

## STUDY ON VEGETATION OF GLACIAL CIRQUES IN MOLDOVEANU AND GALBENA MOUNTAINS, FĂGĂRAȘ MASSIF

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**Abstract.** The paper presents the vegetation of glacial cirques from Moldoveanu and Galbena Mountains, Făgăraș Massif. Some of the plant communities, previously cited in this region, have been confirmed by us. Galbena Mountain is populated by small areas of endemic plant formations because of the major presence of limestone and includes an exceptional glacial cirque – Galbena. In the same time, the water of Moldoveanu Lake, which dominates the upper part of the Valea Rea – forms some of the most spectacular waterfalls within these mountains at Buduri, called Budurile Văii Rele. The Valea Rea gradually changes its orientation to the south-east, forming a basin with low slope, currently occupied by a large peat bog located at 2,000-2,100 m height. The peat bog surface exceeds 1 km<sup>2</sup> and its study will continue in the summer of 2011.

**Keywords:** glacial cirque, Făgăraș Massif, plant communities, characteristic species, vegetation.

### **Rezumat. Studiu asupra vegetației căldărilor glaciare din Munții Moldoveanu și Galbena, Masivul Făgăraș.**

Lucrarea prezintă vegetația căldărilor glaciare din Munții Moldoveanu și Galbena, din Masivul Făgăraș. Unele dintre asociațiile vegetale, citate în regiunea studiată, au fost confirmate și de noi. Muntele Galbena, este populat pe arii restrânse de plante endemice datorită prezenței calcarului și include un circ glaciare de excepție – Galbena. În același timp, apele lacului Moldoveanu care domină partea superioară a Văii Rele, se aruncă la Buduri în cele mai spectaculoase cascade din acești munți, numite Budurile Văii Rele. Valea Rea își schimbă orientarea în direcția sud-est formând un bazin cu pantă lină, ocupat de o mare turbărie situată la 2.000-2.100 m.s.m. Suprafața turbăriei este de 1 km<sup>2</sup> și studiul ei va continua în vara anului 2011.

**Cuvinte cheie:** căldări glaciare, Masivul Făgăraș, asociații vegetale, specii caracteristice, vegetație.

### INTRODUCTION

The distinctive landscape note of the alpine mountains of Făgăraș is given by the expansion and diversity of glacial modelling. Făgăraș is the mountain that holds the largest area of glaciers carved in the Southern Carpathians. In Pleistocene, the Alpine area was located above the regular and permanent snow limit and received sufficient rainfall to supply ice, placing such a spatio-temporal oscillating hionosphere, typical of this era. As a result of their past, Făgăraș Massif present numerous traces: basins, lakes and also ice tongue (FLOREA, 1998). Northern slopes, with sharp gradients, have limited the growth of glaciers in length, while the slow and broad valleys in the south allowed the formation of glaciers with lengths of over 7 km, winding paths, with branches arising from the tributary suspended valleys.

Glacial circuses, locally known as “buckets”, vary in appearance and complexity. Their location at 2,000-2,200 m altitude indicates their formation in a recent glacial phase, corresponding to Wurm.

The total composition of the Făgăraș Mountain in metamorphic rocks, suggests a potential monotony of the landscape, but petrographic and structural differences in modelling exogenous conditions under glacial periglacial and then crio-nival, explains the diversity of forms encountered in these mountains. The high-glacial complex Viștea Mare - Moldoveanu is dominated by two peaks formed by the trapezium mountain, which can be drawn north and south, Y-shaped symmetrical peaks, thus delimiting four large glacial cirques. The eastern slope of the mountain Viștea Mare - Moldoveanu dominates the upper valley cirque of Valea Rea, occupied by Lake Moldoveanu, which is the start of this valley. The triangular shape of the lake is the result of silting, made by a pouring of the north, north-west. The lake is situated at an altitude of 2,165 m, covers an area of 0.45 ha and has a depth of 2 m. The water of the lake, forms some of the most spectacular waterfalls in these mountains at Buduri, called Budurile Văii Rele (PIȘOTA, 1971).

The Valea Rea gradually changes its orientation to the south-east, forming a broad basin with low slope, currently occupied by a large peat bog located between 2,000 and 2,100 m height. The peat bog surface exceeds 1 km<sup>2</sup> and is drained by a dense network of streams (it seems that here was one of the largest glacial lakes in these mountains, clogged with materials from the steep slopes and invaded Sphagnum later). Glacial valley ends abruptly with a threshold of about 400 m, along which successive steps form several waterfalls called Budurile Văii Rele.

To the south, Galbena Mountain (toponym derived from the major presence of limestone) is the southeastern extension of Mount Moldoveanu and includes an exceptional glacial cirque – Galbena.

The Galbena Lake is located at 2,200 m height, with 1.2 ha surface and a depth of 9 m. The cirque presents an upland terrain, with many ram glaciers, marshy areas and three small glacial lakes.

### MATERIAL AND METHOD

The plant nomenclature follow Flora Europaea and CIOCĂRLAN, 2000. The vegetation was studied using the principles of the Central European geobotanical school of surveying the vegetation (BRAUN-BLANQUET, 1964). The phytocenological framing of the vegetation follow various authors (SANDA et al., 1998; COLDEA, 1991; SANDA et al., 2001).

## RESULTS

Overall, the associations identified follow the next phytocenological framing:

- Cls. *Thlaspietea rotundifolii*** BR.-BL. 1948  
 Ord. *Thlaspietalia rotundifolii* BR.-BL. in BR.-BL. et JENNY 1926  
 All. *Papavero-Thymion pulcherrimi* I. POP 1968  
 Ass. *Acino-Galietum anisophylli* BELDIE 1967  
 Ord. *Androsacetalia alpinae* BR.-BL. in BR.-BL. et JENNY 1926  
 All. *Veronicion baumgartenii* COLDEA 1991  
 Ass. *Poo contractae-Oxyrietum digynae* HORV. et al. 1937  
 Ass. *Saxifrago bryoidis-Silenetum acaulis* BOȘCAIU, TÄUBER et COLDEA 1977
- Cls. *Salicetea herbaceae*** BR.-BL. 1948  
 Ord. *Salicetalia herbaceae* BR.-BL. in BR.-BL. et JENNY 1926  
 All. *Salicion herbaceae* BR.-BL. in BR.-BL. et JENNY 1926  
 Ass. *Salicetum herbaceae* RÜBEL 1911 EM. 1933  
 Ass. *Soldanello pusillae-Ranunculetum crenati* (BORZA 1931) BOȘCAIU 1971  
 Ass. *Polytrichetum sexangularis* BR.-BL. 1926  
 Ord. *Arabidetalia coeruleae* RÜBEL ex BR.-BL. 1948  
 All. *Salicion retusae* HORV. 1949  
 Ass. *Salicetum retuso-reticulatae* BR.-BL. 1926
- Cls. *Juncetea trifidi*** (KLIKA et HADAČ 1944 p.p.)  
 Ord. *Caricetalia curvulae* BR.-BL. in BR.-BL. et JENNY 1926  
 All. *Caricion curvulae* BR.-BL. in BR.-BL. et JENNY 1926  
 Ass. *Primulo-Caricetum curvulae* BR.-BL. 1926 EM. OBERD. 1957
- Cls. *Scheuchzerio-Caricetea nigrae*** (NORDH. 1937) TX. 1937  
 Ord. *Caricetalia nigrae* KOCH 1926 EM. NORDH. 1937  
 All. *Caricion nigrae* KOCH. 1926 EM. KLIKA 1934  
 Ass. *Sphagno-Caricetum rostratae* STEFFEN 1931

## DISCUSSIONS

**Ass. *Acino-Galietum anisophylli*** BELDIE 1967

Unsteady small debris slopes situated on the sunny side of the cirque on the southern slope of Galbena Mountain are populated by small areas of endemic plant formations of this association. The accumulation of snow during winter provides an increase of moisture in the growing season. *Acinos alpinus* ssp. *alpinus* is characteristic and sometimes edification species. In the floristic composition, in addition to the species belonging to the order *Thlaspietalia*, many species are of the order *Seslerietalia*, which indicates the direction of development of unsteady calcareous vegetation to grasslands on limestone substrate with fallow (Table 1). Besides the two characteristic species *Acinos alpinus* ssp. *alpinus* and *Galium anisophyllum*, there are almost always present species like *Senecio rupestris*, *Rhodiola rosea*, *Achillea schurii*, *Thymus pulcherrimus*, *Saxifraga moschata*, *Myosotis alpestris*.

**Ass. *Poo contractae-Oxyrietum digynae*** HORV., PAWL., WAL. 1937

The characteristic phytocoenosis for this Balkan association is poorly developed on mobile or fixed debris on the southern slope of Moldoveanu cirque. Characteristic species and edifying for this association are *Poa cenisia* ssp. *contracta* and *Oxyria digyna* (Table 2).

**Ass. *Saxifrago bryoidis-Silenetum acaulis*** BOȘCAIU, TÄUBER et COLDEA 1977

The areas affected by disaggregation within Moldoveanu cirque, where large amounts of snow accumulates in winter, are populated by phytocoenosis association. The coenoses *Silene acaulis* and *Saxifraga bryoides* are characteristic and edifying (Table 3).

**Ass. *Salicetum herbaceae*** RÜBEL 1911 EM. 1933

Hydrophilic plant formations of this association vegetate in the nivation niches or small depressions, in the glacial cirques from Moldoveanu and Galbena mountains, where the snow persists late in summer. The soil has high humidity and is shallow, rocky. Characteristic species and edifying for this association are *Salix herbacea* and *Soldanella pusilla* (Table 4).

**Ass. *Soldanello pusillae-Ranunculetum crenati*** (BORZA 1931) BOȘCAIU 1971

Unsteady and movable small debris in the investigated area is often populated by the association *Soldanello pusillae* - *Ranunculetum crenati*. It is a chiono-petrophilous Daco-Balkan association, of mesophilic nature, which grows mainly in places where we find stagnant snow for a long time, but drained after melting, located on sheltered slopes. Characteristic species *Ranunculus crenatus* and *Soldanella pusilla* are accompanied by species such as: *Primula minima*, *Plantago gentianoides*, *Cerastium cerastoides*, *Gnaphalium supinum*, etc. (Table 5).

Table 1. Ass. *Acino-Galietum anisophylli* BELDIE1967.  
Tabel 1. Asociația *Acino-Galietum anisophylli* BELDIE 1967.

No. of relevée	1	2	3	4	5
<b>Altitude</b>	1800	1800	1900	1900	1900
<b>Slope (degrees)</b>	45	45	30	30	30
<b>Exposure</b>	S	S	S-E	S-E	S-E
<b>General coverage (%)</b>	45	30	25	30	45
<b>Surface of relevée (sq.m.)</b>	4	4	25	4	4
<b>Char. ass.</b>					
<i>Acinos alpinus</i> ssp. <i>alpinus</i>	2	2	1	2	2
<i>Cerastium arvense</i>	2	1	1	1	2
<b>Papavero-Thymion et Thlaspietalia</b>					
<i>Galium anisophyllum</i>	+	1	1	1	1
<i>Thymus pulcherrimus</i>	+	.	+	+	.
<i>Senecio rupestris</i>	.	.	+	+	.
<i>Sedum atratum</i>	+	+	.	.	+
<b>Potentiletalia caulescentis</b> s.l.					
<i>Asplenium viride</i>	.	+	.	+	.
<i>Cystopteris fragilis</i>	.	+	+	.	+
<b>Seslerietalia</b> s.l.					
<i>Achillea schurii</i>	1	+	+	.	+
<i>Myosotis alpestris</i>	+	+	+	+	+
<i>Scabiosa lucida</i>	.	.	+	+	.
<i>Saxifraga moschata</i>	+	+	.	+	+
<i>Carduus kernerii</i>	+	+	+	+	+
<b>Variae Syntaxa</b>					
<i>Alchemilla xanthocchlora</i>	.	.	+	.	+
<i>Rhodiola rosea</i>	+	+	.	+	+
<i>Poa granitica</i>	+	+	1	+	.
<i>Saxifraga aizoides</i>	.	+	.	.	+
<i>Taraxacum alpinum</i>	+	.	+	+	.
<i>Silene acaulis</i>	.	+	.	.	+

Place and date of survey – Galbena Mountain, July 2010

Table 2. Ass. *Poo contractae-Oxyrietum digynae* HORV., PAWL., WAL. 1937.  
Tabel 2. Asociația *Poo contractae-Oxyrietum digynae* HORV., PAWL., WAL. 1937.

No. of relevée	1	2	3	4
<b>Altitude</b>	2100	2150	2100	2100
<b>Slope (degrees)</b>	30	45	30	30
<b>Exposure</b>	S	S-E	S	S
<b>General coverage (%)</b>	30	40	25	30
<b>Surface of relevée (sq.m.)</b>	4	4	4	4
<b>Char. ass.</b>				
<i>Poa cenisia</i> sp. <i>contracta</i>	1	2	1	1
<i>Oxyria digyna</i>	2	2	1	2
<b>Thalaspiaetalia rotundifoliae</b>				
<i>Arabis alpina</i>	+	.	+	+
<i>Saxifraga moschata</i>	+	+	.	.
<i>Artemisia eriantha</i>	.	+	+	.
<b>Salicetalia herbaceae</b> s.l.				
<i>Luzula alpinopilosa</i>	+	.	+	+
<i>Soldanella pusilla</i>	+	+	1	+
<i>Ranunculus crenatus</i>	+	+	1	+
<i>Cerastium cerastoides</i>	.	+	+	+
<i>Gnaphalium supinum</i>	.	+	.	+
<i>Sedum alpestre</i>	+	+	.	.
<b>Variae Syntaxa</b>				
<i>Saxifraga androsacea</i>	+	.	.	+
<i>S. aizoides</i>	.	+	+	+
<i>Senecio carpathicus</i>	+	.	+	.
<i>Achillea schurii</i>	+	+	+	+
<i>Poa alpina</i>	+	+	+	.
<i>Silene pusilla</i>	.	+	.	+

Place and date of survey – Moldoveanu Lake, July 2010.

Table 3. Ass. *Saxifraga bryoidis-Silenetum acaulis* BOȘCAIU, TAUBER et COLDEA 1977.  
 Tabel 3. Asociația *Saxifraga bryoidis-Silenetum acaulis* BOȘCAIU, TAUBER et COLDEA 1977.

No. of relevée	1	2	3	4
<b>Altitude</b>	2150	2100	2100	2100
<b>Slope (degrees)</b>	30	30	30	30
<b>Exposure</b>	S	S-V	S-V	S-V
<b>General coverage (%)</b>	30	40	20	30
<b>Surface of relevée (sq.m.)</b>	4	4	4	4
<b>Char. ass.</b>				
<i>Silene acaulis</i>	1	2	1	2
<i>Poa cenisia</i> ssp. <i>contracta</i>	+	+	.	+
<b>Veronicion et Androsacetalia alpinae</b>				
<i>Saxifraga bryoides</i>	1	1	1	1
<i>Veronica baumgartenii</i>	.	+	+	.
<i>Oxyria digyna</i>	.	.	+	+
<b>Thlaspietalia rotundifolii</b> s.l.				
<i>Saxifraga moscahta</i>	+	+	.	.
<i>Doronicum carpaticum</i>	.	+	+	+
<b>Salicetalia herbaceae</b> s.l.				
<i>Soldanella pusilla</i>	1	+	+	+
<i>Luzula alpinopilosa</i>	+	.	+	+
<i>Sedum alpestre</i>	.	+	.	.
<i>Chrysanthemum alpinum</i>	1	1	+	+
<i>Ranunculus crenatus</i>	+	+	1	+
<b>Variae Syntaxa</b>				
<i>Oreochloa disticha</i>	+	.	+	.
<i>Primula minima</i>	+	1	+	+
<i>Ligusticum mutellina</i>	.	+	+	+
<i>Cerastium alpinum</i>	+	+	.	+
<i>Potentilla aurea</i> ssp. <i>chrysocraspeda</i>	1	+	+	+
<i>Hieracium alpinum</i>	.	.	+	+
<i>Polygonum viviparum</i>	+	+	.	.
<i>Geum montanum</i>	.	.	+	.
<i>Poa alpina</i>	.	+	.	+
<i>Juncus trifidus</i>	+	.	+	.
<i>Myosotis alpestris</i>	+	+	.	+

Place and date of survey – Moldoveanu Lake, July 2010.

Table 4. Ass. *Salicetum herbaceae* BR.-BL. 1913.  
 Tabel 4. Asociația *Salicetum herbaceae* BR.-BL. 1913.

No. of relevée	1	2	3	4	5
<b>Altitude</b>	1900	1900	2000	2100	2000
<b>Slope (degrees)</b>	15	15	30	15	30
<b>Exposure</b>	N	N	N-V	N	N-V
<b>General coverage (%)</b>	40	30	25	20	25
<b>Surface of relevée (sq.m.)</b>	4	4	4	4	4
<b>Char. ass.</b>					
<i>Salix herbacea</i>	3	2	2	1	2
<i>Soldanella pusilla</i>	+	1	+	1	+
<b>Salicion et Salicetalia herbaceae</b>					
<i>Luzula alpinopilosa</i>	.	+	+	.	+
<i>Ranunculus crenatus</i>	+	+	+	+	+
<i>Gnaphalium supinum</i>	+	.	.	+	+
<i>Plantago gentianoides</i>	.	+	+	+	.
<i>Chrysanthemum alpinum</i>	+	.	.	.	+
<b>Salicetea herbaceae</b>					
<i>Cerastium cerastoides</i>	+	+	+	1	+
<i>Veronica alpina</i>	.	+	.	+	+
<i>Sedum alpestre</i>	+	.	+	.	.
<b>Variae Syntaxa</b>					
<i>Primula minima</i>	+	+	+	+	.
<i>Ligusticum mutellina</i>	.	+	.	+	+
<i>Festuca airoides</i>	+	.	+	+	.
<i>Carex curvula</i>	+	+	.	.	+
<i>Campanula alpina</i>	+	.	.	+	+
<i>Homogine alpina</i>	.	+	+	.	+
<i>Juncus trifidus</i>	+	+	.	+	.

Place and date of survey – 1-2, Galbena Mountain, July 2010; 3-5, Moldoveanu Mountain, July 2010.

Table 5. Ass. *Soldanello pusillae-Ranunculetum crenati* (BORZA 1931) BOȘCAIU 1971.  
Tabel 5. Asociația *Soldanello pusillae-Ranunculetum crenati* (BORZA 1931) BOȘCAIU 1971.

No. of relevée	1	2	3	4	5
Altitude	2000	2100	2200	2200	2200
Slope (degrees)	15	30	30	30	15
Exposure	N	N-E	N-E	N	N-E
General coverage (%)	65	40	30	65	60
Surface of relevée (sq.m.)	4	4	4	4	4
<b>Char. ass.</b>					
<i>Soldanella pusilla</i>	3	2	2	3	3
<i>Ranunculus crenatus</i>	2	2	1	2	2
<b>Salicion et Salicetalia</b>					
<i>Plantago gentianooides</i>	1	+	+	1	+
<i>Gnaphalium supinum</i>	+	.	+	+	+
<i>Primula minima</i>	+	+	+	.	+
<i>Carex pyrenaica</i>	.	.	+	+	+
<i>Geum montanum</i>	+	+	.	+	.
<i>Luzula alpinopilosa</i>	.	+	.	+	+
<b>Salicetea herbaceae</b>					
<i>Sedum alpestre</i>	+	.	+	.	+
<i>Taraxacum alpinum</i>	+	.	+	.	.
<i>Cerastium cerastoides</i>	.	+	+	.	+
<b>Variæ Syntaxa</b>					
<i>Ligusticum mutellina</i>	+	+	+	.	+
<i>Agrostis rupestris</i>	.	.	.	+	.
<i>Poa alpina</i>	+	+	.	.	+
<i>Veratrum album</i>	+	.	.	+	+
<i>Achillea schurii</i>	.	+	+	.	+
<i>Deschampsia caespitosa</i>	+	+	.	.	+
<i>Campanula alpina</i>	+	.	+	+	.

Place and date of survey – Moldoveanu Mountain, July 2010.

#### Ass. *Polytrichetum sexangulare* BR.-BL. 1926

*Chionophilous coenoses* of this association are found sporadically in the nivation niches on the north side of Moldoveanu lake cirque where snow is stagnant until early summer. The characteristic species of the association is *Polytrichum sexangulare*. In this association other, there are found other species of moss such as *Dicranum scoparium* and *Mnium splendens*. Few species found in this association are chionophilous cormophyta species (Table 6).

Table 6. Ass. *Polytrichetum sexangulare* BR.-BL. 1926.  
Tabel 6. Asociația *Polytrichetum sexangulare* BR.-BL. 1926.

No. of relevée	1	2	3
Altitude	2100	2150	2150
Slope (degrees)	30	45	30
Exposure	N	N	N-E
General coverage (%)	50	70	60
Surface of relevée (sq.m.)	4	4	4
<b>Char. ass.</b>			
<i>Polytrichum sexangulare</i>	3	3	3
<i>Salix herbacea</i>	1	2	1
<b>Salicion et Salicetalia herbaceae</b>			
<i>Luzula alpinopilosa</i>	1	1	1
<i>Ranunculus crenatus</i>	+	1	1
<i>Plantago gentianoide</i>	+	+	.
<i>Carex pyrenaica</i>	.	+	+
<i>Gnaphalium supinum</i>	+	+	+
<b>Salicetea herbaceae</b>			
<i>Sedum alpestre</i>	+	.	+
<i>Veronica alpina</i>	.	.	+
<i>Cerastium cerastoides</i>	+	+	+
<b>Variæ syntax</b>			
<i>Primula minima</i>	+	+	.
<i>Deschampsia caespitosa</i>	+	+	+
<i>Geum montanum</i>	+	.	.
<i>Carex curvula</i>	.	+	+
<i>Poa alpina</i>	+	+	.
<i>Taraxacum nigriscens</i>	.	+	.
<i>Ligusticum mutellina</i>	+	.	+

Place and date of survey – Moldoveanu Lake, July 2010.

**Ass. *Salicetum retuso-reticulatae* BR.-BL. 1926**

On limestone slopes of Galbena Mountain there are met chionophilous coenoses enlightened by *Salix reticulata* and *S. retusa*, which live with *Dryas octopetala*. Dominant species *S. retusa* vegetate with: *Polygonum viviparum*, *Silene acaulis*, *Ranunculus oreophilus*, *Primula minima*, *Juncus trifidus*, *Carex sempervirens*, etc. Floristic diversity of these coenoses is very large (Table 7).

Table 7. Ass. *Salicetum retuso-reticulatae* BR.-BL. 1926.  
Tabel 7. Asociația *Salicetum retuso-reticulatae* BR.-BL. 1926.

No. of relevée	1	2	3	4	5
Altitude	2200	2200	2100	2100	2150
Slope (degrees)	40	40	35	35	40
Exposure	S	S	S-V	S-V	S-V
General coverage (%)	40	45	60	60	40
Surface of relevée (sq.m.)	4	4	4	4	4
<b>Char. ass.</b>					
<i>Salix retusa</i>	2	2	2	2	1
<i>S. reticulata</i>	2	2	3	3	2
<b>Salicetalia herbaceae</b>					
<i>Salix herbacea</i>	+	.	.	+	+
<i>Luzula alpinopilosa</i>	.	+	+	+	.
<b>Seslerietalia</b>					
<i>Dryas octopetala</i>	+	1	+	+	1
<i>Myosotis alpestris</i>	.	.	+	+	.
<i>Carex sempervirens</i>	+	+	+	.	+
<i>Saxifraga moschata</i>					
<i>Polygonum viviparum</i>	+	+	+	.	+
<i>Silene acaulis</i>	+	+	.	+	+
<i>Ranunculus oreophilus</i>	.	+	+	+	.
<i>Cerastium transsilvanicum</i>	+	.	+	.	+
<i>Saxifraga adscendens</i>	.	+	.	+	.
<i>Armeria alpina</i>	+	.	+	+	+
<b>Variae Syntaxa</b>					
<i>Campanula alpina</i>	.	+	+	.	+
<i>Primula minima</i>	+	.	.	+	+
<i>Doronicum carpaticum</i>	+	+	+	.	1
<i>Festuca airoides</i>	.	+	.	+	.
<i>Veronica baumgarteni</i>	+	.	+	+	.
<i>Huperzia selago</i>	+	.	+	.	+
<i>Gentiana verna</i>	.	+	.	.	+
<i>Soldanella pusilla</i>	+	.	+	+	.
<i>Ligusticum muttelina</i>	+	+	.	.	+
<i>Potentilla aurea ssp. chrysocraspeda</i>	+	.	+	.	.

Place and date of survey –Galbena Mountain, July 2010.

**Ass. *Primulo-Caricetum curvulae* BR.-BL. 1926 EM. OBERD. 1957**

This association is found both in the glacial cirque of Moldoveanu lake and on the wind exposed slopes of Galbena Mountain, where snow persists until late spring. The characteristic species of this association is *Carex curvula*, which carries 60 to 80% coverage. Other species found in the association are: *Festuca airoides*, *Potentilla aurea ssp. chrysocraspeda*, *Primula minima*, *Campanula alpina*, *Hieracium alpinum*, mosses and lichens (Table 8).

**Ass. *Sphagno-Caricetum rostratae* STEFFEN 1931**

The coenoses of this association are met on the bog soil, which is very rich in organic substances and very humid. It's reaction is very acid. The edifications species of this association are *Sphagnum recurvum* and *Carex rostrata*.

Table 8. Ass. *Primulo-Caricetum curvulae* BR.-BL. 1926, EM. OBERD. 1957.  
Tabel 8. Asociația *Primulo-Caricetum curvulae* BR.-BL. 1926, EM. OBERD. 1957.

No. of relevée	1	2	3	4	5
Altitude	2100	2100	2150	2100	2100
Slope (degrees)	30	30	15	45	45
Exposure	S	S-V	S-V	N-V	N
General coverage (%)	65	50	60	40	50
Surface of relevée (sq.m.)	4	4	4	4	4
<b>Char. ass.</b>					
<i>Carex curvula</i>	3	3	3	2	3
<i>Primula minima</i>	2	1	2	2	1
<b>Caricion et Caricetalia curvulae</b>					

<i>Campanula alpina</i>	1	+	1	+	+
<i>Festuca airoidis</i>	+	1	+	+	+
<i>Agrostis rupestris</i>	+	+	.	.	+
<i>Primula minima</i>	+	+	+	+	.
<i>Sesleria coerulans</i>	.	+	.	.	+
<i>Phyteuma nanum</i>	+	.	.	+	+
<i>Luzula spicata</i>	.	.	+	+	.
<i>Oreochloa disticha</i>	+	+	.	.	.
<b>Juncetea trifidi</b>					
<i>Juncus trifidus</i>	+	.	+	+	.
<i>Hieracium alpinum</i>	+	+	+	.	+
<i>Pulsatilla alba</i>	.	.	.	+	+
<i>Minuartia sedoides</i>	+	.	.	+	.
<b>Variae Syntaxa</b>					
<i>Deschampsia flexuosa</i>	.	+	+	.	+
<i>Polygonum viviparum</i>	+	.	+	+	.
<i>Anthemis carpatica</i>	+	+	+	.	.
<i>Poa alpina</i>	.	.	.	+	+
<i>Dianthus glacialis</i>	+	.	+	.	+
<i>Silene acaulis</i>	+	+	.	+	+
<i>Potentilla ternata</i>	+	+	+	.	.
<i>Ligusticum mutellina</i>	.	.	+	.	+
<i>Pedicularis verticillata</i>	+	+	.	+	.

Place and date of survey – 1-3, Moldoveanu Lake, July 2010; 4-5, Galbena Mountain, July 2010.

Table 9. Ass. *Sphagno-Caricetum rostratae* STEFFEN 1931.  
Tabel 9. Asociația *Sphagno-Caricetum rostratae* STEFFEN 1931.

No. of relevée	1	2	3	4
Altitude	2000	2000	2100	2000
Slope (degrees)	10	15	10	10
Exposure	S	S	S	S
General coverage (%)	65	80	65	60
Surface of relevée (sq.m.)	4	4	4	4
<b>Char. ass.</b>				
<i>Sphagnum recurvum</i>	3	3	2	3
<i>Carex rostrata</i>	2	3	3	2
<b>Caricion et Caricetalia</b>				
<i>Carex echinata</i>	1	+	1	+
<i>Juncus triglumis</i>	+	.	+	+
<i>Cyperus fuscus</i>	.	+	+	.
<i>Epilobium palustre</i>	+	+	.	+
<i>Luzula spadicea</i>	+	.	+	+
<b>Sphagnetalia</b>				
<i>Eriophorum vaginatum</i>	+	+	+	.
<i>Polytrichum commune</i>	.	+	+	+
<b>Calthion</b>				
<i>Caltha palustris</i>	+	+	.	+
<i>Myosotis palustris</i>	+	+	+	+
<i>Crepis paludosa</i>	.	.	+	+
<b>Variae Syntaxa</b>				
<i>Luzula sudetica</i>	+	.	.	.
<i>Nardus stricta</i>	.	+	+	.
<i>Ranunculus repens</i>	.	+	+	+
<i>Homogyne alpina</i>	+	+	.	+
<i>Carex bryzoides</i>	+	.	+	.
<i>C. pallescens</i>	.	+	.	+
<i>Sphagnum palustrre</i>	+	+	+	.

Place and date of survey –Moldoveanu Lake, July 2010.

## CONCLUSIONS

There have been identified phytocoenoses belonging to nine associations. The area has been less studied, so we decided to start research in the summer of 2010. We will make a study over the communities settled down in and around the peat bog during the summer of 2011.

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