengesellschaften Österreichs,* VEB Gustav Fischer Verlag Jena. Stuttgart. New York; **II:** p. 468-505

PAX F., 1898 - Die Vegetation der Erde II. Grundzüge der Pflanzenverbreitung in den Karpathen, Verlag von Wilhelm Engelmann, Leipzig; **I:** p. 158.

ŞTEFĂNESCU C., 1998 - *Blocul Carpatic Românesc*, Ed. Hardiscom, Piteşti; p. 184-187.

VELCEA MICALEVICH VALERIA, SAVU AL., 1982 - *Geografia Carpaților şi a Subcarpaților României*, Ed. Did. şi Ped., Bucureşti; p. 103-167.

WEBER H.E., MORAVEC J., THEURILLAT J. P. 2000 - *International Code of Phytosociological Nomenclature*. 3rd edition, Journal of Vegetation Science Opulus Press Uppsala, Sweden; **XI:** p. 739-768.

****, 1966 - *Atlasul climatologic al R.S. România*. Ed. Acad. R.S.R., Bucureşti.