THE STUDY OF ASSOCIATION *PHYLLITIDI-FAGETUM* IN CODRU-MOMA MOUNTAINS (NORTH-WESTERN ROMANIA)

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Abstract. In the present study we aimed to analyse the phytocoenoses that take part in the association *Phyllitidi-Fagetum* Vida (1959) 1963, in the area of the Codru-Moma Mountains.

The phytocoenoses of association *Phyllitidi-Fagetum* Vida (1959) 1963 were analyzed from the point of view of floristic diversity, of the life forms spectrum, of the floristic elements spectrum and the diagram of the ecological indices.

The presence of this association in Codru-Moma Mountains was signaled following 10 phytocoenological relevées done during the period 2008-2010.

Keywords: association, phytocoenoses, life forms, floristic elements, ecological indices, Codru-Moma Mountains

INTRODUCTION

Situated in the west of the Apuseni Mountains, Codru-Moma Mountains (Fig. 1), is presented as an important promontory oriented in the north-west and south-east direction, delimited by the central block of Bihor through Curmătura Crişţiorului. The marginal fracture lines offer a pronounced character of horst [18].

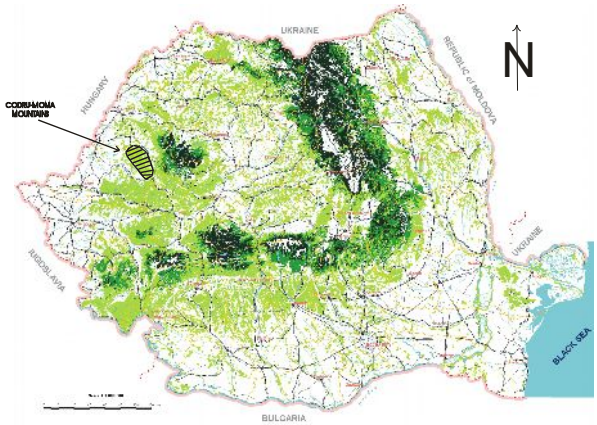

Figure 1. Geographical location of Codru-Moma Mountains in Romania [24]

Except the south-eastern sector, the limits of the massive with the neighboring regions are very clear. To north-east the limit is marked by the steep slopes of the mountains as compared to the Depression of Beiuş, that corresponds to the petrographic contact between the "mosaic" of tough rocks in the mountain and the mio-pliocen sedimentary in the depression. The south-western limit is highlighted also by a litologic contact. To the north, the epigenetic defile of Crişul Negru, between Borz and Şoimi, constitutes a clear limit. The clear delimitation of the south-eastern limit of Codru-Moma Mountains has some problems, in this area it is evident a steep slope corresponding to the contact between the friable deposits of the Zimbru-Avram Iancu depressionary corridor (marl, sands, torrential gravel) sedimented in the connecting corridor between the "gulf" of Beiuş and Brad-Hălmagiu basin on the Crişul Alb river and the volcanogenic-sedimentary formations [22].

The varied configuration of the relief reflects the geologic complexity. The crystalline founding crossed by the granitoids of Codru is covered by volcanic and Permian sedimentary formations (riolitic and basaltic rocks and a wide range of detritic red rocks), followed by dolomites, chalk, black shales, grit stones, Mesozoic marl and neogen volcanic rocks [22].

The European beech forests in the area of Codru-Moma Mountains can be differentiated in blended beech forests and pure beech forests. The blended beech forests are most widely spread in Codru-Moma Mountains (98%). Besides beech (*Fagus sylvatica*) there are also other arborescent species in their contents, the common hornbeam (*Carpinus betulus*) forming the hornbeam-beech forests and the sessile oak (*Quercus petraea*) forming oak-beech forests. The pure beech forests lie on small areas in Codru-Moma Mountains (2%), they being cantonated at high altitudes and in inaccessible places. If the blended beech forests are known like this as results from the studies of the botanist Paucă A. [18], the pure beech forests with hart's tongue (*Asplenium scolopendrium)* have not been studied yet in this area. That is why in this paper we aim at the study of pure beech forests that reunite the phytocoenoses of association *Phyllitidi-Fagetum* Vida (1959) 1963.

The association *Phyllitidi-Fagetum* Vida (1959) 1963 is frequently found in the area of Codru-Moma Mountains on rocks and stony, chalky terrains, on ombrogen slopes, where there is intrazonal vegetation inside the pure beech forests [20].

MATERIALS AND METHODS

In the study of the plant communities we used as coenotaxonomic unit the vegetal association, characterized by phytocoenoses which were analyzed on the phytocoenological relevées [8, 15]. The indices of abundance-dominance used are those from the Braun-Blanquet scale [5, 13, 14, 23]. The identification of the association was done on the dominant and characteristic species.

The size of the sample areas homogenous from the floristic point of view was established according to the

type of vegetation (forest), those being of 400 square meters for all the studied phytocoenological relevées.

The association *Phyllitidi-Fagetum* Vida (1959) 1963 was analyzed after the main ecological indices (humidity, temperature and chemical reaction of the soil), after the biological forms and floristic elements, the results being graphically presented in diagrams.

The table of the association contains information related to the species in the floristic composition of the association, the number of the relevée, the altitude, the exposition, the slope, the heights of the trees, the consistence of tree layer, the covering of the herbaceous layer and the area of the relevée. In the table of association synthetic phytocoenotic indices were calculated for each species, the constancy (K) and the average abundance-dominancy (ADm).

The including of the association in the cenotaxonomic system was done after the newly issued synthesis papers [16, 21], as well as after articles that deal with association *Phyllitidi-Fagetum* Vida (1959) 1963 [2-4, 6-11, 17, 19].

During the period 2008-2010, 10 phytocoenological relevées were carried out in the pure beech (*Fagus sylvatica*) forests with hart's tongue (*Asplenium scolopendrium)* from Codru-Moma Mountains, met on the soils rich in chalk on the steep slopes.

RESULTS

Association *Phyllitidi-Fagetum* Vida (1959) 1963, fall in syntaxonomical terms as follows [20]:

Class ***Querco-Fagetea*** Br.-Bl. et Vlieger in Vlieger 1937 em. Borhidi 1996

Order ***Fagetalia sylvaticae*** Pawlowscki in Pawlowscki et al. 1928

Aliance ***Symphyto cordati-Fagion*** Vida 1963

Suballiance ***Moehringio muscosae-Acerenion*** Boşcaiu et al. 1982.

In the area of Codru-Moma Mountains there were identified 10 localities where one can find phytocoenoses belonging to association *Phyllitidi-Fagetum* Vida (1959) 1963. The ten relevées were identified in the following localities: Peak of Măgurii on Şesuta Valey, affluent of Tărcăiţa Valley; Summit of Caprei and "La Vălaie", near Briheni; Peak of Dâmbul Moţului, near Trei Holumburi; Brook of Râposu, affluent of Tărcaiţa Valley and Valea Seacă near Moneasa Spa.

The association *Phyllitidi-Fagetum* Vida (1959) 1963 (Fig. 2), was identified in Codru-Moma Mountains on rocky slopes on Măgurii Summit, Caprei and Dâmbul Moţului Summit, with different expositions, shady or semi-shady, on the detritus with various fixing stages on Râposu Stream and Valea Seacă. This association appears as a special type of intrazonal vegetation in the beech floor and develops in Codru-Moma Mountains on chalk layers and rendzinic soils, with a high degree of humidity and low humus content.

The studied association can be found at altitudes between 600-950 m, on slopes with an inclination between 20-40˚ and with shady and semi-shady expositions. The trees layer in the phytocoenoses is well constituted, highlighting the European beech (*Fagus sylvatica*), the mountain sycamore maple (*Acer pseudoplatanus*), the field sycamore maple (*Acer platanoides*) and the mountain elm (*Ulmus glabra*), which form monofloored trees, with high ages (120-140 years) and with heights between 20-26 m. The consistency of the trees layer is between 0.7-1.0, and the covering of the herbaceous layer is between 50-100%.

Figure 2. Association *Phillitidi-Fagetum* Vida (1959) 1963 on peak Dâmbul Moţului, in Codru-Moma Mountains.

The floristic inventory of beech (*Fagus sylvatica*) phytocoenoses with hart's tongue (*Asplenium scolopendrium*) from Codru-Moma Mountains sums up a number of 108 species (Table 1).

Among the characteristic species to the sub-alliance *Moehringio muscosae-Acerenion* Boşcaiu et al. 1982 and alliance *Symphyto cordati-Fagion* Vida 1963 found in the identified phytocoenoses, we mention the following: *Acer pseudoplatanus, Acer platanoides, Ulmus glabra, Symphytum cordatum, Dentaria glandulosa, Aconitum vulparia* ssp. *vulparia, Doronicum columnae, Geranium robertianum, Moehringia muscosa, Polystichum aculeatum, Lunaria rediviva, Aruncus dioicus, Euphorbia carniolica.*

From the table of association (Table 1) it results that together with the edifying species of *Fagus sylvatica* (K=V, ADm=72.5) and *Asplenium scolopendrium* (K=V, ADm=23.8), the following appear with a dominant constancy and abundance: *Mercurialis perennis* (K=V, ADm=2.7), *Cardamine bulbifera* (K=V, ADm=2.3), *Geranium robertianum* (K=V, ADm=1.85), *Galium odoratum* (K=V, ADm=1.80), *Lamium galeobdolon* (K=V, ADm=1.4), *Acer pseudoplatanus* (K=IV, ADm=4.65), *Sambucus nigra* (K=IV, ADm=2.55), *Dentaria glandulosa* (K=IV, ADm=2.3), *Galanthus nivalis* (K=IV, ADm=1.25), *Polystichum aculeatum* (K=IV, ADm=0.85), *Lathyrus vernus* (K=IV, ADm=0.4), *Polygonatum odoratum* (K=IV, ADm=0.35), *Arum maculatum* (K=IV, ADm=0.35).

In the spectrum of the life forms (Fig. 3), the hemicryptophytes can be found in a high percentage (H=50%), followed by geophytes (G=23.96%) with a very short life cycle and megaphanerophytes (MPh=9.38%), the other life forms having a reduced representation.

Table 1. *Phyllitidi-Fagetum* Vida (1959) 1963 in Codru-Moma Mountains [11, 20].

F.b.	E.f.	U	T	R	Number	1	2	3	4	5	6	7	8	9	10	K	ADm
					Altitude (m.s.m.)	800	700	780	900	920	950	850	720	620	600		
					Exposition	N	N	NE	E	NE	N	N	NV	NE	N		
					Slope (º)	34	20	26	20	30	40	35	20	30	20		
					Hights of the trees (m)	20	24	22	25	25	20	22	26	26	20		
					Consistency of tree layer	0.8	0.9	0.9	0.9	1.0	90	1.0	0.7	0.9	0.9		
					Herbaceous layer coverage (%)	70	90	80	90	80	70	100	50	50	50		
					Area (m²)	400	400	400	400	400	400	400	400	400	400		
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
MPh	E	3	3	0	As. *Fagus sylvatica*	4	5	5	4	4	5	4	4	4	5	V	72.50
G	Cp	3.5	3	5	*As. Asplenium scolopendrium*	3	4	3	+	1	2	1	2	3	2	V	23.80
					Moehringio muscosae-Acerenion; Symphyto cordati-Fagion												
MPh	Eua	3.5	3	3	*Acer pseudoplatanus*	·	·	+	+	2	+	2	1	·	1	IV	4.65
MPh	Eua	3	3	3	*Acer platanoides*	·	+	·	·	·	·	·	·	2	·	I	1.80
H	Ec	4	2.5	4	*Aconitum vulparia* ssp. *vulparia*	+	·	·	+	1	+	+	·	·	+	III	0.75
H	Eua	4	2.5	3	*Aruncus dioicus*	·	·	·	·	·	·	·	+	·	·	I	0.05
G	End. carp.	4	2.5	4	*Dentaria glandulosa*	1	1	+	+	1	·	·	·	+	1	IV	2.15
H	Alp-Balc-Carp	3.5	2	3.5	*Doronicum columnae*	·	·	1	·	+	·	+	+	+	+	III	0.75
H	Ec	3	4	4	*Euphorbia carniolica*	·	+	·	·	·	·	·		·	·	I	0.05
Th	Cosm	3.5	3	3	*Geranium robertianum*	1	+	+	1	1	+	+	+	+	+	V	1.85
H	Ec	4	3	4	*Lunaria rediviva*	·	·	1	·	·	·	·	1	+	1	II	1.55
H	Ec	4	2	4	*Moehringia muscosa*	+	·	+	·	·	+	·	+	·	·	II	0.20
H	E	3.5	3.5	3.5	*Polystichum aculeatum*	·	+	1	+	+	+	+	+	·	+	IV	0.85
H	End. carp.	3	2	3	*Symphytum cordatum*	·	+	·	·	·	·	1	·	·	+	II	0.60
MPh	Eua	4	3	3	*Ulmus glabra*	2	·	·	1	+	·	·	·	·	+	II	2.35
					Fagetalia sylvaticae												
H	Eua	3.5	3	3	*Actaea spicata*	+	·	·	+	·	·	·	+	·	+	II	0.20
G	E	3.5	3.5	4	*Allium ursinum*	·	·	·	1	·	+	·	·	·	1	II	1.05
G	Ec	3.5	3.5	4	*Arum maculatum*	·	+	+	+	·	+	+	·	+	+	IV	0.35
H	Eua	3.5	3	4	*Asarum europaeum*	+	·	1	·	·	·	·	·	·	1	II	1.05
G	Ec	3	3	4	*Cardamine bulbifera*	1	+	+	1	+	1	1	+	+	+	V	2.30
G	Ec	3	3	0	*Corydalis cava*	+	+	1	4	3	·	·	·	·	·	III	10.60
G	Eua	3	3	0	*Coryalis solida*		+	·	·	1	·	1	·	·	·	II	1.05
nPh	Eua	3.5	3	3	*Daphne mezereum*	+	·	·	·	+	+	+	+	·	·	III	0.25
Ch	E	3	3.5	4	*Euphorbia amygdaloides*	·	·	+	·	·	·	·	+	·	·	I	0.05
G	E	3.5	3	4	*Galanthus nivalis*	+	+	+	+	1	1	+	·	·	·	IV	1.25
G	Eua	3	3	3	*Galium odoratum*	·	1	1	+	+	+	+	1	+	+	V	1.80
G	Eua	2.5	3	3	*Galium schultesii*	·	·	·	·	·	·	+	+	+	·	II	0.15
H	Eua	3	3.5	3	*Isopyrum thalictroides*	·	+	+	+	+	+	·	·	·	+	III	0.30
H	Eua	3	0	4	*Lamium galeobdolon*	+	+	+	+	+	+	1	1	+	+	V	1.40
H	Eua	3.5	0	4	*Lamium maculatum*	·	+	·	·	1	+	·	+	·	·	II	0.65
G	Eua	3	0	4	*Lilium martagon*	·	·	·	·	·	·	·	+	·	·	I	0.05
G	Eua	3.5	3	4	*Mercurialis perennis*	1	1	1	+	+	+	1	1	+	·	V	2.70
G	Cp	4	3	3	*Oxalis acetosella*	·	·	·	·	·	·	·	·	·	1	I	0.50
H	Eua	3.5	0	4	*Paris quadrifolia*	+	+	·	+	·	+	·	·	·	·	II	0.20
H	Eua	3	2	5	*Primula officinalis*	·	·	·	·	·	·	·	+	·	·	I	0.05
H	E	3.5	3	3	*Pulmonaria officinalis*	+	+	·	·	+	·	·	·	+	·	II	0.20
nPh	Eua	3	2.5	3	*Rubus hirtus*	+	·	·	+	·	+	·	·	+	·	II	0.20
H	Eua	3.5	3	4	*Salvia glutinosa*	·	·	·	·	+	·	+	+	+	·	II	0.20
H	Eua	3.5	3	0	*Scrophularia nodosa*	·	·	·	·	+	·	+	·	·	·	I	0.10
H	Eua	3.5	3	4	*Sanicula europaea*	·	·	·	·	·	·	·	·	+	·	I	0.05
H	Eua	3	3	3	*Symphytum tuberosum* ssp. *nodosum*	·	·	·	·	·	·	·	+	·	·	I	0.05
					Querco-Fagetea												
MPh	Eua	2.5	3	3	*Acer campestre*	·	+	·	·	·	·	·	·	+	·	I	0.10
G	Cp	3.5	4	0	*Anemone nemorosa*	1	·	·	·	·	+	·	·	·	+	II	0.60
G	Eua	3.5	3	4	*Anemone ranunculoides*	+	·	·	+	·	+	+	·	·	·	II	0.20
H	Ec	3	2.5	3.5	*Aposeris foetida*	·	·	·	·	·	·	·	+	·	·	I	0.05
H	Cosm	4	2.5	0	*Athyrium filix-femina*	·	·	·	+	·	·	·	·	·	+	I	0.10
H	Eua	3	3	4	*Brachypodium sylvaticum*	·	·	·	·	·	·	·	+	·	·	I	0.05
H	Eua	2.5	3	2	*Calamagrostis arundinacea*	·	·	·	+	·	·	+	·	·	·	I	0.10
l-nPh	Ec	3	3	3	*Clematis vitalba*	·	·	·	·	·	·	·	·	+	·	I	0.05

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
H	Eua	3	3	0	*Campanula persicifolia*	·	·	+	+	·	+	·	·	·	·	II	0.15
H	Eua	3	2	0	*Campanula rapunculoides*	·	·	·	·	·	·	·	+	·	·	I	0.05
G	Eua	3.5	3	4	*Circaea lutetiana*	·	·	·	·	+	·	·	+	·	·	I	0.10
mPh	Ec	3	3.5	4	*Cornus mas*	·	·	·	·	·	·	·	·	+	·	I	0.05
mPh	E	3	3	3	*Corylus avellana*	·	·	·	·	·	·	·	+	1	·	I	0.55
mPh	Eua	2.5	3	3	*Crataegus monogyna*	·	·	·	·	·	·	·	·	+	·	I	0.05
H	Ec	2.5	3	3	*Dactylis polygama*	·	·	·	·	·	·	·	·	+	·	I	0.05
H	Eua	4	3	0	*Dryopteris filix-mas*	+	+	·	·	·	·		+	·	·	II	0.15
G	Eua	3.5	3.5	4	*Erythronium dens-canis*	·	·	·	+	·	+	·	·	·	·	I	0.10
H	Eua-M	3	0	3	*Epilobium montanum*	·	·	·	·	·	·	·	·	+	·	I	0.05
mPh	E	3	3	3	*Euonymus europaeus*	+	·	·	·	·	·	·	·	·	·	I	0.05
mPh	E	3	3	4	*Euonymus latifolius*	·	·	·	+	2	+	2	·	+	·	III	3.65
H	E	4	2	3	*Festuca drymeja*	+	·	+	·	·	·	·	·	+	·	II	0.15
H	Ec	4	3	4.5	*Geranium phaeum*	+	·	·	·	1	+	·	·	·	·	II	0.60
H	Cp	3	3	4	*Geum urbanum*	·	+	·	·	·	·	·	·	+	·	I	0.10
H	Mp	2.5	3	4	*Glechoma hirsuta*	·	·	+	·	·	·	·	·	+	·	I	0.10
l-nPh	Atl-M	3	3	3	*Hedera helix*	+	·	·	+	·	3	4	+	+	·	III	10.20
H	DB	2.5	3	4	*Helleborus purpurascens*	·	·	+	·	·	·	·	+	+	·	II	0.15
H	Cp	3	3	4	*Hepatica nobilis*	+	+	+	·	·	+	·	+	·	·	III	0.25
G	Eua	3	3	3	*Lathyrus vernus*	+	+	+	·	·	+	+	+	+	+	IV	0.40
H	Mp	3	4	3	*Lathyrus venetus*	·	·	·	·	·	·	·	·	+	+	I	0.10
G	Ec	4	3	3	*Leucojum vernum*	·	·	·	·	·	·	·	·	·	1	I	0.50
H	E	2.5	3	4	*Melica uniflora*	·	·	+	·	·	·	·	·	1	·	I	0.55
H	E	3	3	0	*Mycelis muralis*	+	+	·	1	·	+	·	+	+	·	III	0.75
H	Eua	3	3	0	*Poa nemoralis*	·	·	·	+	·	·	·	·	+	·	I	0.10
G	E	3	3	3	*Polygonatum multiflorum*	+	·	·	·	·	·	·	·	·	·	I	0.05
G	Eua	2	3	4	*Polygonatum odoratum*	+	·	·	+	+	+	+	+	·	+	IV	0.35
MPh	Eua	3	2	2	*Populus tremula*	+	·	·	·	·	·	·	·	·	·	I	0.05
MPh	E	3	3	3	*Prunus avium*	·	·	·	+	+	·	·	·	+	·	II	0.15
nPh	E	2	3	3	*Rosa canina*	+	·	·	·	·	·	·	·	+	·	I	0.10
H	Eua	3	3	0	*Stellaria holostea*	·	+	+	·	·	·	·	·	·	·	I	0.10
H	Eua	3.5	0	0	*Stachys sylvatica*	·	·	·	+	·	·	·	+	·	·	I	0.10
H	Eua	2.5	3	5	*Melittis melissophyllum*	·	·	·	·	·	·	·	+	·	·	I	0.05
MPh	E	2.5	3	4	*Sorbus torminalis*	·	·	·	·	·	·	·	·	+	·	I	0.05
G	M	3	3.5	4	*Tamus communis*	·	·	·	·	·	·	·	+	+	·	I	
MPh	DB	2.5	3.5	3	*Tilia tomentosa*	·	·	·	·	·	·	·	·	+	·	I	0.05
					Variae syntaxa												
H	Cosm	3	0	4	*Asplenium trichomanes* ssp. *qvadrivalens*	+	+	·	·	·	·	·	·	+	·	II	0.15
H	Eua	3	3	4	*Chelidonium majus*	·	·	·	·	·	·	+	·	+	·	I	0.10
H	Eua	3.5	2	0	*Cystopteris fragilis*	·	+	·	·	+	·	+	·	+	·	II	0.20
H	Ec	3.5	2	3	*Doronicum austriacum*	·	+	·	+	·	·	·	·	·	·	I	0.10
Th	Cp	3	3	3	*Galium aparine*	·	+	+	·	·	·	·	·	+	·	II	0.15
Th	Eua	3	0	4	*Lamium purpureum*	·	·	+	·	·	·	·	·	·	+	I	0.10
G	Cp	3.5	3	4	*Polypodium vulgare*	·	·	·	·	+	+	+	·	·	·	II	0.15
mPh	Mp	3	3	3	*Sambucus nigra*	+	+	+	+	+	2	1	·	·	+	IV	2.55
H	Eua	2	3	0	*Sedum maximum*	·	·	·	+	·	+	+	·	·	·	II	0.15
H	Cosm	3	3	4	*Urtica dioica*	·	·	·	·	·	+	+	·	·	+	II	0.15
TH	E	2.5	3.5	4	*Verbascum phlomoides*	·	·	·	·	·	·	·	+	+	·	I	0.10

Legend: L.f. - life forms; MPh - Megaphanerophytes; mPh - Mezophanerophytes; nPh - Nanophanerophytes; l-nPh - Climbing plants; Ch - Chamaephytes; H - Hemicryptophytes; G - Geophytes; Th - Annual terophytes; TH - Biannual terophytes; F.e. - floristic elements; Cp - Circumpolar; Eua - Eurasian; E - European; Ec - Central European; End. carp. - Carpathian endemism; DB - Daco-Balkan; P-Pan - Ponto Pannonian; Cosm - Cosmopolitan; Atl-M - Atlantic-Mediterranean; Mp - Mediterrano-Pontic; M – Mediterranean; Alp-Balc-Carp - Alpo-Balkan-Carpathian; U – humidity; T – temperature; R - the chemical reaction of the soil.
Species that occur in a single relevé: *Alliaria petiolata, Asplenium ramosum*, *Cruciata laevipes, Gentiana asclepiadea, Heracleum sphondylium, Parietaria officinalis, Polystichum lonchitis, Sedum vulgare, Urtica urens, Valeriana officinalis, Veronica chamaedrys.*
Place and date of relevé: 1 – Summit of Măgurii (Bihor county) 09.V-04.VIII 2010; 2-3 – Summit of Caprei (Bihor county) 24.V.2010; 4-7 – Summit of Dâmbul Moţului (Arad county) 24.IV-04.VIII 2010; 8 – Brook of Râposu (Bihor county) 16.VIII.2008-15.IV.2009; 9 – La Vălaie place - Briheni village (Bihor county) 24.V.2010; 10 - Valea Seacă (Bihor county) 30.V.2010.

In the identified and studied phytocoenoses it can be noticed that the synusia of megaphanerophytes dominates in quantity, but in number the greatest percentage is occupied by hemycryptophytes. The high percentage of hemicriptophytes indicates some natural disturbances (derooting, breakages of snow and wind) appeared in the area in the past years.

The floristic elements (Fig. 4) with the greatest percentage in the studied association are given by the Eurasian species (Eua=45.83%), followed by the European (E=17.71%) and central-European species (Ec=14.58%), the other floristic elements having a more reduced percentage representation. The spectrum of floristic elements suggests the inclusion of this

association in the biom of broadleaf forests from Eurasia, but with a European and central European particularity [12].

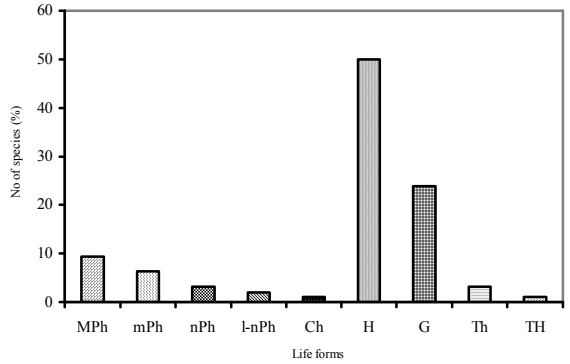

Figure 3. The life forms spectrum of the association *Phyllitidi-Fagetum* Vida (1959) 1963, where: MPh - Megaphanerophytes; mPh - Mezophanerophytse; nPh - Nanophanerophytes; l-nPh - Climbing plant; Ch - Chamaephytes; H - Hemicryptophytes; G - Geophytes; Th - Annual therophytes; TH - Biannual therophytes.

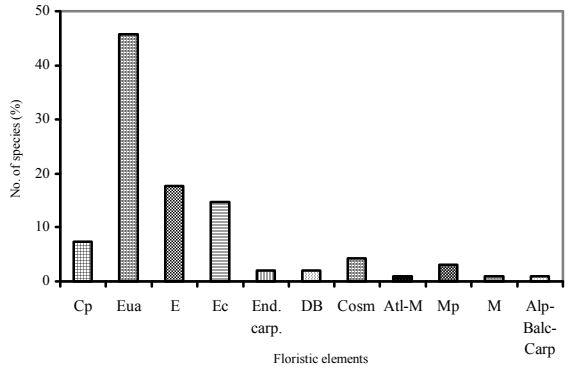

Figure 4. Spectrum of floristic elements of the association *Phyllitidi-Fagetum* Vida (1959) 1963, where: Cp - Circumpolar; Eua - Eurasian; E - European; Ec - Central European; End. carp. - Carpathian endemism; DB - Daco-Balkan; Cosm - Cosmopolitan; Atl-M - Atlantic-Mediterranean; Mp - Mediterrano-Pontic; M – Mediterranean; Alp-Balc-Carp - Alpo-Balkan-Carpathian.

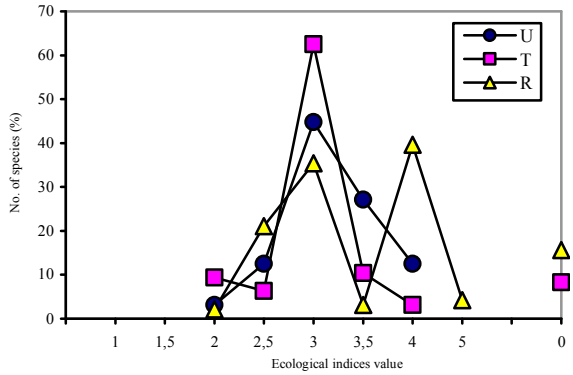

Figure 5. Diagram of ecological indices for the association *Phyllitidi-Fagetum* Vida (1959) 1963, where: U – humidity; T – temperature; R - the chemical reaction of the soil.

As regards the ecological indices (Fig. 5), the mesophytes ($U_{3-3.5}$=71.87%) and the mesohygrophytes ($U_{4-4.5}$=12.5%) are preponderant, and from the temperature point of view the micro-mesothermophylous species ($T_{3-3.5}$=72.92 %) followed by microtermophilous ($T_{2-2.5}$=15.63 %) are numerous. The reaction of the soil determine the fact that the biggest percentage is occupied by the weekly acid neutrophylous species (R_4=40.62 %), followed by the acido- neutrophylous (R_3=38.55 %) and amphitolerant species (R_0=15.63%).

The analysis of the ecological indices of *Fagus sylvatica* forests with *Asplenium scolopendrium* from Codru-Moma Mountains shows the fact that these phytocoenoses are included in the group of mesophylous broadleaf forests belonging to a habitat with a balanced hydric regime and a temperate-continental climate, cantonated on week acid- neutral to acid- neutral soil reaction.

DISCUSSIONS

The European beech (*Fagus sylvatica*) forests with hart's tongue (*Asplenium scolopendrium*) are a particular type of phytocoenoses found in the area of Codru-Moma Mountains, cantonated on steep slopes, with chalk layer, on rendzinic soils, with the rock at surface and on semi-mobile detritus. The rich floristic compositions of these phytocoenoses, correlated with the specific edapho-climatic conditions they develop in, are arguments for preserving them [19].

The botanist A. M. Paucă made descriptions of the woody vegetation in the area of Codru-Moma Mountains [18]. In her study she refers to phytocoenoses with black burdock (*Symphytum cordatum*) found in the pure beech forests in Codru-Moma Mountains, which are subordinated to the association called *Fagetum carpaticum*, without describing the phytocoenoses of *Asplenium scolopendrium* [18]. In the table of *Fagetum carpaticum* association the *Asplenium scolopendrium* species does not appear in the floristic composition, maybe due to the fact that association *Phyllitidi-Fagetum* Vida (1959) 1963 was not known in that period, being described and validated later by Vida (1959) 1963.

The botanist identified and described on limestone, the association known at that time as *Acereto-Fraxinetum typicum* (G.) Tx. 1937, in a number of four phytocoenological relevées, in their structure being found the *Asplenium scolopendrium* (sub *Scolopendrium vulgare*) and *Fagus sylvatica* species. The phytocoenoses belonging to this association were identified by the botanist at the edge of forest consisting of mixed beech and hornbeam continuing to the phytocoenoses by the neighboring watercourses. In the table of the association *Acereto-Fraxinetum typicum* (G.) Tx. 1937 described by A. Paucă, one can find with high frequency species that are characteristic today for the association *Acereto-Ulmetum* Beldie 1951 (*Acer pseudoplatanus, Ulmus glabra, Fagus sylvatica, Fraxinus excelsior, Corylus avellana, Asplenium scolopendrium, Lunaria rediviva, Helleborus purpurascens*).

In our country, the association *Phyllitidi-Fagetum* Vida (1959) 1963 was described near the studied area,

in the area of Vulcan Mountain, towards the Valley of Crişul Alb River [1]. Comparatively, the studied association can be found in the same stational conditions in the two areas (Codru-Moma Mountains and Vulcan Mountains), the phytocoenoses of this association being cantonated on chalk layer, soils of rendzines type and steep slopes from high altitudes (above 600-1080 m). It can be noticed the fact that in Codru-Moma Mountains, the association *Phyllitidi-Fagetum* Vida (1959) 1963 can be found mainly on shady expositions (N, NE, NV), with a high humidity in the soil all the year long, while on Vulcan Mountain it can be found on semi-shady and sunny expositions (V, E, SE). The total number of species identified in the phytocoenoses belonging to the association *Phyllitidi-Fagetum* Vida (1959) 1963 in the area of Codru-Moma Mountains (108 species) is approximately equal to the total number of species in Vulcan Mountain (113 species). Comparing the spectrum of life forms of the studied association for the two areas, it can be noticed that the hemicryptophytes have the biggest percentage (50%), followed by geophytes (23%). In Codru-Moma Mountains the spectrum of floristic elements for the association *Phyllitidi-Fagetum* Vida (1959) 1963 shows a bigger presence of the Eurasian species (45.8%) followed by the European species (17.7%), while in the area of Vulcan Mountain the Eurasian species have a smaller percentage (26%), followed by the European (24%) and central European ones (18%). The ecological indices of the studied association in the two areas show from the humidity point of view preponderance of the mesophytes species, the micro-mesotermophytes being the dominant species as regards temperature, and the weekly acid-neutrophytes have a bigger percentage as regards the chemical reaction of the soil.

The presence in the table of association of many characteristic species to the sub-alliance *Lathyro hallersteinii-Carpinenion* Boşcaiu et al. 1982 (*Aposeris foetida, Arum maculatum, Prunus avium, Dactylis polygama, Dentaria glandulosa, Festuca drymeja, Melica uniflora, Stellaria holostea, Galium schultesi)*, shows the fact that the phytocoenoses of association *Phyllitidi-Fagetum* Vida (1959) 1963 from Codru-Moma Mountains have a tendency of succession towards the hornbeam forests, the cause being the irrational exploitation of European beech forests in the area.

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