

STUDY ON FLORA AND VEGETATION OF THE PEAT BOG IN THE VALEA REA BUCKET, FĂGĂRAȘ MASSIF

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Abstract. The southeastern Carpathian peat bogs are a widespread habitat in the subalpine floor of the Făgăraș Mountains. They are found in the area of glacial lakes and on valleys and slopes near the streams. On the smooth plateau with excess moisture of the Valea Rea there is a peat bog on an area of about 1 ha. Located at the base of the Viștea Mare and Moldoveanu peaks, the Valea Rea Bucket, modulated by glaciers that dug into the rock of the mountain, sheltered a plateau on which the place of gravel is taken by a swamp area with the appearance of a small delta, with an area of about one kilometer square and several small lakes and islands of vegetation. On the left, the Valea Rea Bucket is guarded by the Galbena Mountain and Roșu Peak (2465 m), on the right by the Valea Rea Edge and in front by the Viștea Mare (2527 m) and Moldoveanu (2544) massive, Moldoveanu being the highest peak in the country. Under the Moldoveanu peak there is a large lake, the Triangular Lake of Moldoveanu, which received this name due to its shape. Located at 2159 m altitude, it is located at the top of the glacial bucket and is fed by underground springs. From the Triangular Lake of Moldoveanu (Iezerul Moldoveanu) the water flows through the Budurile Văii Rele, in the most spectacular waterfalls in this area, to the Valea Rea stream, the main tributary of the Doamnei River.

Keywords: peat bog, flora, vegetal associations, Valea Rea bucket, Făgăraș Massif.

Rezumat. Studiul florei și al vegetației mlaștinii din Găleata Văii Rele, Masivul Făgăraș. Turbăriile sud-est carpatice constituie un habitat răspândit în etajul subalpin din munții Făgăraș. Se întâlnesc în zona lacurilor glaciare și pe văi și versanți în vecinătatea pâraielor. Pe platoul lin cu exces de umiditate al Văii Rele se află o turbărie pe o suprafață de circa 1 ha. Situată la baza vârfulor Viștea Mare și Moldoveanu, Găleata Văii Rele, modulată de ghețarii care au săpat în roca muntelui, adăpostește un platou pe care locul pietrișului este luat de o zonă de mlaștină cu aspect de mică deltă, cu o suprafață de circa un kilometru pătrat și mai multe lacuri de mici dimensiuni și insule de vegetație. În stânga, Găleata Văii Rele este străjuită de Muntele Galbena și Vârful Roșu (2465 m), în dreapta de Muchia Văii Rele iar în față de masivele Viștea Mare (2527 m) și Moldoveanu (2544), Moldoveanu fiind cel mai înalt vârf din țară. Sub vârful Moldoveanu se află un lac mare, Iezerul Triunghiular al Moldoveanului care a primit această denumire datorită formei sale. Situat la 2159 m altitudine el se găsește în partea superioară a căldării glaciare și este alimentat de izvoare subterane. Din Iezerul Triunghiular al Moldoveanului (Iezerul Moldoveanu) apa se scurge prin Budurile Văii Rele, în cele mai spectaculoase cascade din această zonă, până în pâraul Valea Rea, principalul afluent al Râului Doamnei.

Cuvinte cheie: mlaștină, flora, asociații vegetale, Găleata Văii Rele, Masivul Făgăraș.

INTRODUCTION

Oligotrophic peat bogs (mud ponds), usually formed only on nutrient-poor supports, allow the development of only some species well adapted to an acidic pH and excess water. They occupy not very large areas, of the order of thousands of m² or hectares, being spread both in the boreal and in the subalpine floor and in the upper part of the forest floor (GAFTA & MONTFORD, 2008).

Peat bogs are not too numerous in our country (about 250) and they cover almost 1350 ha. Under the rather irregular cover of the moss (at a depth of a few cm to a few m) there is a peat formed from the dead parts of the moss and other plants preserved in the strong acid environment of the marsh. On the edges, a swampy ring arises from the drainage water.

Located at the base of Viștea Mare and Moldoveanu peaks, the Valea Rea Bucket, modulated by glaciers that dug into the rock of the mountain, sheltered a plateau on which the place of gravel is taken by a swamp area with the appearance of a small delta, with an area of about one kilometer square and several small lakes and islands of vegetation. On the left, the Valea Rea Bucket is guarded by the Galbena Mountain and Red Peak (2465 m), on the right by the Valea Rea Edge and in front by the Viștea Mare (2527 m) and Moldoveanu (2544) massive, Moldoveanu being the highest peak in the country.

Under the Moldoveanu peak there is a large lake, the Triangular Lake of Moldoveanu (Photo 1), which received this name due to its shape. Located at 2159 m altitude it is located at the top of the glacial bucket and is fed by underground springs. From the Triangular Lake of Moldoveanu (the Moldoveanu Lake) the water flows through the Buds of the Valea Rea, in the most spectacular waterfalls in this area, to the Valea Rea stream, the main tributary of the Doamnei River.

MATERIAL AND METHODS

The plant nomenclature follows Flora Europaea and CIOCĂRLAN, 2000. Synthesis works for Romanian vegetation, carried out by different authors or collectives of authors from Romania (COLDEA, 1991; SANDA et al., 2001) and the principles of Central European geobotanical school of surveying the vegetation (BRAUN-BLANQUET, 1964) were used to classify the association.



Photo 1. The Triangular Lake Moldoveanu – original.

RESULTS AND DISCUSSIONS

The south-eastern Carpathian peat lands are a widespread habitat in the subalpine floor of the Făgăraș Mountains. They are found in the area of glacial lakes and on valleys and slopes in the vicinity of streams. On the smooth plateau with excess moisture of Valea Rea there is a peat bog on an area of about 1 ha. The edifying moss species of the peat lands are *Sphagnum* genus (*S. fuscum* (Schimp.) H. Klinggr., *S. palustre* L.) which is associated with *Polytrichum* species (*P. commune* Hedw., *P. strictum* Bridel, J. Bot (Schradler) and other bryophytes, forming peat or tuff developed inside the small lakes (Photo 2) or on soils which are permanently saturated by water (Photo 3). There are many *Carex* species in the marginal swamp.

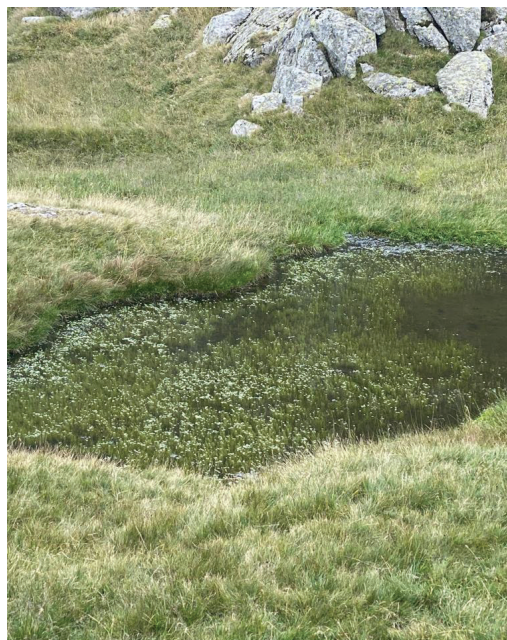
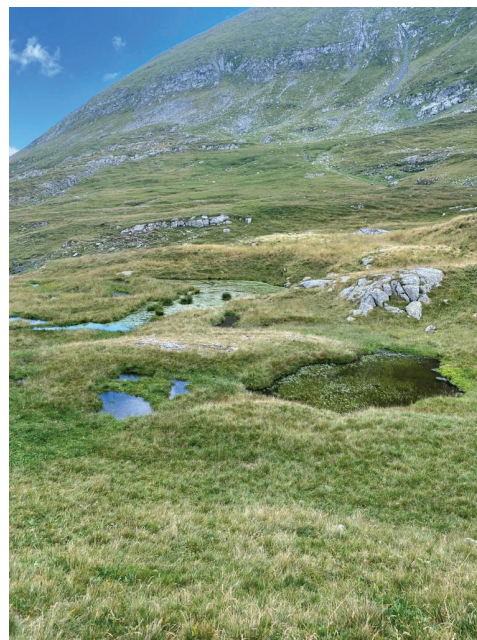
Photo 2. *Sphagnum* sp. inside the small lake – original.

Photo 3. The swamp in the Valea Rea bucket – original.

The peat land area is clearly marked in summer by the fruiting of *Eriophorum vaginatum* L. (Photo 4), so this habitat is easy to identify from July to September. Also, the presence of peat moss (*Sphagnum* sp., one of the few easily recognizable genera of bryophytes) is an almost certain indicator of the presence of this habitat. The flora is represented by *Achillea schurii* Schultz Bip., *Aconitum tauricum* Wulf., *Carex nigra* (L.) Reichard ssp. *dacica* (Heuffel) Soó, *Carex curta* Good., *Carex rostrata* Stokes, *Carex echinata* Murray, *Carex brizoides* L., *Caltha palustris* L., *Cardamine amara* L., *Cerastium cerastoides* (L.) Britton, *Chaerophyllum hirsutum* L., *Chrysosplenium alpinum* Schur, *Chrysosplenium alternifolium* L., *Crepis paludosa* (L.) Moench, *Cyperus fuscus* L., *Deschampsia caespitosa* (L.) Beauv., *Epilobium*

palustre L., *Epilobium nutans* F.W.Schmidt, *Eriophorum vaginatum* L., *Equisetum palustre* L., *Filipendula ulmaria* (L.) Maxim., *Homogyne alpina* (L.) Cass., *Juncus filiformis* L., *Juncus triglumis* L., *Juncus effusus* L., *Ligusticum mutellina* (L.) Crantz, *Luzula alpinopilosa* (Chaix) Breistr., *Luzula sudetica* (Willd.) Schultes, *Lychnis flos-cuculi* L., *Myosotis scorpioides* L., *Nardus stricta* L., *Parnasia palustris* L., *Phylonotis seriata* Mitt, *Plantago gentianoides* Sibth. et Sm., *Poa alpina* L., *Polygonum bistorta* L., *Potentilla erecta* (L.) Räsch., *Ranunculus repens* L., *Saxifraga stellaris* L., *Saxifraga aizoides* L., *Stellaria nemorum* L., *Stellaria uliginosa* Murray, *Silene pusilla* Waldst. et Kit., *Viola biflora* L., *Senecio subalpinus* Koch, *Soldanella hungarica* Simonkai ssp. *major* (Neilr.) S. Pawl., *Taraxacum alpinum* (Hoppe) Hagetschw., *Veratrum album* L.

The spectrum of ecological categories highlights the high share of meso-hygrophilous, cryophilic and acidophilic to euriionic species. Hemicriptophytes predominate in the spectrum of bioforms. The floristic elements with a high weight are the circumboreal species. In Romania, due to the accentuated variation of the relief, climate, soils, as well as the floral richness, a large number of vegetal associations are formed from almost all the phytosociological classes existing in Europe (DONIȚĂ et al., 2005). We identified the following vegetal associations in the studied territory:

Peat swamps:

Sphagno - Caricetum rostratae Steffen 1931

Swamps, peat bogs, springs and streams:

Carici dacicae – Plantaginetum gentianoidis Boșcaiu et al. 1972

Philonotido – Calthetum laetae (Krajina 1933) Coldea 1991

Chrysosplenio alpinii – Saxifragetum stellaris Pawl. et Walas 1949

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 and very acid. The edification species of this association are *Sphagnum palustre* L. and *Carex rostrata* Stokes (Table 1).

Table 1. Ass. *Sphagno - Caricetum rostratae* Steffen 1931.

No. of relevée	1	2	3	4
Altitude	2000	2000	2100	2100
Slope (degrees)	10	10	15	15
Exposure	S	S	S	S
General coverage (%)	75	75	60	65
Surface of relevée (sq.m.)	4	4	4	4
Char.ass.				
<i>Sphagnum palustre</i>	1	2	2	2
<i>Carex rostrata</i>	2	1	1	2
Caricion et Caricetalia				
<i>Carex echinata</i>	.	+	+	+
<i>Cyperus fuscus</i>	+	+	.	.
<i>Juncus triglumis</i>	+	.	+	.
<i>Epilobium palustre</i>	.	+	.	+
<i>Luzula alpinopilosa</i>	+	+	+	.
Sphagnetalia				
<i>Eriophorum vaginatum</i>	+	+	+	+
<i>Polytrichum comune</i>	+	+	.	+
Calthion				
<i>Caltha palustris</i>	.	+	+	+
<i>Polygonum bistorta</i>	+	.	.	+
<i>Myosotis scorpioides</i>	+	.	+	+
<i>Filipendula ulmaria</i>	.	.	+	.
<i>Crepis paludosa</i>	.	+	.	+
Variae syntaxa				
<i>Nardus stricta</i>	+	.	+	+
<i>Veratrum album</i>	.	+	.	+
<i>Ranunculus repens</i>	+	.	+	+
<i>Sphagnum palustre</i>	.	+	+	.
<i>Carex bryzoides</i>	.	+	.	+
<i>Homogyne alpina</i>	+	+	+	.
<i>Potentilla erecta</i>	.	.	.	+
<i>Chrysosplenium alternifolium</i>	+	+	.	.
<i>Luzula sudetica</i>	+	.	+	+

Place and date of survey – Valea Rea Bucket, August 2020

Ass. *Carici dacicae – Plantaginetum gentianoidis* Boșcaiu et al. 1972 - coenoses of *Carex nigra* (L.) Reichard ssp. *dacica* (Heuffel) Soó which grows near springs and on acid wetlands in the subalpine and alpine floor of the Făgăraș Mountains (Photo 5) are grouped in this endemic association for the south-eastern Carpathians. The association is formed due to the high groundwater level and does not occupy too large areas (Table 2).

Table 2. Ass. *Carici dacicae* – *Plantaginetum gentianoidis* Boşcaiu et al. 1972.

No. of relevée	1	2	3	4
Altitude	2000	2000	2100	2100
Slope (degrees)	10	10	15	15
Exposure	S	S	S	S
General coverage (%)	75	75	60	65
Surface of relevée (sq.m.)	4	4	4	4
Char.ass.				
<i>Carex nigra</i> ssp. <i>dacica</i>	3	3	3	2
<i>Plantago gentianoides</i>	3	3	2	2
Caricion et Caricetalia				
<i>Carex curta</i>	1	1	+	+
<i>Cyperus fuscus</i>	+	+	.	.
<i>Juncus filiformis</i>	1	+	+	+
Sphagnetalia				
<i>Eriophorum vaginatum</i>	1	1	+	+
<i>Polytrichum comunae</i>	+	+	+	+
Calthion				
<i>Caltha palustris</i>	+	.	.	+
<i>Polygonum bistorta</i>	.	+	+	.
<i>Myosotis scorpioides</i>	+	+	+	+
<i>Filipendula ulmaria</i>	.	+	.	+
<i>Crepis paludosa</i>	+	+	+	+
Variae syntaxa				
<i>Luzula sudetica</i>	+	+	.	+
<i>Nardus stricta</i>	+	+	+	+
<i>Taraxacum alpinum</i>	+	.	+	+
<i>Soldanella hungarica</i> ssp. <i>major</i>	+	+	.	.
<i>Epilobium nutans</i>	.	+	+	.
<i>Saxifraga stellaris</i>	+	.	+	.
<i>Philonotis seriata</i>	+	+	.	+
<i>Ligusticum mutellina</i>	.	.	+	.

Place and date of survey – Valea Rea Bucket, August 2020

Photo 4. *Eriophorum vaginatum* L. – original.

Photo 5. Stream near the swamp – original.

Ass. *Philonotido* – *Calthetum laetae* (Krajina 1933) Coldea 1991 - this association is encountered near the streams whose water flows easily on alluvial-colluvial soils, near the swamps on the Valea Rea plateau (Photo 6). The presence of rupicolous species such as *Carex nigra* (L.) Reichenbach ssp. *dacica* (Heuffel) Soó, *Carex echinata* Murray et *Juncus filiformis* L., indicates the syndynamic evolution of these coenoses towards associations of the order *Caricetalia nigrae* as the soil turbulence process progresses (Table 3).

Table 3. Ass. *Philonotido – Calthetum laetae* (Krajina 1933) Coldea 1991.

No. of relevée	1	2	3	4
Altitude	2000	2000	2100	2100
Slope (degrees)	10	10	15	15
Exposure	S	S	S	S
General coverage (%)	75	75	60	65
Surface of relevée (sq.m.)	4	4	4	4
Char.ass.				
<i>Phylonotis seriata</i>	3	3	3	2
<i>Chrysosplenium alternifolium</i>	1	1	1	1
Cardamino-Montion et Montio-Cardaminetalia				
<i>Caltha palustris</i>	4	4	4	3
<i>Cardamine amara</i>	+	+	.	.
<i>Saxifraga stellaris</i>	+	.	+	+
<i>Epilobium nutans</i>	+	.	.	+
<i>Stellaria uliginosa</i>	.	+	+	.
Adenostiletalia s.l.				
<i>Chaerophyllum hirsutum</i>	+	+	+	+
<i>Stellaria nemorum</i>	+	+	+	.
<i>Viola biflora</i>	+	+	.	+
<i>Veratrum album</i>	.	+	+	+
<i>Aconitum tauricum</i>	+	+	.	+
Variae syntaxa				
<i>Deschampsia caespitosa</i>	+	.	+	.
<i>Crepis paludosa</i>	.	+	.	+
<i>Cerastium cerastioides</i>	+	+	+	.
<i>Luzula alpinopilosa</i>	+	.	+	.
<i>Myosotis scorpioides</i>	+	+	.	+
<i>Poa alpina</i>	.	+	+	+
<i>Parnassia palustris</i>	+	.	.	.
<i>Plantago gentianoides</i>	+	+	+	.
<i>Juncus effusus</i>	+	.	.	+
<i>Ranunculus repens</i>	.	+	+	+
<i>Senecio subalpinus</i>	+	.	+	.
<i>Carex nigra ssp. dacica</i>	+	+	.	+
<i>Juncus filiformis</i>	.	+	+	.
<i>Equisetum palustre</i>	+	.	.	+

Place and date of survey – Valea Rea Bucket, August 2020

Photo 6. *Caltha palustris* L. – original.

Ass. *Chrysosplenio alpinii* – *Saxifragetum stellaris* Pawl. et Walas 1949 - the coenoses of this endemic association are most often found at the edge of springs and streams whose waters flow easily from the alpine and subalpine level. The increased requirements of these species in terms of humidity factor make the association become hydro-hygrophilous. In the studied area, these coenoses characterized the vegetation of springs and streams in the subalpine floor from acid to neutral substrate. The characteristic and edifying species are the Carpathian endemic *Chrysosplenium alpinum* Schur and the alpine element *Saxifraga stellaris* L. which marks a cover of 30-40%.

Table 4. Ass. *Chrysosplenio alpinii* – *Saxifragetum stellaris* Pawl. et Walas 1949.

No. of relevée	1	2	3	4	5
Altitude	2000	2000	2100	2100	2100
Slope (degrees)	10	10	15	15	15
Exposure	S	S	S	S	S
General coverage (%)	75	75	60	65	65
Surface of relevée (sq.m.)	4	4	4	4	4
Char.ass.					
<i>Chrysosplenium alpinum</i>	1	2	3	2	2
<i>Saxifraga stellaris</i>	2	3	3	2	2
Cratoneurion commutati					
<i>Silene pusilla</i>	1	1	+	+	1
<i>Saxifraga aizoides</i>	+	+	.	.	+
Cardamino-Montion et Montio-Cardaminetalia					
<i>Caltha palustris</i>	+	1	+	1	+
<i>Cardamine amara</i>	+	+	+	.	+
<i>Epilobium nutans</i>	.	+	.	+	.
Adenostyletalia					
<i>Chaerophyllum hirsutum</i>	+	.	+	.	.
<i>Stellaria nemorum</i>	+	+	+	+	+
<i>Viola biflora</i>	.	+	.	+	.
<i>Aconitum tauricum</i>	+	+	+	.	+
Variae syntaxa					
<i>Myosotis scorpioides</i>	+	.	+	+	.
<i>Deschampsia caespitosa</i>	.	+	.	+	.
<i>Cerastium cerastioides</i>	+	.	+	+	+
<i>Luzula alpinopilosa</i>	.	+	+	.	.
<i>Senecio subalpinus</i>	+	.	.	+	+
<i>Achillea schurii</i>	+	+	.	.	+
<i>Juncus triglumis</i>	.	+	+	+	.
<i>Carex echinata</i>	.	.	+	.	+
<i>Lychnis flos-cuculi</i>	+	+	.	+	.
<i>Senecio subalpinus</i>	+	.	+	+	+

Place and date of survey – Valea Rea Bucket, August 2020

CONCLUSIONS

The pressures on global biodiversity are intense. Over-exploitation, habitat destruction and modification and introduced species are resulting in unprecedented levels of native species extinction and decline. It is therefore vital to identify, to study, to value and above all to protect those parts of the Earth that make a particularly important contribution to global diversity. In our country, the Făgăraș Mountains have global conservation significance; a large number of native plant species and habitats are found here, many of which are endemic to the region. There is also a wide variety of bird and mammal species.

In order to contribute to the conservation of this ecosystem and its genetic diversity throughout its entire geographical area, it is necessary to protect and regenerate the marginal areas of low conservation value, which appeared as a result of degradation or deterioration due to leisure and tourism activities. These habitats which contain protected species, relict species, endemic species are threatened by numerous negative anthropogenic impacts.

Interdiction measures must be enforced depending on the impact factors, with the human factor being the most destructive.

Following the trips in the region, we noticed that grazing does affect the swampy area, the route of the animals being inside the studied area. In the studied area, the paths created by tourists inside the swampy area are not so numerous, so that the habitats can be saved from extinction. Knowing the different habitat types, their distribution and extent is very important to develop a management plan for the Făgăraș Mountains.

This plan is necessary to improve the conservation status of habitats and species through a series of strategic actions following the increasing ecological database. All this will lead to the protection of the swampy area and implicitly of the habitats in the region.

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Received: April 5, 2021

Accepted: July 23, 2021