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MONTANE GRASSLANDS DOMINATED BY *AGROSTIS CAPILLARIS* AND *FESTUCA RUBRA* IN MARAMUREŞ COUNTY I. PHYTOSOCIOLOGICAL ANALYSIS

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Abstract: This study concerned the identification and statistical validation of coenotaxa dominated by *Agrostis capillaris* and *Festuca rubra*, as well as the assessment of differential species corresponding to each coenotaxon. In order to achieve these results, 121 phytosociological relevés were investigated between 2003-2006 in the mountainous area of Maramureş County. The analyses led to the identification of the following coenotaxa: *Hypochoeri radicatae-Agrostetum tenuis* Pop *et* al. 1988; *Anthyllido vulnerarae-Festucetum rubrae* (Máthe *et* Kovács 1960) Soó 1971; *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952 and *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952 subass. *avenuletosum praeustae* subass. nova.

Keywords: grassland, syntaxonomy, phytosociology, classification, *Agrostis capillaris, Festuca rubra, Avenula praeusta, Anthyllis vulneraria*, *Molinio-Arrhenatheretea*, grassland biodiversity, evenness.

Introduction

Some of the major goals of vegetation studies are to emphasize discontinuities in the vegetation cover and to classify the vegetation types according to valid general structural features, in the frame of a hierarchic system based on vegetal associations. The high degree of structural heterogeneity of grasslands dominated by *Agrostis capillaris* and *Festuca rubra*, as well as the high diversity of the locations they cover render their assignment to coenotaxonomic units difficult; as a proof, a large number of coenotaxa have been described. The main goals of our study were the identification and statistical validation of coenotaxa dominated by *Agrostis capillaris* and *Festuca rubra*, the assessment of differential species corresponding to each coenotaxon, and performing a detailed characterisation of the identified coenotaxa.

Methods

Maramureş county is located near the northern border of Romania. It covers 6215 km^2 of which most areas are mountainous and hilly, in spite of the low altitudes of the depressionary areas (135 m along Someş Valley and 204 m along Tisa) The mountainous area may be divided into three regions: Rodna Mountains in the north-east, Maramureşului Mountains in the north, ad the volcanic chain of the Oaş-Gutâi-Ţibleş Mountains [15]. Within the latter region, four massives may be separated, *i.e.* Igniş, Gutâi, Lăpuşului, and Ţibleş. Maramureş county has a moderate-continental temperate climate that can be divided into: montane climate, including the depression subtype (Maramureş Depression), and hills and plateau climate, including a different depression climate subtype (Baia Mare Depression, Copalnic, and Lăpuş) [15].

Our study is based on 121 de relevés investigated in the mountainous areas of Maramureş county between June-August 2003-2006. The relevés were realized by using a stratified sampling procedure [9] according to the Braun-Blanquet method, on square sampling areas (quadrats) of 25 m^2 (5 x 5 m). The plant species were identified based on the monographs „Flora

Ilustrată a României" [3], "Flora R.P.R-R.S.R" vol. I-XII [23], while the nomenclature of the phytotaxa corresponds to that adopted by the Flora Europaea [25]. The environment variables taken into account were divided into four main categories: topographic (altitude, exposure, slope, and moisture topographic index), edaphic (pH, cations, phosphorus, organic matter in soil), climate (potential direct incident radiation, warming index), and biotic (general vegetation coverage, bryophytes coverage, type of greenlands usage, and litter depth *i.e.* cover of dead leaves) factors. Based on recorded topographic factors, the Topographic Moisture Index (TMI) was calculated; TMI provides information on the potential moisture in the investigated stations [14].

Three soil samples were collected on an aleatory basis in each investigated area, from the uppermost 20 cm of soil, which were air-dried and sieved by using a 2 mm mesh screen. From each soil sample, 100 g were selected for analyses. The edaphic factors have been defined in the Laboratory of Applied Vegetation Dynamics from the University of Liverpool, Great Britain. Soil reaction was measured in aqueous solution by using a HANNA PH211R pH-meter. An ammonium acetate solution [1] was used for cation (Ca^{2+}, Mg^{2+} and K^{+}) extraction followed by a quantitative analysis by using an UNICAM 929 atomic absorption spectrophotometer. Phosphorus was extracted with the Olsen reagent in vessels washed with HCl for avoiding accidental contamination; the quantification was performed by using the spectrophotometer. The results are expressed as mg/l. The organic matter in soil was determined by gravimetry; 3 g of soil dried at 105° C for water removal were used. When the sample reached a constant weight, it was heated at 550° C for 3 hours in order to burn the whole amount of organic matter. The difference between the weight of the dry soil sample and the final weight represents the amount of organic matter in soil (%).

Among the climatic factors, the potential annual Direct Incident Radiation (DIR) and Heat Load (HL) have been calculated based on the values for slopes, latitude, and exposure [12]. Latitude and slope have been determined by using military topographic maps, scale 1:25000. In the case of biotic factors, besides the general vegetation coverage and bryophytes coverage, also the litter depth was measured: the thickness was determined in three aleatory points in each of the phytosociological relevé and the average value (mm) was calculated. The land use was coded according to our own proposed classification into 7 types: 1 – abandoned greenlands, 2 – meadow, 3 – meadow grazed early in the spring and late in the autumn, 4 – pasture grazed by cattle, 5 – pasture grazed by cattle and sheep, 6 – pasture grazed by sheep, 7 – sheep's (stable) present.

The classification of the investigated phytocoenoses was performed by applying a hierarchical analysis using the 1.8-2 [13] version of the *vegan* library, for R 2.3.1 [16] the UPGMA (Unweighted Pair-Group Method using Arithmetic average) method being used for the calculation of the similarity matrix based on the quantitative expression of the Bray-Curtis index. The optimal number of groups present in the studied samples was defined by using the EM (Expectation Maximization) method implemented by the *mclust* library [8] based on the BIC (Bayesian Information Criterion). The phytosociological nomenclature used for defining the investigated grasslands follows the International Phytosociological Nomenclature Code [26] based on the system proposed by Coldea [4].

The identified coenotaxa were characterized according to the bioforms spectra, geoelements, U, T, R, N and L indices, the types of social behaviour, and the coenotic groups. The ecological indices for humidity (U), temperature (T) and soil reaction (R) proposed by Csűrös, Șt., Csűrös-Kaptalan, M. and Resmeriță, I. [5, 6], while the indices for nitrogen (N), light (L) and social behaviour of the plants proposed by Borhidi for the flora of Hungary [2] were used for analysing the structure of the phytocoenosis in various ecological categories. The coenotic groups, the bioforms categories, and the geoelements used for this study are acknowledged by the school of biology in Cluj and were adopted from monographs on the

Romanian flora and vegetation [19, 20, 21, 22]. In the view of identifying the highly discriminating species for each coenotaxon, the species' index value was calculated [7] based on the algorithm implemented by the *labdsv* library, version 1.2-2 [17] for R 2.3.1.

Among the phytocoenotic indices used for coenotaxa characterization, besides the species constant the Shannon diversity index (H') and its exponential variation (N_1) - showing the diversity of a phytocoenosis with the same number of common species that produces the same value of the diversity index [10], were calculated. The average density of an analysed syntaxon is given by the arithmetic mean of the diversity indices in each relevé when the syntaxon occurs. The phytocoenosis evenness was calculated based on the E_{var} index [24] that, compared to other currently used evenness indices, measures the species abundance variation independently form the specific richness of the analysed phytocoenoses. The *Ecological Methodology* version 5.2 software [11] was used for calculating the diversity and evenness indices. In addition, the average pastoral value was calculated for each coenotaxon [18].

The second part of this study presents ecological aspects and dynamics of the investigated phytocoenoses.

Results and Discussions

Based on the optimum number of groups, the studied 121 phytosociological relevés were classified into four groups corresponding to the following coenotaxonomic units:

Molinio-Arrhenatheretea Tx. 1937

Arrhenatheretalia Pawl. 1928

Cynosurion cristati Br.-Bl. *et* Tx. 1943

1. *Hypochoeri radicatae-Agrostietum tenuis* Pop *et* al. 1988
2. *Anthyllido vulnerariae-Festucetum rubrae* (Máthe *et* Kovács 1960) Soó 1971
3. *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952

- *avenuletosum praeustae* subass. nova

1. Hypochoeri radicatae-Agrostietum capillaris Pop *et* al. 1988 *(Festuco-Agrostetum tenuis montanum* Csűrös et Resmeriță 1960, *Agrostietum tenuis montanum* apud Resmeriță 1970, *Agrostetum tenuis biharicum* Resmeriță 1965*)*, is an association identified in stations located on plateaus or smooth to moderate slopes (5-30°), showing various exposures and high variations of the altitudes (620-1225 m.s.m). Its phytocoenoses grow on acidic soils (pH between 4.37 and 5.31 rich in organic matter (contents varying between 6.49 and 20.31%). A relatively rich flora (Table 1.1) consisting of 117 species and an average number of 35 species/relevé as shown also by the values for the diversity indices H'=2.194 and N_1=4.61 characterises this unit.

Because of the dominance of the species *Agrostis capillaris* and *Festuca rubra*, the evenness index is relatively low, E_{var}=0.487. Among the total number of species, 39.83% are typical for the alliance, order and class that dominates the association, 17.80% are typical for the *Festuco-Brometea* Class, imprinting a more xerophylous character to this phytocoenosis, and 9.32% are characteristic for the *Nardo-Callunetea* Class; the species belonging to the *Querco-Fagetea* Class are present in the same concentration (%). The only species with high indicative (discriminative) value were *Hypochoeris radicata* (81.32%, p=0.0001), *Agrostis capillaris* (41.83%, p=0.0001) and *Campanula patula* ssp. *patula* (29.23%, p=0.002).

From an ecological perspective, the concentration of various species in the studied phytocoenoses is as follows: mesophytes (45.30%), xero-mesophytes (36.75%), micro-mesotherms (37.61%), eurytherms (34.19%), microtherms (22.22%), euryionic species (45.30%), transitional acidophilous-to-neutrophylous (23.08%), and weakly acidophilous-to-neutrophylous species (15.38%).

The social behaviour of the plants is dominated by the generalist species (38.46%) and by the perturbation-tolerant species (35.04%), besides which the competitive species (5.98%), specialist species (5.98%), weeds (4.27%), ruderal competitors (1.71%), and natural pioneer species (0.85%) are also present.

According to the request for nitrogen in soils, 19.66% species are typical for soils depleted in nitrogen, 17.95% for moderate oligotrophic soils, 19.66% for submesotrophic soils, 14.53% for mesotrophic soils, while 12.82% are species preferring soils moderately rich in nutrients. Very poorly represented are species typical for soils extremely depleted in nitrogen, for soils rich in mineral nitrogen, and for fertilised soils. Taking into account the preference for light, most of the species are semi light-demanding (38.46%) and light-demanding (33.33%).

The spectrum of social behaviour is dominated by the generalist species (38.46%), followed by the disturbance-tolerant (35.04%), specialists (5.98%) competitors (5.98%), weeds (4.27%), ruderal competitors (1.71%) and natural pioneers (0.85%) species.

The Eurasiatic species are dominant (47.86%), followed by the European (20.51%), circumpolar (11.96%) and Central-European (8.55%) species. Very poorly represented are Pontic, submediterranean, Dacian-Balkanic, Alpine-Carpathian-Balkanic, Carpathian-Balkanic, Carpathian-Balkanic-Caucasian and cosmopolitan species.

The floristic spectrum of the association the hemicryptophytes prevail (76.07%), accompanied by terophytes (13.67%) and to a lesser extent by camephytes, geophytes and mesophanerophytes.

The phytocoenoses of this association are used as pastures, usually during early spring and late autumn, being considered areas with medium pastoral value (Vp=2.49).

2. Anthyllido vulnerariae-Festucetum rubrae (Máthe *et* Kovács 1960) Soó 1971 (*Festuco rubrae-Cynosuretum* Tx. 1940 subass. *festucetosum rubrae* Máthe et Kovács 1960) association is located on smooth to steep slopes (5-40^{o}) showing southern exposure (SE, S, SW) on hills at altitudes between 670 and 1006 m.s.m. The phytocoenoses grow on weakly acidophilous-to-neutrophylous soils with pH values between 5.41 and 6.51, poor in organic matter (4.38-13.075%) pointing to high levels of decay organisms activity. In spite of a similar total number of species (115 species, Table 1, 2) and average number of 37 species/relevé as compared to the previous association, significantly higher diversity indices (H'=2.914, N_1=7.71) were obtained. However, due to the codominance of the dominant species, accompanied by *Agrostis capillaris* showing a high abundance the evenness of the phytocoenoses (E_{var}=0.451) is lower than that of the previous association. Floristically, 43.48% of the species are typical for the class and order that defines the association, 21.74% are typical for Class *Festuco-Brometea* that imprints a strong xeric feature to the phytocoenoses, while 9.57% are typical for Class *Nardo-Callunetea*. The phytocoenoses of the *Anthyllido vulnerariae-Festucetum rubrae* association contain a relatively high number of species with indicative value, at values for the transgression probability p<0.01: *Anthyllis vulneraria* (94.96%); *Briza media* (50.58%); *Polygala comosa* (42.86%); *Trifolium pratense* (37.90%); *Tragopogon pratense* ssp *orientalis* (36.07%); *Knautia arvensis* (31.91%); *Plantago media* (31.72%) and *Pimpinella saxifraga* (26.43%). These species clearly individualize this phytocoenosis by other ones with associations edified by *Agrostis capillaris* and *Festuca rubra*.

Mesophytes (44.35%) and xero-mesophytes (40%) dominate the association, besides which moderate thermophylous (37.39%), micro-mesotherms (21.74%), eurytherms (31.30%), euryionic (41.74%), weakly acidophilous-to-neutrophylous (23.48%), and acidophilous-to-neutrophylous (20%) species are also present.

Table 1: Structure of the grasslands dominated by *Agrostis capillaris* **and** *Festuca rubra*
1 Hypochoeri radicatae-Agrostietum capillaris Pop *et* al. 1988
2- Anthyllido vulnerariae-Festucetum rubrae (Máthe *et* Kovács 1960) Soó 1971
3-5- Festuco rubrae-Agrostietum capillaris Horv. (1951) 1952

Analysed association	**1**		**2**		**3**		4		**5**	
No. of relevés	16		14		39		32		10	
Altitude (a.s.l)	620	1225	670	1050	580	1268	610	1000	665	1006
Slope (degrees)	0	30	5	40	0	45	5	50	5	35
Aspect	N,NE,E,SE,S,V		SE,S,SV		N,NE,E,SE,S,SV,V,NV		N,NE,SE,S,SV,V,NV		N,E,SE,SV,V,NV	
TMI	21	51	13	36	9	39	9	54	19	34
pH	4.30	5.31	5.41	6.51	4.09	7.11	4.05	7.29	4.47	6.06
Soil organic matter (%)	6.49	20.31	4.38	13.08	5.09	22.76	4.89	22.29	9.12	20.18
Mg (mg/l)	0.78	9.82	1.08	4.15	0.68	24.20	0.74	28.69	2.90	9.35
Ca (mg/l)	11.93	69.33	24.51	249.34	6.96	983.58	12.77	365.19	14.76	65.62
K (mg/l)	3.37	11.17	2.42	6.27	2.89	70.46	1.86	60.50	3.43	18.14
P (mg/l)	1.48	11.84	2.96	6.88	1.11	10.92	1.11	17.21	0.52	5.98
DIR	1.776	2.609	2.430	2.669	1.332	2.679	1.432	2.633	1.655	2.499
HL	1.655	2.520	2.177	2.679	1.332	2.679	1.332	2.609	1.670	2.561
Vegetation cover (%)	90	100	90	100	95	100	90	100	85	100
Bryophytes cover (%)	0	80	0	50	0	80	0	80	25	80
Land use	2	3	3	3	2	6	2	6	3	6
Litter depth (mm)	0	17	0	7.33	0	12	0	15	2.33	28
Surface	25	25	25	25	25	25	25	25	25	25
	AD	**K**	**AD**	**K**	**AD**	**K**	**AD**	**K**	**AD**	**K**
Arr.										
Festuca rubra	**2**	**V**	**3**	**V**	**4**	**V**	**2-3**	**V**	**3**	**V**
Agrostis capillaris	**4**	**V**	**1-2**	**V**	**2**	**V**	**3**	**V**	**2**	**V**
M-Arr.										
Hypochoeris radicata	**+-1**	**V**	**.-+**	**I**	**.-+**	**I**	**.-+**	**II**	**.-+**	**II**
F-Br.										
Anthyllis vulneraria	**.-+**	**I**	**1-3**	**V**	**.-1**	**II**	**.-2**	**II**	**.**	**.**
N-Cln.										
Nardus stricta	**.-1**	**III**	**.-+**	**I**	**.-2**	**V**	**.-2**	**IV**	**.-3**	**V**
Arr.										
Knautia arvensis	**.-+**	**II**	**.-+**	**V**	**.-+**	**II**	**.-+**	**III**	**.-+**	**I**
Cynosurus cristatus	**.-+**	**IV**	**.-+**	**III**	**.-+**	**II**	**.-+**	**III**	**.-+**	**I**
Carlina acaulis	**.-+**	**I**	**.-+**	**IV**	**.-+**	**II**	**.-+**	**II**	**.-+**	**III**
Campanula patula ssp patula	**.-+**	**IV**	**.-+**	**II**	**.-+**	**I**	**.-+**	**II**	**.-+**	**II**
Tragopogon pratense ssp orientalis	**.-+**	**I**	**.-+**	**IV**	**.-+**	**II**	**.-+**	**II**	**.-+**	**I**
Myosotis arvensis	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**	**.**	**.**
Centaurea phrygia ssp pseudophrygia .-+, I (4); Arrhenatherum elatius .-+, I (4); Senecio jacobea .-+,I (2,4); Crepis biennis .-+,,I (3,4); Gladiolus imbricatus .-+,I (3,4); Traunsteinera globosa .-+,I (4,5); Silene vulgaris .-+,I (2,3); Bellis perennis .-+,I (3,4); Trisetum flavescens .-+,I (3,4); Veronica arvensis .-+,I (1,4).										
M-Arr.										
Anthoxanthum odoratum	**.-+**	**V**	**.-1**	**IV**	**.-+**	**III**	**.-+**	**V**	**.-+**	**V**
Achillea millefolium	**.-+**	**V**	**.-+**	**IV**	**.-1**	**IV**	**.-+**	**IV**	**.-+**	**IV**
Plantago lanceolata	**.-+**	**V**	**.-+**	**V**	**.-+**	**IV**	**.-+**	**V**	**.-+**	**V**
Trifolium pratense	**+**	**V**	**.-1**	**V**	**.-+**	**IV**	**.-+**	**IV**	**.-+**	**IV**
Leucanthemum vulgare	**.-+**	**V**	**.-1**	**V**	**.-+**	**IV**	**.-+**	**IV**	**.-+**	**II**
Thymus pulegioides	**.-+**	**IV**	**.-+**	**III**	**.-+**	**IV**	**.-1**	**IV**	**.-+**	**III**
Leontodon autumnalis	**.-+**	**V**	**.-+**	**III**	**.-+**	**III**	**.-+**	**IV**	**.-+**	**III**
Briza media	**.-+**	**III**	**.-1**	**V**	**.-+**	**III**	**.-+**	**IV**	**.-+**	**III**
Trifolium repens	**.-+**	**III**	**.-+**	**III**	**.-+**	**IV**	**.-+**	**III**	**.-+**	**III**
Centaurea phrygia	**.-+**	**III**	**.-+**	**II**	**.-+**	**IV**	**.-+**	**IV**	**.-+**	**III**
Luzula campestris	**.-+**	**III**	**.-+**	**IV**	**.-+**	**III**	**.-+**	**III**	**.-+**	**IV**
Stellaria graminea	**.-+**	**IV**	**.-+**	**IV**	**.-+**	**IV**	**.-+**	**III**	**.-+**	**II**
Polygala vulgaris	**.-+**	**III**	**.-+**	**II**	**.-+**	**III**	**.-+**	**III**	**.-+**	**II**
Rhinanthus angustifolius	**.-+**	**III**	**.-+**	**IV**	**.-+**	**II**	**.-+**	**III**	**.-+**	**II**
Centaurea jacea	**.-+**	**II**	**.-+**	**IV**	**.-+**	**II**	**.-+**	**II**	**.-+**	**I**
Leontodon hispidus	**.-+**	**II**	**.-+**	**III**	**.-+**	**II**	**.-+**	**II**	**.-+**	**III**
Rumex acetosa	**.-+**	**III**	**.-+**	**II**	**.-+**	**II**	**.-+**	**II**	**.-+**	**III**
Cerastium fontanum ssp vulgare	**.-+**	**II**	**.-+**	**III**	**.-+**	**II**	**.-+**	**II**	**.-+**	**II**
Taraxacum officinale	**.-+**	**I**	**.-+**	**II**	**.-+**	**III**	**.-+**	**II**	**.-+**	**III**
Stachys officinalis	**.-+**	**II**	**.-+**	**II**	**.-+**	**II**	**.-+**	**III**	**.-+**	**I**
Holcus lanatus	**.-+**	**II**	**.-+**	**II**	**.-+**	**I**	**.-+**	**II**	**.-+**	**I**
Trifolium montanum	**.-+**	**I**	**.-+**	**III**	**.-+**	**II**	**.-+**	**II**	**.-+**	**I**
Veronica chamaedrys	**.-+**	**I**	**.-+**	**II**	**.-+**	**II**	**.-+**	**I**	**.-+**	**II**
Gymnadenia conopsea	**.-+**	**I**	**.-+**	**II**	**.-+**	**II**	**.-+**	**II**	**.-+**	**II**
Ranunculus acris	**.-+**	**III**	**.-+**	**I**	**.-+**	**I**	**.-+**	**II**	**.-+**	**I**
Arnica montana	**.-+**	**I**	**.**	**.**	**.-+**	**I**	**.-1**	**II**	**.-1**	**II**
Linum catharticum	**.-+**	**I**	**.-+**	**III**	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**
Dactylis glomerata	**.**	**.**	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**
Festuca pratensis	**.-+**	**I**	**.-+**	**I**	**.-+**	**I**	**.-+**	**II**	**.-+**	**I**

Rumex crispus	.-+	I	.-+	I	.-+	I	.-+	I	.	.
Dianthus deltoides	.-+	I	.	.	.-+	I	.-+	I	.	.
Viola tricolor	.-+	II	.	.	.-+	I	.-+	I	.-+	I
Ononis arvensis	.-+	I	.-+	II	.-+	I	.-+	I	.	.
Vicia cracca	.	.	.-+	I	.-+	I	.-+	I	.	.
Phleum pratense	.-+	II	.-+	I	.	.	.-+	I	.	.
Lychnis flos-cuculi	.-+	I	.	.	.-+	I	.-+	I	.	.
Angelica sylvestris	.	.	.-+	I	.-+	I	.	.	.-+	I

Ophioglossum vulgatum .-+,II (2); Veronica serpyllifolia .-+,I (4,5); Centaurium erythraea .-+,I (4,5); Lathyrus pratensis .-+,I (1,4); Crepis setosa .-+,I (2,3); Pimpinella major .-+,I (4); Orchis ustulata .-+,I (3); Carex panicea .-+,I (1); Polygala comosa .-+,III (2); Filipendula ulmaria .-+,I (4,5); Rhinanthus minor .-+,I (2,3).

M										
Trollius europaeus	.	.	.-+	I	.-1	I	.-+	I	.-+	I
Deschampsia caespitosa	.	.	.	.	.-+	I	.-+	I	.-+	I

Agrostis stolonifera .-+,I (3); Dianthus superbus .-+,I (2); Stachys germanica .-+,I (3); Juncus conglomeratus .-+,I (3); Succisa pratensis .-+,I (4); Telekia speciosa .-+,I (3,4).

F-Br.										
Hypericum perforatum	.-+	IV	.-+	II	.-+	III	.-+	III	.-+	II
Hieracium pilosella	.-1	II	.-+	III	.-+	III	.-1	III	.-2	IV
Lotus corniculatus	.-+	IV	.-+	IV	.-+	III	.-+	IV	.-+	IV
Pimpinella saxifraga	.-+	IV	.-+	V	.-+	II	.-+	III	.-+	II
Galium verum	.-1	III	.-1	IV	.-+	II	.-+	III	.-1	I
Plantago media	.-+	II	.-+	IV	.-+	III	.-+	III	.	.
Dianthus carthusianorum	.-+	II	.-+	II	.-+	I	.-+	III	.-+	II
Campanula rotundifolia	.-+	I	.-+	III	.-+	II	.-+	I	.-+	II
Scorzonera purpurea ssp rosea	.-+	I	.-+	I	.-+	II	.-+	I	.-+	I
Peucedanum oreoselinum	.-+	II	.-+	I	.-+	I	.-+	I	.-+	I
Trifolium aureum	.-+	I	.-1	II	.-+	I	.-+	II	.	.
Silene italica ssp nemoralis	.-+	I	.-+	I	.-+	I	.-+	I	.-+	I
Scabiosa ochroleuca	.-+	I	.-+	II	.-+	I	.-+	I	.	.
Brachypodium pinnatum	.	.	.-1	II	.	.	.-+	I	.	.
Campanula glomerata	.-+	I	.-+	II	.-+	I	.-+	I	.	.
Carlina vulgaris	.	.	.	.	.-+	I	.-+	I	.-+	I
Erigeron acer	.-+	I	.-+	I	.	.	.-+	I	.-+	I
Galium molugo	.-+	I	.-+	I	.-+	I	.	.	.	.
Thymus glabrescens	.-+	I	.	.	.-+	I	.-+	I	.	.
Potentilla argentea	.	.	.-+	I	.-+	I	.-+	I	.	.
Leontodon crispus ssp crispus	.-+	I	.-+	II	.	.	.	.	.	.

Centaurea biebersteinii ssp biebersteinii .-+,I (2,4,5); Euphorbia cyparissias .-+,I (4); Filipendula vulgaris .-+,I (4); Sanguisorba minor .-+,I (2); Trifolium campestre .-+,I (1,3); Ajuga genevensis .-+,I (4); Thymus pannonicus .-+,I (2); Scabiosa columbaria ssp pseudobanatica .-+,I (4); Agrimonia eupatoria .-+,I (2); Minuartia verna .-+,I (4); Phleum phleoides .-+,I (3,4); Helianthemum nummularium .-+,I (4); Teucrium chamaedrys .-+,I (2); Asperula cynanchica .-+,I (3,5); Carex caryophyllea .-+,I (2,4); Hypochoeris maculata .-+,I (1,5).

N-Cln.										
Potentilla erecta	.-+	IV	.-1	III	.-+	IV	.-+	IV	.-+	IV
Viola canina	.-+	III	.-+	III	.-+	III	.-+	III	.-+	III
Viola declinata	.-+	I	.	.	.-+	I	.-+	I	.-+	II
Danthonia decumbens	.-+	II	.-+	I	.-+	II	.-+	II	.-+	II
Euphrasia stricta	.-+	III	.-+	IV	.-+	II	.-+	II	.-+	I
Carex ovalis	.-+	II	.	.	.-+	II	.-+	II	.-+	II
Genista tinctoria	.-+	I	.-+	I	.-+	I	.-+	II	.-+	I
Carex pallescens	.-+	II	.-+	II	.-+	II	.-+	II	.-+	I
Campanula patula ssp abietina	.-+	I	.-+	I	.-+	II	.-+	II	.	.
Hieracium aurantiacum	.	.	.-+	II	.-+	I	.-+	I	.-+	II
Gentianella austriaca	.	.	.-+	I	.-+	I	.-+	I	.-1	II
Avenula praeusta	.	.	.	.	.-+	I	.-+	I	.-+	I
Crepis conyzifolia	.	.	.-+	I	.-+	I	.-+	I	.-+	I

Hieracium lactucella .-1,I (5); Hypericum maculatum .-+,I (3,4,5); Antennaria dioica .-+,I (3,4,5); Campanula serata .-+,I (5); Thesium alpinum .-+,I (4); Alchemilla monticola .-+,I (1,3).

Ch										
Carduus acanthoides	.	.	.	.	.-+	I	.-+	I	.-+	I
Echium vulgare	.	.	.-+	II	.	.	.-+	I	.	.
Daucus carota ssp carota	.	.	.	.	.-+	I	.-+	I	.	.

Linaria vulgaris .-+,I (1); Stellaria media .-+,I (3); Cirsium vulgare .-+,I (3); Arenaria serpyllifolia .-+,I (2); Geranium pusillum .-+,I (4); Capsella bursa-pastoris .-+,I (4); Potentilla reptans .-+,I (1,5).

Pl										
Prunella vulgaris	.-+	V	.-+	III	.-+	III	.-+	III	.-+	III
Poa annua	.-+	I	.	.	.-+	I	.-+	I	.-+	I
Juncus effusus	.	.	.	.	.-+	I	.	.	.-2	I
Lolium perenne	.-+	I	.	.	.-+	I	.-1	I	.-+	I
Salvia verticillata	.	.	.-+	I	.-+	I	.-+	I	.	.

Lysimachia nummularia .-+,I (3); Juncus inflexus .-+,I (1,4); Cichorium intybus .-+,I (2); Plantago major .-+,I (1,3).

Q-F										
Veronica officinalis	.-+	III	.-+	III	.-+	II	.-+	III	.-+	III
Luzula luzuloides	.-+	I	.-+	I	.-+	II	.-+	I	.-+	II
Cruciata glabra	.-+	II	.-+	I	.-+	II	.-+	II	.-+	I
Achillea distans	.-+	II	.-+	I	.-+	I	.-+	I	.-+	II
Solidago virgaurea	.-+	I	.	.	.-+	I	.-+	II	.-+	I

Pteridium aquilinum	.	.	.-1	I	.-+	I	.-+	I	.	.
Gentiana asclepiadea	.-+	I	.	.	.-+	I	.-+	I	.-+	I
Digitalis grandiflora	.	.	.-+	I	.	.	.-+	I	.	.
Rosa canina	.	.	.-1	I	.-+	I	.-+	I	.-+	I
Cirsium erisithales	.-+	I	.	.	.-+	I	.-+	I	.-+	I

Trifolium ochroleucom .-+,I (3,4); Poa nemoralis .-+,I (3); Trifolium medium .-+,I (3,4); Melampyrum bihariense .-+,I (3,4); Glechoma hederacea .-+,I (4); Clinopodium vulgare .-+,I (1,4); Orchis mascula .-+,I (4,5); Carpinus betulus .-+,I (4); Astragalus glycyphyllos .-+,I (3,4); Campanula trachelium .-+,I (3); Hieracium sabaudum .-+,I (1,2); Fagus sylvatica .-+,I (2,4); Carex montana .-+,I (4); Geranium phaeum .-+,I (4); Fragaria vesca .-+,I (3,4); Campanula persicifolia .-+,I (1,4).

Fa										
Astrantia major	.	.	.-+	I	.-+	I	.-+	I	.-+	I
Phyteuma spicatum	.-+	I	.	.	.-+	I	.-+	I	.-+	I
Listera ovata	.	.	.	.	.-+	I	.-+	I	.-+	I

Tanacetum corymbosum .-+,I (1,4); Brachypodium sylavaticum .-+,I (3,4); Viola reichenbachiana .-+,I (4); Crataegus monogyna .-+,I (1,3); Aegopodium podagraria .-+,I (4); Campanula rapunculoides .-+,I (3); Carex sylvatica .-+,I (3); Coryllus avellana .-+,I (5); Dryopteris filix-mas .-+,I (3,5); Luzula pilosa .-+,I (3); Myosotis sylvatica .-+,I (4); Helleborus purpurascens .-+,I (2).

V-Pi										
Vaccinium myrtillus	.-+	I	.	.	.-+	I	.-+	I	.-+	II
Luzula sylvatica	.	.	.	.	.-+	I	.-+	I	.-+	II

Lycopodium clavatum .-+,I (4,5); Deschampsia flexuosa .-+,I (1,3); Vaccinium vitis-idaea .-+,I (3,4).

Ins.										
Ranunculus polyanthemos	.-+	V	.-+	IV	.-+	IV	.-+	IV	.-+	IV
Rumex acetosella	.-+	III	.-+	III	.-+	II	.-+	II	.-+	III
Alchemilla xanthochlora	.	.	.-+	III	.-+	II	.-+	I	.-1	II
Polygala amara	.-+	I	.-+	II	.-+	I	.-+	II	.-+	I
Omalotheca sylvatica	.-+	III	.	.	.-+	I	.-+	III	.-+	III
Juncus buffonius	.-+	I	.	.	.-+	I	.-+	I	.	.
Laserpitium latifolium	.	.	.-+	I	.-+	I	.-+	I	.	.
Equisetum arvense	.-+	I	.-+	I	.-+	I	.-+	I	.	.
Medicago sativa ssp falcata	.-+	I	.-1	II	.	.	.-+	I	.-+	I
Parnassia palustris	.	.	.-+	I	.-+	I	.-+	I	.-+	I
Carduus kerneri ssp kerneri	.-+	I	.	.	.-+	I	.	.	.-+	I
Cruciata laevipes	.-+	I	.	.	.	.	.-+	I	.-+	I
Trifolium arvense	.-+	I	.-+	I	.	.	.-+	I	.	.

Verbascum phlomoides .-+,I (1,2); Scleranthus uncinatus .-+.I (4,5); Anthemis macrantha .-+, I (3); Phleum montanum .-+,I (3,4); Cardaminopsis halleri .-+,I (4); Spergularia rubra .-+,I (5); Ranunculus bulbosus .-+,I (3); Juncus compressus .-+,I (1); Campanula cervicaria .-+,I (3), Verbascum blattaria .-+,I (4); Rorripa sylvestris .-+,I (1); Elymus repens .-+,I (3); Carex hirta .-+,I (1); Hypochoeris uniflora .-+,I (3); Lathyrus sylvestris .-+,I (3,4); Echinops sphaerocephalus .-+,I (3); Lathyrus latifolius .-+,I (2); Lysimachia vulgaris .-+,I (4,5); Rumex alpinus .-+,I (1,3); Serratula tinctoria .-+,I (5); Phleum alpinum .-+,I (1,3); Populus nigra .-+,I (5); Rubus caesius .-+,I (3); Salix caprea .-+,I (4,5); Cerastium fontanum .-+,I (3); Ranunculus repens .-+,I (1); Poa chaixii .-+,I (3); Thymus commosus .-+,I (4,5); Urtica dioica .-+,I (3,4); Cuscuta europaea .-+,I (3); Epilobium angustifolium .-+,I (5); Galeopsis speciosa .-+,I (3); Verbascum nigrum .-+,I (4); Centaurea phrygia ssp melanocalathia .-+,I (2,3).

Location of the relevés: 1. Lăpuş Mts. (2003-2004) – 7 relevés; Maramureşului Mts. (2005) – 1 relevé; Ţibleş Mts. (2004) – 6 relevés; Rodnei Mts. (2005) – 2 relevés; **2**. Maramureşului Mts. (2003) – 2 relevés; Rodnei Mts. (2004-2005) – 10 relevés; Ţibleş Mts. (2004) – 2 relevés; **3**. Gutâi Mts. (2003-2004) – 5 relevés; Lăpuş Mts. (2003-2004) – 4 relevés; Ţibleş Mts. (2004) – 5 relevés; Rodnei Mts. (2004-2005) – 9 relevés; Igniş Mts. (2004) – 4 relevés; Maramureşului Mts. (2004-2005) – 12 relevés; **4**. Gutâi Mts. (2005) – 3 relevés; Lăpuş Mts. (2003-2004) – 11 relevés; Ţibleş Mts. (2004) – 8 relevés; Rodnei Mts. (2005) – 5 relevés; Maramureşului Mts. (2005) – 5 relevés; **5**. Gutâi Mts. (2003) – 4 relevés; Lăpuş Mts. (2003-2004) – 4 relevés; Ţibleş Mts. (2004) – 1 relevé; Rodnei Mts. (2005) – 1 relevé.

The oligotrophic character of the soil is illustrated by the prevalence of species typical for soils highly depleted in nitrogen (28.70%), followed by species preferring moderately oligotrophic (17.39%), submesotrophic (20%), and mesotrophic (13.91%) soils. Most of the species are semi light-demanding (37.39%), light-demanding (32.17%) and very high light-demanding (7.83%) as an argument for the insulated locations occupied by the phytocoenoses.

The spectrum of social behaviour is dominated by the generalist species (37.39%), followed by the distubance-tolerant (33.04%), specialists (9.57%) and competitors (7.83%) species.

Concerning the areal-geographical structure, the Eurasiatic (46.96%), European (23.48%), Central-European (10.43%) and circumpolar (8.70%) species prevail in the association. In very low amounts, also Alpine-Carpathian-Balkanic, Atlantic, Carpathian-Balkanic, Dacian, Dacian-Balkanic, Mediterranean, submediterranean and cosmopolite species are present. The representation of bioforms is as follows: hemicryptophytes (74.78%), terophytes

(13.92%), camephytes (5.22%), geophytes (4.35%), megaphanerophytes (0.87%), and mesophanerophytes (0.87%).

The grasslands containing this association are exclusively used as meadows grazed early in the spring and late in the autumn, their grazing value being modest (V_p=2.15).

3. Festuco rubrae-Agrostietum capillaris Horv. (1951) 1952 covers large areas in the montane zone of Maramureş county, being located on plateaus or on slopes varying between 5 and 50°, with various exposures and large variation limits of the altitude (580-1268 m.s.m.). The association grows on soils with pH values between 4.09 and 7.29, low to moderate concentrations of organic matter (4.89 – 22.29 %) and highly variable potential humidity values (TMI=9-54).

The association is very heterogeneous as far as the floristic structure is concerned (Table 1, 3-5): 222 cormophyte species, of which 31.53% are characteristic for the subordinating class, order and alliance, 17.56 % are characteristic for the *Querco-Fagetea* Class, 13.51% for the *Festuco-Brometea* Class, and 8.56% for Class *Nardo-Callunetea*. The phytocoenoses of this association are characterized by a medium diversity (H'=2.312, N_1=5.11) defined by a relative large number of species (33 species/ relevé). In spite of these features, evenness shows relatively low values (E_{var}=0.463) because of the quantitative dominance of only 2-3 species. Based on the quantitative prevalence of one of the codominant species, three facies types can be defined within this association: *festucosum* (Table 1, 3), with *Festuca rubra* as discriminant species (indval=31.24%, p=0.0001) showing mean coverage of 62.5%; *agrostiosum* (Table 1, 4), with *Agrostis capillaris* as discriminant species (indval=25.1%, p=0.0001), and *nardetosum* (Table 1, 5), with *Hieracium pilosella* (49.63%, p=0.003), *Nardus stricta* (47.14%, p=0.004) and *Gentianella austriaca* (29.57%, p=0.006) as discriminant species.

Ecologically, the whole association is dominated by mesophytes (47.30%), xero-mesophytes (33.33%), moderate thermophylous (43.69%), micro-mesotherms (25.68%), eurytherms (24.32%), euryionic (40.99%), acidophilous-to-neutrophylous (25.23%), and weakly acidophilous-to-neutrophylous (21.17%) species. According to their preference for the amount of nitrogen in soils, a large diversity of stations was noticed for this associations, with no prevalent type. Thus, 19.37% of the species are typical for soils highly depleted in nitrogen, 14.86% for moderate oligotrophic soils, 19.37% for submesotrophic, and 15.77% for mesotrophic soils. The presence of plants preferring soils moderately rich in nutrients (9.46%), of those specific for soils rich in mineral nitrogen (7.66%), fertilized (3.15%), and superfertilized (1.35%) soils points to the influence of anthropozoogenous factors that determine an increase of the concentration of mineral nitrogen in soils.

Regarding the species' preference for light, semi light-demanding species prevail in the association (34.23%), followed by light-demanding species (30.18%); besides, shadow (1.80%), shadow – semi light (4.05%), semi shadow (6.31%), and semi shadow – semi light (14.41%) species grow, suggesting either the presence of phytocoenoses in more or less shadowed stations, or their location in the vicinity of groups of trees from where the forest species migrate towards the grasslands.

The spectrum of social behaviour is dominated by the generalist species (36.04%), followed by the disturbance-tolerant (31.98%), specialists (10.36%), competitors (6.76%), weeds (4.05%), ruderal competitors (1.35%) and natural pioneers (0.90%) species.

The phytocoenoses of this association are dominated by Eurasiatic species (45.05%), followed by European (18.47%), Central-European (11.26%) and circumpolar (9.46%) species. They are accompanied by small amounts of Alpine-Carpathian, Alpine-Carpathian-Balkanic, Atlantic-Mediterranean, Carpathian-Balkan, Carpathian-Balkan-Caucasian, Dacian, Dacian-Balkanic, endemic, Mediterranean, submediterranean, Pontic, Pontic-Mediterranean and cosmopolitan species. The bioforms spectrum is clearly dominated by hemicryptophytes

(71.62%), accompanied by terophytes (15.32%), geophytes (4.50%), camephytes (5.41%), mesophanerophytes (1.80%), and megaphanerophytes (1.35%).

The phytocoenoses of this association are used as meadow grazed early in the spring and late in the autumn, as well as as cattle, cattle and sheep, or only sheep pastures with medium pastoral value as proved by the measured index V_p=2.12.

Table 2: ***Festuco rubrae-Agrostietum capillaris*** Horv. (1951) 1952 subass. ***avenuletosum praeustae*** subass. nova (type relevé: 4)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Altitude (a.s.l)	737	762	784	784	750	790	778	790	743	750	
Aspect	N	SE	N	N	NE	N	N	N	SE	NE	
Slope (degrees)	5	10	15	15	5	15	15	25	10	5	
TMI	51	27	45	45	49	40	45	31	27	49	
pH	5.18	5.23	5.39	5.23	5.07	4.98	5.13	5.21	5.16	4.97	
Soil organic matter (%)	17.842	18.471	20.118	16.603	19.532	20.413	21.321	21.094	19.259	20.754	
Mg (mg/l)	3.34	3.27	3.24	3.17	3.52	3.37	3.67	3.61	3.28	3.41	
Ca (mg/l)	25.87	26.14	29.32	25.73	24.17	23.54	29.48	27.73	26.68	24.56	
K (mg/l)	4.12	3.83	3.7	4.52	4.67	5.17	8.32	6.08	5.43	4.07	
P (mg/l)	3.733	3.196	2.590	3.330	2.696	3.031	8.696	4.353	4.842	3.031	
DIR	2.301	2.499	2.033	2.033	2.330	2.033	2.033	1.776	2.499	2.330	
HL	2.3297	2.3556	2.1085	2.1085	2.3013	2.1085	2.1085	1.8848	2.3556	2.3013	
Vegetation cover (%)	100	100	100	100	100	100	100	100	100	100	
Bryophytes cover (%)	75	75	70	70	75	75	90	50	50	80	
Land use	3	5	3	3	5	5	3	3	5	5	
Litter depth (mm)	62.33	55	71.33	67.33	70	59.33	52.33	70	49.33	51.33	
Surface	25	25	25	25	25	25	25	25	25	25	**K**
Arr.											
Festuca rubra	+	+	+	+	2	+	+	+	3	2	**V**
Agrostis capillaris	+	+	+	+	+	+	+	+	+	+	**V**
Na											
Avenula praeusta	5	5	5	5	4	4	4	4	3	3	**V**
M-Arr.											
Anthoxanthum odoratum	+	+	+	+	+	.	+	+	+	+	**V**
Briza media	.	+	+	+	+	.	.	+	+	.	**IV**
Leucanthemum vulgare	+	+	.	+	+	.	+	+	+	.	**IV**
Centaurea phrygia	+	.	+	.	+	+	+	.	+	.	**IV**
Luzula campestris	.	+	+	+	.	+	+	+	.	.	**IV**
Stellaria graminea	+	.	.	.	+	+	.	.	.	.	**IV**
Polygala vulgaris	.	+	.	.	+	+	.	+	+	.	**III**
Rhinanthus angustifolius	+	.	+	+	+	.	.	.	+	.	**III**
Centaurea jacea	.	+	+	+	.	+	.	+	.	.	**III**
Rumex acetosa	+	+	+	+	.	.	.	.	.	.	**III**
Arnica montana	+	.	.	.	.	+	.	+	+	.	**III**
Achillea millefolium	.	+	.	.	+	.	+	.	+	.	**III**
Thymus pulegioides	+	+	.	.	+	.	.	.	+	+	**III**
Leontodon autumnalis	.	.	+	.	.	.	.	.	+	.	**II**
Plantago lanceolata	+	.	.	.	.	.	.	.	+	.	**II**
Trifolium pratense	+	.	.	.	+	.	.	.	.	.	**II**
Gymnadenia conopsea	+	.	.	.	.	.	.	+	.	.	**II**
Dactylorhiza maculata	+	.	.	.	.	.	.	+	.	.	**II**
Carlina acaulis	.	+	.	.	.	+	.	.	+	.	**II**

Specii cu prezență sub 15%: Trifolium montanum + (8); Veronica chamaedrys + (5); Ranunculus acris + (8); Deschampsia caespitosa + (1).

F-Br.											
Peucedanum oreoselinum	+	+	+	+	.	+	+	+	+	.	**V**
Hypericum perforatum	.	+	+	+	+	+	+	.	+	.	**IV**
Hieracium pilosella	.	.	.	.	.	.	.	+	+	.	**II**
Lotus corniculatus	.	.	.	.	.	.	+	+	+	.	**II**
Pimpinella saxifraga	+	.	+	+	.	.	.	.	.	.	**II**
Galium verum	+	.	.	+	+	.	.	.	.	.	**II**

Scorzonera purpurea ssp rosea	+	.	.	.	+	.	.	.	.	.	II
Silene italica ssp nemoralis	.	+	.	.	.	.	.	.	.	+	II
Specii cu prezență sub 15%: Galium molugo + (1); Hypochoeris maculata + (9).											
N-Cln.											
Genista tinctoria	+	+	+	+	+	+	+	+	+	+	V
Potentilla erecta	+	+	+	+	+	+	+	+	+	+	V
Carex pallescens	+	+	.	.	+	+	.	+	+	+	IV
Galium pumillum	.	.	+	.	.	+	+	+	+	+	IV
Nardus stricta	.	+	+	+	+	+	+	.	.	2	IV
Viola canina	.	+	+	+	+	.	.	.	+	+	IV
Antennaria dioica	.	+	.	.	+	+	.	+	+	.	III
Danthonia decumbens	.	.	.	+	.	.	+	.	.	.	II
Chamaespartium sagittale	+	.	.	.	.	.	.	.	.	+	II
Campanula patula ssp abietina	+	.	.	.	+	.	.	.	+	.	II
Hypericum maculatum	+	.	.	.	.	.	.	.	.	+	II
Specii cu prezență sub 15%: Euphrasia strica + (7); Carex ovalis + (2).											
Q-F											
Veronica officinalis	+	+	.	.	+	.	.	.	+	+	III
Luzula luzuloides	.	.	.	.	.	+	.	+	.	.	II
Cruciata glabra	+	.	+	.	.	.	.	.	.	.	II
Pteridium aquilinum	.	.	.	.	+	.	.	.	+	+	II
Platanthera bifolia	.	.	.	.	.	.	.	+	+	.	II
Brachypodium sylvaticum	.	.	.	.	.	.	.	.	.	+	II
V-Pi											
Vaccinium myrtillus	+	+	.	+	+	+	+	+	+	+	V
Deschampsia flexuosa	.	+	+	+	+	2	+	+	.	+	V
Vaccinium vitis-idaea	+	+	1	1	2	1	2	1	+	2	V
Lycopodium clavatum	.	.	.	.	+	+	.	+	.	.	II
Îns.											
Ranunculus polyanthemos	+	.	.	.	+	.	.	.	.	.	II
Specii cu prezență sub 15%: Lysimachia vulgaris + (1); Lysimachia nummularia + (7).											

Location and date of relevés' investigation: 1, 2, 5 – 25.06.2005 –Gutâi Mts., "La Deal"; **3, 4, 7** – 25.07.2005 – Gutâi Mts., "La Deal"; **6, 8** – 24.06.2006 –Gutâi Mts., "La Deal"; **9, 10** – 25.06.2006 –Gutâi Mts., "Pe Onțan".

Festuco rubrae-Agrostietum capillaris Horv. (1951) 1952 subass. ***avenuletosum praeustae*** subass. nova, type relevé: Table 2, relevé 4. This subassociation was identified in Gutâi Mountains, on smooth slopes (5-25°) with dominantly northern exposure at altitudes varying between 737-790 m.s.m. It grows on acidic-to-neutral soils (pH=4.97-5.39) with high contents of organic matter (16.6-21.32%). The phytocoenoses of this infracoenotaxon show 100 % coverage and present a well-developed Bryophytes cover that may occupy up to 90% of the surface. Another typical feature of these phytocoenoses is the presence of a deep litter cover with thicknesses varying between 49.33 and 71.33 mm. The cormoflora of this coenotaxon is represented by 63 species, with about 25 species/relevé in average. One to three species are dominant, thus both diversity (H'=1.692, N_1=3.49), and evenness (E_{var}=0.422) show relatively low values. Among the species composing the subassociation, 41.26 % are typical to *Molinio-Arrhenatheretea*, 22.22% to *Nardo-Callunetea*, 15.87% to *Festuco-Brometea*, 9.53% to *Querco-Fagete*, and 6.35% to *Vaccinio-Picetea* Class respectively. The phytocoenoses of this subassociation include a relatively high number of discriminant species, *i.e. Vaccinium vitis-idaea* (99.83%, p=0.0001); *Avenula praeusta* (99.78%, p=0.0001); *Deschampsia flexuosa* (77.89%, p=0.0001); *Vaccinium myrtillus* (60.47%, p=0.0001); *Galium pumillum* (60%, p=0.0001); *Genista tinctoria* (54.60%, p=0.0001); *Peucedanum oreoselinum* (36.67%, p=0.0004); *Antennaria dioica* (36.63%, p=0.0001), and *Carex pallescens* (25.61%, p=0.005). In the references, no other coenotaxa have been previously described together with *Avenula praeusta*.

Regarding ecology, the subassociation shows mesophyle (44.44%) to xero-mesophyle (31.75%) features; additionally poorly meso-hygrophyle (9.52%), and eurytherms (42.86%) species, microtherms (26.98%) to micro-mesotherms (25.40%), euryionic (41.27%) to weakly acidophilous-to-neutrophylous (30.16%), and acidophilous-to-neutrophylous (20.63%) species are also present. The oligotrophic character of the stations occupied by the phytocoenoses of the subassociation is also underpinned by the high concentration of species typical for soils very depleted in nitrogen (36.51%), besides which species characterizing moderate oligotrophic soils (17.46%), submesotrophic (19.05%), and mesotrophic (14.29%) soils are also present. The semi light-demanding (41.27 %) and the light-demanding (26.98%) species prevail.

Concerning the social behaviour of the plants, the phytocoenoses are dominated by generalist (41.27%) and perturbation-tolerant (30.16%) species, followed by specialist (11.11%), competitive (9.52%) and natural pioneer (1.59%) species.

The Eurasiatic species prevail (50.79%), but European (17.46%) and circumpolar (11.11%) species accompany them. In lesser concentrations Central-European (9.52%), cosmopolitan (4.76%), Atlantic-Mediterranean (3.17%), Alpine-Carpathian-Balkanic and Dacian-Balkanic species (1.59% each) were identified. Regarding bioforms, hemicryptophytes are the most prominent (77.78%), followed by camephytes (12.70%), geophytes (6.35%), and annual terophytes (3.17%).

In spite of their very low pastoral value (V_p=0.97), the phytocoenoses of this coenotaxon are used both as meadow grazed early in the spring and late in the autumn and as pasture grazed by cattle and sheep.

Conclusions

The investigation of the 121 relevés resulted in the identification of four coenotaxa, represented by three associations and a subassociation new for science. The differential species corresponding to each coenotaxon were identified, allowing the coenotaxonomic assignment of the vegetation.

Regarding the phytodiversity of the identified coenotaxa, the highest diversity characterizes the *Anthyllido vulnerarae-Festucetum rubrae* (Máthe et Kovács 1960) Soó 1971 association, while the lowest values were recorded for the *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952 subass. *avenuletosum praeustae* subass. nova. The *Hypochoeri radicatae-Agrostetum tenuis* Pop *et* al 1988 association shows the maximum evenness value, while the phytocoenoses dominated by *Avenula praeusta* are characterized by the minimum evenness value.

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PAJIŞTILE MONTANE EDIFICATE DE *AGROSTIS CAPILLARIS* ŞI *FESTUCA RUBRA* DIN JUDEȚUL MARAMUREŞ
I. ANALIZA FITOSOCIOLOGICĂ

(Rezumat)

Acest studiu a urmărit atât identificarea şi validarea din punct de vedere statistic a cenotaxonilor edificați de *Agrostis capillaris* şi *Festuca rubra*, cât şi evidențierea speciilor diferențiale corespunzătoare fiecărui cenotaxon. Pentru aceasta au fost analizate un număr de 121 de relevee fitosociologice, efectuate în perioada 2003-2006 în zona montană a județului Maramureş. În urma analizelor efectuate au fost identificați următorii cenotaxoni: *Hypochoeri radicatae-Agrostetum tenuis* Pop *et* al. 1988; *Anthyllido vulnerarae-Festucetum rubrae* (Máthe *et* Kovács 1960) Soó 1971; *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952 şi *Festuco rubrae-Agrostietum capillaris* Horv. (1951) 1952 subass. *avenuletosum praeustae* subass. nova.