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PHYTOCOENOLOGICAL STUDIES ON OLIGOTROPH PEAT BOG OF BIHORULUI MOUNTAINS

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ABSTRACT. The oligotrophic peat bog of Bihorului Mountains are quartered in the valleys with northern exposure, of siliceous substrate, forming habitats with high conservation value, which are home to over 10 rare relict species. The phytocoenosis of the associations *Sphagnetum magellanici, Sphagno cuspidati – Rhynchosporetum albae, Caricetum limosae* were analyzed by us in terms of floristic composition, ecological spectra of the type of life forms and floral elements, in terms of chart ecological factors: moisture, soil temperature and chemical reaction.

Keywords: phytocoenosis, association, peat bog, life forms, floristic elements, glacial relicts, brook Bătrâna, Călineasa plane, Bihorului Mountains

INTRODUCTION

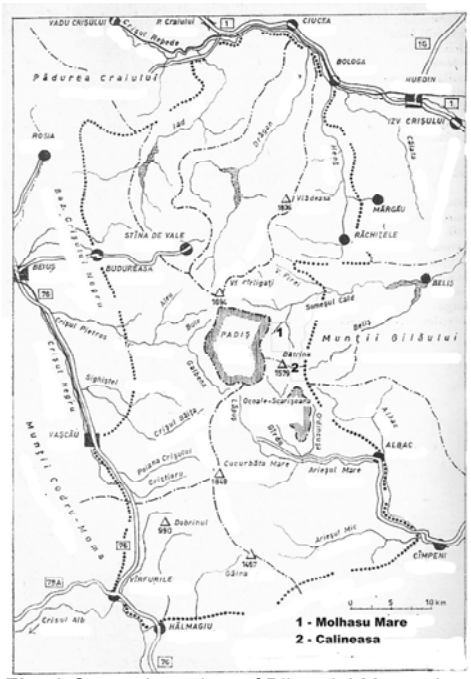

Fig. 1 General preview of Bihorului Mountains

Under the general scheme of the Apuseni Mountains, Bihorului Mountains (Figure 1) occupy a central position, forming the core of which is undoing orographic radial main branches of the Apuseni Mountains. Meanwhile, Bihorului Mountains is also a hydrographic center of major rivers that start divergent - Crişul Repede River at north to west, Someşul Cald River to east, Arieşul River at south to east and Crişul Negru River to west. The peculiarity of these mountains is the presence of closed basins in the central area, developed through a complicated set of non-karstificable rocks (conglomerates, sandstones, purple shale) and karstificable, with underground drainage.

The climate of Bihorului Mountains is generally wet and cold; the vertical layer is manifested in all determinants of climate. Average annual air temperature is 2ºC in the northern and southern parts and 4ºC in the central limestone platform. In January, average air temperature is -7°C in the high mountains and -3ºC in the valleys, while in July the average temperature recorded 10°C. The prevailing wind is western, bringing rain and causing a large number of cloudy days. Annual rainfall in the highlands of Bihorului Mountains exceeds 1400 mm; the maximum amount in our country is found only in much higher mountains (Rodnei, Făgăraş and Retezat). For foothills, fall from an annual average rainfall of 800 mm.

These phenomena, combined with rock and terrain features that provide detailed changes and reversals due to local disturbance of the basement, climate and topography, have an important role in the distribution of vegetation in the Bihorului Mountains. Here are found very different plant species, some of the elements present on steep rock with southern exposition, are relicts of some hot climates, the tertiary, while others present in peat bog developed on the springs of northern valleys are relicts of cold climates, in times of glaciations age.

The peat bog from Bihorului Mountains, locally called "molhaş", develops in the valleys of springs of the Bătrâna, Călineasa, Trânghieşti, Someşul Cald rivers, located in the northern lowlands or with northern exposure. The peat bog of Molhasul Mare area develops in the stream of Bătrâna on Izbucu Mare and Izbucu Mic springs, in a micro-U-shaped valley at an altitude of about 1050 m, over an area of about 80 ha. The peat bog from Valea Călineasa spring develops a plateau in northern exposure at an altitude of 1430 m, over an area of about 2-3 meters.

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MATERIALS AND METHODS

The study of peat bog from Bihorului Mountains have used research methods of the Central European Phytosociology School based on the principles and methodology developed by (Braun-Blanquet, 1926) and adapted by (Borza, 1934; Borza, Boşcaiu, 1965) in particular vegetation cover in our country.

Phytosociology mappings made during the four study visits at the peat bog of Izbucul Călinesei, on Călineasa plateau, and spring area of the brook Bătrâna during August-September 2009, included areas of homogeneous floristic and physiognomic evidence, which were chosen in the characteristic fragments of the studied phytocoenosis, their size ranging from 8 to 100 m2.

Quantitative assessment of the participation of each species to describe associations was with the index of abundance - dominance (AD) after the evaluation system developed by (Braun-Blanquet, Pavillard, 1928). Association table contains information on species within the floristic composition of the association, life forms, floristic elements, ecological indices (moisture, temperature, chemical reaction of the soil), serial number of the mapping, altitude (MSM), exposition, inclination (degrees), the consistency of forest stands (%) herbaceous layer cover (%) area (m2), place and date of reports. At the end of the table was entered and was calculated constant (K) whose classes ranging from I to V expresses the degree of coenotic fidelity of each species to environment of phytocoenosis of the associations.

For completion of the environmental study of the association, we have represented graphically the distribution of life forms, floristic elements and ecological factors.

RESULTS AND DISCUSSIONS

Following field studies made in 2009 and investigations carried out by us on peat bog of the head of the Bătrâna brook (Bihor County, fig.2) and of the plateau of Izbucul Călineasa Valley (Alba County, fig.3), we identified a total of three associations: Sphagnetum magellanici, Sphagno cuspidati – Rhynchosporetum albae, Caricetum limosae, whose results on floristic composition and ecological analysis we present below.

Fig. 2 Aspects from peat bog of Molhaşul Mare on Bătrâna brook (photo: Togor G., 2009)

Fig. 3 Aspects from peat bog of the plateau of Izbucul Călineasa Valley (photo: Togor G., 2009)

1. Association ***Sphagnetum magellanici*** (Malcuit 1929) Kästner and Flössner 1933 (Syn.: *Eriophoro vaginati – Sphagnetum* I.Pop et.al 1987) *pinetosum mugi* Coldea, Plămadă 1989.

This association is mentioned in several location of the Eastern Carpathians (Gutâi, Bistriţei, Harghita, Bodoc, Vrancei) by (Coldea, Plămadă 1989), Gutâi Mountains - Izvoarele peatland by (Raţiu, Moldovan, 1972) and in the Western Carpathian Mountains, Bihorului Mountains - Izbucul Mare peatland by (Coldea, Plămadă, 1970; Coldea, Plămadă, 1980; Coldea, Plămadă, 1989; Coldea, Plămadă, Bartok, 1977; Coldea, Plămadă, Wagner, 1997; Pop, Hodişan, Cristea, 1987).

On the European continent, the phytocoenosis of this association are spread from Western Europe in peatlands of the Black Forest of Germany (Dierssen, 1977; Dierssen K., Reichelt, 1988), in the peatlands of the Romanian Carpathians, which is the south-eastern limit of the geographical distribution area.

In the Bihorului Mountains this association has been identified by us in peatlands of the Molhaşul Mare from the head of Bătrâna brook (Bihor county) and the karst spring Călineasa Valley, on Călineasa plateau (Alba County), both tributaries of the right of the Someşul Cald River.

The paludous phytocoenosis of the association *Sphagnetum magellanici* develop priority in the central area of oligotroph bogs studied by us, where there is excess moisture, giving rise to deposits 2-5 m thick peat soil and less to marginal zone, which is slightly summer. These phytocoenosis peat layer has a low mineral salts (1-1.5%) and a chemical reaction strongly acidic (pH = 3.5–4.8).

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Due to extreme climatic conditions (strong acid chemical reaction, the average annual temperature of 2ºC to 3°C, excess moisture), floristic composition of this association is confined to a small number of plants: 20 vascular plant species, representing 76% of flora inventory species and 6 bryophytes (muscle of the genera *Sphagnum, Polytrichum, Pleurozium*) representing 24% of the flora of peat (Table 1).

Physiognomy of the association is given by *Sphagnum magellanicum* (with a high constant - K = IV, poor coverage in our mapped places, 0.5%), dominant and characteristic species of phytocoenosis of peat from Central Europe (Dierssen, 1977; Feldmeyer, 1985; Kaule, 1973; Neuhausl, 1972) and by *Sphagnum fuscum* with lush growth, forming thick layers of 3-5 m, constant maximum K = V, covering 80% of phytocoenosis of peat identified by us in Bihorului Mountains in northwestern Romania, with whom reappear to a small area in 2 mapping (with K = II, coverage 0.5%) the Mountain Pine (*Pinus mugo*) as differential species of the sub-association *pinetosum mugo* Coldea, Plamada 1989.

In the phytocoenosis of the peat described from Central Europe (Dierssen, 1977; Neuhausl, 1972), the populations of *Pinus rotundata* are prevalent in trees layer, while *Pinus mugo* occurs sporadically or missing. The phytocoenosis of the Romanian peats are the sole enlightening in the shrub layer *Pinus mugo*, in the herbaceous layer *Eriophorum vaginatum*, *Carex pauciflora*, *Empetrum nigrum*, *Andromeda polifolia*, *Oxycoccus palustris*, with an average coverage of 70%, in moss layer *Sphagnum magellanicum*, *Sphagnum fuscum*, *Sphagnum fallax*, *Sphagnum angustifolium* with an average coverage of 80%.

In the floristic structure is distinguished hygrophilous and mezo-hygrophilous species characteristic to the alliance ***Sphagnion magellanici***, *Eriophorum vaginatum, Carex pauciflora, Empetrum nigrum*, to the order ***Sphagnetalia magellanici***, the class ***Oxycocco-Sphagnetea*** *– Andromeda polifolia, Oxycoccus palustris, Oxycoccus microcarpus, Drosera rotundifolia, Carex echinata, Carex rostrata, Juncus alpinus*. In this oligotroph and ombrogenous association a small number of transgressive species entering from the class ***Vaccinio – Piceetea***: *Vaccinium myrtillus, Vaccinium vitis-idaea, Picea abies, Calluna vulgaris, Melampyrum sylvaticum.*

Diagram ecological factors (Figure 3) highlight the preponderant participation in the referred association the hygrophilous species (U_5 = 40%) followed by the mezo-hygrophilous ($U_{4-4.5}$ = 15%), expression of a resort with a permanent excess of water. As most species are thermally microtherm ($T_{2-2,5}$ = 45%), equal to the amphitolerant (T_0 = 45%), expression of a microclimate with very cold ecotop (a short summer, cold, wet favorable physiological plant development, followed by a long winter, frosty, snowy, the species is in standby). Depending on the chemical reaction of the soil, most species are strongly acidophilic (R_1 = 45%), followed by ion amphitolerant (R_0 = 30%) and acidophilic (R_2 = 20%) expression of the colonization of peaty soils located acid substrate, peat moss accumulated in deposit not decompose but induce a greater acidity.

In the spectrum of the life forms (Fig.4) are found in large percentage the hemicryptophytes (H = 40%) followed by camephytes (Ch = 25%), reflecting a habitat that gives them the best living conditions and where they feel protected against the extreme conditions (during the summer heat, frost snowy winter) and they provide a constant fluid balance throughout the growing season.

In terms of floristic elements (Fig. 5) the predominant species are circumpolar (Cp = 60%) followed by the circumpolar-boreal and European-alpine (E (ALP) + Bor = 15%) signifying an ecotop with a very cold and humid microclimate similar at the oligotroph and ombrogene of postglacial marshes, which have found refuge until today, some species with arctic and circumpolar-boreal origin, called glacial relicts.

The importance of association ***Sphagnetum magellanici*** (Malcuit 1929) Kästner et Flössner 1933.

Because the peat bog are poor nutritional mineral substances and chemical reaction is highly acidic, they have a poor flora and monotonous, with predominance of the bryophyte generating the genus *Sphagnum* peat.

The peat of the peat bog generated phytocoenosis which are oligotroph, hygrophilous, microtherm and strongly acidophilic, has multiple uses in the energy industry, chemical, pharmaceutical (therapeutic mud) in a mixture of soil for plant pots, in preparing nutritious substrate for cultivated mushrooms etc.

Due to high acidity, the thickness of peat layer (2-6 m) which was formed along the millennia, the peat bog have importance phytohistorical, phytogeographic, in the conservation of paleohistory information (preservation of pollen grains), allowing us rebuild the evolution of flora and local vegetation.

It is an association with many rare and relict species, representing remnants of the glacial period *Carex pauciflora, Empetrum nigrum, Andromeda polifolia, Oxycoccus palustris, Oxycoccus microcarpus, Drosera rotundifolia*, which is why it must be effectively protected and free of any exploitation.

2. Association ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926

It is an extremely rare association whose phytocoenosis were described only a few oligotroph marshes in Bihorului Mountains to the Molhaşul Mare, in Vladeasa Mountains to Călăţele by (Coldea, Plămadă, 1970), in Făgăraş Mountains to the Mlaca Tătarilor, swamp Arpaşu de Sus by (Coldea, 1981; Coldea, Plămadă, 1980). Paludous oligotroph phytocoenosis of the association ***Sphagno cuspidati – Rhynchosporetum albae*** were identified by us as vegetating within lakes clogged the head of the Bătrâna brook, on Izbucul Mare, right tributary of the Someşul

Cald River (Bihor County). These lakes have a small area and water depth is only 5.7 cm in early summer and dry in autumn or very dry periods. The water of these lakes is poor in mineral nutrients and substances are a chemical reaction strongly acidic (pH 3.5-5).

Table 1

As. *Sphagnetum magellanici* (Malcuit 1929) Kästner et Flössner 1933 (Syn.: *Eriophoro vaginati – Sphagnetum* Pop I. et. al 1987) *pinetosum* mugi Coldea, Plămadă 1989

Life form	F.e	U	T	R	Mapping	1	2	3	4	5	6	7	8	K
					Altitude (m.s.m)	1050	1050	1050	1050	1050	1050	1430	1430	
					Surface (m^2)	100	6	6	100	100	100	100	100	
					Coverage (%)	70	60	60	80	40	80	80	80	
H	Cp (bor)	4.5	0	1.5	*As.Eriophorum vaginatum*	+	+	+	1	+	1	1	1	V
					As.Sphagnum fuscum	4	4	5	4	5	5	4	5	V
MPh	E(alp)	0	2	0	*Subas. Pinus mugo*	.	.	.	.	+	+	.	.	II
					Sphagnion magellanici									
					Sphagnum magellanicum	1	+	+	+	+	+	.	.	IV
					Sphagnum fallax	+	+	+	.	.	.	1	+	III
					Sphagnum angustifolium	1	.	+	.	+	+	.	.	III
H	Cp (bor)	5	2.5	1	*Carex pauciflora*	+	1	2	2	1	2	.	.	IV
nPh	Cp (arct-alp)	3.5	0	0	*Empetrum nigrum*	+	+	1	2	1	2	3	2	V
					Sphagnetalia magellanici, Oxycocco - Sphagnetea									
Ch	Cp (bor)	5	2.1	1	*Andromeda polifolia*	4	2	1	2	2	3	.	.	IV
Ch	Cp (bor)	5	0	2	*Oxycoccus palustris*	1	.	2	2	+	+	+	1	V
Ch	Bor	5	0	2	*Oxycoccus microcarpus*	+	.	+	.	.	.	.	+	II
H	Cp (bor)	5	2.5	1	*Drosera rotundifolia*	+	2	1	+	+	+	.	.	IV
					Polytrichum strictum	+	.	+	.	1	+	+	1	IV
H	Cp (bor)	5	2	1	*Carex echinata (Carex stellulata)*	.	.	.	.	.	.	+	+	II
Hh	Cp (bor)	5	2	0	*Carex rostrata*	.	.	+	.	.	.	+	1	II
H	Cp (bor)	4	2	2	*Juncus alpinus*	.	.	.	.	.	.	+	.	I
					Vaccinio – Piceetea									
nPh	Cp (bor)	0	2	1	*Vaccinium myrtillus*	+	.	.	.	.	.	1	.	II
Ch	Cp (bor)	3	2	1	*Vaccinium vitis-idaea*	+	.	.	.	.	.	2	1	II
Ch	Atl (Ec)	0	0	1	*Calluna vulgaris*	.	2	1	1	.	.	1	3	IV
Th	Eua (mont)	3	0	1.5	*Melampyrum sylvaticum*	.	.	.	.	.	.	+	+	II
MPh	E	0	0	0	*Picea abies*	+	.	+	+	.	.	1	1	IV
					Pleurozium schreberi	.	.	.	.	.	.	+	+	II
					Variae Syntaxa									
H	Eua	4	3	0	*Molinia caerulea*	.	.	.	+	.	+	.	.	II
H	Eua	3.5	3	3	*Agrostis canina*	.	.	.	.	.	.	+	+	II
Th-TH	Cosm	3.5	0	0	*Poa annua ssp.varia*	.	.	.	.	.	.	+	.	I
H	Cp (bor)	5	0	2	*Epilobium palustre*	.	.	.	.	.	.	+	+	II

Location and date: 1-2 Peatland Molhaşul Mare, on the brook Bătrâna - left bank, 25.08.2009, 3-4 Peatland Molhaşul Mare, on the brook Bătrâna - right bank, 25.08.2009, 5-6 Lake on peatland Molhaşul Mare, on the brook Bătrâna 08.10.2009; 7-8 Peatland Călineasa on the Călineasa Plateau 30.09.2009

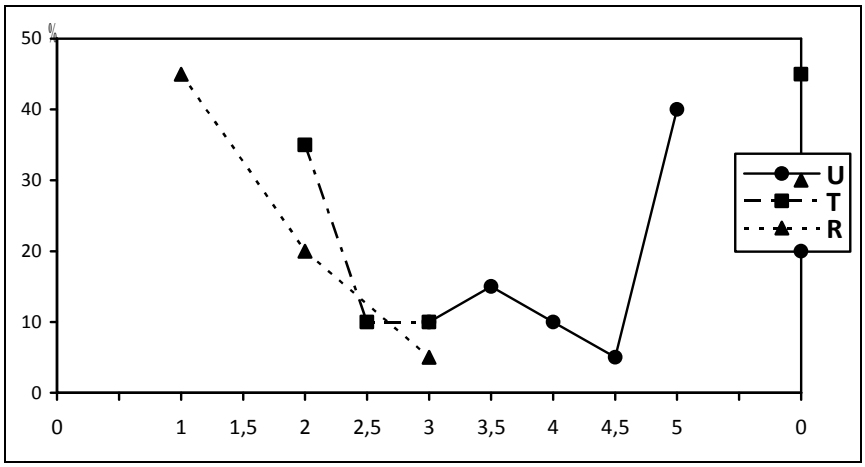

Fig. 3 Diagram of ecological factors of ass.Sphagnetum magellanici (Malcuit 1929) Kästner et Flössner 1933 (Syn.: Eriophoro vaginati – Sphagnetum I.Pop et.al 1987) pinetosum mugi Coldea, Plămadă 1989

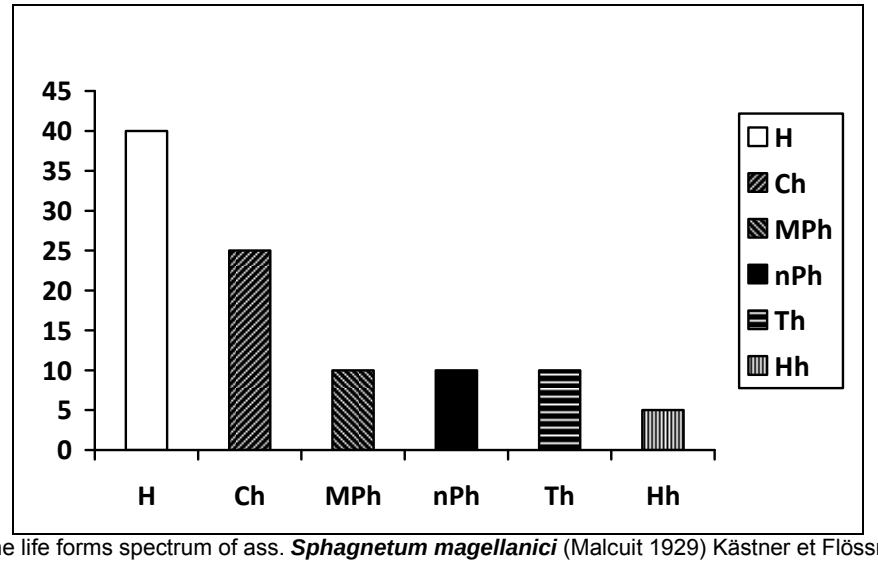

Fig. 4 The life forms spectrum of ass. ***Sphagnetum magellanici*** (Malcuit 1929) Kästner et Flössner 1933 (Syn.: *Eriophoro vaginati – Sphagnetum* I.Pop et.al 1987) *pinetosum mugi* Coldea, Plămadă 1989

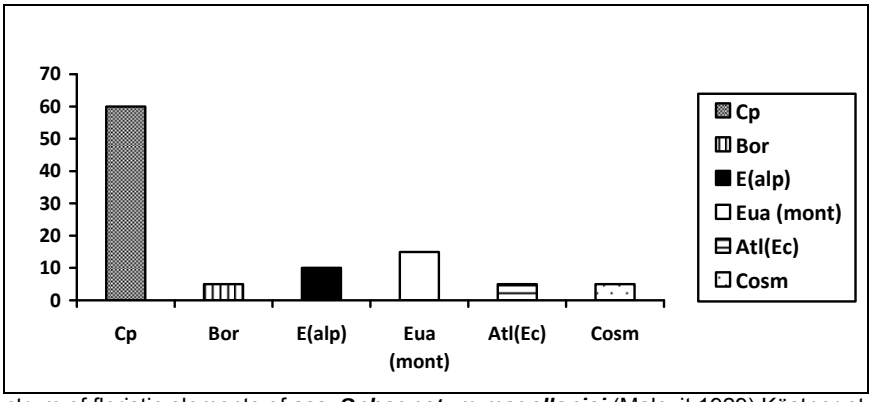

Fig. 5 The spectrum of floristic elements of ass. ***Sphagnetum magellanici*** (Malcuit 1929) Kästner et Flössner 1933 (Syn.: *Eriophoro vaginati – Sphagnetum* I.Pop et.al 1987) *pinetosum mugi* Coldea, Plămadă 1989

Analyzed in terms of flora and ecology, the phytocoenosis of *Rhynchospora alba* in the Romanian Carpathians belong to two sub-associations: **typicum** (Osvald 1923) Dierssen et Reichelt 1988, with low-grade differential species for the class **Scheuchzerio–Caricetea nigrae** yet rich in oligotroph diagnosis species of the order **Sphagnetalia**, class **Oxycocco–Sphagnetea**. Its sub-association that they belong, and

we identified their phytocoenosis in Bihorului Mountains, which resemble those of Central Europe described by (Braun, 1970; Dierschke, 1979; Oberdorfer, 1977; Rybnicek, 1970; Rybnicek, 1974), while the phytocoenosis located in the sub-mountain area of the Făgăraş Mountains - Mlaca Tătarului are of mezotrophic character and they belong to the sub-association **caricetosum echinata** Coldea 1981, with the differential species on *Carex echinata, Carex nigra, Agrostis canina*.

Because of reduced surface of the lakes that are invariably advanced sealing process, the extreme conditions of life resulting from a mountain top floor habitat with a very cold and humid micro-climate, the phytocoenosis of this association amounts to (Table 2) vascular plant a total of 10 species (73%) and 4 species bryophytes (27%). Physiognomy of the association is printed by *Rhynchospora alba*, the maximum constant (K = V) in herbaceous layer synusia, species whose average coverage amounts to 60% and *Sphagnum cuspidatum* with the maximum constancy (K = V), located in moss layer synusia, whose species account for an average coverage of 75%. Both species are telling co-dominant report.

In the floristic composition of the five mappings made by us is distinguished hygrophilous species, characteristic of the alliance, order and class ***Rhynchosporion albae, Scheuchzerio–Caricetalia nigrae, Scheuchzerio–Caricetea nigrae***: *Carex limosa, Drosera rotundifolia, Scheuchzeria palustris, Eriophorum scheuchzeri, Sphagnum angustifolium*. In this relict association penetrate a significant number of oligotroph species, transgressive from class ***Oxycocco–Sphagnetea***: *Eriophorum vaginatum, Andromeda polifolia, Empetrum nigrum, Oxycoccus microcarpus, Carex pauciflora*.

Table 2

Ass. ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926

L.f.	F.e.	U	T	R	Mapping	1	2	3	4	5	K
					Altitude (m.s.m)	1050	1050	1050	1050	1050	
					Surface (m^2)	25	25	25	12	16	
					Coverage (%)	45	65	70	70	45	
H	Eua	5	0	2	*As. Rhynchospora alba*	3	4	4	2	3	V
					As. Sphagnum cuspidatum	4	5	5	4	4	V
					Rhynchosporion albae, Scheuchzerio-Caricetalia nigrae, Scheuchzerio-Caricetea nigrae						
H	Cp(bor)	5	2	1.5	*Carex limosa*	1	+	+	1	1	V
H	Cp(bor)	5	2.5	1	*Drosera rotundifolia*	+	+	+	+	+	V
G	Cp(bor)	5	2.5	2	*Scheuchzeria palustris*	.	.	.	1	+	II
H	Cp(arct-alp)				*Eriophorum scheuchzeri*	.	+	.	+	.	II
					Sphagnum angustifolium	.	.	+	.	+	II
					Oxycocco – Sphagnetea						
H	Cp(bor)	4.5			*Eriophorum vaginatum*	+	+	+	+	+	V
Ch	Cp(bor)	5	2.1	1	*Andromeda polifolia*	.	.	1	1	+	III
nPh	Cp(arct-alp)	3.5	0	0	*Empetrum nigrum*	.	.	.	.	+	I
Ch	Bor	5	0	2	*Oxycoccus microcarpus*	.	.	.	.	+	I
H	Cp(bor)	5	2.5	1	*Carex pauciflora*	+	.	.	+	+	III
					Polytrichum strictum	+	+	.	.	+	III
					Sphagnum magellanicum	+	+	.	.	.	II

Note: Locality and date: 1-2 Lake Molhaşul Mare, to the Observer, 8.10.2009; 3-5 Lake Molhaşul Mare, to the Bătrâna brook, 8.10.2009

Diagram ecological factors (fig. 6) record the overwhelming dominance of hygrophilous species (U_5 = 80%), followed by the mezo-hygrophilous ($U_{4,\ 5}$ = 10%). As to heat, most species in the pool are microtherm ($T_{2\text{-}2,\ 5}$ = 50%) followed by heat amphitolerant (T_0 = 40%) and cryophilic (T_1 = 10%), with an expression of an ecotop very cold and humid microclimate. Compared to the chemical reaction of the soil, most species of the association are strongly acidophilic (R_1 = 50%) followed by acidophilic species (R_2 = 40%), expression of peaty soils located on acid substrate, the peat moss is not decomposed but accumulates each year and cause great acidity.

Spectrum of life forms (Fig. 7) shows the overwhelming dominance of hemicryptophytes (60%), large distance followed by camephytes (20%).

The spectrum of floristic elements (fig. 8) shows the categorically dominance of the circumpolar species (Cp = 80%) followed by the circumpolar-boreal (Bor = 10%), expression of a very cold and humid micro-climate, in a somewhat similar to that of the oligotroph and ombrogenous marshes of postglacial.

The importance of ass. ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926 It is a relict association, surviving in this land from the post-glacial period. Because it is composed by a large number of rare and relict species (*Rhynchospora alba*,

Carex limosa, Drosera rotundifolia, Scheuchzeria palustris, Andromeda polifolia, Empetrum nigrum, Oxycoccus microcarpus, Carex pauciflora) it must be effectively protected with its natural environment.

3. Association ***Caricetum limosae*** Br.-Bl.1921 (*Syn.: Carici limosae–Sphagnetum* Resmeriţă 1973)

It is a rare association in our country, whose phytocoenosis were identified and analyzed in several oligotroph mountain swamps (900-1100 m) of the Eastern Carpathians Mountains (Gutâi, Maramureş, Rodna, Călimani, Harghita, Bodoc) by (Coldea, Plămadă, 1970; Coldea, Plămadă, Bartok, 1977; Raţiu, Moldovan, 1972), the Western Carpathians (Bihorului, Gilău) by (Coldea, Marchievici, 1978; Pop, Hodişan, Cristea, 1987).

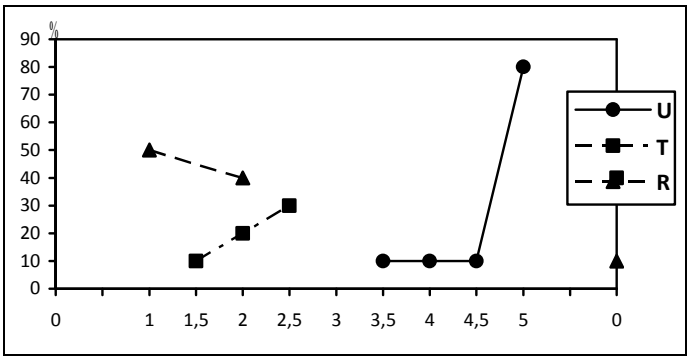

Fig. 6 Diagram of ecological factors of ass. ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926

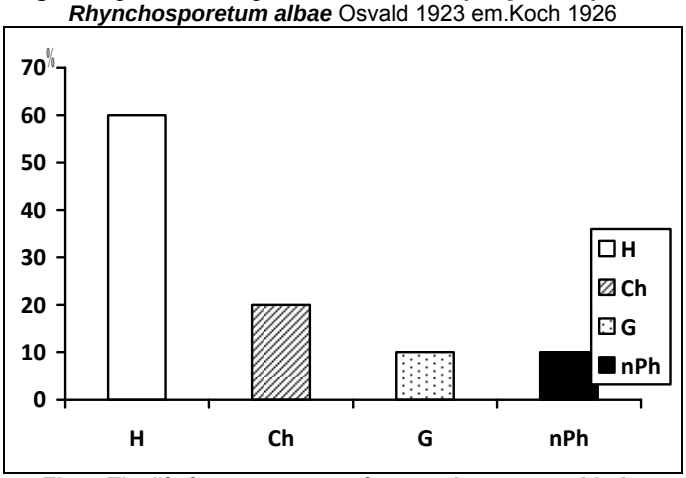

Fig. 7 The life forms spectrum of ass. ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926

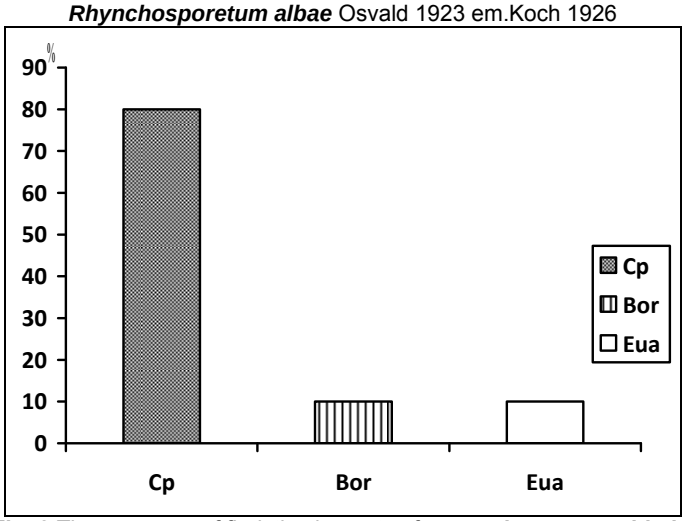

Fig. 8 The spectrum of floristic elements of ass. ***Sphagno cuspidati – Rhynchosporetum albae*** Osvald 1923 em.Koch 1926

Paludous, oligotroph phytocoenosis of this association have been identified by us in Bihorului Mountains, as vegetating in shallow (10-15 cm), highly acidic (pH 3.5-4.2), poor nutritional mineral substances in the lakes the head of the Bătrâna brook, on Izbucul Mare Valley (Bihor County), known as well as "Molhaşul Mare de la Izbuce". The phytocoenosis of this association amounts to the floristic inventory we conducted a total of 12 vascular plant species (75%) and 4 bryophytes species (25%). Physiognomy of the association is given the characteristic species *Carex limosa* with an average coverage of 50%, constant maximum (K = V), located in herbaceous layer synusia and the species *Sphagnum cuspidatum* telling the media coverage of 60%, constant maximum (K = V) in moss layer synusia.

Table 3

Ass. *Caricetum limosae* Br.-Bl.1921 (*Syn.: Carici limosae – Sphagnetum* Resmeriţă 1973)

L.f.	F.e.	U	T	R	Mapping	1	2	3	4	5	K
					Altitude (m.s.m)	1050	1050	1050	1050	1050	
					Surface (m^2)	25	50	100	8	8	
					Coverage (%)	65	65	45	40	40	
H	Cp(bor)	5	2	1.5	As. *Carex limosa*	4	4	3	3	3	V
					Rhynchosporion albae, Scheuchzerio – Caricetalia, Scheuchzerio – Caricetea						
H	Cp(bor)	5	2.5	1	*Drosera rotundifolia*	+	+	+	+	+	V
Ch	Cp(bor)	5	2.5	1	*Lycopodium inundatum*	.	.	.	.	+	V
					Sphagnum cuspidatum	4	1	5	5	4	V
					Sphagnum rusowii	+	.	1	.	+	III
H	Cp(arct-alp)	5	1.5	2.5	*Eriophorum scheuchzeri*	.	.	+	.	.	I
					Oxycocco – Sphagnetea						
H	Cp(bor)	5	2.5	1	*Carex pauciflora*	+	+	1	+	.	IV
H	Cp(bor)	4.5	0	1.5	*Eriophorum vaginatum*	.	.	+	.	+	II
Ch	Cp(bor)	5	2.1	1	*Andromeda polifolia*	+	+	.	.	.	II
nPh	Cp(arct-alp)	3.5	0	0	*Empetrum nigrum*	.	+	.	+	.	II
Ch	Cp(bor)	5	0	2	*Oxycoccus palustris*	.	.	.	.	+	I
Ch	Bor	5	0	2	*Oxycoccus microcarpus*	+	.	.	.	.	I
					Polytrichum strictum	+	+	+	.	.	III
					Sphagnum magellanicum	+	.	+	.	.	II
					Variae Syntaxa						
H	Cp(bor)	5	2	0	*Carex rostrata*	.	.	.	+	.	I
H	Eua	4	3	0	*Molinia caerulea*	.	.	.	.	+	I

Locality and date: 1-2 Lake Molhaşul Mare, to Observer, 8.10.2009; 3-5 Lake Molhaşul Mare, to Bătrâna brook, 8.10.2009

In the floristic composition of the five mappings (Table 3) made by us in field, is distinguished the differential species for the alliance, order, class ***Rhynchosporion albae, Scheuchzerio–Caricetalia, Scheuchzerio–Caricetea***: *Drosera rotundifolia, Lycopodium inundatum, Eriophorum scheuchzeri, Sphagnum cuspidatum, Sphagnum rusowii.* In the referred association, they are held a number of six glacial relict species, transgressive from class ***Oxycocco–Sphagnetea***: *Carex pauciflora, Andromeda polifolia, Empetrum nigrum, Oxycoccus palustris, Oxycoccus microcarpus, Eriophorum vaginatum*, which suggests the development of this association to phytocoenosis of alliance ***Sphagnion magellanici***, similar to phytocoenosis that described in Central Europe by (Bartech, 1940; Braun, 1968; Duvigneaud, 1949; Géhu, Richard, Tüxen, 1972; Krisai, 1971/1972; Phillipi, 1977).

Specific ecological conditions of life (Figure 9) print to the association an authoritarian hygrophilous character (U_5=75%), to weak mezo-hygrophilous ($U_{4\text{-}4,5}$=16.6%). Compared to temperature, the present species are micro-therm ($T_{2\text{-}2,5}$=50%), followed by heat amphitolerant (T_0=33.3%), thus signifying the membership to an ecotop very cold and humid micro-climate. Regarding the chemical reaction of the soil, the dominant species are strong acidophilic (R_1=50%), followed by acidophilic (R_2=25%) and amphitolerant (R_0=25%).

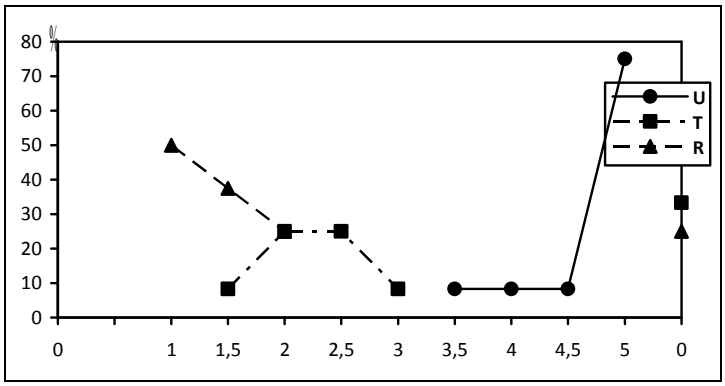

Fig. 9 Diagram of the ecological factors of ass. *Caricetum limosae* Br.-Bl.1921 (*Syn.: Carici limosae – Sphagnetum* Resmeriţă 1973)

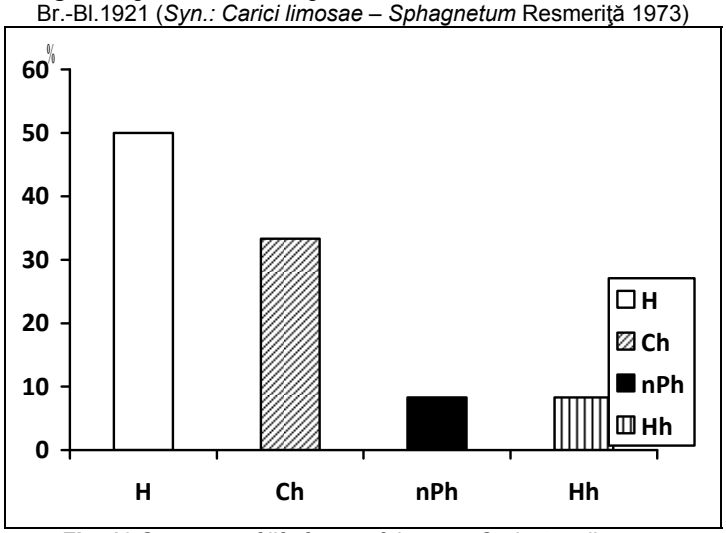

Fig. 10 Spectrum of life forms of the ass. *Caricetum limosae* Br.-Bl.1921 (*Syn.: Carici limosae – Sphagnetum* Resmeriţă 1973)

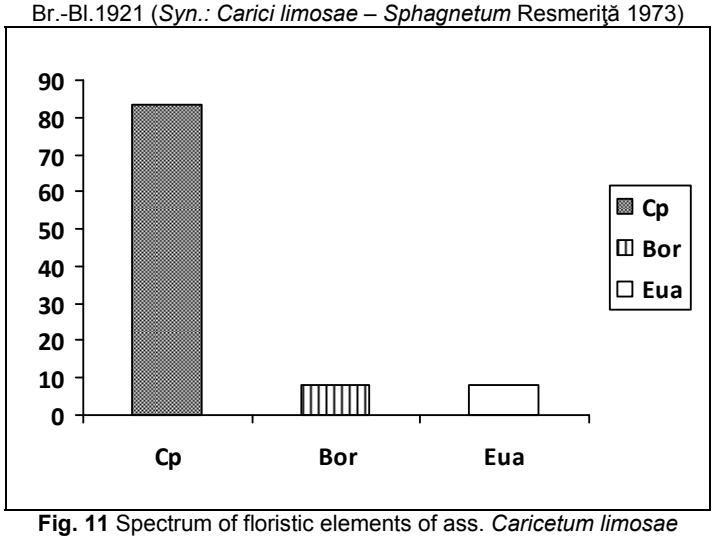

Fig. 11 Spectrum of floristic elements of ass. *Caricetum limosae* Br.-Bl.1921 (*Syn.: Carici limosae – Sphagnetum* Resmeriţă 1973)

Spectrum of life forms (fig.10) reveals the dominance in association of hemicryptophyte species (H = 50%), followed by camephytes (Ch = 33.3%) suggesting the affiliation to a habitat with constant conditions, optimal living, free from adverse extremes.

In the floristic elements spectrum (Fig.11) shows the categorically dominance of circumpolar species (Cp = 83.3%), followed by the circumpolar-boreal (Bor = 8.3%), suggesting the genetic affiliation to the oligotroph and ombrogene swamps of post-glacial.

The importance of ass. ***Caricetum limosae*** Br.-Bl.1921 (*Syn.: Carici limosae–Sphagnetum* Resmeriţă 1973)

Given that this association is very rare in our country, that in its phytocoenosis are preserved many of glacial relicts species, rare, endangered, important scientifically, such as *Carex limosa, Drosera rotundifolia, Lycopodium inundatum, Carex pauciflora, Andromeda polifolia, Empetrum nigrum, Oxycoccus palustris, Oxycoccus microcarpus*, it must be effectively protected with its natural environment.

CONCLUSIONS

The paludous, oligotroph, strongly acidophilic phytocoenosis identified by us in the Bihorului Mountains, the Călineasa Valley (Alba County) and Bătrâna brook (Bihor County) belong to associations that are relict considered, surviving in this territory since the ice age.

The phytocoenosis of the associations *Sphagnetum magellanici, Sphagno cuspidati – Rhynchosporetum albae, Caricetum limosae* analyzed by us in peat peat bog of Bihorului Mountains, have in their floristic composition a number of ten rare species, glacial relict and red listed as endangered, vulnerable. These types of habitats, with very high conservative value, are listed as priority in European classification of habitats (EMERALD, Corine, EUNIS, Palearctic Habitats, Nature 2000). The two areas studied by us are included in the special conservation area in the Apuseni Natural Park, the peat bog of "Molhasul Mare de la Izbuc" have status of scientific reserve. But it is necessary to effective protection of these very sensitive areas by establishing continuous and careful monitoring and a system of protection of the administrative and scientific institutions entitled.

In addition to scientific content, we want our work to have a protective effect in educating citizens in the spirit of ecological behavior towards nature.

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