

CALCOPHILOUS GRASSLANDS IN PĂDUREA CRAIULUI MOUNTAINS

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Abstract. This study presents the calcophilous vegetal associations developed on the limy rocky areas, very common in Pădurea Craiului Mountains. These associations are affiliated with the coenotaxonomical system based on the dominant species and analyzed from an ecological, phytogeographical and of bioforms point of view, based on phytocaenological tables. Meadows installed on limestone rockeries make up 7 vegetal associations: *Festucetum pallentis*, *Asplenio rutae-murariae-Melicetum*, *Seslerietum rigidae*, *Seslerietum heufflerianae*, *Sedo hispanici-Poetum nemoralis*, *Asplenietum trichomano-rutae-murariae*, and *Pparietarium officinalis*. These associations belong to 4 vegetation classes. The most widespread are *Festuca pallentis* meadows. They are important for protecting the soil against erosion, as they develop mostly on slopes with a high inclination, sometimes on scree, and rocky outposts. Generally these meadows have no economic importance.

Key words: Pădurea Craiului Mountains, ecological studies, vegetal association, phytosociological table.

INTRODUCTION

The Pădurea Craiului Mountains are situated in the north-eastern part of the Apuseni Mountains (The Western Mountains), mostly composed of limestone, with heights between 350 and 986 m and a climatic regimen with the annual average temperature of circa 7.5°C, precipitations of 856.6 mm. Abundant vegetation developed in these conditions, dominated by forests and grasslands. Due to the dominant limy substratum, there has been installed a calcophilous vegetation, presented in the following coenotaxonomical system:

FESTUCO-BROMETEA Br.-Bl. et Tx. 1943

Stipo eriocaulis–Festucetalia pallentis Pop (1968) 1989

Seslerio-Festucion pallentis Klika 1931

1. *Festucetum pallentis* (Soó 1959) Pop et Hodişan 1985

2. *Asplenio rutae-murariae-Melicetum ciliatae* Soó 1940

ELYNO-SESLERIETEA Br.-Bl. 1949

Seslerietalia rigidae Gergely 1967

Seslerion rigidae Zolyomi 1939

3. *Seslerietum rigidae* Borza 1934

4. *Seslerietum heufflerianae* (Zolyomi 1930) Soó 1944

ASPENIETEA TRICHOMANIS (Br.-Bl. in Meier et Br.-Bl. 1934) Oberd. 1977

Asplenietalia rutae–murariae Oberd. et al. 1967

Cystopteridion (Nordh. 1936) J.L. Rich 1972

5. *Sedo hispanici-Poetum nemoralis* (Soó 1944) Pop et Hodişan 1985

6. *Asplenietum trichomano-rutae-murariae* Tx. 1937
 - *ceterachetosum* subas. nova

THLASPIETEA ROTUNDIFOLII Br.-Bl. 1926

Galio-Parietalia officinalis Gergely *et al.* 1966

Parietaron officinalis Gergely *et al.* 1966

7. *Parietarium officinalis* Csürös 1958

1. *Festucetum pallentis* Soó 1959, Pop and Hodişan 1985 (Table 1)

It is an association found in gorges and in limy steeps, sometimes inaccessible, therefore this study cannot describe all the potential phytocoenosis in the massif. These groups have a specific physiognomy due to the green bluish colour of the edifying species. The phytocoenosis of *Festuca pallens* have a limited affiliation, due to the microstationary conditions in which they vegetate, between 30% and 75% (Table 1). They settle on sunny slopes and with an inclination between 25° and 75°.

Table 1

Festucetum pallentis (Soó, 1959 ; Pop and Hodişan, 1985)

						No. of the survey	1	2	3	4	5
						Altitude (×10 m)	42	42	40	40	45
						Orientation	E	V	E	E	V
						Slope inclination in degrees	75	70	35	40	25
						Covering (%)	55	50	45	75	30
U	T	R	Biof	Geoelement	Surface (m ²)		15	10	20	15	15
						Car. as.					
2	4	5	H	sM	<i>Festuca pallens</i>		3	2-3	3	4	2-3
						Stipo-Festucetalia pallentis					
3	3	5	Ch	D	<i>Thymus comosus</i>		1-2	1-2	1	+	+
1	3.5	5	H	Eua	<i>Melica ciliate</i>		+	+	.	.	.
1.5	4.5	4	H	sM	<i>Phleum montanum</i>		.	.	+	+	.
1.5	3	5	G	P-Med	<i>Allium flavum</i>		.	.	+	+	.
2	3	5	H	B	<i>Carduus candicans</i>		.	.	+	+	.
						Seslerion					
2	3.5	3.5	H	Carp-Balc-Apen	<i>Edra jantus graminifolius</i>		.	.	.	.	1
						Festucetalia valesiaca					
3	3	3	H	Eua (Med)	<i>Galium mollugo</i>		+	+	.	.	.
2	3.5	4.5	H	E	<i>Potentilla cinerea</i>		.	.	+	+	+
2	3.5	4	H	sM	<i>Seseli pallasii</i> (= <i>varium</i>)		.	.	+	+	.
1.5	4	4	TH-H	E	<i>Centaurea micranthos</i>		+	+	+	+	+
2	3	3	H	Eua	<i>Scabiosa ochroleuca</i>		.	+	+	+	.
2	4	3	Ch	Eua	<i>Veronica prostrata</i>		.	+	.	.	.
1.5	4	5	Ch	E	<i>Teucrium montanum</i>		.	.	+	+	+
1.5	3.5	4	H	Eua	<i>Potentilla recta</i>		.	.	+	.	.
1.5	3	3	H	Eua (Med)	<i>Anthemis tinctoria</i>		.	.	+	.	.
2	3.5	3	Ch	Eua	<i>Artemisia campestris</i>		.	.	.	+	.
2	4	3	H	Eua	<i>Fragaria viridis</i>		+	.	.	.	.
						Festuco-Brometea					
2	3	4	H	E (Med)	<i>Anthyllis vulneraria</i>		.	+	.	.	.
2	3.5	4.5	H	P-Med	<i>Asperula cynanchica</i>		+	+	.	+	.
0	3	3	Ch	E	<i>Sedum acre</i>		+	.	+	+	+
2	3	4	Th-H	Cp	<i>Arabis hirsuta</i>		+	.	+	+	+
2	4	0	H	Eua	<i>Salvia verticillata</i>		.	+	.	.	.
1.5	3	0	H	E	<i>Poa compressa</i>		.	+	.	.	.
2	3	4	H-G	Eua	<i>Euphorbia cyparissias</i>		.	+	.	+	.
1.5	3.5	4	Th-TH	E	<i>Calamintha acinos</i>		.	.	+	.	.
1.5	4	3	Th	P-Med	<i>Tunica prolifera</i>		.	.	+	+	.

2	3	4	TH	Eua	<i>Echium vulgare</i>	.	.	+	.	.
2	3.5	3	Th	Eua	<i>Crepis foetida</i>	.	.	+	.	.
2	3	0	H	Eua	<i>Hypericum perforatum</i>	.	.	.	+	.
2	4	2	H	Cp	<i>Potentilla argentea</i>	.	.	.	+	.
2	4	4	Ch	sM	<i>Teucrium chamaedrys</i>	+	+	+	+	+
<i>Asplenietalia rutae-murariae</i>										
1.5	3	5	H	Cp	<i>Asplenium ruta-muraria</i>	+	+	+	+	.
3	0	4	H	Cosm	<i>Asplenium trichomanes</i>	.	+	.	.	.
2	5	4	H	Atl-Med	<i>Ceterach officinarum</i>	.	.	+	.	.
Accompanying										
3	3	4	H	E	<i>Hypericum montanum</i>	.	+	.	.	.
2	3	2	H	E	<i>Hieracium maculatum</i>	.	+	.	.	.
2.5	3	4	H-Ch	Ec	<i>Helianthemum hirsutum</i>	+	+	+	+	.
3	3	3	Th	E	<i>Euphrasia rostkoviana</i>	+	+	.	.	.
3	0	0	H	Eua	<i>Leontodon autumnalis</i>	+	.	.	.	.
2	2	4	H-Ch	Cp	<i>Minuartia verna</i>	+	.	.	.	.
2.5	3	0	TH-H	Eua (Med)	<i>Daucus carota</i>	.	+	.	.	.
3	2	4	Th-H	E (Med)	<i>Linum catharticum</i>	.	+	.	.	.
1	3.5	4	H	Med	<i>Cleistogenes serotina</i>	.	.	.	+	.
3	3.5	4	Ch	E	<i>Euphorbia amygdaloides</i>	.	.	+	.	.
3	3	0	Th	Eua	<i>Odontites serotina</i>	.	.	.	+	.
2	3	4	TH-H	Eua	<i>Verbascum nigrum</i>	.	.	.	+	.

Place and date of the surveys: 1, 2 – Lorău, Boiului valley, 28.06.1996; 3, 4 – Şuncuiuş, at the castle, 19.07.1998; 5 – Şuncuiuş, Mişid valley, 19.07.1998.

The floral composition of these 5 surveys is mostly heterogenic containing 48 species, with a great share for only a few species: *Festuca pallens*, *Thymus comosus*, *Centaurea micranthos*, *Teucrium chamaedrys*, *Asplenium ruta-muraria* etc.

The phytocoenosis of the association have the only carpato-balcano-apenin element in Pădurea Craiului Mountains – *Edrajanthus graminifolius*, the only locality in this massif and where the species vegetate at the lowest altitude in the Romanian Carpathians. The population of this species vegetate in the mountain paths with *Festuca pallens*, and in the crannies of the vertical rocks.

The diagram of the ecological values shows the xero-mesophylous (U_2 – 53.1%), micro-mesothermic (68%) and low acid-neutrophylous (44.6%) nature of the association's phytocoenosis.

In the bioforms spectrum the hemicryptophytes (53.1%) have the main share, followed by camephytes (14.8%).

The geoelements spectrum is dominated by eurasiatic species (36%), followed by the european ones (26%). We remark a considerable number of species of south origin, as well as the dacic element – *Thymus comosus* – present in all analysed phytocoenosis.

These grasslands have no fodder value, due to their inaccessibility, thus they maintain themselves mostly unchanged.

2. *Asplenio rutae-murariae-Melicetum ciliatae* Soó, 1940 (Table 2)

It is a pioneer, calcophilous and xenophilous association that settles in partly fixed scree or on rocky slopes partly covered with vegetation. It prefers the sunny orientation, on slopes with high inclination, at altitudes of 340-480 m. The phytocoenosis make a low covering, containing in the floral composition only 23 species, partly due to the little surfaces where it develops. The analysis of the main ecologic values of the analysed phytocoenosis shows the xero-mesophylous (56.0%), micro-mesothermic (69.5%) and low acid-neutrophylous (52.1%) to basophylous nature.

The dominant bioforms are the hemicryptophytes (47.8%), followed by camephytes (13%), the others participating with low percentage to the establishment of the phytocoenosis.

The geoelements are mostly eurasiatics (30.4%), followed by europeans (17.3%). The other floral elements are present only in low percentages: Cosm – 8.6%, Ec – 4.3%, sM – 4.3%, P – 4.3%, D – 4.3%, Cp – 4.3%.

It has no economic relevance.

Table 2

Asplenio rutae-murariae-Melicetum ciliatae (Soó, 1940)

						No. of the survey	1	2	3
						Altitude (×10 m)	42	48	34
						Orientation	V	V	E
						Slope inclination in degrees	40	50	65
						Covering (%)	55-60	60	60
U	T	R	Biof	Geoelement	Surface (m ²)		10	10	10
Car. as.									
1	3.5	5	H	Eua	<i>Melica ciliata</i>	2-3	3	3	
1.5	3	5	H	Cp	<i>Asplenium ruta-muraria</i>	+	+	+	
3	0	4	H	Cosm	<i>Asplenium trichomanes</i>	+	.	+	
Festucetalia valesiaca									
2	4	3	H	Eua	<i>Fragaria viridis</i>	+	+	+	
1.5	3.5	4	H	Eua	<i>Potentilla recta</i>	+	.	+	
1.5	4	4	TH-H	E	<i>Centaurea micranthos</i>	.	+	.	
2	3	4	H	E	<i>Sanguisorba minor</i>	.	+	.	
Festuco-Brometea									
2	4	4	Ch	sM	<i>Teucrium chamaedrys</i>	2	2	2	
2.5	3	0	H	Eua	<i>Galium verum</i>	+	+1	.	
1.5	3.5	4	Th-TH	E	<i>Calamintha acinos</i>	+	.	.	
2	3	4	H-G	Eua	<i>Euphorbia cyparissias</i>	+	+	.	
2.5	3	4	Th	Eua	<i>Trifolium campestre</i>	+	.	+	
1.5	3	0	H	E	<i>Poa compressa</i>	+	+1	+	
2	3	4	H	Ec (Med)	<i>Coronilla varia</i>	+	1	.	
2.5	3	4	Th	Eua (Med)	<i>Medicago lupulina</i>	.	+	+	
2	4	0	Ch	P	<i>Thymus glabrescens</i>	.	.	+	
Accompanying									
3	2	4	Th-H	E (Med)	<i>Linum catharticum</i>	+	+1	+	
2	3	3	H	Eua	<i>Origanum vulgare</i>	+	.	.	
3	3	5	Ch	D	<i>Thymus comosus</i>	+	+	+	
2.5	3	4	H-Ch	Ec	<i>Helianthemum hirsutum</i>	+	+	+	
3.5	3	0	H	Cosm	<i>Cystopteris fragilis</i>	.	.	+	
2	3	3	Phn	E (Med)	<i>Prunus spinosa</i>	.	.	+	
2	4	3	H-G	Eua (Med)	<i>Sedum maximum</i>	.	.	+	

Place and date of the surveys: 1 – Şuncuiuş, Mişid valley, 5.07.1992; 2 – Lorău, Boiului valley, 8.07.1996; 3 – Vârciorog, Pietroasa valley, 25.08.1996.

3. Seslerietum rigidae Borza, 1934 (Table 3)

This association's phytocoenosis settle on abrupt slopes, with 30-35° inclination and sunny orientation. It is well represented, with a specific floral composition, xerophyllous (29 species), plus the mesophyllous species from the Festuco-Brometea class and Molinio-Arrhenatheretea class coenosis. The representation reduces as we descend towards the bottom of the slope, due mainly to the sheeps and goats that by trying to climb on these plants alterate at a time the superficial soil and the bushes of grass.

By analyzing the phytocoenosis from an ecologic point of view, we notice that by the moisture content the dominant species are xero-mesophytes (58.6%), followed by mesophytes

(27.5%) and by xerophytes (13.7%). By the temperature, most of the species are micro-mesothermic (55%), followed by amphytolerant species and by those moderate thermophilous. By the chemical reaction of the soil the dominant species are those low acid-neutrophilous, followed by eurionics ones.

Table 3

Seslerietum rigidae (Borza, 1934)

						No. Of the survey	1	2	3
						Altitude ($\times 10$ m)	70	69	68
						Orientation	S	S	SV
						Slope inclination in degrees	30	30	35
						Covering (%)	85	75	70
U	T	R	Biof	Geoelement	Surface (m ²)	30	30	30	
Seslerion et Seslerio-Festucion pallentis									
2.5	2	5	H	Carp-Balc	<i>Sesleria rigida</i>	5	4-5	4	
3	3	5	Ch	D	<i>Thymus comosus</i>	+1	+1	+	
Seslerietalia									
2.5	3	4	H-Ch	Ec	<i>Helianthemum hirsutum</i>	+	+	+	
Festucetalia valesiacae									
1.5	4	5	Ch	E	<i>Teucrium montanum</i>	+	+1	+	
3	2	4	Th-H	E (Med)	<i>Linum catharticum</i>	+	+	+	
2.5	0	0	H	Eua	<i>Lotus corniculatus</i>	+	+	+	
1	4	4	H-Ch	Eua	<i>Veronica spicata</i>	+	.	+	
2	3	3	H	Eua	<i>Scabiosa ochroleuca</i>	+	+	+	
1.5	3.5	4	H	Eua	<i>Inula ensifolia</i>	.	+	+	
2	4	4	H	Eua (Med)	<i>Cynanchum vincetoxicum</i>	.	.	+1	
Festuco-Brometea									
2.5	3.5	4	G	Eua	<i>Anthericum ramosum</i>	+	+	.	
2	4	4	Ch	sM	<i>Teucrium chamaedrys</i>	+	+	+	
1.5	3	0	H	E	<i>Poa compressa</i>	+	.	.	
2	3.5	5	H	P-Med	<i>Asperula cynanchica</i>	+	+	+	
2.5	3	0	H	Eua	<i>Filipendula hexapetala</i>	+	.	+	
2	3	4	H-G	Eua	<i>Euphorbia cyparissias</i>	+	+	+	
3	3	2	Ch	End	<i>Thymus dacicus</i>	+	+	.	
2	3	2	H	E	<i>Hieracium pilosella</i>	+	+	.	
2	3	0	H	Eua	<i>Hypericum perforatum</i>	.	+	.	
2	4	0	H	Eua	<i>Salvia verticillata</i>	.	+	.	
2.5	0	3	H	Eua	<i>Plantago media</i>	.	+	.	
2	3	4	H	Eua	<i>Viola hirta</i>	.	+	.	
Festucion rupicolae									
2	5	4	H	E	<i>Dorycnium herbaceum</i>	+	+	.	
Molinio-Arrhenatheretea									
3	0	0	H	Eua	<i>Leontodon autumnalis</i>	+	+	+	
3	0	0	H	Eua	<i>Achillea millefolium</i>	+	.	+	
3	0	0	H	Eua	<i>Taraxacum officinalis</i>	.	+	.	
Accompanying									
2.5	3.5	4	TH	sM	<i>Verbascum phlomoides</i>	.	+	+	
3	3	3	H	E	<i>Campanula rapunculoides</i>	.	+	.	
3.5	3	3	Th	Eua	<i>Vicia tetrasperma</i>	.	+	.	

Place and date of the survey: 1 – 3 – Damiş, Homorişti hill, 9.08.1998.

From a biological point of view, the dominant species are the hemi cryptophytes (63%), followed by camephytes. The very few terophytes are of no relevance for the reference of the association's phytocoenosis.

Among the phytogeographical elements, the dominants are eurasiatic plants (60%) and europeans (21%). The presence of the thermophylous and endemic plants is considerable: *Verbascum phlomoides*, *Asperula cynanchica*, *Teucrium chamaedrys*, *Thymus dacicus*, accompanying the carpato-balcanic dominant element – *Seseli rigidum*.

4. *Seslerietum heufflerianae* (Zolyomi 1930) Soó 1944 (Table 4)

The association's phytocoenosis has been identified on a limy massif almost vertical, with nordic orientation. The flora of the analyzed coenosis contains only a small part of the species specific to this association. Due to the fact that it is settled not far above the riverbed of Crişul Repede (cca 2 m), we find in this phytocoenosis a few meso-hydrophylous species (*Sellaginella helvetica*, *Asplenium viride*, *Valeriana officinalis*).

The floral composition of the phytocoenosis is the following:

Table 4

<i>Seslerietum heufflerianae</i> (Zolyomi, 1930; Soó, 1944)						
2	3,5	4	H	Carp-End	<i>Sesleria heuffleriana</i>	4-5
4	3,5	4	Ch	Eua	<i>Sellaginella helvetica</i>	1
4	2	4	H	Cp	<i>Asplenium viride</i>	+
3	3	0	H	Eua	<i>Poa nemoralis</i>	+
4	3	4	H	Eua	<i>Valeriana officinalis</i>	+
2,5	3	3	Th	D	<i>Melampyrus bihariense</i>	+
2,5	3	2	H	Cp	<i>Hieracium umbellatum</i>	+
3	3,5	4	Ch	E	<i>Euphorbia amygdaloides</i>	+
3	0	4	H	Eua	<i>Seseli libanotis</i>	+
3	3	3	H	E	<i>Campanula rapunculoides</i>	+
3	3	4	H	E	<i>Campanula persicifolia</i>	+
2	3	3	H	Eua	<i>Origanum vulgare</i>	+
2	4	4	H	Eua	<i>Cynanchum vincetoxicum</i>	+

Place and date of the survey: Şuncuiuş, Crişul Repede valley, at Lesiana, 19.08.1997.

5. *Sedo hispanici-Poëtum nemoralis* (Soó 1944) Pop et Hodişan 1985 (Tabel 5)

It is a pioneer association settled on limy rocks, shady and moistly. The association's coenosis are in process of forming, developed in the crannies and the shelves of the rocks, where bioaccumulating processes led to the forming of a layer of soil. Although Pietroasa Valley has a vestic orientation, because of the opposite massif, the surface where the phytocoenosis develops is never sunny. Because of the great rocks' inclination, sometimes with very few cleaves, the forming of coenosis is very weak, between 40% and 60%. In the floral composition of phytocoenosis (26 species), besides the plants specific to Asplenietea class, we also notice nemoral species, belonging to Querco-Fagetea class, which have migrated from the woods above the rocks.

From an ecologic point of view, the specific role is held by the mesophylous, xero-mesophylous, micro-mesothermic, acid-neutrophylous and low acid-neutrophylous species. We also notice the great percentage of the euriionic species.

The phytocoenosis' analysis by the bioforms shows the great share of the hemicryptophytes (52%), followed by the hemicryptophyto-geophytes (H-G) species (20%) and by the annual terophytes (12%).

In the goelements' analysis the dominant are the eurasiatic species (44%), followed by the european ones (E + Ec – 20%).

6. *Asplenietum trichomano-rutae-murariae* Tx. 1937 (Table 6)

- *ceterachetosum* subas. nova prov.

This pioneer sub-association of lime rocks, unlike the previous one, vegetates on the sunny slopes, with mainly great inclination (up to 85°). Here too, the forming of the phytocoenosis is determined by the mountain paths and the crannies in the lime rocks on which it settles, being somewhere between 40% and 60%. The flora of the analysed phytocoenosis includes 48 species of cormophytes.

Table 5

Sedo hispanici-Poëtum nemoralis (Soó 1944) Pop et Hodişan 1985

						No. Of the survey	1	2
						Altitude(×10 m)	30	35
						Orientation	N	V
						Slope inclination in degrees	85	85
						Covering (%)	60	40
U	T	R	Biof	Geoelement	Surface (m ²)	4	4	
Car. as.								
3	3	0	H	Eua	<i>Poa nemoralis</i>	.	+	
1	3,5	4	Th	sM	<i>Sedum hispanicum</i>	+	.	
Asplenion et Asplenetea								
3	0	4	H	Cosm	<i>Asplenium trichomanes</i>	3-4	3	
3,5	3	0	H	Cosm	<i>Cistopteris fragilis</i>	+	+	
2,5	3	4	Th	E	<i>Cardaminopsis arenosa</i>	.	+	
2	4	3	H-G	Eua (Med)	<i>Sedum maximum</i>	.	+	
Fagion, Fagetalia et Querco-Fagetea								
3,5	0	4	H	Cosm	<i>Polystichum setiferum</i>	+	.	
3	2,5	3	H	Eua	<i>Fragaria vesca</i>	+	.	
3,5	3	3	Th	Eua (Med)	<i>Geranium robertianum</i>	+	.	
2	3	0	Th-TH	Eua	<i>Torilis rubella</i>	+	.	
3	2,5	3	H	E	<i>Viola reichenbachiana</i>	+	+	
3,5	3	0	G-H	Ec	<i>Lamium galeobdolon</i>	.	+	
4	3	3	G-H	Cp	<i>Oxalis acetosella</i>	.	+	
2,5	3	3	G	Ec	<i>Galium schultesii</i>	.	+	
3,5	0	4	H	E	<i>Saxifraga rotundifolia</i>	.	+	
4	2	3	G-H	Med	<i>Festuca drymeia</i>	.	+	
Accompanying								
2,5	0	0	H	Eua	<i>Leontodon hispidus</i>	+	.	
2	3	3	H	Eua	<i>Origanum vulgare</i>	+	.	
2,5	0	3	H	Eua	<i>Plantago media</i>	+	.	
0	3	3	Ch	E	<i>Sedum acre</i>	+	.	
3	3	0	H-Ch	Eua	<i>Glechoma hederacea</i>	+	.	
2	3	0	H	Eua	<i>Hypericum perforatum</i>	+	.	
3,5	3	5	G	Cp	<i>Phyllitis scolopendrium</i>	.	+	
2	3,5	3	H	sM	<i>Silene viridiflora</i>	.	+	
3	3	4	H	Eua	<i>Dactylis glomerata</i>	.	+	
2,5	3	4	G-H	P-Med	<i>Medica picta</i>	.	+	

Place and date of survey: 1 – between Călăţea and Vârciorog, Lazea hill, 30.08.1996; 2 – Vârciorog, Pietroasa valley, 30.08.1996.

The floral composition of the phytocoenosis determined us to affiliate them with a new sub-association – **ceterachetosum** (catalog type, survey 5) and not with *Asplenio-Ceterachetum Vives 64* association, which is a southern association, mediteranean-balkan, characterized by *Asplenium fontanum* species. There are also missing other southern species: *Draba lasiocarpa*, *Alyssum petraeum*, *Dianthus kitaibeli*, *Micromeria pulegium*, species that are specific to *Alyssetosum petraeae* sub-association, subordinate to *Asplenio-Ceterachetum* association, described in Banat (Coldea, 1991).

The association's analysis by the main ecologic values shows its xerophyllous (26%) to xero-mesophyllous (50%) specific, micro-mesothermic (58%) to moderate thermophyllous (18%) and acid-neutrophyllous of this one. Bioforms are dominated by hemicryptophytes (54%), followed by chamephytes (15%). We can explain the presence of terophytes in a large percentage (17%) by the sinanthropic impact on these phytocoenosis, that are close to localities, on the access roads' sides, in the proximity of grasslands.

Table 6

Asplenietum trichomano-rutae-murariae Tx. 1937										
- ceterachetosum subas. nova										
				No. of the survey	1	2	3	4	5	
				Altitude (×10 m)	42	55	55	55	40	
				Orientation	SE	E	E	E	S	
				Slope inclination in degrees	65	85	85	80	65	
				Covering (%)	38-40	50	50	30	60	
U	T	R	Biof	Geoelement	Surface (m ²)	10	6	12	5	20
Car. as.										
1,5	3	5	H	Cp	<i>Asplenium ruta-muraria</i>	+1	.	+	+	+
3	0	4	H	Cosm	<i>Asplenium trichomanes</i>	.	.	.	+1	.
Asplenio-Ceterachetum										
2	5	4	H	Atl-Med	<i>Ceterach officinarum</i>	2	2-3	2-3	2	3-4
Asplenion et Asplenietalia rutae-murariae										
2,5	3	4	Th	E	<i>Cardaminopsis arenosa</i>	.	.	+	+	.
Asplenio-Festucion pallentis										
1,5	4	4	H	Carp-Balc	<i>Festuca pallens</i>	+	.	.	.	.
1	3,5	4	Ch	sM	<i>Sedum hispanicum</i>	+1	+	.	.	+
1	3,5	5	H	Eua	<i>Melica ciliata</i>	+	.	.	.	+
Asplenetea rupestris										
3	3	5	Ch	D	<i>Thymus comosus</i>	.	.	.	.	+1
2	3	4	H-G	Eua (Med)	<i>Sedum maximum</i>	.	.	+	+	.
Festucetalia valesiaca										
1,5	3	3	H	Eua (Med)	<i>Anthemis tinctoria</i>	+	.	.	.	.
1,5	4	4	H-TH	E	<i>Centaurea micranthos</i>	+	.	.	.	+
2	5	5	H	P-Med	<i>Stachys recta</i>	+	.	.	.	.
1,5	4	3	Th	P-Med	<i>Tunica prolifera</i>	+	.	.	.	.
2	3	3	H	Eua	<i>Scabiosa ochroleuca</i>	+	.	.	.	+
3	0	3	H	Alp-Carp-Balc	<i>Silene italica</i>	+	.	.	.	.
2	3	4	H	E	<i>Sanguisorba minor</i>	.	+	+	.	.
1,5	3,5	4	Ch	Eua	<i>Thymus pannonicus</i>	.	.	2	+	.
2	4	4	H	Eua	<i>Cynanchum vincetoxicum</i>	.	.	.	+	.
1,5	4	5	Ch	E	<i>Teucrium montanum</i>	+	.	.	.	+
Accompanying										
2	3	3	H	Eua	<i>Calamintha vulgaris</i>	+	+	+	.	.
3	2	4	Ch	E	<i>Dianthus carthusianorum</i>	+	.	.	.	.
1,5	4,5	4	H	sM	<i>Phleum montanum</i>	+	.	.	.	.
3	2	4	Th-H	E (Med)	<i>Linum catharticum</i>	+	.	.	.	.
1	3	0	Th-TH	Ec	<i>Alyssum alyssoides</i>	+	.	.	.	.
2	4	0	Ch	P	<i>Thymus glabrescens</i>	+	2	.	.	.
2	3,5	4	H	sM	<i>Seseli varium</i>	+	.	.	.	.
3	3	3	H	Eua (Med)	<i>Galium mollugo</i>	+	.	.	.	+
2	3	5	H	B	<i>Carduus candicans</i>	+	.	.	.	.
2,5	3	4	H-Ch	Ec	<i>Helianthemum hirsutum</i>	+	+	.	.	.
2	3	3	H	Eua	<i>Potentilla chrysantha</i>	+	.	.	.	+
2	4	4	Ch	sM	<i>Teucrium chamaedrys</i>	+	+	+	.	.
2	3	4	TH-H	Eua	<i>Verbascum nigrum</i>	+	.	.	.	.
4	2	0	H	Eua (Med)	<i>Potentilla erecta</i>	.	.	+	.	.
2	3	4	TH	Eua (Med)	<i>Echium vulgare</i>	.	+	.	.	.

2,5	0	0	H	Eua	<i>Leontodon hispidus</i>	.	+	+	.	.
3	2	0	Th-TH	Eua	<i>Sedum annuum</i>	.	+	.	.	+
3,5	3	3	Th	Eua (Med)	<i>Geranium robertianum</i>	.	+	.	.	.
4	2	5	H	Ec	<i>Moehringia muscosa</i>	.	+	.	.	.
2	3	4	H	Eua	<i>Carex pairei</i>	.	.	+	.	.
1,5	3	0	H	E	<i>Poa compressa</i>	.	.	+	.	.
2	4	2	H	Cp	<i>Potentilla argentea</i>	.	.	+	.	.
2	3	4	H-G	Eua	<i>Euphorbia cyparissias</i>	.	.	.	+	.
1,5	3,5	4	Th-TH	E	<i>Calamintha acinos</i>	.	.	.	.	+
2	3,5	4,5	H	P-Med	<i>Asperula cynanchica</i>	.	.	.	.	+
2	2	4	H-Ch	Cp	<i>Mimuartia verna</i>	.	.	.	.	+
3	3	0	Th	Eua	<i>Odontites serrotina</i>	.	.	.	.	+
2,5	3	2,5	H	Cp	<i>Hieracium umbellatum</i>	.	.	.	.	+

Place and date of the survey: 1 – Şuncuiuş, Mişid valley, 1.06.1994; 2 – 4 – Albioarei gorge, 25.08.1996; 5 – Şuncuiuş, under the castle, 20.08.1996.

The phytogeographical elements are dominated by the eurasiatic ones (39%), european in the large meaning (E + Ec – 24%). The presence of termophylous elements (mediteranean, submetiteranean, ponto-mediteranean, balcanic) is though remarcable in low percentage, but significant: *Seseli varium*, *Sedum hispanicum*, *Phleum montanum* etc.

The phytocoenosis of this association have no economic relevance, being in return the co enological basis for the vegetation covering of the lime rocks on which they vegetate.

Table 7

Parietarium officinalis Csűrös 1958

						No. of the survey	1	2
						Altitude (×10 m)	40	60
						Orientation	N	V
						Slope inclination in degrees	5-6	18-20
						Covering (%)	80	90
						Surface (m ²)	15	15
U	T	R	Biof	Geoelement				
Car. as.								
4	3,5	4	H	sM	<i>Parietaria officinalis</i>	4-5	5	
Parietarium et Parietarietalia								
3	3	4	H	Eua	<i>Anthriscus silvestris</i>	+	+	
2,5	3	3	Th-TH	Eua	<i>Lapsana communis</i>	+	.	
4	3	5	H	Ec	<i>Lunaria rediviva</i>	.	+	
4	3	3	H	Ec	<i>Geranium phaeum</i>	+	+	
3,5	3	4	H	E	<i>Lamium maculatum</i>	+	+	
3,5	3	4	H	Ec	<i>Lamium galeobdolon</i>	.	+	
Arctium								
3	3	4	Th-TH	Eua	<i>Alliaria petiolata</i>	+	.	
3	3	4	H	Cosm	<i>Urtica dioica</i>	+	+	
Fagetalia								
3,5	3	4	H-G	Eua	<i>Asarum europaeum</i>	+	+	
3,5	3	3	Th	Cosm	<i>Geranium robertianum</i>	+	.	
3,5	3	3	H	Ec	<i>Pulmonaria officinalis</i>	+	.	
Accompanying								
3	0	0	Th-TH	Cosm	<i>Stellaria media</i>	+	+	
2,5	3	4	TH-H	Ec	<i>Cardaminopsis arenosa</i>	.	+	
3	3	3	Th	Cp	<i>Galium aparine</i>	+	.	

Place and time of surveys: 1 – Şuncuiuş, at the mouth of Păstorilor Cave, 19.08.1997; 2 – Meziad, at the mouth of the cave, 21.07.1994.

7. *Parietarium officinalis* Csűrös 1958 (Table 7)

The phytocoenosis of this association develops mainly in the proximity of the caves' mouths, in shady places, at the bottom of the rocks, the specific species being a plant pretty widespread in this massif.

Besides the dominant species for the aliance and the order, it includes a seria of species from Fagetalia order, due to the fact that this association's coenosis mainly develop under the trees. We also notice the presence of some wild-growing plants, nitrophyllous species, like: *Urtica dioica*, *Stellaria media*, *Galium aparine*. The association's phytocoenosis have a large covering, but the flora is poor in species, totalizing only 15 of them (Table 7).

From the ecologic values' point of view the association have a stong mesophyllous, micro-mesothermic and low acid-nitrophyllous character.

The biologic forms are dominated by hemi cryptophytes (53%), followed by terophytes (33%).

Most of the geoelementes are central-european (32%), eurasiatics (27%) și cosmopolites (20%). It has no economic relevance.

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REZUMAT

PAJIȘTILE CALCOFILE DIN MUNȚII PĂDUREA CRAIULUI

Munții Pădurea Craiului sunt acoperiți în mare parte de vegetație ierboasă. Pe stâncăriile calcaroase de pe versanții mai mult sau mai puțin abrupti, datorită formațiunilor calcaroase de suprafață, s-a instalat o vegetație calcofilă caracteristică. Au fost identificate 7 asociații vegetale: *Festucetum pallentis*, *Asplenio rutae-murariae-Melicetum*, *Seslerietum rigidae*, *Seslerietum heufflerianae*, *Sedo hispanici-Poaetum nemoralis*, *Asplenietum trichomano-rutae-murariae*, și *Parietarium officinalis*, care aparțin la 4 clase de vegetație. Fitocenozele asociațiilor sunt analizate din punct de vedere ecologic, al bioformelor și al elementelor geografice, pe baza tabelor fitosociologice. Din punct de vedere economic, aceste asociații au o valoare redusă, compensată însă de cea ecoprotectivă.