

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG MOUNTAINS (SOUTH CARPATHIANS)

SIMON TIBOR¹, PÓCS TAMÁS²

Abstract: 4 plant communities unknown in the European syntaxonomy are described from the alpine and subalpine belts of Parâng Mountains, based on vegetation studies of the authors during 1955–1960. These are: *Arabis alpina-Saxifraga aizoides*, *Arabis alpina-Delphinium elatum*, *Dianthus tenuifolius-Festuca dalmatica* and the *Primula minima-Dryas octopetala* communities. These communities could be described later as new associations in the possession of more relevés from different localities. The East and South Carpathian *Doronico carpatici-Festucetum pictae* association is distinguished under this new name from the *Festucetum pictae* Krajina described from the Tatra Mountains. 7 further associations are found as new to the Parâng Mountains.

Keywords: phytocoenology, alpine vegetation, Parâng Mountains, Southern Carpathians, Romania

Introduction

After the terrific IInd World War, during the years of 1955-'60 opened the opportunity the first time for a group of young Hungarian botanists (A. Borhidi, P. Juhász-Nagy, T. Simon, I. Skoflek, G. Vida, led by T. Pócs) to visit the Southern Carpathians, making acquaintance with its rich flora and vegetation. Their main goal was to study the vegetation of Parâng Mountains, scarcely known on those times, using the quadrat of Braun-Blanquet method. They offered their co-operation to the Romanian botanists working in the same area.

As a result of this activity, some papers were already published, containing records on the Parâng Mountains, as the account of VIDA (1963) on the beach forests (*Sympyto-Fagion*), the spruce forests (*Vaccinio-Piceetalia*) by BORHIDI (1971), the study on the subalpine bushes (*Rhododendro myrtifolii-Pinetum mughi*), pastures and swards by SIMON (2007, 2008-2009), but the rest of these vegetation studies (meadows and pastures by Juhász-Nagy and the subalpine and alpine vegetation studies of the present authors) remained unpublished. In the meantime a detailed monograph was published on the pastures of Parâng Mountains, including also the geography, plants, animals and fungi and their economic value, by BUIA & al. (1962). The monograph has a phytocoenology chapter, describing in details the majority of grassland communities. The alpine and subalpine vegetation of many other parts of the Romanian Carpathians were described in other modern monographs (e.g. by BOŞCAIU 1971, COLDEA 1990, 1991).

Some floristic data were published by PÓCS (1957) and by PÓCS & SIMON (1957) with the record of *Aubrieta croatica*, new to the whole Carpathians and Romania.

¹Department of Plant Taxonomy and Ecology, Institute of Biology, Eötvös Loránd University, Budapest – Hungary, Pázmány P. sétány 1/C, H-1117

² Department of Botany, Institute of Biology, Eszterházy Károly College, Eger – Hungary, pf 43. H-3301, e-mail: colura@chello.hu

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

A complete flora of Parâng Mountains was also initiated, of which three volumes were published by PÓCS (1961, 1962, 1968). A very important new addition was the discovery of *Allium obliquum*, not far from the locality of *Aubrietia*, by PLOAIE (1990).

Our aim in this paper is to complete the picture on the rich alpine and subalpine vegetation of Parâng Mountains with our unpublished phytosociological relevés. Our investigations are new, especially demonstrating the rock and scree vegetation. The 5 synthetic tables contains information on 19 subalpine and alpine plant communities, among which 4 are new to European syntaxonomy. Several associations are described as new to Parâng or supplement previously known communities. We also tried to establish the level of naturalness of alpine vegetation more than 50 years ago to supply a reference base. This is comparable with the present situation, influenced by human activites, discussed by PLOAIE (1996), PLOAIE & TURNOCK (1999), PLOAIE & al. (2002).

Materials and methods

Alpine and subalpine plant communities were surveyed with the Central European phytocenological methods of Braun-Blanquet (1951). The phytosociological relevés were made by T. Pócs during 24-26 Sept., 1955, 12 July-5 Aug., 1956 and 3-19 Aug., 1960, and by T. Simon during 24 July-5 Aug., 1956. We used 5×5 m (25 m^2) sample squares if not otherwise mentioned. In the table the species are arranged alphabetically within each K groups. The nomenclature of vascular species is according to OPREA (2005), of the mosses follows OCHYRA & al. (2003), the liverworts ŠTEFĂNUȚ (2008), while that of the lichens BIELCZYK & al. (2004). The description of habitat of each relevé are included into this paper. After them, the proportion of geographical elements according to OPREA (2005), coenotaxonomic groups according to BELDIE (1967), BOȘCAIU (1971), BOROS (1968), COLDEA (1990, 1991) and POP & al. (1999-2000), IVAN & al. (1992), social behaviour according to BORHIDI (1995) and the conservational value according to the groups of SIMON (1988) and on the base of DIHORU & NEGREAN (2009) are summarized. The values of Simon demonstrate the ratio of groups referring to naturalness versus degradation. We also had to take into account that since the mid-fifties of the last century the concept of "plant associations" have changed considerably, giving more significance to the "local associations" distinguished by endemic and geographically differentiating species. In most cases the Carpathian or even West-, East- or Southern Carpathian associations became separated from those described from the Alps.

Results and discussion

The syntaxonomic position of the plant communities investigated (in bold letters):

RHIZOCARPETEA GEOGRAPHICI Wirth 1972

Umbilicarietalia cylindrica Wirth 1972

Rhizocarpion alpicola Frey 1933

Rhizocarpetum alpicola Frey 1923 (Buellio sororiae-

Rhizocarpetum geographicae Wirth 1972)

Umbilicariion cylindrica Frey 1933

Umbilicarietum cylindrica Frey 1933

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- ASPLENIETEA RUPESTRIS Br.-Bl. 1934
Androsacetalia vandelii Br.-Bl. 1926
Silenion lerchenfeldiana Simon 1957
Seleno lerchenfeldiana-Potentilletum haynaldiana Horvat,
Pawl. & Walas 1937
- THLASPIETEA ROTUNDIFOLII Br.-Bl. 1926
Thlaspietalia rotundifolii Br.-Bl. 1926
Papavero-Thymion pulcherrimi I. Pop 1968
Arabis alpina-Saxifraga aizoides community
Arabis alpina-Delphinium elatum community
Androsacetalia alpinae Br.-Bl. 1926
Festucion pictae Krajina 1933
Doronicocarpatici-Festucetum pictae Pócs et Simon nomen
nov. (non Festucetum pictae auct. roman., non Krajina 1933)
- SALICETEA HERBACEAE Br.-Bl. 1947
Salicetalia herbaceae Br.-Bl. 1926
Salicion herbaceae Br.-Bl. 1926
Polytrichetum sexangulariae Br.-Bl. 1926
Poo supinae-Cerastietum cerastoidis (Söry 1954) Oberd. 1957
Salicetum herbaceae Br.-Bl. 1913
Soldanello pusillae-Ranunculetum crenati Borza (1931)
Boșcaiu 1971
- JUNCETEA TRIFIDI Klika et Hadač 1944
Caricetalia curvulae Br.-Bl. 1926
Caricion curvulae Br.-Bl. 1925
Primulo-Caricetum curvulae Br.-Bl. 1926 em. Oberd. 1957
Loiselurio-Vaccinion Br.-Bl. 1926
Cetrario-Loiseleurietum Br.-Bl. 1926
Primula minima-Dryas octopetala community
- SESLERIETEA ALBICANTIS Br.-Bl. 1948 em. Oberd. 1978
Seslerietalia albicans Br.-Bl. 1926
Festuco saxatilis-Seslerion bielzii (Pawl. et Walas 1949) Coldea 1984
Dianthus tenuifolius-Festuca dalmatica community
- MONTIO-CARDAMINETEA Br.-Bl. et Tx. 1943
Montio-Cardaminetalia Pawl. 1928
Cardamino-Montion Br.-Bl. 1925
Cratoneuretum filicino-commutati (Kuhn 1937) Oberd. 1977
- SCHEUCHZERIO-CARICETEA NIGRAE (Nordh. 1937) Tx. 1937
Caricetalia nigrae Koch 1926 em. Nordh. 1937
Caricion nigrae Koch 1926 em. Klika 1934
Carici dacicae-Plantaginetum gentianoidis Coldea 1981
- BETULO-ADENOSTYLETEA Br.-Bl. et Tx. 1943
Adenostyletalia Br.-Bl. 1931
Adenostylon alliariae Br.-Bl. 1925
Heracleetum palmati Pușcari et al.
Salici-Alnetum viridis Colic et al. 1962

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

EPILOBIETEA ANGUSTIFOLII Tx. et Prsg. in Tx. 1950

Atropetalia Vlieg. 1937

Epilobion angustifolii (Rübel 1933) Soó 1933

Calamagrostetum arundinaceae subalpinum Csűrös 1962

Description of the studied plant communities

LICHEN DOMINATED COMMUNITIES OF SILICEOUS ROCKS
(RHIZOCARPETEA GEOGRAPHICI Wirth 1972)

Although they occur along the whole range of Carpathians in the montane, subalpine and alpine belts, on open siliceous rocks, hitherto we have relatively few coenological observations on these interesting communities. From Romania, MARDARI (2008) reports *Parmelietum conspersae* and *Umbilicarietum cylindrica* from the Bistrița Mountains in the Eastern Carpathians. We observed such communities in the Romanian Western Carpathians (Apuseni Mountains), Eastern Carpathians (Călimani Mountains) and in the Southern Carpathians, namely: Făgăraș, Retezat, and Parâng mountains. The following relevés represent two associations of this group. The lichens in these and in the other relevés were identified by the late dr. Ö. Szatala (Botany Department of the Hungarian Natural History Museum, BP).

Rhizocarpetum alpicola Frey 1923 (*Buellio sororiae-Rhizocarpetum geographicae* Wirth 1972)

This community seems to prefer the cooler, longer snow covered rocks and especially the large siliceous boulders on scree slopes. The relevés in table 1 are from the SW exposed scree slopes, just below the Parâng Hut, at 1,750 m altitude, with inclination of 30° as average. The scree is composed of 0.2-2 m (in average 1 m) large gneiss stones and boulders. The size of relevés in each case is 50 × 50 cm (25 dm²). This association is widespread in the glacial valleys of Parâng Mountains, up to 2,400 m altitude, where it fully covers the larger siliceous boulders and stones of the scree slopes and moraines, giving them a special greenish yellow color (Tab. 1, rel. 1-5).

Tab. 1. *Rhizocarpetum alpicola* Frey 1923 (rel. 1-5); *Umbilicarietum cylindrica* Frey 1933 (rel. 6)

Aspect	SW	S	SW	S	W	K	S
Slope (°)	35	40	8	10	60		80
Coverage of lichens (%)	95	99	95	90	98		98
Surface (m²)	0.25	0.25	0.25	0.25	0.25		0.25
Relevé no.	1	2	3	4	5		6
Rhizocarpon alpicola	5	5	3	4	5	V	1
Orthogrimmia donniana	+	1	1	+	1	V	+
Pertusaria lactea	1	3	1	1	3	V	-
Rhizocarpon radioatum	1	2	2	+	2	V	-
Umbilicaria cylindrica	2	2	2	1	2	V	4
Lecidea auriculata	1	2	3	2	-	IV	-
Lecanora bicincta	-	-	+	+	1	III	1

Lepraria neglecta	-	+	-	+	+	III	-
Umbilicaria polyphylla	-	-	1	2	-	II	-
Cladonia squamosa	-	-	-	+	+	II	-
Cornicularia normoerica	-	-	1	+	-	II	+
Lecidea lithophila	-	+	-	-	+	II	-
Melanelia stygia	+	-	-	1	-	II	-
Deschampsia flexuosa	+	-	-	-	-	I	-
Lecidea conflueans	1	-	-	-	-	I	-
Parmelia omphalodes	-	-	-	+	-	I	-
Rhizocarpon geographicum	-	-	1	-	-	I	-
Umbilicaria crustulosa	-	-	-	2	-	I	+
Alectoria ochroleuca	-	-	-	-	-	-	+
Brodoa intestiniformis	-	-	-	-	-	-	+
Ceratodon purpureus	-	-	-	-	-	-	+
Evernia divaricata	-	-	-	-	-	-	+
Lecanora cenisia	-	-	-	-	-	-	1
Lecanora rupicola	-	-	-	-	-	-	+
Ophioparma ventosa	-	-	-	-	-	-	1
Platismatia glauca	-	-	-	-	-	-	1
Protoparmelia badia	-	-	-	-	-	-	2
Ramalina carpatica	-	-	-	-	-	-	2
Rinodina atrocinerea	-	-	-	-	-	-	+
Sphaerophorus fragilis	-	-	-	-	-	-	+

Place of relevés: 1-5. Parâng Mountains, the glacial valleys, up to 2,400 m. s. l.; 6. Badea rocks, at 1,820 m. s. l.

Umbilicarietum cylindricae Frey 1933

We observed this community on the near vertical, relatively dry, open, often S exposed siliceous cliffs in the Parâng Mountains, from the montane to the alpine belt, at 1,500-2,400 m altitudes. We made only one relevé, in the subalpine belt, at 1,820 m altitude, from the S facing micaschist cliffs of Badea rocks (inclination=80°). The size of sample square was 50 × 50 cm and the coverage of lichens 98%. It alternates with *Rhizocarpetum alpicola*e according to the aspect of the cliffs (Fig. 1).

If we compare this relevé with the table of MARDARI (2008), apart from the dominant species only one other species, *Umbilicaria crustulosa* is identical, but JAMES et al. (1977) distinguishes several “nodums” within this association, according to the environmental conditions (Tab. 1, rel. 6).

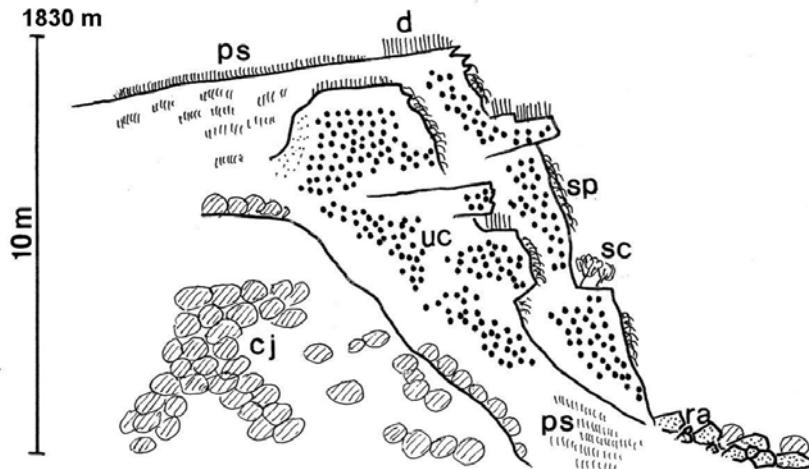


Fig. 1. The vegetation of the schistaceous Badea rocks in the subalpine belt, between the Parâng chalet and Parâng summit

cj: *Campanulo abietinae-Juniperetum*; **d:** *Dianthus tenuifolius-Festuca dalmatica* community; **ps:** *Potentillo-Festucetum airoidis*; **ra:** *Rhizocarpetum alpicola*; **sc:** *Spiraeetum ulmifoliae*; **sp:** *Sileno lerchenfeldiana-Potentilletum haynaldiana*, type habitat of *Draba simonkaiana*; **uc:** *Umbilicarietum cylindricae* (drawn by T. Pócs)

ROCK CLIFFS (ASPLENIETEA RUPESTRIS Br.-Bl. 1934)

The open chasmophytic vegetation on the subalpine and alpine siliceous cliffs of Parâng Mts. have close relationships with those of the eastern part of Balkan Peninsula, encountered within *Silenion lerchenfeldiana* Simon 1958.

Sileno lerchenfeldiana-Potentilletum haynaldiana Horvat, Pawłowski et Walas 1937

This association was originally described from the Bulgarian Rila [HORVAT & al. 1937] and Pirin mountains [SIMON, 1958]. In the monograph of BUIA & al. (1962) it is not mentioned, but it was published by COLDEA (1991) from the siliceous rocks of Parâng Mountains in a synthetic table, represented by 6 relevés. In 1956 we made 5 relevés on the Badea rocks and in the Mândra circus, represented in Tab. 2 below. It is a “curtain community”, dominated by chasmophytic species as *Silene lerchenfeldiana*, *Potentilla haynaldiana*, *Sympyandra wanneri* and *Thymus balcanus*, with III-V constancy value indexes, hanging on the mostly southern exposed siliceous (slate, gneiss, granite) cliffs. The proportion of Dacic-Balcanik species is important (12%) and this is the habitat of *Draba simonkaiana*, endemic to Parâng Mountains and critically endangered, according to DIHORU & NEGREAN (2009). The naturalness of community is relatively high, with only 7% of species referring to disturbance. Its occurrence also in other Southern Carpathian Mts. can be expected (Tab. 2, rel. 1-5).

SCREE SLOPE VEGETATION (THASPIETEA ROTUNDIFOLII Br.-Bl. 1926)

In the Parâng Mountains, this type of vegetation is very well developed on the “slope curtains” below rocky ridges and sometimes on the larger moraines, both on limestone and on siliceous bedrock. The scree slopes are special substrate, easily moving, poor in organic matter, with extreme water conditions. They are practically unsuitable for grazing, therefore their vegetation is well preserved. The extremities stimulate evolution, forcing the species to adjust themselves to these conditions. Many of them develop stolons or tussocks to fix the moving substrate (e. g. *Arabis* spp., *Cerastium* spp.), others store water and nutrients in their body (e.g. *Saxifraga* spp., *Sedum* spp.) or in underground organs (*Aconitum* spp., *Delphinium* spp.). In the monograph of BUIA et al. (1962) these communities were not published, except for “*Festucetum pictae*” from the siliceous screes.

CALCAREOUS SCREE SLOPES (THLASPIETALIA ROTUNDIFOLII Br.-Bl. 1926)

Arabis alpina-Saxifraga aizoides community

These communities belong to alliance *Papavero-Thymion pulcherrimi* I. Pop 1968, which is the Southern Carpathian equivalent of *Thlaspeion rotundifolii* Jenny & Lips 1930 em. Zollitsch 1968.

Arabis alpina-Saxifraga aizoides community is one of the representatives of the pioneer communities on the calcareous screes, especially in the limestone areas of central Parâng Mountains. It commonly occurs on the fine or medium large grained scree slopes. It has a relative high diversity, with only a few species of high constancy (K) value, as: *Saxifraga aizoides*, *Aconitum toxicum*, *Arabis alpina* and *Poa laxa* subsp. *pruinosa*. The Dacic-Balcanik geoelements have a considerable proportion (19%). Concerning the coenoelements, Seslerietea species are represented by 25%, Thlaspietea by 21%, as *Aconitum toxicum*, *Arabis alpina*, and *Delphinium elatum*, Asplenietea by 14% (*Saxifraga aizoides* and *Pritzelago alpina* subsp. *brevifolia*). Comparing this community with other Romanian Thlaspietalia associations, perhaps it is closest to *Acino-Galietum anisophylli* Beldie 1967. The occurrence of this new community can be expected also from other calcareous areas of the Southern Carpathians (Tab. 2, rel. 6-10).

Arabis alpina-Delphinium elatum community

It is a community of the coarse limestone scree, with some altiherbosa character. We discovered *Aubrieta columnae* subsp. *croatica* when made relevés from this community in 1956. In Parâng Mountains could not find *Linaria alpina*, which is so characteristic in similar habitats of Piatra Craiului and Bucegi Mountains. Spectacular species are in the Parâng Mountains the always present *Delphinium elatum* and *Aconitum tauricum*. Significant is the high proportion of Dacic-Balcanik geoelements (*Cerastium arvense* subsp. *molle*, *Campanula serrata*, *Alyssum repens*) and that of the Thlaspietea coenoelements (35%; for instance *Arabis alpina*, *Delphinium elatum*, *Aubrieta columnae* subsp. *croatica*). The naturalness of the community is demonstrated by the high proportion of protected and natural accessory species (Tab. 2, rel. 11-15).

Tab. 2. *Sileno lerchenfeldiana-Potentilletum haynaldiana* Horvat, Pawłowski et Walas 1937 (rel. 1-5); *Arabis alpina-Saxifraga aizoides* community (rel. 6-10); *Arabis alpina-Delphinium elatum* community (rel. 11-15)

Aspect	S-SE	S	S	SE	SE	K	SE	E-SE	NE	N	N	K	E	SE	SE	E	E	K
Slope (°)	90	90	90	90	90		45	45	35	25	30		40	45	45	35	35	
Coverage of herb layer (%)	90	70	70	80	80		20	30	40	30	30		10	20	20	20	10	
Coverage of moss layer (%)	20	10	5	20	15		-	-	5	5	15		0.5	0.5	0.5	0.5	0.5	
Height of herb layer (cm)	-	-	-	-	-		40	35	20	25	10		40	35	20	25	10	
Surface (m ²)	4	4	4	4	4		25	25	25	25	25		25	25	25	25	25	
Relevé no.	1	2	3	4	5		6	7	8	9	10		11	12	13	14	15	
Festuca airoides	1	1	2	2	2	V	-	-	+	-	-	I	-	-	-	-	-	-
Juncus trifidus	3	3	3	2	1	V	-	-	-	-	-	-	-	-	-	-	-	-
Luzula spicata	1	1	+	1	1	V	-	-	-	-	-	-	-	-	-	-	-	-
Potentilla haynaldiana	4	2	1	3	2	V	-	-	-	-	-	-	-	-	-	-	-	-
Thymus balcanus	+	1	1	+	+	V	-	+	1	-	-	II	-	-	-	-	-	-
Dianthus tenuifolius	2	1	2	-	+	IV	-	-	-	-	-	-	-	-	-	-	-	-
Silene lerchenfeldiana	-	2	3	+	+	IV	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga aizoides	-	-	-	-	-	-	+	+	1	2	2	V	+	+	-	1	+	IV
Aconitum toxicum	-	-	-	-	-	-	+	1	+	+	-	IV	-	-	-	-	-	-
Arabis alpina	-	-	-	-	-	-	+	1	-	+	+	IV	+	+	1	1	+	V
Aconitum tauricum	-	-	-	-	-	-	-	-	-	-	-	-	1	+	1	+	+	V
Cerastium arvense subsp. molle	-	-	-	-	-	-	-	-	-	-	-	-	+	1	1	1	1	V
Poa laxa subsp. pruinosa	-	-	-	-	-	-	+	+	-	1	+	IV	-	-	-	-	-	-
Acinos alpinus	-	-	-	-	-	-	+	+	-	+	-	III	+	+	+	-	-	III
Campanula serratula	-	-	-	-	-	-	+	+	+	-	-	III	+	+	+	-	-	III
Galium anisophyllum	-	-	-	-	-	-	+	1	+	-	-	III	1	+	1	+	1	V
Rhodiola rosea	-	-	-	-	-	-	-	-	-	-	-	.	+	-	-	+	+	III
Poa alpina	-	-	-	-	-	-	+	+	-	-	+	III	-	-	-	-	-	-
Poa alpina f. vivipara	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	II
Silene pusilla	-	-	-	-	-	-	-	-	-	-	-	III	-	-	-	-	-	-
Biscutella laevigata	-	-	-	-	-	-	+	+	-	-	-	II	-	+	+	-	-	II
Cerastium arvense subsp.	-	-	-	-	-	-	-	1	1	-	-	II	-	-	-	-	-	-

Poa nemoralis var. agrostoides	+	2	2	-	-	III	-	-	+	-	-	I	-	-	-	-	-	-
Potentilla aurea subsp. chrysocraspeda	-	-	-	-	-	-	-	-	+	-	-	I	-	-	-	-	-	-
Rhododendron myrtifolium	-	-	-	-	-	-	-	-	+	-	-	I	-	-	-	-	-	-
Sesleria bielzii	-	-	-	-	-	-	-	-	1	-	-	I	-	-	-	-	-	-
Soldanella pusilla	-	-	-	-	-	-	-	-	-	+	-	I	-	-	-	-	-	-
Taraxacum alpinum	-	-	-	-	-	-	-	-	-	+	-	I	-	-	-	-	-	-
Veronica aphylla	-	-	-	-	-	-	-	-	-	+	-	I	-	-	-	-	-	-
Viola biflora	-	-	-	-	-	-	-	-	-	-	-	I	-	+	-	+	+	III
Viola declinata	-	-	-	-	-	-	-	-	-	+	-	I	-	-	-	-	-	-
Sedum alpestre	+	+	+	-	-	III	-	-	-	-	-	-	-	-	-	-	-	-
Symphyandra wanneri	3	3	1	-	-	III	-	-	-	-	-	-	-	-	-	-	-	-
Carex ornithopoda	+	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Festuca dalmatica	2	1	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Sedum atratum	-	+	+	-	-	II	-	-	-	-	-	-	-	+	+	-	-	II
Veronica baumgartenii	-	-	-	+	+	II	-	-	-	-	-	-	-	-	-	-	-	-
Allium ericetorum subsp. ericetorum	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Allium victorialis	-	-	-	1	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Cystopteris fragilis	-	+	-	-	-	I	+	+	-	+	-	III	-	+	+	-	-	II
Genista tinctoria var. oligosperma	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Juniperus communis subsp. alpina	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Primula minima	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga adscendens	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga bryoides	-	-	-	1	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga paniculata var. brevifolia	1	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga pedemontana subsp. cymosa	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
BRYOPHYTA & MARCHANTIOPHYTA																		
Orthogrammia donniana	+	+	2	2	1	V	-	-	-	-	-	-	-	-	-	-	-	-
Polytrichum piliferum	1	-	1	1	+	IV	-	-	-	-	-	-	-	-	-	-	-	-
Polytricum juniperinum	1	2	+	-	-	III	-	-	-	-	-	-	-	-	-	-	-	-

<i>Radula lindenbergiana</i>	-	+	+	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
<i>Amphidium mougeotii</i>	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pohlia elongata</i>	-	-	1	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rhabdoweisia fugax</i>	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rhytidium rugosum</i>	-	1	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Polytrichastrum alpinum</i>	-	-	-	-	-	-	-	-	+	-	-	I	-	-	-	-	-	-
<i>Preissia quadrata</i>	-	-	-	-	-	-	+	-	-	-	-	I	+	+	-	+	-	III
LYCHENOPHYTA																		
<i>Cetraria islandica</i>	-	+	+	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
<i>Parmelia sulcata</i>	-	1	+	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cladonia pyxidata</i>	-	-	-	2	+	II	-	-	-	-	+	I	-	-	-	-	-	-
<i>Cladonia gracilis</i>	1	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cladonia squamosa</i>	2	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Sphaerophorus fragilis</i>	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-

Place of relevés: 1. Badea rocks, 1,830 m; 2. Badea rocks, 1,830 m, 1870 m; 3. Badea rocks, 1,860 m; 4-5. Groapa Mândrii, median ridge, 2,060 m; 6. Coasta lui Rusu, 2,130 m.s.l., on fine grained limestone scree; 7. Coasta lui Rusu, 2,140 m.s.l., on fine grained limestone scree; 8. Coasta lui Rusu, 2,180 m.s.l., on medium size serpentine scree; 9. Coasta lui Rusu, 2,080 m.s.l.; 10. Coasta lui Rusu, 2,130 m.s.l., on fine grained limestone scree; 11. Coasta lui Rusu, 2,165 m.s.l., coarse limestone scree; 12. ibid., 2,130 m.s.l.; 13. ibid., 2,130 m; 14. ibid., 2,080 m; 15. ibid., 2,080 m.s.l.

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

SILICEOUS SCREE SLOPES (ANDROSACETALIA ALPINAE Br.-Bl. 1926)

Widespread plant communities on the siliceous scree slopes of the subalpine and alpine belt of Carpathians, well summarized by COLDEA (1991) under the alliances of *Veronicion baumgartenii* Coldea and *Festucion pictae* Krajina. The first alliance units the associations of mobile screes in the Eastern and Southern Carpathians, with a number of endemic and Daco-Balcanik species, while the second units the association of the semi-fixed, fine grained siliceous screes of the Carpathians.

***Doronico carpatici-Festucetum pictae* Pócs et Simon nomen nov.**
(=*Festucetum pictae* auct. roman., non Krajina 1933)

According to our opinion the Transylvanian association differs enough from the *Festucetum pictae* Krajina 1933, originally described from the Tatra Mountains, to be described as a separate association under the new name of *Doronico carpatici-Festucetum pictae*. The Eastern and Southern Carpathian association has several Daco-Balcanik geoelements missing from the Northern Carpathians, as: *Cerastium transsilvanicum*, *Doronicum carpaticum*, *Rhododendron myrtifolium*, and *Veronica baumgartenii*. It can be discussed whether the association should be classified on ecological basis into the alliance of *Festucion pictae* or on the basis of Daco-Balcanik geoelements better under *Veronicion baumgartenii*. The association is widespread in the Rodnei, Făgăraș, and Retezat Mountains [COLDEA, 1991] and is mentioned by BUIA (1962) from the Parâng Mountains without detailed description. DOMIN (1933) described an association also under the name of *Festucetum pictae* from the Bucegi Mountains, which, due to its calcareous substrate, differs from the above. Geographically it is transitional between the Tatras community and those described from the Bulgarian mountains by SIMON (1958) and by HORVAT & al. (1974). In the scree fixing succession it is transitional towards the *Caricion curvulae* mats. The association contains a good number of species worth to be protected (e.g. *Sedum atratum*, *Leucanthemopsis alpina*, *Poa laxa*, *Gentiana punctata*, *Cerastium transsylvanicum*) (Tab. 3, rel. 1-5).

Tab. 3. Ass. *Doronico carpatici-Festucetum pictae* Pócs et Simon nomen nov. (rel. 1-5); *Polytrichetum sexangularis* Br.-Bl. 1926 (rel. 6-7); *Poo supinae-Cerastietum cerastoidis* (Söry 1954) Oberd. 1957 (rel. 8-10); *Salicetum herbaceae* Br.-Bl. 1926 (rel. 11-13); *Soldanello pusillae-Ramunculetum crenati* Borza (1931) Boșcaiu 1971 (vel aff.) (rel. 14-16)

Aspect	NW	E-NE	NW	S	SE	K	S	W	-	W	W	NE	NE	NE	N	N	N
Slope (°)	35	45	40	35	30		40	15	-	30	30	4	8	3	40	30	30
Coverage of herb layer (%)	10-20	60	60	10	15		5	10	8	30	30	70	60	60	70	60	60
Coverage of moss layer (%)	5-10	10-20	10	-	-		95	90	95	70	70	10	30	30	70	80	80
Surface (m ²)	25	25	25	25	25		1	4	0.2	1	1	1	1	1	?	?	?
Relevé no.	1	2	3	4	5		6	7	8	9	10	11	12	13	14	15	16
<i>Sedum atratum</i>	+	+	+	+	+	V	-	-	-	-	-	-	-	-	-	-	-
<i>Gnaphalium supinum</i>	-	+	+	+	+	IV	-	-	-	-	-	-	-	-	+	-	-
<i>Leucanthemopsis alpina</i>	-	+	+	1	1	IV	-	-	-	-	-	-	-	-	+	+	1
<i>Ligisticum mutellina</i>	1	1	1	-	1	IV	-	-	-	-	-	-	-	-	1	1	1
<i>Anthoxanthum odoratum</i>	+	2	1	-	+	IV	-	-	-	-	-	-	-	-	-	-	-
<i>Poa supina</i>	-	-	-	-	-	-	+	2	4	4	+	+	-	-	-	-	-
<i>Salix herbacea</i>	-	-	-	-	-	-	-	-	-	-	-	3	4	4	-	-	-
<i>Poa laxa</i> subsp. <i>pruinosa</i>	+	-	-	2	1	III	-	-	-	-	-	-	-	-	-	-	-
<i>Campanula abietina</i>	+	+	+	-	-	III	-	-	-	-	-	-	-	-	-	-	-
<i>Doronicum carpaticum</i>	1	1	1	-	-	III	-	-	-	-	-	-	-	-	+	-	-
<i>Festuca picta</i>	2	3	3	-	-	III	-	-	-	-	-	-	-	-	-	1	1
<i>Geum montanum</i>	+	1	+	-	-	III	-	-	-	-	-	-	-	-	-	-	+
<i>Juncus trifidus</i>	1	+	+	-	-	III	-	-	-	-	-	-	-	-	-	-	-
<i>Luzula alpinopilosa</i> subsp. <i>obscura</i>	-	+	+	-	+	III	-	-	-	-	-	-	-	-	4	4	3
<i>Ranunculus montanus</i> subsp. <i>pseudomontanus</i>	+	+	+	-	-	III	-	-	-	-	-	-	-	-	-	+	-
<i>Rhododendron myrtifolium</i>	+	+	+	-	-	III	-	-	-	-	-	-	-	-	+	-	-
<i>Soldanello pusilla</i>	+	1	+	-	-	III	-	1	-	-	-	-	-	-	2	2	2
<i>Veratrum album</i>	2	1	+	-	-	III	-	-	-	-	-	-	-	-	-	-	+

Aconitum toxicum	+	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Arenaria biflora	-	-	-	+	1	II	-	-	-	-	-	-	-	-	-	-	-	-
Athyrium distentifolium	+	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Campanula alpina	-	+	+	-	-	II	-	-	-	-	-	-	-	-	1	-	-	-
Carex pyrenaica	-	+	-	-	+	II	-	-	-	-	-	-	-	-	-	-	-	-
Festuca airoides	-	-	+	-	+	II	-	-	-	-	-	-	-	-	-	-	-	-
Gentiana punctata	+	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Homogyne alpina	+	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Oreochloa disticha	-	+	+	-	-	II	-	-	-	-	-	1	+	+	-	-	-	-
Pedicularis verticillata	-	+	+	-	-	II	-	-	-	-	-	-	-	+	-	-	-	-
Potentilla aurea subsp. chrysocraspeda	-	-	+	+	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Primula minima	-	+	+	-	-	II	-	-	-	+	+	3	3	3	+	-	-	-
Ranunculus crenatus	-	+	+	-	-	II	-	-	-	-	-	-	-	-	-	+	2	-
Veronica alpina	-	+	+	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-
Achillea distans subsp. stricta	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Agrostis rupestris	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Alchemilla glabra	-	1	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Campanula serrata	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Carex curvula	-	-	-	+	-	I	-	-	-	-	-	+	1	+	-	-	-	-
Cardamine resedifolia	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Cerastium transylvanicum	-	-	1	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Cerastium cerastoides	-	-	-	+	-	I	+	+	2	2	2	+	-	-	-	1	+	-
Dryopteris filix-mas	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Hieracium alpinum	-	+	-	-	-	I	-	-	-	-	-	-	-	-	+	-	-	-
Luzula luzuloides var. cuprina	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Luzula spicata	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Oxyria digyna	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	+	-	-
Polygonum viviparum	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga carpatica	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga moschata	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Saxifraga stellaris	-	-	-	-	+	-	I	-	+	-	-	-	-	-	-	+	-	-

Senecio subalpinus	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Silene vulgaris	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Taraxacum nigricans	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Vaccinium myrtillus	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Veronica baumgartenii	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Viola biflora	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Cerastium lanatum	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-
Deschampsia cespitosa	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Leucanthemopsis alpinus	-	-	-	-	-	-	-	+	-	+	+	2	1	1	-	-	-	-
Persicaria vivipara	-	-	-	-	-	-	-	-	2	-	-	1	1	-	-	-	-	-
Plantago gentianoides	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Saxifraga bryoides	-	-	-	-	-	-	-	-	+	1	1	1	-	-	-	-	-	-
Sedum alpestre	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-
Silene acaulis	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Taraxacum fontanum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	1	-
Anthemis carpatica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Phyteuma confusum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Poa media	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Sesleria bielzii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
BRYOPHYTA																		
Polytrichum piliferum	+	-	+	+	+	IV	+	-	-	3	3	-	-	-	-	-	-	-
Polytrichastrum alpinum	-	-	-	+	1	II	-	-	-	-	-	1	2	3	3	-	-	-
Polytrichastrum sexangulare	-	-	-	+	+	II	5	5	1	1	1	-	-	-	-	-	-	-
Bartramia ithyphylla	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Bazzania trilobata	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Heterocladium dimorphum	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Kiaeria starkei	+	-	-	-	-	I	-	-	-	-	-	-	-	-	1	-	-	-
Polytrichum juniperinum	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-
Sanionia uncinata	-	-	+	-	-	I	-	-	-	-	-	-	-	-	+	-	-	-
Weissia wimmeriana	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-

Bryum spp.	-	-	-	-	-	-	+	-	3	-	-	-	-	-	-	-	-
Paraleucobryum enerve	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-
Warnstorfia exannulata	-	-	-	-	-	-	1	-	-	1	1	-	-	-	-	4	5
Anthelia juratzkana	-	-	-	-	-	-	-	+	4	-	-	-	-	-	-	-	-
Dicranum scoparium	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Jungermannia sphaerocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Hylocomium proliferum	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Lophozia sudetica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Rhytidadelphus triqueter	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Scapania undulata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
LICHENOPHYTA																	
Cetraria islandica	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-
Cladonia rangiferina	-	-	-	-	-	-	+	-	-	-	-	+	-	+	-	-	-
Solorina crocea	-	-	-	-	-	-	+	+	-	+	+	-	-	-	-	-	-
Stereocaulon alpinum	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Thamnolia vermicularis	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-

Place of relevés: 1. Groapa Mândrii, 2,030 m.s.l., on coarse scree; 2. ibid., 2,000 m, medium sized scree; 3. ibid., 2,040 m.s.l., medium sized scree; 4. Piatra Tăiată, 2,160 m.s.l., fine grained scree; 5. Setea Mare - Piatra Tăiată, 2,340 m.s.l., fine graine scree; 6. Mândra-ridge, 2,500 m.s.l.; 7. ibid., 2,500 m.s.l.; 8. Cârja-circus, 2,100 m.s.l.; 9. Piatra Tăiata, 2,250 m.s.l.; 10. Mândra Ridge, 2,500 m.s.l.; 11. Vf. Mândra, 2,520 m.s.l.; 12. ibid., 2,525m.s.l.; 13. ibid., 2,525 m.s.l.; 14. N slope of Cârja-summit (2,400 m.s.l.), siliceous cliffs; 15. Groapa Mândrii, 2,030 m.s.l., cliffs of median ridge; 16. ibid.

SNOW VALLEYS (SALICETEA HERBACEAE Br.-Bl. 1926)

These pioneer communities (Fig. 2) develop in the alpine belt above the altitude of 2,000 m, in depressions of summits and in N exposed slopes or valleys where the snow melts only during summertime. They occur often along the eternal snow patches (firn). The habitat is usually wet from the melting water and has a lifespan of only 2-3 months per year. The communities living in this habitat are poor in species, have a considerable moss layer and their herb layer is often stunted. We studied in the Parâng Mountains three associations belonging to this group, namely *Polytrichetum sexangularis*, *Salicetum herbaceae*, and *Soldanello pusillae-Ranunculetum crenati*.

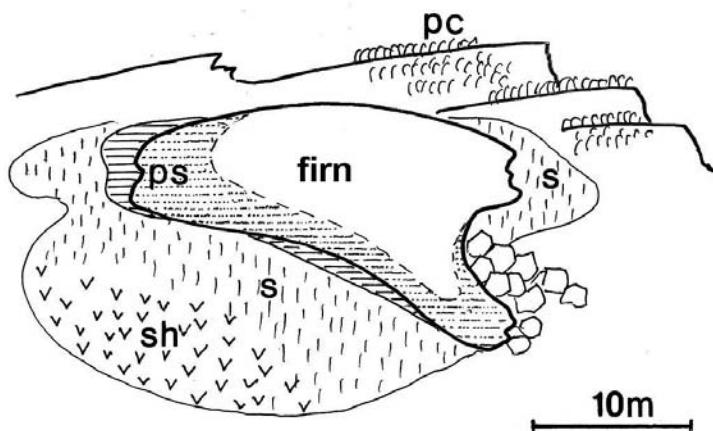


Fig. 2. Vegetation of a snow valley at 2,500 m altitude, on the W side of Mândra summit, on the 31st July, 1956

pc: Primulo-Caricetum curvulae; **ps:** Polytrichetum sexangularis; **s:** Poo supinae-Cerastietum cerastoidis; **sh:** Salicetum herbaceae (drawn by T. Pócs)

***Polytrichetum sexangularis* Br.-Bl. 1926**

This association is located around the eternal snow patches of Cârja, Mândra and Tăiata summits, on fine, humus rich, muddy soil. Along the prevailing mosses, the occurrence of *Cerastium cerastoides* and at places the dominancy of *Poa supina* is striking. Among the geoelements, the European-alpine and Alpine-arctic types dominate (86%). Among the coenotaxa, the *Salicetea herbaceae* are prominent (64%). A number of species are worth to be protected, like *Cerastium cerastoides*, *Saxifraga bryoides* and *Soldanella pusilla*. The association is well known from the Southern Carpathians, but new to the Parâng Mountains (Tab. 3, rel. 6-7).

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

***Poo supinae-Cerastietum cerastoidis* (Söry 1954) Oberd. 1957**

After *Polytrichetum sexangularis* this community has the longest snow cover, surrounding the snowfields. There is no sharp limit between these two communities. The succession reaches to *Salicetum herbaceae* only at places which are longer snowfree. It is a very poor community, consisting of phanerogams with the dominance of *Poa supina* and/or *Cerastium cerastoides*, which have relatively short active life cycles. According to COLDEA (1991) this chiono-hygrophilous community is known from the Rodnei, Retezat, Țarcu and Godeanu Mts., and new to Parâng Mts. (Tab. 3, rel. 8-10).

***Salicetum herbaceae* Br.-Bl. 1926**

We observed the dwarf stands of this tundra like community on the Mândra summit at 2,520 m altitude. The snow cover in this habitat lasts a bit shorter time than the previous association. On the humus rich, fine, acidic soil, *Salix herbacea* is the dominant species, while the codominants are *Primula minima*, *Leucanthemopsis alpinus* and *Persicaria vivipara*; the moss layer is usually formed by *Polytrichastrum alpinum*. Among the geoelements, the circumboreal type is dominant (51%), while among the coenotaxons the Salicatea herbaceae and Caricetea curvulae are prevailing. *Plantago gentianoides*, *Primula minima*, *Saxifraga bryoides* and *Silene acaulis* are among the species worth to be protected. The association is known from the Rodnei, Bucegi, Făgărăș and Godeanu-Țarcu Mts. in Romania, being new to the Parâng Mts. (Tab. 3, rel. 11-13).

***Soldanello pusillae-Ranunculetum crenati* Borza (1931) Boșcaiu 1971 (vel aff.)**

This plant community thrives on the northerly exposed rocks and slopes, with fine grained, wet and humus rich rubble. The coverage of herb and moss layer is considerable. Conspicuous species are: *Luzula alpinopilosa*, *Soldanella pusilla*, *Leucanthemopsis alpina*, *Ligusticum mutellina* and *Ranunculus crenatus*. In the moss layer *Polytrichastrum alpinum* and *Warnstorffia exannulata* are dominating. The circumboreal species are in majority, with their 38%, but the 23% Dacic-Balcanik species, like *Doronicum carpaticum*, *Poa media*, *Ranunculus crenatus*, *Rhododendron myrtifolium*, *Sesleria bielzii* underline the independent character of the Southern Carpathian association, hitherto known only from Godeanu-Țarcu and Făgărăș Mts. Among coenotaxa, the Caricetalia curvulae species with 26%, Vaccinio-Piceetalia with 23% and Thlaspietea species with 21% are in majority. The Parâng community slightly differs from the stands described from Țarcu and Făgărăș Mts. by the lack of *Plantago gentianoides* and *Gnaphalium supinum* and by the more prominent occurrence of *Luzula alpinopilosa* (Tab. 3, rel. 14-16).

MATS OF ARCTIC-ALPINE CHARACTER (JUNCETEA TRIFIDI Klika et Hadač 1944)

Communities of the wind exposed ridges and summits on siliceous ground above 2,000 m in the Carpathians and the Balkan Peninsula formed by pillow grasses and herbs and latticed dwarf shrubs.

***Primulo minimae-Caricetum curvulae* Br.-Bl. 1926**

These climazonal alpine mats remained quite well in their original, natural state, except for the sides of regularly used tourist paths. Moderate grazing seems not causing serious degradation in these mats. It is widespread with some geographical variations all over the European Alpine-Carpathian-Balkanik mountain systems, on soils of siliceous bedrocks. In Parâng Mts. this is the most widespread alpine community. It was already studied by BUIA & al. (1962), represented by 15 relevés containing 34 species. We think that it will be a useful supplement to these our 10 further relevés with 50 species. The overall dominant species is *Carex curvula*, accompanied mostly by: *Agrostis rupestris*, *Festuca airoides*, *Geum montanum*, *Hieracium alpinum* and *Potentilla aurea* subsp. *chrysocraspeda*. Characteristic is the dominance of circumboreal geoelements, mostly from the coenotaxa of *Caricetalia curvulae* and of *Vaccinio-Piceetalia*, with the majority of specialists and competitors. *Campanula alpina*, *Cerastium cerastoides*, *Saxifraga bryoides*, *Sedum alpestre*, *Veronica baumgartenii* and *Pulsatilla alba* are partly unical species, worth to be protected (Tab. 4, rel. 1-10).

***Primula minima-Dryas octopetala* community**

We observed this interesting association on the snow protected granitic layers of the highest summits. *Dryas octopetala* is a real edifier, community builder. It obviously belongs to Loiseleurio-Vaccinion alliance, without some of its species, but accompanied by several elements not occurring in Cetrario-Loiseleurietum, like *Carex curvula*, *Luzula spicata*, *Oreochloa disticha* and *Pedicularis verticillata*. It is different from *Dryadetum octopetalae* described by RÜBEL (1912) from the Bernina Alps, as the latter has a number of calciphilous species and the Parâng community has some Dacic elements, like *Cerastium transsylvanicum*. Observing this community from more places maybe justifies to describe it as a new association (Tab. 4, rel. 11).

***Cetrario-Loiseleurietum* Br.-Bl. 1926**

This association is related to the previous one, although belongs to Loiselurio-Vaccinion alliance. It develops usually on the finely granulated gravelly soils in northern exposure, usually under longer snow protection. It is dominated by circumboreal geoelements, like *Loiseleuria procumbens*, *Vaccinium gaultheroides* and *V. vitis-idaea*. Among the coenotaxa, those of Androsacetalia and some Salicetea herbaceae elements are dominant. A number of species are unicate and worth protection, like *Eritrichum nanum*, *Leucanthemopsis alpina*, *Huperzia selago* and *Campanula alpina*. BUIA & al. (1962) published 18 relevés from the altitude of 1,800-2,100 m. We think that our 5 relevés from 2,150-2,400 m complete the picture (Tab. 4, rel. 12-16).

Tab. 4. *Primula minima-Caricetum curvulae* Br.-Bl. 1926 (rel. 1-10); *Primula minima-Dryas octopetala* community (rel. 11); *Cetrario-Loiseleurietum* Br.-Bl. 1926 (rel. 12-16)

Aspect	W-NW	W-NW	W-SW	W-NW	NW	K	NE-N	S	NE	NE	N-NE	N-NW	K
Slope (°)	3	30-40	3-4	2-15	10		15-20	10	20	20	20	25	
Coverage of herb layer (%)	70	80	90	85	90		95	90	50	70	70	65	
Coverage of moss layer (%)	20	15	15	5	20		3	10	20	20	20	20	
Surface (m ²)	4	1	1	1	1		1	1	1	1	1	1	
Relevé no.	1	2-3	4-5	6-8	9-10		11	12	13	14	15	16	
Campanula alpina	1	+	+	1	1	V	+	1	-	-	-	-	II
Carex curvula	4	4	4	4	4	V	1	-	-	-	-	-	-
Hieracium alpinum	1	1	1	1	+	V	+	+	+	+	+	+	V
Phyteuma confusum	1	1	1	1	+	V	-	-	+	+	+	+	IV
Potentilla aurea subsp. chrysocraspeda	1	1	1	+	1	V	-	-	-	-	-	-	-
Primula minima	2	2	1	2	1	V	1	+	2	+	1	1	V
Festuca airoides	1	1	+	1	-	IV	+	+	1	1	1	1	V
Homogyne alpina	-	1	2	+	+	IV	-	-	-	-	-	-	-
Soldanella pusilla	+	-	+	1	+	IV	-	-	-	-	-	-	-
Vaccinium gaultherioides	+	-	+	1	+	IV	-	1	+	+	4	4	V
Vaccinium vitis-idaea	+	+	1	1	-	IV	-	-	1	1	1	1	IV
Dryas octopetala	-	-	-	-	-	-	5	-	-	-	-	-	-
Eritrichium nanum	-	-	-	-	-	-	-	-	1	+	+	+	IV
Leucanthopsis alpina	-	1	1	-	1	III	-	-	-	-	-	-	-
Omalotheca supina	+	-	+	+	-	III	-	-	-	-	-	-	-
Oreochloa disticha	-	1	-	1	-	II	+	-	-	-	-	-	-
Rhdodendron myrtifolium	+	-	+	1	-	III	-	-	+	+	-	+	III
Juncus trifidus	-	+	+	-	-	II	-	+	1	-	-	1	III
Ligusticum mutellina	-	+	+	-	-	II	-	-	-	-	-	-	-
Luzula spicata subsp. mutabilis	-	+	+	-	-	II	+	-	-	-	-	-	-
Persicaria vivipara	-	-	-	1	2	II	1	+	-	-	-	-	I
Salix herbacea	-	-	-	1	1	II	+	2	-	-	-	-	-

<i>Agrostis rupestris</i>	-	1	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Avenastrum versicolor</i>	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Carex atrata</i>	-	-	-	-	1	-	I	1	-	+	-	-	-	1	II				
<i>Cerastium cerastoides</i>	-	-	-	-	1	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Euphrasia minima</i>	-	-	+	-	-	I	-	-	-	-	-	+	+	II					
<i>Geum montanum</i>	-	-	1	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Juniperus communis</i> subsp. <i>alpina</i>	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Loiseleuria procumbens</i>	-	-	-	-	1	-	I	-	4	3	4	4	4	3	V				
<i>Luzula alpinopilosa</i>	-	-	-	-	1	-	I	-	-	-	-	-	-	-	-	-	-	-	-
<i>Poa annua</i> subsp. <i>supina</i>	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pulsatilla alba</i>	+	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Saxifraga bryoides</i>	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Sedum alpestre</i>	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Silene acaulis</i>	-	-	-	+	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Vaccinium myrtillus</i>	1	-	-	-	-	I	-	-	-	1	-	-	-	-	I	-	-	-	-
<i>Veronica baumgartenii</i>	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Luzula sudetica</i>	-	-	-	-	-	-	-	-	+	-	+	-	1	III					
<i>Cerastium transsylvanicum</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I				
<i>Leucanthemopsis alpina</i>	-	-	-	-	-	-	-	-	-	1	+	-	-	+	II				
<i>Agrostis rupestris</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	I	-	-	-	-
<i>Pedicularis verticillata</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I				
<i>Huperzia selago</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	I			
BRYOPHYTA																			
<i>Paraleucobryum enerve</i>	1	-	1	-	1	III	-	+	-	-	-	-	-	-	I				
<i>Polytrichastrum alpinum</i>	-	+	+	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Polytrichum piliferum</i>	-	+	2	-	-	II	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Diplophyllum obtusifolium</i>	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hylocomium proliferum</i>	-	-	-	-	+	I	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Polytrichum juniperinum</i>	-	-	-	-	+	I	+	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rhytidadelphus triquetrus</i>	-	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-

<i>Sanionia uncinata</i>	-	-	-	-	1	I	+	-	-	-	-	-	-
<i>Anthelia juratzkana</i>	-	-	-	-	-	-	-	1	-	-	-	-	I
<i>Plagiochila asplenoides</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
<i>Polytrichastrum sexing.</i>	-	-	-	-	-	-	-	-	1	-	-	-	I
LICHENES													
<i>Thamnolia vermicularis</i>	1	+	1	-	-	III	-	1	1	1	+	1	V
<i>Alectoria scalaris</i>	-	1	1	-	-	II	-	-	-	-	-	-	-
<i>Cladonia mitis</i>	-	+	-	-	+	II	-	-	-	-	-	-	-
<i>Alectoria nigrescens</i>	+	-	-	-	-	I	-	-	-	-	-	-	-
<i>Alectoria ochroleuca</i>	+	-	-	-	-	I	-	-	-	-	-	-	-
<i>Cetraria aculeata</i>	-	-	-	-	-	-	-	-	+	-	-	+	II
<i>Cetraria cucullata</i>	-	-	-	-	-	-	-	+	-	-	-	-	I
<i>Cetraria nivalis</i>	1	-	-	-	-	I	-	1	+	-	-	+	III
<i>Cetraria islandica</i>	3	1	1	-	1	IV	1	3	3	2	1	1	V
<i>Cladonia mitis</i>	-	+	-	-	+	II	-	-	-	-	-	-	-

Place of relevés: 1. Parâng-Cârja Summit, 2,150 m.s.l., grazed; 2. Cârja Summit, 2,300 m.s.l.; 3. Cârja Summit, 2,400 m.s.l.; 4. Stoinița Summit, 2,350 m.s.l., grazed; 5. Gemănearea Summit, 2,380 m.s.l.; 6. Mândra Summit, 2,330 m.s.l.; 7. ibid.; 8. Mândra Summit, 2,519 m.s.l.; 9. Mândra Summit, 2,440 m.s.l.; 10. ibid.; 11. Mândra Summit, 2,400 m.s.l.; 12. Groapa Mândrii, 2,200 m.s.l., median ridge; 13. Păpușa Summit, 2,150 m.s.l.; 14. ibid.; 15. ibid.; 16. ibid.

ALPINE ROCK SWARDS (SESLERIETEA ALBICANTIS)

Dianthus tenuifolius-Festuca dalmatica community

This community appears in closed mats on the South facing escarpment edges of Păpușa and Parâng Summits, between 1,800 and 1,900 m. The soil, according to the vegetation, is somewhat calcareous. On the base of two relevés it can be classified in Festuco saxatilis-Seslerion bielzii alliance. With the dominance of *Festuca dalmatica* and with the presence of Dacic *Dianthus tenuifolius* and Dacic-Balcanik *Bupleurum diversifolium*, *Jovibarba heuffelii*, *Genista oligosperma* and *Lilium jankae*, it seems to be an independent association with Balcanik connections. Along the calciphilous species Caricetalia curvulae coenotaxa, also occur others, as *Euphrasia minima*, *Festuca airoides* and *Agrostis rupestris*. The junior author observed a similar community on the limestone rocks of Vânturarița Mts., just 40 km E-SE from the central part of Parâng Mts. and named it provisionally as a xerothermic subalpine *Festuca dalmatica-Phleum montanum* association [POCS, 1963]. There, it occurs between 1,600 and 1,800 m, on the steep SE slopes of Mts. Albu and Buila (Tab. 5, rel. 1-2).

Tab. 5. *Dianthus tenuifolius-Festuca dalmatica* community (rel. 1-2); *Cratoneuretum filicina-commutati* (Kuhn 1937) Oberd. 1977 (rel. 3-4); *Carici dacicae-Plantaginetum gentianoidis* Boșcăiu et al. 1972 (rel. 5); *Heracleetum palmati* Pușcaru et al. 1956 (rel. 6); *Salici-Alnetum viridis* Colic et al. 1962 (rel. 7); *Calamagrostetum arundinaceae subalpinum* Csürös 1962 (rel. 8)

Aspect	S	S	E	E	S	E-NE	N	S
Slope (°)	30	30	2	2	15	30	15	50
Coverage of upper canopy (%)	-	-	-	-	-	-	3-4	-
Coverage of lower canopy (%)	-	-	-	-	-	-	85	-
Coverage of herb (%)	90	80	85	75	60	98	85	90
Coverage of mosses (%)	4	4	85	70	40	70	10	-
Surface (m ²)	20	2	5	5	5	25	25	25
Relevé no.	1	2	3	4	5	6	7	8
<i>Festuca dalmatica</i>	5	4	-	-	-	-	-	-
<i>Dianthus tenuifolius</i>	2	2	-	-	-	-	-	+
<i>Saxifraga stellaris</i>	-	-	5	4	1	-	-	-
<i>Heracleum palmatum</i>	-	-	-	-	-	3	-	-
<i>Sorbus aucuparia</i>	-	-	-	-	-	-	2	-
<i>Picea abies</i>	-	-	-	-	-	-	+	-
<i>Picea abies</i> juv.	-	-	-	-	-	-	+	-
<i>Pinus mugo</i>	-	-	-	-	-	-	+	-
<i>Alnus viridis</i>	-	-	-	-	-	-	5	-
<i>Juniperus communis</i> subsp. <i>alpina</i>	-	-	-	-	-	-	+	-
<i>Adenostyles alliariae</i>	-	-	-	-	-	5	3	-
<i>Dryopteris dilatata</i>	-	-	-	-	-	-	2	-
<i>Senecio nemorensis</i> subsp. <i>fuchsii</i>	-	-	-	-	-	-	2	1
<i>Oxalis acetosella</i>	-	-	-	-	-	-	1	-
<i>Ranunculus platanifolius</i>	-	-	-	-	-	-	-	1
<i>Vaccinium myrtillus</i>	-	-	-	-	-	-	-	1
<i>Veratrum album</i>	-	-	-	-	-	2	1	1
<i>Athyrium distentifolium</i>	-	-	-	-	-	-	1	1
<i>Geranium sylvaticum</i> subsp. <i>caeruleatum</i>	-	-	-	-	-	-	-	1
<i>Anthoxanthum odoratum</i>	-	-	-	-	-	-	-	1
<i>Hypericum maculatum</i>	-	-	-	-	-	-	-	1
<i>Viola declinata</i>	-	-	-	-	-	-	-	+

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

Avenastrum versicolor	-	-	-	-	-	-	-	+
Homogyne alpina	-	-	-	-	-	-	1	-
Saxifraga rotundifolia	-	-	-	-	-	-	1	-
Aconitum paniculatum	-	-	-	-	-	-	+	-
Angelica archangelica	-	-	-	-	-	-	+	-
Avenella flexuosa	-	-	-	-	-	-	+	+
Rubus idaeus	-	-	-	-	-	-	+	
Aconitum tauricum	-	-	-	-	-	1	-	+
Rumex arifolius	-	-	-	-	-	1	+	-
Senecio subalpinus	-	-	-	-	-	-	+	-
Soldanella hungarica subsp. major	-	-	-	-	-	-	+	+
Streptopus amplexifolius	-	-	-	-	-	-	+	
Campanula rotundifolia subsp. polymorpha	-	-	-	-	-	-	-	1
Trisetum flavescens	-	-	-	-	-	1	-	-
Gentiana punctata	-	-	-	-	-	+	-	-
Saxifraga heucherifolia	-	-	-	-	-	3	-	-
Poa minor	-	-	-	-	-	2	-	-
Stellaria nemorum	-	-	-	-	-	2	-	-
Ligusticum mutellina	-	-	-	-	-	1	-	-
Primula elatior	-	-	-	-	-	1	-	-
Campanula abietina	-	-	-	-	-	+	+	
Geum montanum	-	-	-	-	-	+	-	-
Soldanella pusilla	-	-	-	-	-	+	-	-
Cardamine amara	-	-	2	2	-	-	+	
Carex dacica	-	-	+	1	-	-	-	-
Cerastium cerastoides	-	-	2	1	-	-	-	-
Deschampsia cespitosa	-	-	2	2	2	-	+	2
Epilobium nutans	-	-	+	+	-	-	-	-
Poa alpina f. vivipara	-	-	+	1	-	-	-	-
Plantago gentianoides	-	-	1	+	1	-	-	-
Aconitum napellus	-	-	+	-	-	-	-	-
Alchemilla glabra	-	-	1	-	-	1	-	-
Caltha palustris subsp. laeta	-	-	-	+	-	-	-	-
Ranunculus montanus subsp. pseudomontanus	-	-	+	-	-	+	-	-
Viola biflora	-	-	+	-	-	-	1	-
Juncus filiformis	-	-	-	-	4	-	-	-
Carex echinata	-	-	-	-	2	-	-	-
Alchemilla flabellata	-	-	-	-	+	-	-	-
Cardamine pratensis var. rivularis	-	-	-	-	+	-	-	-
Bellardiochloa violacea	-	1	-	-	-	-	-	-
Poa nemoralis var. agrostoides	2	2	-	-	-	-	-	2
Jovibarba heuffelii	1	-	-	-	-	-	-	-
Thymus alpestris	1	1	-	-	-	-	-	-
Allium ericetorum subsp. ericetorum	-	1	-	-	-	-	-	-
Allium victorialis	+	-	-	-	-	-	-	2
Bupleurum diversifolium	1	-	-	-	-	-	-	1
Calamagrostis arundinacea	1	1	-	-	-	-	-	5
Luzula luzuloides var. cuprina	1	-	-	-	-	-	-	+
Allium vineale	+	-	-	-	-	-	-	-
Agrostis rupestris	+	-	-	-	+	-	-	-
Bruckenthalia spiculifolia	+	-	-	-	-	-	-	-
Carex sempervirens	+	+	-	-	-	-	-	1
Crocus vernus subsp. vernus	+	-	-	-	-	-	-	+
Hieracium aurantiacum	-	-	-	-	-	-	-	+
Scrophularia scopolii	-	-	-	-	-	-	-	+

TIBOR SIMON, TAMÁS PÓCS

Euphrasia minima	+	-	-	-	-	-	-	-
Festuca airoides	+	+	-	-	+	-	-	-
Genista oligosperma	+	-	-	-	-	-	-	-
Lilium jankae	+	-	-	-	-	-	-	-
Seseli libanotis	-	-	-	-	-	-	-	+
Sesleria biepii	-	-	-	-	-	-	-	+
Thesium alpinum	-	-	-	-	-	-	-	+
Seseli libanotis var. humilis	+	-	-	-	-	-	-	-
Saxifraga pedemontana subsp. cymosa	+	-	-	-	-	-	-	-
Sedum annum	+	+	-	-	-	-	-	-
Thymus balcanus	-	+	-	-	-	-	-	-
Silene lerchenfeldiana	+	-	-	-	-	-	-	-
BRYOPHYTA								
Plagiobryum zierii	+	-	-	-	-	-	-	-
Polytrichum piliferum	1	-	-	-	-	-	-	-
Thallose liverworts (sterile)	+	-	-	-	-	-	-	-
Cratoneuron filicinum	-	-	5	4	-	-	-	-
Drepanocladus exannulatus	-	-	+	2	-	-	-	-
Philonotis seriata	-	-	2	2	4	-	-	-
Bryum schleicheri	-	-	1	-	2	-	-	-
Calliergonella cuspidata	-	-	-	+	-	-	-	-
Pseudoleskeia incurvata	-	-	-	-	-	3	+	-
Plagiothecium succulentum	-	-	-	-	-	2	-	-
Pellia endiviaefolia	-	-	-	-	-	1	-	-
Polytrichum commune	-	-	-	-	-	+	1	-
Dicranum polysetum	-	-	-	-	-	-	1	-
Diplophyllum albicans	-	-	-	-	-	-	1	-
Dicranum scoparium	-	-	-	-	-	-	+	-
Isothecium myosuroides	-	-	-	-	-	-	+	-
Plagiothecium laetum	-	-	-	-	-	-	+	-
Pohlia cruda	-	-	-	-	-	-	+	-
Rhizomnium punctatum	-	-	-	-	-	-	+	-
Radula lindenbergiana	-	-	-	-	-	-	+	-
LYCHENOPHYTA								
Cladonia pyxidata	+	-	-	-	-	-	-	-
Cladonia rangiferina	+	-	-	-	-	-	-	-
Thamnolia vermicularis	+	-	-	-	-	-	-	-

Place of relevés: 1. Păpușa ridge, 1,900 m.s.l.; 2. Parâng Summit, 1,830 m.s.l.; 3-4. Groapa Mândrii, 1,810 m.s.l.; 5. South from the western peak of Păpușa, at 1,800 m.s.l.; 6. Mândra circus, 2,040 m.s.l.; 7. Jiețu Valley, 1,700 m.s.l.; 8. Mt. Păpușa, 1,900 m.s.l.

SPRING BOGS (MONTIO-CARDAMINETEA Br.-Bl. & Tx. 1943)

Cratoneuretum filicina-commutati (Kuhn 1937) Oberd. 1977

We have found on the bottom of Mândra circus, among *Rhododendro-Pinetum mughi* stands, spring bogs similar to those shortly characterised by BUIA & al. (1962). These can be identified as *Cratoneuretum filicina-commutati* association. It is related also to *Chrysosplenio alpini-Saxifragetum stellaris* Pawł. et Walas 1949, but due to the complete lack of *Chrysosplenium alpinum* we could not classify them there. The other spring bog community, the montane-subalpine *Chrysosplenio-Cardaminetum amarae* Mass. 1959 seems to be bound to the forests belts at lower altitudes. The spring bog is surrounded by *Carici echinatae-Sphagnetum* transition bog, here and there with raised bog

NEW ASPECTS OF THE ALPINE VEGETATION OF PARÂNG-MOUNTAINS ...

characters. Along the brook flowing out from the bog, *Carex pauciflora* and *Scapania undulata* were found (Tab. 5, rel. 3-4).

MONTANE FENS (SCHEUZERIO-CARICETEA NIGRAE)

***Carici dacicae-Plantaginetum gentianoidis* Boșcaiu et al. 1972**

Based on the composition of the only one sample, the community can be classified in the alliance of *Caricion nigrae*, with characteristics species as *Carex echinata* and *Plantago gentianoides*, which was described from the Parâng Mts. as *Caricetum dacicae* Buia et al. 1962. This fragment was observed South from the western peak of Păpușa, at 1,800 m altitude, on the muddy gravel bank of a streamlet (Tab. 5, rel. 5).

ARCTIC-ALPINE ALTHERBOSA (BETULO-ADENOSTYLETEA)

***Heracleetum palmati* Pușcaru et al. 1956**

The association was described first from the montane-subalpine belts of Bucegi Mountains, then from almost all other ranges of the Romanian Western Carpathians, South Carpathians, and even from parts of the East Carpathians [GERGELY & RATIU, 1986]. From the spruce belt of Parâng mountains BUIA & al. (1962) mentioned it briefly. We observed this endemic altherbosa community along streamlets in the alpine belt. It needs further studies whether the communities from the spruce belt and from the subalpine and alpine belts can be distinguished as separate associations. All these stands are rich in Adenostyletea elements. Our relevé is from the NE end of the median ridge dividing Mândra circus into two parts, altitude 2,040 m, exposure E-NE, inclination 30°, coverage of upper herb layer (80-90 cm high) is of 98%, and of lower herb layer is of (10-30 cm) 60%. Moss layer coverage is 70% (Tab. 5, rel. 6).

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

This bush community is widespread in the upper montane and subalpine belts of the Carpathians and takes over the place of *Pinus mugo* always on the wet or drenched rocks or gravels. It is known from Parâng Mts. [BUIA & al. 1962]. Our relevé is an addition from Jiețu Valley, 1,700 m altitude, on northern aspects, 15° slope. Upper canopy height is of 6-8 m, coverage 3-4%, lower canopy 2-2.5 m height, coverage 85%, herb layer 30-80 cm height, 85%, moss layer 10%. Litter is of 30%. Soils are situated on gravels, being very wet (Tab. 5, rel. 7).

Calamagrostetum arundinaceae subalpinum Csűrös 1962

An interesting community was observed on the South slope of Păpușa Summit, above the timberline. Due to the lack of Epilobion angustifoliae, Sambucion, Atropion, or Fagetalia coenoelements and the presence of some subalpine and Asplenietea species (as *Carex sempervirens*, *Campanula polymorpha*, *Bupleurum diversifolium*, *Dianthus tenuifolius*, *Seseli libanotis*, *Allium victorialis*, *Luzula luzuloides* var. *cuprina*) it seems to be different from the Central European *Calamagrosti arundinaceae-Digitalatum grandiflorae* association. It probably can be identified with the *Calamagrostetum arundinaceae subalpinum*, described by CSŰRÖS & al. (1962) from the Bihor-Vlădeasa Mts., as both associations are more natural than the forest clearing communities and occur on the scree slopes of subalpine belt. Probably they develop at the place of *Campanulo abietinae-Juniperetum* after its burning. The clarification of its relation with the above communities needs further studies. Our relevé is from the south facing cliffs of Mt. Păpușa, on wet, South aspects (slope of 50°!), scree slope among boulders, at 1,900 m altitude. Herb layer is of 40-60 cm high, with a coverage of 98%; there was no moss layer (Tab. 5, rel. 8).

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Fig. 3. The senior author makes a phytocoenological relevé on Parângul Mic summit, at 2,050 m.s.l., in an open *Potentillo-Festucetum airoides*. **Fig. 4.** *Primulo-Caricetum curvulae* on the Cârja summit, at 2,400 m.s.l. **Fig. 5.** The calcareous scree slope of the E slope of Coasta lui Rusu, at 2,200 m.s.l. **Fig. 6.** *Arabis alpina-Delphinium elatum* community on the coarse limestone scree of the previous locality. **Fig. 7.** *Doronico carpatici-Festucetum pictae* on the coarse siliceous scree in Groapa Mândrii, at 2,030 m.s.l. **Fig. 8.** *Aquilegia transylvanica*, one of the most spectacular species in the alpine belt of Parâng Mts. **Fig. 9.** *Soldanello pusillae-Ranunculetum crenati* with the dominance of *Luzula alpinopilosa* on the N facing slopes of Groapa Mândrii, still partly snow covered by the end of July, 1956. **Fig. 10.** The N facing siliceous cliffs and scree slopes of Braiul summit (2,345 m.s.l.) (photos 3-7 and 9-10 by T. Pócs, photo 8 by T. Simon)



Fig. 11. Our generous hosts, the “ciobans” (shepherds) in Groapa Mândrii. **Fig. 12.** Morning in our camp near a sheepfold of Groapa Mândrii, at 1,915 m.s.l. (photos by T. Simon). **Fig. 13.** The Roșilele Tarn, at 1,978 m, with the scree slopes and summit of Ieșul Summit (2,375 m.s.l.) in background. **Fig. 14.** Gneiss rocks with *Rhizocarpetum alpicola*e and *Umbilicarietum cylindrica*e, on the scree slopes below Parâng Hut, at 1,750 m.s.l. (photos by T. Pócs)

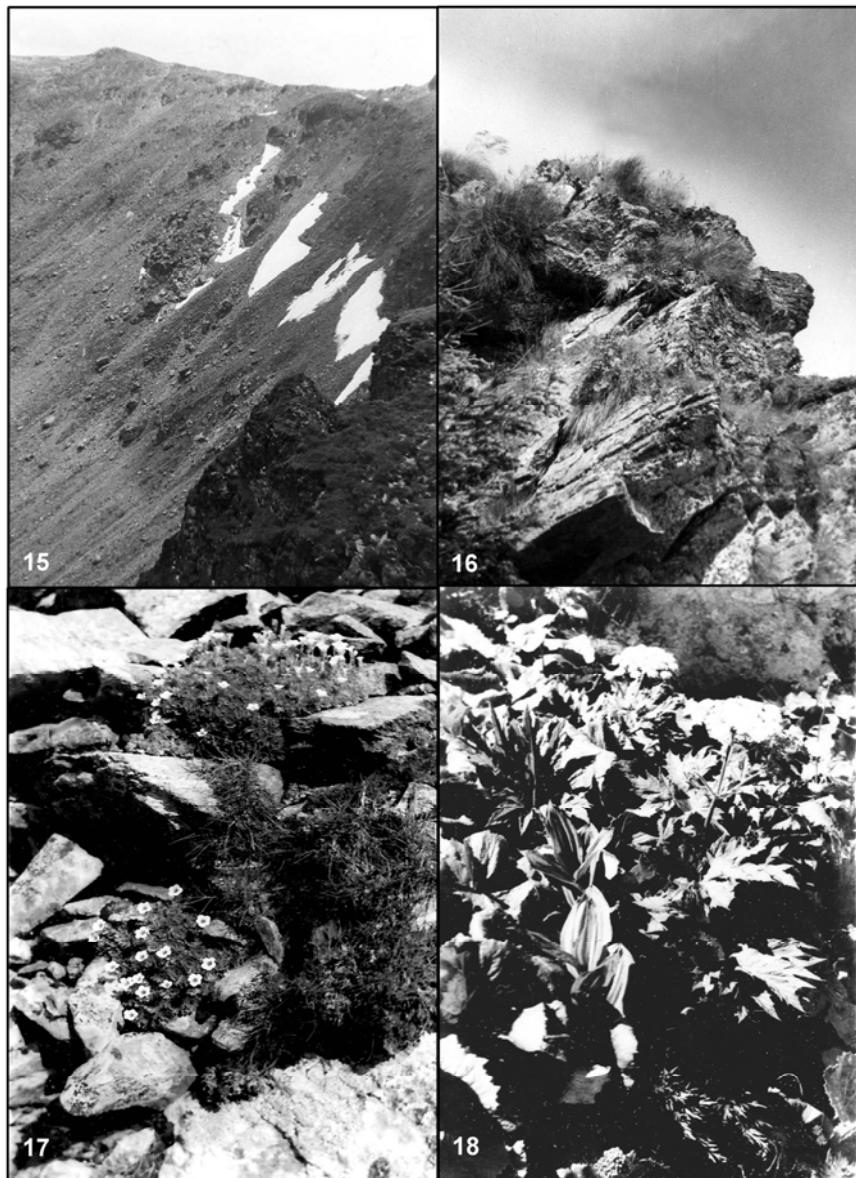


Fig. 15. Steep scree slopes on the NW aspects of Mândra, at 2,400-2,500 m.s.l. **Fig. 16.** *Silene lerchenfeldiana-Potentilletum haynaldianae* on the Badea rocks, at 1,825 m.s.l. (photos by T. Simon). **Fig. 17.** *Saxifraga pedemontana* subsp. *cymosa* on the screes of Mândra, at 2,400 m.s.l. **Fig. 18.** *Heracleum palmati* in Groapa Mândrii, at 2,040 m.s.l. (photos by T. Pócs) v