PHYTOSOCIOLOGICAL CONSIDERATIONS REGARDING SILICEOUS SCREES FROM MERIDIONAL CARPATHIANS (ROMANIA)

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Abstract. This paper presents a phytosociological study of the vegetation of siliceous screes from Meridional Carpathians that belong to *Androsacetalia alpinae* Br.-Bl. 1926 order. The purpose of this study was to characterize the plant associations from these stations and highlight their floristic similarities calculating the Relative Euclidean distance on the basis of the Ward method. Five plant associations were characterized and analysed, as follows: *Saxifrago carpathicae-Oxyrietum digynae* Pawl. et al. 1928, *Poo contractae-Oxyrietum digynae* Horv. et al. 1937, *Saxifrago bryoidis-Silenetum acaulis* Boşcaiu, Täuber et Coldea 1977, *Veronico baumgartenii-Saxifragetum bryoidis* Boşcaiu et al. 1977, *Festucetum picturatae* Krajina 1933 corr. Malinovsky et Kricsfalusy 2000. The hierarchical analysis confirmed the syntaxonomical affiliation to the *Androsacetalia alpinae* Br.-Bl. 1926 order by outlining distinct clusters.

Keywords: plant associations, siliceous screes, Meridional Carpathians, Romania.

Rezumat. Considerații fitosociologice asupra grohotișurilor silicioase din Carpații Meridionali (România). Lucrarea de față prezintă un studiu fitosociologic al vegetației grohotișurilor silicioase din Carpații Meridionali care se încadrează în ordinul *Androsacetalia alpinae* Br.-Bl. 1926. Scopul studiului a fost caracterizarea asociațiilor vegetale din aceste stațiuni și evidențierea similarităților lor floristice calculând distanța Euclidiană medie, pe baza metodei Ward. Au fost caracterizate și analizate 5 asociații vegetale: *Saxifrago carpathicae-Oxyrietum digynae* Pawl. et al. 1928, *Poo contractae-Oxyrietum digynae* Horv. et al. 1937, *Saxifrago bryoidis-Silenetum acaulis* Boşcaiu, Täuber et Coldea 1977, *Veronico baumgartenii-Saxifragetum bryoidis* Boşcaiu et al. 1977, *Festucetum picturatae* Krajina 1933 corr. Malinovsky et Kricsfalusy 2000. Analiza ierarhică a confirmat încadrarea sintaxonomică în alianțele ordinului *Androsacetalia alpinae* Br.-Bl. 1926 prin conturarea unor clusteri distincți.

Cuvinte cheie: asociații vegetale, grohotișuri silicioase, Carpații Meridionali, România.

INTRODUCTION

Phytocoenoses of the *Thlaspietea rotundifolii* class develop on mobile, semi-fixed screes in which the size of rock fragments is variable (CHYTRÝ, 2009).

According to CIUCĂ et al. (1977), the screes are found on both the nemoral level and the alpine level in the Romanian Carpathians. The vegetal groupings of limestone screes from the nemoral level are part of the *Stipion calamagrostis* Jenny-Lips alliance ex Br.-Bl. 1950. The siliceous screes are found mainly on the subalpine and alpine level, and the characteristic phytocoenoses correspond to the associations of the order *Androsacetalia alpinae* Br.-Bl. 1926, alliances *Veronicion baumgartenii* Coldea 1991 and *Festucion picturatae* Krajina 1933.

COLDEA et al. (2017) recognize only one order (*Androsacetalia alpinae* Br.-Bl. 1926) that includes 6 plant associations characteristic to siliceous screes: *Saxifrago carpathicae-Oxyrietum digynae* Pawl. et al. 1928, *Saxifrago carpathicae-cymosae Coldea* (1986) 1990, *Poo contractae-Oxyrietum digynae* Horv. et al. 1937, *Saxifrago bryoidis-Silenetum acaulis* Boşcaiu, Täuber et Coldea 1977, *Veronico baumgartenii-Saxifragetum bryoidis* Boşcaiu et al. 1977, *Festucetum picturatae* Krajina 1933 corr. Malinovsky et Kricsfalusy 2000.

CHIFU et al. (2014) distinguish two orders in which the phytocoenoses of the siliceous screes from the subalpine and alpine level (*Androsacetalia alpinae* Br.-Bl. 1926) and those of the siliceous screes from the mountain and submountain level (*Galiopsietalia segetum* Oberd. et Siebert in Oberd. 1977) are fitted.

The same authors include the *Sileno acaulis – Minuartietum sedoidis* Puşcaru et al. 1956 association to the *Androsacetalia alpinae* Br.-Bl. 1926 order. On the other hand, SANDA et al. (2008) and COLDEA et al. (2017) place it in the *Carici rupestris-Kobresietea bellardi* Ohba 1974 class. COLDEA et al. (2017) synonymizes it with *Oxytropido carpaticae-Elynetum* (Puşcaru et al. 1956) Coldea 1991, and SANDA et al. (2008) treat it as distinct syntaxon. Characteristic coenoses have been described from Bucegi Mountains, Făgăraş Mountains and Rodna Mountains.

CHIFU et al. (2014) describe the *Doronico carpatici-Poëtum minoris* Puşcaru et al. 1956 association from the *Androsacetalia alpinae* Br.-Bl. 1926 order. These phytocoenoses can be found in the Ceahlău Mountains and Bucegi Mountains, on slopes with high degree of inclination and dominated by the sciaphilous and chionophilous species. Belonging to this order is, probably, taken into account by the high constancy of some species from *Veronicion baumgartenii* alliance (*Achillea oxyloba* subsp. *schurii, Doronicum carpaticum, Oxyria digyna, Bistorta vivipara*) and *Thlaspietea rotundifolii*class (*Arabis alpina, Poa alpina, Taraxacum nigricans, Rhodiola rosea, Saxifraga adscendens, Saxifraga moschata*). SANDA & POPESCU (1995) quote this association from the alpine level of Făgăraş Mountains, along the troughs and rocky ridges, on steep slopes.

Festucetum picturatae (Krajina 1933 corr. Malinovsky et Kricsfalusy 2000) is considered a plant association typical to the *Thlaspietea rotundifolii*class by SANDA et al. (2008) and COLDEA et al. (2017). These phytocoenoses are characteristic to subalpine and alpine level of Romanian Carpathians (Rodna Mountains, Făgăraş Mountains, Retezat Mountains) and vegetate on fixed or semi-fixed siliceous screes, on ranker soils (COLDEA et al., 2017 from

COLDEA, 1990). The same authors support the affiliation to the *Androsacetalia alpinae* order due to the presence in the floristic composition of characteristic species, and mention that species characteristic to the *Caricion curvulae* and*Salicion herbaceae* alliances are also present in the case of coenoses with *Festuca picturata*, developed in the alpine habitats, where the snow persists for a long time. Maybe for this reason, CHIFU et al. (2014) describe this plant association in the *Juncetea trifidi* Hadač 1946 class.

Interesting is the opinion of other authors (JAROLÍMEK & ŠIBÍK (Eds.), 2008; KLIMENT et al., 2010; JANIŠOVÁ & ŠIBÍK (Eds.), 2015; MUCINA et al., 2016; TELYATNIKOV, 2016) who deal with the *Festucetum picturatae* Krajina 1933 corr. Malinovsky et Kricsfalusy 2000 association at the *Salicetea herbaceae* Br.-Bl. 1948 class.

The siliceous screes communities from Meridional Carpathians belong to the 8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) natural habitat as stated by GAFTA & MOUNTFORD (2008).

According to the Romanian classification system (DONIȚĂ et al., 2005), the siliceous screes from Meridional Carpathian belong to five types of natural habitats: R6101 South-Eastern Carpathian communities of siliceous gravel with *Silene acaulis* and *Minuartia sedoides*, R6102 South-Eastern Carpathian communities of semi-fixed siliceous screes with *Festuca picta* and *Senecio carniolicus*, R6104 South-Eastern Carpathian communities of mobile and weakly fixed siliceous screes with *Oxyria dygina*, R6105 South-Eastern Carpathian communities of semi-fixed siliceous screes with *Saxifraga bryoides, Silene acaulis* and *Veronica baumgartenii*.

The main purpose of this study was to highlight the floristic similarities of the siliceous screes from Meridional Carpathians calculating the Relative Euclidean distance on the basis of the Ward method.

MATERIALS AND METHODS

The study area was represented by the mountain chain of the Meridional Carpathians, separated in the western part by the Occidental Carpathians through the Cerna-Timiș-Bistra-Hațeg-Ștei-Orăștie Pass, and in the eastern part by the Curvature Carpathians through the Prahova Valley.

Scientific papers were consulted regarding the plant communities from this area in order to characterize the vegetation of siliceous screes (Table 1). We used the syntaxonomical classification elaborated by COLDEA et al. (2017). In this regard, 102 phytosociological surveys belonging to five plant associations recorded from Meridional Carpathians were analysed. Each plant association was synthetically characterized by interpreting data from phytosociological surveys. The scientific name of taxa was updated according to Flora Europaea, on-line database (***. http://ww2.bgbm.org/EuroPlusMed/query.asp).

In order to establish the degree of floristic similarity between the plant associations on the siliceous screes, a dendrogram was developed using the SYSTAT program version 10.2. The Relative Euclidean distance calculated on the basis of the Ward method was chosen as a similarity index, which allowed a clearer grouping of the surveys belonging to the same associations or the surveys of the associations from the same alliance into distinct clusters. This method was also used by POP (2009) in his doctoral thesis for the similarity analysis of the plant groupings for screes from Piatra Craiului Mountains.

Only 70 phytosociological surveys were considered in the similarity analysis, a number of 32 surveys being presented in the scientific literature as synoptic phytosociological tables, which cannot be used in a such analysis.

Table 1. Provenance of the phytosociological surveys characteristic to siliceous screes (*Androsacetalia vandelii* order).

Plant association	Authors	Year of publication	Number of surverys	Location
Saxifrago carpathicae-Oxyrietum digynae Pawl. et al. 1928	Voik Wilhelm, Schneider-Binder Erika	1978	6	Scara Peak, between the Avrig Lake and Ciortea, Strunga Dracului, Călţun Peak, Căldarea Bâlii below Capra (Făgăraş Mountains)
Poo contractae-Oxyrietum digynae Horv. et al. 1937	Boşcaiu Nicolae	1971	7	Groapa Bistrei, Pietrile Dracilor, Obârşia Hidegului, Bodea Peak (Ţarcu Mountains)
	Puşcaru-Soroceanu Evdochia, Csűrös Ştefan, Puşcaru Dumitru, Popova-Cucu Ana	1981	8	Făgăraş Mountains
	Coldea Gheorghe	1993	9	Custura Mountain (Retezat Mountains)
	Stancu Daniela	2005	7	Buda Mountain, Râiosu Mountain (Făgăraş Mountains)
Saxifrago bryoidis-Silenetum acaulis Boşcaiu, Täuber et Coldea 1977	Boşcaiu Nicolae, Täuber Ferdinand, Coldea Gheorghe	1977	10	Custura Peak, Gruniul Peak (Retezat Mountains)
	Boşcaiu Monica, Boşcaiu Nicolae, Ehrendorfer Friedrich	1999	4	Custura Peak (Retezat Mountains), Doamna Valleys, Râiosu (Făgăraş Mountains)

	Stancu Daniela	2005	9	Buda Mountain, Râiosu Mountain (Făgăraş Mountains)
Veronico baumgartenii-Saxifragetum bryoidis Boşcaiu et al. 1977	Boşcaiu Nicolae, Täuber Ferdinand, Coldea Gheorghe	1977	10	Judele Peak, Muchia Ascuţită Peak, Bucura Peak, Custura Văii Pietrele, Pietrele Valley, Peleaga Peak, Păpuşa Peak (Retezat Mountains)
	Stancu Daniela	2005	2	Buda Mountain to Poliţa lui Vodă (Făgăraş Mountains)
Festucetum picturatae Krajina 1933 corr. Malinovsky et Kricsfalusy 2000	Borza Alexandru	1934	3	Căldarea Zănoaga, Căldarea Tăul Negru (Retezat Mountains)
	Csűrös Şt., Kovács A., Moldovan I.	1964	2	Bucura Peak, Judele Peak (Retezat Mountains)
	Puşcaru- Soroceanu Evdochia, Csűrös Ştefan, Puşcaru Dumitru, Popova-Cucu Ana	1981	15	Făgăraş Mountains
	Boşcaiu Monica, Boşcaiu Nicolae, Ehrendorfer Friedrich	1999	5	Custura Bucurii, Poarta Bucurei, Tăul Ştirbului (Retezat Mountains)
	Simon Tibor, Pócs Tamás	2012	5	Groapa Mândrii, Piatra Tăiată, Setea Mare-Piatra Tăiată (Parâng Mountains)

RESULTS AND DISCUSSIONS

Characterization of plant associations

***Saxifrago carpathicae-Oxyrietum digynae* Pawl. et al. 1928**

This plant grouping was only mentioned from the Făgăraş Mountains, where it is developed on the mobile screes from glacier cauldrons, under rocky walls or troughs, supported with disaggregation material and covered with snow for a long time (VOIK & SCHNEIDER, 1978)

These plant communities vegetate on the north-eastern, north-western and eastern slopes, with inclination degree up to 45^0, and more than 2100 m altitude.

Oxyria digyna, Doronicum carpaticum, Saxifraga aizoides, S. androsacea, S. rotundifolia, *Arabis alpina, Hornungia alpina* subsp. *brevicaulis, Taraxacum nigricans, Achillea oxyloba* subsp. *schurii, Poa alpina, Chrysosplenium alpinum, Geum montanum* have a high constancy in the phytocoenoses of Făgăraş Mountains.

The herbaceous layer is weakly developed, the maximum coverage being 35%. The plant communities are outlined by the characteristic species of *Veronicion baumgartenii* alliance, *Androsacetalia alpinae* (*Poa laxa, Oxyria digyna, Achillea oxyloba* subsp. *schurii*) and *Thlaspietalia rotundifolii*orders (*Doronicum carpaticum, Saxifraga moschata, Arabis alpina*). The high humidity promotes the coexistence of species characteristic to snow bed groupings (*Sedum alpestre, Soldanella pusilla, Gnaphalium supinum, Cerastium cerastoides, Ranunculus crenatus, Viola alpina*).

***Poo contractae-Oxyrietum digynae* Horv. et al. 1937**

The plant communities with *Poa cenisia* and *Oxyria digyna* are mentioned from the Retezat Mountains, Făgăraş Mountains and Ţarcu Mountains by COLDEA (1993), SANDA et al. (2008) and COLDEA et al. (2017). CHIFU et al. (2014) consider that the plant grouping represented by *Geum reptans* and *Oxyria digyna* from Bucegi Mountains belongs to *Poo contractae-Oxyrietum digynae* Horv. et al. 1937. These plant communities were described from the Bucegi Mountains by BELDIE (1967) and PUŞCARU et al. (1956) on the northern slopes where snow lingers for a long time and humidity is high in the summer. DRĂGULESCU (1990) mentions fragmentary phytocoenoses with *Oxyria digyna* from Cindrel Mountains.

These phytocoenoses are installed between 1850-2100 m altitude, on very inclined slopes ($45\text{-}60^0$ in the Ţarcu Mountains) or slightly inclined slopes ($15\text{-}30^0$ in Făgăraş Mountains), with a good coverage of the herbaceous layer (25-50%) in the Făgăraş Mountains due to lower slope inclination (Fig. 1).

This plant grouping is developed on mobile, semi-fixed screes, derived from the disaggregation of crystalline schists in the Retezat Mountains. *Oxyria digyna* and *Poa cenisia* realize a coverage of 25% in this area (BORZA & BOŞCAIU, 1965; COLDEA, 1993; DIHORU & NEGREAN, 2009; SÎRBU et al., 2013).

The floristic composition is formed by the characteristic species for the *Veronicion baumgartenii* alliance and the *Androsacetalia alpinae* order (*Achillea oxyloba* subsp. *schurii, Geum reptans, Luzula alpinopilosa, Oxyria digyna, Poa laxa, Saxifraga adscendens, S. carpatica, S. bryoides, S. oppositifolia, S. pedemontana* subsp. *cymosa, S. rotundifolia, Veronica baumgartenii, Cardamine resedifolia*) accompanied by the snow bed elements from *Salicetea herbaceae*class (*Veronica alpina, Taraxacum panalpinum, Soldanella pusilla, Ranunculus crenatus, Ochlopoa supina, Gnaphalium supinum, Cerastium cerastoides*). Some species have a high constancy in the Făgăraş Mountains such as: *Oxyria digyna, Soldanella pusilla, Ranunculus crenatus, Cerastium cerastoides, Taraxacum panalpinum, Achillea oxyloba* subsp. *schurii, Sedum alpestre, Saxifraga rotundifolia, Veronica alpina*.

Figure 1. Plant communities with *Oxyria digyna* and *Saxifraga carpatica* from Făgăraş Mountains (original).

***Saxifrago bryoidis-Silenetum acaulis* Boşcaiu, Täuber et Coldea 1977**

This association is mentioned from the Retezat Mountains by BOŞCAIU et al. (1977), BOŞCAIU et al. (1999) and from the Făgăraş Mountains by STANCU (2005), BOŞCAIU et al. (1999). It develops on fragments resulted from the disaggregation of crystalline schists, where snow accumulates during the winter, at over 2000 m altitude. Generally, groupings with *Saxifraga bryoides* and *Silene acaulis* vegetate on small surfaces (1-4 m^2), on southern, western and northern slopes and inclination degree about 30-45^0. The coverage of the vegetation is higher in the Retezat Mountains ranging 50-80%, while the herbaceous layer is poorly developed in the Făgăraş Mountains (15%).

Together with two edified species of this association, species from the *Veronicion baumgartenii* alliance and *Androsacetalia alpinae* order (*Achillea oxyloba* subsp. *schurii, Gentiana frigida, Geum reptans, Luzula alpinopilosa, L. spicata, Oxyria digyna, Poa cenisia, Saxifraga oppositifolia, S. pedemontana* subsp. *cymosa, Sedum alpestre, Veronica baumgartenii*) are present. Also, there are species from *Salicetea herbaceae*class (*Soldanella pusilla, Taraxacum panalpinum, Ranunculus crenatus, Gnaphalium supinum, Leucanthemopsis alpina, Ranunculus crenatus, Salix herbacea*).

***Veronico baumgartenii-Saxifragetum bryoidis* Boşcaiu et al. 1977**

In the Retezat Mountains, coenoses with *Veronica baumgartenii* and *Saxifraga bryoides* populate rock fragments due to the active gelifraction, on peaks over 2200 m altitude, in sheltered stations where deflation is more pronounced (BOŞCAIU et al., 1977).

In the Făgăraş Mountains, this grouping is developed on a granodioritic substrate related to the calcareous area, where the alteration possibilities of the substrate have permanentized this relict association having reduced competition capacity in the invasion of other populations (STANCU, 2005).

Similar phytocenoses, poorly represented, were also cited by DRĂGULESCU (1990) from the Cindrel Mountains. The communities of the Retezat Mountains are characterized by a greater floristic diversity, with 10 phytosociological surveys being made here, compared to the Făgăraş Mountains where there were only two surveys. The degree of herbaceous layer coverage is higher in the Retezat Mountains (20-50%). Among the species that have recorded high constancy we can mention: *Saxifraga pedemontana* subsp. *cymosa*, *Poa laxa, Doronicum carpaticum, Leucanthemopsis alpina, Luzula alpinopilosa, Oreochloa disticha, Hieracium alpinum, Cerastium alpinum, Primula minima*.

***Festucetum picturatae* Krajina 1933 corr. Malinovsky et Kricsfalusy 2000**

In Romania, the phytocoenoses edified by *Festuca picturata* were reported from Retezat Mountains (BORZA, 1934; CSŰRÖS et al., 1964; BOŞCAIU et al., 1999), Rarău Mountains, Maramureş Mountains (RESMERIŢĂ et al., 1977), Rodnei Mountains (COLDEA, 1990), Făgăraş Mountains (PUŞCARU-SOROCEANU et al., 1981), Parâng Mountains (SIMON & PÓCS, 2012), Bucegi Mountains (Domin, 1933 cited by SIMON & PÓCS, 2012) and Cindrel Mountains (DRĂGULESCU, 1990).

This grouping populates the northern, eastern or southern slopes, with varying degrees of inclination (30-45^0) in the Parâng Mountains. The herbaceous layer is well-structured (over 50 species of cormophytes) with coverage between 10-60%. The moss layer has a coverage of 10-20%, being represented by 10 species of bryophytes.

Phytocoenoses with *Festuca picturata* were identified in Retezat Mountains at 1900-2300 m altitudes, on detrital gravels and dry soils, on slopes between 10^0-60^0, with northern, southern or southwest exposure. The coenoses are degraded due to grazing in some areas, while in others (Șaua between the Tăul Negru cauldron, Șeselor Peak, Judele Peak) they represent intermediate stage to the associations of the *Caricetalia curvulae*order (BORZA, 1934; CSŰRÖS et al., 1964).

SIMON & PÓCS (2012) identified this association in the Parâng Mountains, but they named it *Doronico carpatici-Festucetum pictae* (Pócs et Simon 2012). According to them, "the Transylvanian association differs enough from the *Festucetum pictae* Krajina 1933, originally described from the Tatra Mountains. The Eastern and Southern Carpathian association has several Daco-Balkan geoelements missing from the Northern Carpathians, as: *Cerastium transsilvanicum, Doronicum carpaticum, Rhododendron myrtifolium, Veronica baumgartenii*. [...] In the scree fixing succession it is transitional towards the *Caricion curvulae* mats."

In contrast to the Făgăraș Mountains, the floristic diversity is more pronounced in the Parâng Mountains, among the species that have high constancy as follows: *Sedum atratum, Gnaphalium supinum, Leucanthemopsis alpina, Ligusticum mutellina, Anthoxanthum odoratum, Poa laxa* subsp. *pruinosa, Campanula abietina, Doronicum carpaticum, Festuca picturata, Geum montanum, Juncus trifidus, Luzula alpinopilosa* subsp. *obscura, Ranunculus pseudomontanus, Rhododendron myrtifolium, Soldanella pusilla, Veratrum album*.

Similarity analysis for plant associations from siliceous screes

The similarity dendrogram (Fig. 2) obtained by analysing 70 surveys of plant associations characteristic to siliceous screes, calculating the Relative Euclidean Distance (Ward method), revealed the outline of two main clusters (A and B).

The cluster A includes *Poo contractae-Oxyrietum digynae* and *Saxifrago carpathicae-Oxyrietum digynae* associations identified in the Făgăraș Mountains and Țarcu Mountains. The floristic affinities between these two associations were also observed by BOȘCAIU (1971), who considers that *Saxifrago carpathicae-Oxyrietum digynae* is the Carpathian vicariant of the *Oxyrietum digynae* from Alps. The plant groups from Southern Carpathians edified by *Oxyria digyna* formed on semi-fixed screes of glacial circles, on slopes with a predominantly northern exposure, at over 1850 m altitude. They are individualized from a floristic point of view through a nucleus of characteristic species from the *Veronicion baumgartenii* alliance and *Androsacetalia alpinae* order, that have a high constancy (*Achillea oxyloba* subsp. *schurii, Oxyria digyna, Poa laxa, Saxifraga carpatica, S. bryoides, Veronica baumgartenii, Poa cenisia*).

The survey of *Poo contractae-Oxyrietum digynae* from Țarcu Mountains (POTA12-Bodea Peak) has a greater similarity with the coenoses of *Veronico baumgartenii-Saxifragetum bryoidis*. The edifying species are missing from its floristic inventory, but *Saxifraga bryoides* has a larger coverage. The grouping edified by *Silene acaulis* (SSFG70-Râiosu) from the Făgăraș Mountains is closer to the phytocoenoses of *Saxifrago carpathicae-Oxyrietum digynae* from the same massif from a floristic point of view, being classified in the cluster A. The coenose edified by *Silene acaulis* from Retezat Mountains (SSRT67-Custura Peak) has floristic similarities, determined rather by the accompanying species (*Campanula alpina, Carex atrata, Juncus trifidus, Ligusticum mutellina, Pedicularis verticillata, Phyteuma confusum, Primula minima*), with the grouping edified by *Festuca picturata* (FPRT60-Bucura Peak) from the same mountain.

Cluster B is divided into two major groups: B1, that includes surveys of *Saxifrago bryoidis-Silenetum acaulis*, *Veronico baumgartenii-Saxifragetum bryoidis* from the Făgăraș and Retezat Mountains, and B2 affiliated to *Festucetum picturatae* from the Parâng Mountains and Retezat Mountains.

The B1 group is made up of two subgroups: B1a, where the communities of screes from Făgăraș Mountains of the *Saxifrago bryoidis-Silenetum acaulis* association are present, and B1b consists of the coenoses of *Saxifrago bryoidis-Silenetum acaulis* (Retezat Mountains) and *Veronico baumgartenii-Saxifragetum bryoidis* (Retezat Mountains and Făgăraș Mountains).

The surveys of *Saxifrago bryoidis-Silenetum acaulis* from the Făgăraș Mountains are affiliated to a distinct cluster than the one with similar coenoses from the Retezat Mountains, installed on the northern, western or southern slopes and whose herbaceous layer has an average coverage of 70%. The characteristic species for alliance and order (*Saxifraga pedemontana* subsp. *cymosa, Oxyria digyna, Gentiana frigida, Luzula spicata, Saxifraga bryoides*) are distinguished by a greater constancy in the floristic composition of the communities from the Retezat Mountains.

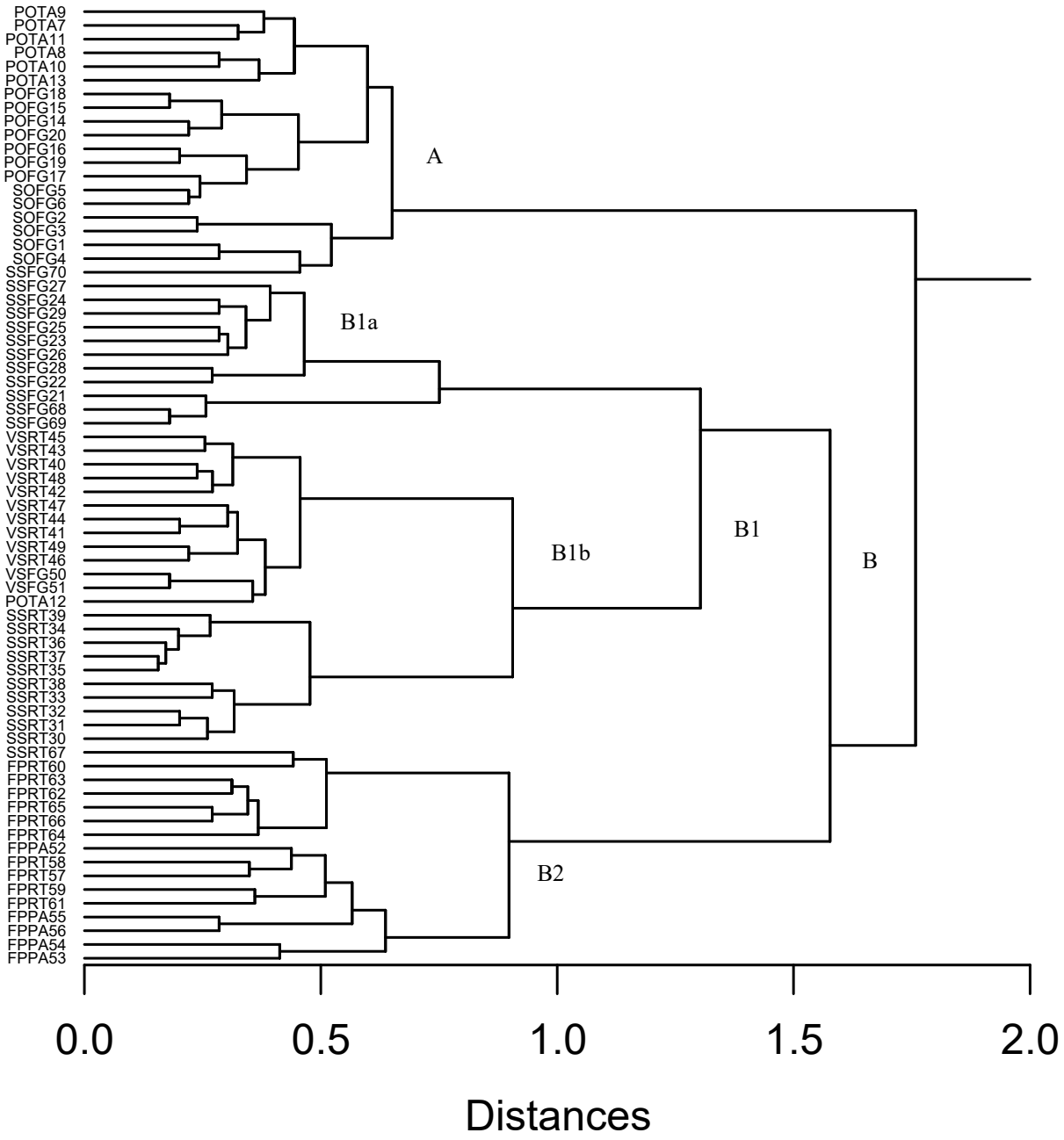

Figure 2. Similarity dendrogram of the surveys of plant associations on siliceous screes from Meridional Carpathians using Relative Euclidian Distance (Ward method) (PO - *Poo contractae-Oxyrietum digynae*; SO - *Saxifrago carpathicae-Oxyrietum digynae*; SS - *Saxifrago bryoidis-Silenetum acaulis* VS - *Veronico baumgartenii-Saxifragetum bryoidis*; FP - *Festucetum picturatae*; RT – Retezat; FG – Făgăraş; TA – Ţarcu; PA – Parâng)

CONCLUSIONS

The diversity of microstationary conditions of the siliceous screes from the Retezat Mountains and Făgăraș Mountains is reflected by the high coenotaxonomic diversity (five plant associations for the Făgăraș Mountains and four for Retezat Mountains). The siliceous screes offer optimal conditions for development, especially for heliophilous, mesophilous, cryophilous, eutrophic and strongly acidophilous species.

The hierarchical analysis revealed the grouping of plant associations in distinct clusters corresponding to the alliances to which they belong based on the floristic similarities.

These natural habitats offer refuge for important Carpathian and Carpathian-Endemic species, such as: *Achillea oxyloba* subsp. *schurii, Cerastium transsilvanicum, Chrysosplenium alpinum, Dianthus glacialis* subsp. *gelidus, Doronicum carpaticum, Leucanthemopsis alpina, Poa laxa* subsp. *pruinosa, Thymus pulcherrimus, Trisetum fuscum, Veronica baumgartenii.*

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Received: April 14, 2020
Accepted: June 10, 2020