



The Natural Priority Habitats in the Alpine zone of Bucegi Massif (Romanian Southern Carpathians)

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ABSTRACT: The research aim was to select and delimit natural habitats in the Romanian Southern Carpathians, in the alpine zone of the Bucegi Massif to realize the network of protected areas, Natura 2000, in Romania. Therefore, both the habitats and their priority Red Book species were identified, as well as Carpathian endemic or artic-alpine species. Habitats were described and the codes for them were in accordance with the database from the EMERALD software; the habitat classification is based on "A classification of Palearctic habitats", Habitats Directives - 92/43/EEC and on Romanian Law 462/2001 Annex 2. Consequently, the EUNIS code for habitats was used, related to phytosociological associations, as described in Romanian phytosociological literature. The Romanian codes for all of these were also added.

Key words: Natura 2000, phytocoenoses, priority species

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INTRODUCTION

Biodiversity conservation is a major subject for researchers all around the world. It was a global target by 2010 of the Convention on Biological Diversity (CBD 2003a, 2003b, 2005) and the UN World Summit on Sustainable Development to accomplish a significant reduction of the current rate of biodiversity loss. This was a huge step in preserving biodiversity (MACE & BAILLIE 2007). The rules for the protection and use of biodiversity were compiled in the CBD (2003a, 2003b, 2005) at the United Nations Conference on Environment and Development in Rio de Janeiro 1992.

Protecting natural areas is a useful endeavor for many reasons (LEROUX *et al.* 2010). On the basis of the information provided in 2009 in the World Database on Protected Areas (WDPA), it was calculated that between 10.1% and 15.5% of the world's land surface is located within protected areas (SOUTULLO 2010).

In such a protected area we recognized several habitats. The first habitat definition was given by DARWIN (1859): 'the locality in which a plant or animal naturally lives'. This 'habitat' refers simply to the precise location occupied by

a species or a group of species according to its abiotic and biotic preferences. To explain what a habitat is, the Habitats Directive (EUROPEAN COMMISSION 1992) has this definition: 'terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural'. Another definition was given by MOSS & WYATT (1994); they described 'habitat' as a synonym for 'biotope' in a paper describing the CORINE effort (now EUNIS, WOOD & RIPTON 1998) to create a harmonized European habitat classification system and database - the natural habitats in the Habitats Directive are a mixture of several typologies: geographic, geomorphologic, coenotic. These classifications cause many problems owing to the differing interpretations of the various EU countries that try to apply the Directive (JOHNSTON *et al.* 2002). According to these definitions, DAVIES & MOSS (1999) proposed the classification of habitats throughout Europe in the EUNIS classification (the European Nature Information System).

The framework to organize habitats according to the same methodology as that used for the CORINE Biotopes *Habitats of the European Community* typology (DEVILLERS *et al.* 1991) was *A classification of Palearctic*

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habitats (DEVILLERS & DEVILLERS-TERSCHUREN 1996) prepared for the Council of Europe.

Beside the systems of classification of habitats in Europe, national systems of classification of habitats or ecosystems were elaborated in most European countries. They are based on rather different methods, and thus the accomplishment of a correspondence between them is a complex operation that requires a coherent system

of assimilation and interpretation. Those manuals of assimilation of European systems of classification of habitats, and that used in the implementation of the Natura 2000 network, especially with national classifications, have been elaborated in most countries of the European Community.

In Romania, DONIȚĂ *et al.* (2005) described the main types of habitats of the country uniformly accordingly to CORINE (1991) and Palearctic Habitats (1996, 1999). Hereby a total of 357 habitats belonging to 7 classes and 24 subclasses of the Palearctic Habitats classifying system have been described (DONIȚĂ *et al.* 2005, 2006). However, the characteristic associated vegetation covered by the Manual of Habitats suggests a serious lack of interpretation of Natura 2000 habitats in Romania. Explanation of their standard description is also missing (GAFTA & MOUNTFORD 2008).

Area of study. The Bucegi Massif (45.41°N, 25.45°E) is part of the Romanian Carpathians. The Carpathian mountain range covers 47% of Romania (Fig. 1). The Romanian Carpathians are divided into three groups: Eastern Carpathians, Southern Carpathians (with the highest peaks) and Western Carpathians. The largest area of the Carpathians (55%) is located in Romania. The Romanian Carpathians are characterized by an alternation of mountainous and depressions, valleys and gorges and the diversity and the configuration of vegetation, a varied landscape with different types of relief particularities (glacial, karstic, riverine, structural-lithological) and they form the eastern and southern boundaries of the region. The Carpathians are Europe's largest mountain range with an area of about 210000 km² and 1500 km along the Central and South-Eastern Europe represented the eastern wing of the great Central Mountain System of Europe (UNEP 2007). In this area the climate is temperate-continental with strong altitudinal gradients. The annual average temperature is 9°C in the plains to below 0°C on the mountain peaks, and precipitation ranges between <500 mm to >2000 mm.

The Carpathian region has exceptional conservation value. There is old growth and natural forest stands in that area as well as valuable cultural landscapes. The area is rich in endemic taxa.

The Bucegi Massif is a territory with an altitudinal range varying from 798 to 2505 m and annual average rainfall ranging from 177 to 1423 mm. The floristic survey deals with parameters such as species richness, uniqueness, life forms and dispersal modes of these plants, in relation to altitudinal and rainfall gradients and geology. The predominant rock type in these mountains is the Bucegi Conglomerate, a Cretaceous formation with lots of limestone.

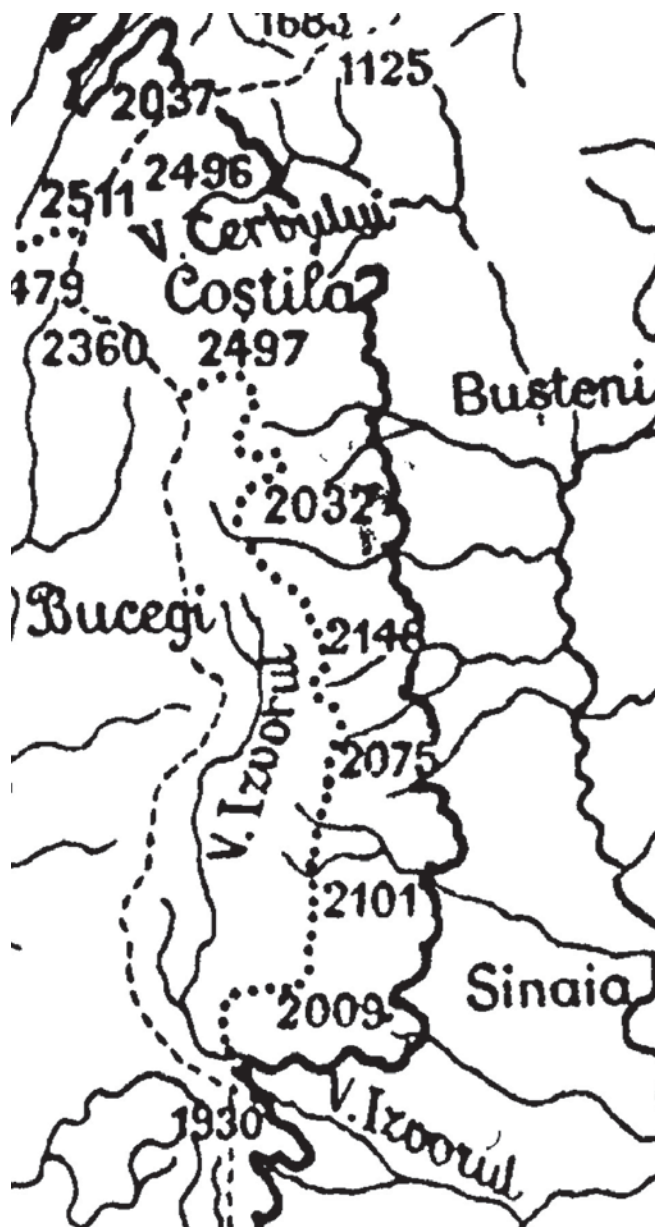


Fig. 1 Map of the Bucegi Massif

MATERIAL AND METHODS

Field data collection: The studied territory was surveyed to identify the principal phytocoenoses in that area (sensu NICOLAE 2005). Floristic data were collected from 110 randomly selected plots (100 m x 100 m in meadows or pasture) from field sites selected subjectively in the alpine area.

For each plot, floristic and geographic data were collected. The latitude and longitudes were recorded for each plot using a Global Positioning System (GPS). Field information about different vegetation types and other parameters such as deforestation, grazing pressure, general topography of the area were also recorded. Floristic data from each plot were recorded using the Braun-Blanquet approach (BRAUN-BLANQUET 1964). Nomenclature follows Cormophytes Flora of Romania (SANDA *et al.* 2003). For species identification, the Illustrated Flora of Romania (CIOCARLAN 2009), the Flora of Romania (SĂVULESCU (ed.) 1952-1976) and Flora Europaea (TUTIN *et al.* 1968-1980, 1993; CD 2001) were used.

For each of the phytocoenoses, the Natura 2000 (1992), EMERALD (1979), CORINE (1991), Palearctic Habitats (1996, 1999), EUNIS codes for habitats were searched. The codes for them are also given in accordance with the Romanian manual (DONIȚĂ *et al.* 2005, 2006) to determine correspondence between the natural habitats from Romania and those described in the European classifications.

Endemic species were described in each habitat as well as priority species compared with those given in the Romanian Red Book (DIHORU & NEGREAN 2009). According to these, natural priority habitats in the Bucegi Massif were described.

The majority of releves for each phytocoenose have been published elsewhere (BIȚĂ 1999; BIȚĂ-NICOLAE 2009). The nomenclature for the syntaxa follows MUCINA *et al.* (1993a, 1993b)

RESULTS AND DISCUSSION

The habitats recorded in the Bucegi Massif are listed in Table 1. Some habitats need to be specially protected within areas that are already designated as protected. A few of them are noted with an asterisk because they are priority habitats (EUROPEAN COMMISSION 2007). The following species are identified as priority species: *Soldanella montana* Willd. and *Centaurea triumpheti* (DIHORU & NEGREAN 2009), but also vulnerable and rare species: *Achillea schurii* Schultz-Bip subsp. *schurii* (Schultz-Bip) Heimerl, *Centaurea pinnatifida* Schur, *Cerastium arvense* L. subsp. *lerchenfeldianum* (Schur) Asch. et Graebn., *C. fontanum* Baumg. subsp. *macrocarpum* (Schur) Jalas,

C. transsilvanicum Schur, *Chamorchis alpina* (L.) Rich., *Coeloglossum viride* (L.) Hartm., *Dianthus glacialis* Haenke subsp. *gelidus* (Schott, Nyman et Kotschy) Nyman, *D. spiculifolius* Schur, *Doronicum carpaticum* (Griseb. et Schenk) Nyman, *Erigeron uniflorus* L., *Festuca carpatica* F.G. Dietr., *Gentiana lutea* L., *Kobresia myosuroides* (Vill.) Fiori, *Leontopodium alpinum* Cass., *Leucanthemum waldsteinii* (Schultz Bip.) Pouzar, *Ligularia sibirica* (L.) Cass., *Loiseleuria procumbens* (L.) Desv., *Lomatogonium carinthiacum* (Wulfen) Rchb., *Onobrychis montana* DC. subsp. *transsilvanica* (Simonk.) Jáv., *Oxytropis carpatica* Uechtr., *Pinguicula alpina* L., *P. vulgaris* L., *Poa molinerii* Balb. subsp. *glacialis* Beldie, *Pseudorchis albida* (L.) A. et D. Löve, *Ranunculus pseudomontanus* Schur, *Rhododendron myrtifolium* Scott et Kotschy., *Saxifraga oppositifolia* L., *Sesleria bielzii* Schur, *Thymus pulcherrimus* Schur, *Tozzia alpina* L., *Vaccinium uliginosum* L., *Viola alpina* Jacq. and Carpathian or Balkan endemic species such as: *Astragalus alpinus* L., *Campanula patula* L. subsp. *abietina* (Griseb.) Simonk., *Carduus kernerii* Simonk. subsp. *kernerii*, *Heracleum palmatum* Baumg., *Linum extraaxilare* Kit. (OLTEAN *et al.* 1994).

For each habitat coordinates and altitudes are given.

CONCLUSIONS

Twelve differing phytocoenoses from the Bucegi Massif are described – the alpine belt (*Cetrario-Loiseleurietum procumbentis*, *Rhododendro myrtifolii-Vaccinietum*, *Rhododendro myrtifolii-Pinetum mugii*, *Salici-Alnetum viridis*, *Oxytropido carpaticae-Elynetum*, *Potentillo chrysocraspedae-Festucetum airoidis*, *Seslerio-Festucetum versicoloris*, *Diantho tenuifolii-Festucetum amethystinae*, *Scorzonero roseae-Festucetum nigricantis*, *Violo declinatae-Nardetum*, *Sesleriohaynaldianae-Caricetum sempervirentis*, *Carduo kernerii-Festucetum carpaticae*). Almost all have a correspondence in Natura 2000, EMERALD, CORINE, Palearctic Habitats, EUNIS codes for habitats. For each association we noticed priority cormophyte species (rare species according to the Red Book of Romania) but also other endemic, rare and threatened species according to the previous (and larger) Red List of Romania.

Moreover, a few endemic habitats in the Carpathians area are described. Additional field investigations will assess the current condition of these habitats and especially priority and Carpathian endemic habitats.

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Table 1. Habitats, coordinates and altitudes, habitat codes and the priority and Romanian Red List species.

Habitat	Coordinates	NATURA	Emerald	Corine
	Altitudes	2000 Codes	Codes	Codes
<i>Cetrario-Loiseleurietum procumbentis</i> Br-Bl. et al. 1939	45.35°N, 25.48°E 2000-2200 m	4060 Alpine and Boreal heaths	31.4 Alpine and Boreal heaths;	31.411 <i>Loiseleuria</i> heaths
<i>Rhododendro myrtifolii-Vaccinietum</i> Borza (1955) 1959 em. Boşcaiu 1971	45.42°N 25.48°E 1800-2400 m	4060 Alpine and Boreal heaths	31.424 Carpathian Kotschy's alpenrose heaths	31.4 Alpine and Boreal heaths
<i>Rhododendro myrtifolii-Pinetum mugo</i> Borza 1959 em. Coldea 1995	45.38°N 25.48°E 1350-2100 m	4070* Bushes with <i>Pinus mugo</i> and <i>Rhododendron myrtifolium</i>	31.424 Alpine and Boreal heaths	-
<i>Salici-Alnetum viridis</i> Colič et al. 1962	45.41°N 25.49°E 1200-1900 m	-	31.1 Alpine and Boreal heaths	31.611 Alpine green alder scrub
<i>Oxytropido carpaticae-Elynetum</i> (Puşcaru et al. 1956) Coldea 1991	45.38°N 25.48°E 1800-2400 m	6170 Alpine and subalpine calcareous grasslands	-	36.42 Wind edge naked-rush swards
<i>Potentillo chrysocraspedae-Festucetum airoidis</i> Boşcaiu 1971	45.35°N 25.48°E	-	-	36.34 Crooked-sedge swards and related communities
<i>Seslerio-Festucetum versicoloris</i> Beldie 1967	45.41°N 25.49°E 2200-2400 m	6170 Alpine and subalpine calcareous grasslands	-	36.4 Alpine and subalpine calciphilous grasslands
<i>Diantho tenuifolii-Festucetum amethystinae</i> (Domin 1933) Coldea 1984	45.35°N 25.48°E 1700-1800 to 2300 m	6170 Alpine and subalpine calcareous grasslands	-	36.43 Stepped and garland grasslands
<i>Scorzonero roseae-Festucetum nigricantis</i> (Puşcaru et al. 1956) Coldea 1978	45.38°N 25.48°E 850-2200 m	6230* Species-rich <i>Nardus</i> grasslands, in siliceous substrates in mountain areas	-	36.31 Alpic mat-grass swards and related communities
<i>Violo declinatae--Nardetum</i> Simon 1966	45.42°N 25.48°E 2100-2200 m	6230* Species-rich <i>Nardus</i> grasslands, in siliceous substrates in mountain areas	-	36.31 Alpic mat-grass swards and related communities
<i>Seslerio haynaldiana-Caricetum sempervirentis</i> Puşcaru et al. 1956	45.43°N 25.44°E 1800-2400 m	6170 Alpine and subalpine calcareous grasslands	-	36.4 Alpine and subalpine calciphilous grasslands
<i>Carduo kernerii-Festucetum carpaticae</i> (Puşcaru et al. 1956) Coldea 1990	45.44°N 25.45°E 1800-2400 m	6170 Alpine and subalpine calcareous grasslands	-	36.4 Alpine and subalpine calciphilous grasslands

Pal. Hab. Codes	EUNIS	Romanian	Priority	Romanian Red List
	Codes	Codes	Species	
31.4113 Carpathian dwarf azalea heaths	F2.211 Alpine dwarf azalea heaths	R3101	<i>Soldanella montana</i>	<i>Dianthus glacialis</i> ssp. <i>gelidus</i> , <i>Kobresia myosuroides</i> , <i>Loiseleuria procumbens</i> , <i>Pinguicula alpina</i> , <i>P. vulgaris</i> , <i>Ranunculus pseudomontanus</i> , <i>Rhododendron myrtifolium</i> , <i>Vaccinium uliginosum</i>
1.424 Carpathian Kotschy's alpenrose heaths	F2.224 Carpathian <i>Rhododendron kotschyi</i> heaths	R3104		<i>Achillea oxyloba</i> ssp. <i>schurii</i> , <i>Loiseleuria procumbens</i> , <i>Pinguicula alpina</i> , <i>Rhododendron myrtifolium</i> , <i>Saxifraga oppositifolia</i>
31.562 Carpathian alpenrose mountain pine scrub	F2.46 Carpathian <i>Pinus mugo</i> scrub	R3105		<i>Rhododendron myrtifolium</i>
31.62152 Hercynio-Carpathian Silesian willow brush	F2.3112 Carpathian green alder scrub	R3110		<i>Campanula patula</i> ssp. <i>abietina</i> , <i>Heracleum palmatum</i> , <i>Leucanthemum waldsteinii</i> , <i>Tozzia alpina</i>
36.425 Carpathian naked-rush swards	36.42 Wind edge (<i>Kobresia myosuroides</i>) swards	R3601		<i>Achillea oxyloba</i> ssp. <i>schurii</i> , <i>Oxytropis carpatica</i> , <i>Poa molinerii</i> ssp. <i>glacialis</i> , <i>Thymus pulcherrimus</i> <i>Astragalus alpinus</i> , <i>Chamorchis alpina</i> , <i>Erigeron uniflorus</i> , <i>Kobresia myosuroides</i> , <i>Viola alpina</i>
36.34322 Eastern Carpathian <i>Festuca airoides</i> grasslands	4.3432 Carpathian <i>Festuca airoides</i> grasslands	R3604		<i>Cerastium arvense</i> ssp. <i>lerchenfeldianum</i> , <i>Dianthus glacialis</i> ssp. <i>gelidus</i> <i>Rhododendron myrtifolium</i> , <i>Thymus pulcherrimus</i> <i>Loiseleuria procumbens</i> , <i>Lomatogon carinthiacum</i> , <i>Saxifraga oppositifolia</i>
36.34322 Eastern Carpathian <i>Festuca versicolor</i> grasslands	4.3432 East Carpathian calciphile stepped grasslands	R3605		<i>Achillea oxyloba</i> ssp. <i>schurii</i> , <i>Anthemis carpatica</i> , <i>Cerastium arvense</i> ssp. <i>lerchenfeldianum</i> , <i>Dianthus glacialis</i> ssp. <i>gelidus</i> , <i>Dianthus spiculifolius</i> , <i>Linum perenne</i> ssp. <i>extraaxilare</i> , <i>Onobrychis transsilvanica</i> , <i>Thymus pulcherrimus</i>
36.43923 Eastern Carpathian <i>Festuca amethystina</i> grasslands	4.3432 East Carpathian calciphile stepped grasslands	R3607	<i>Soldanella montana</i>	<i>Cerastium arvense</i> ssp. <i>lerchenfeldianum</i> , <i>Coeloglossum viride</i> , <i>Dianthus glacialis</i> ssp. <i>gelidus</i> , <i>Dianthus spiculifolius</i> , <i>Linum perenne</i> ssp. <i>extraaxilare</i> , <i>Leontopodium alpinum</i> , <i>Lomatogonium carthiacum</i> , <i>Onobrychis transsilvanica</i> , <i>Nigritella rubra</i> , <i>Thymus pulcherrimus</i>
36.3172 Eastern Carpathian mat-grass swards	E 4.31 Alpic <i>Nardus stricta</i> swards and related communities	R3608		<i>Bruckenthalia spiculifolia</i> , <i>Campanula patula</i> ssp. <i>abietina</i> , <i>Cerastium fontanum</i> ssp. <i>macrocarpum</i> , <i>Coeloglossum viride</i> , <i>Pinguicula vulgaris</i>
36.3172 Eastern Carpathian mat-grass swards	E 4.31 Alpic <i>Nardus stricta</i> swards and related communities	R3609	<i>Soldanella montana</i>	<i>Campanula patula</i> ssp. <i>abietina</i> , <i>Dianthus glacialis</i> ssp. <i>gelidus</i> , <i>Pseudorchis albida</i> , <i>Thymus pulcherrimus</i>
36.34322 Eastern Carpathian <i>Festuca versicolor</i> grasslands	E4.3432 East Carpathian calciphile stepped grasslands	R3611	<i>Centaurea triumpheti</i>	<i>Centaurea pinnatifida</i> , <i>Cerastium arvense</i> ssp. <i>lerchenfeldianum</i> , <i>C. transsilvanicum</i> , <i>Dianthus spiculifolius</i> , <i>Gentiana lutea</i> , <i>Linum perene</i> ssp. <i>extraaxilare</i> , <i>Onobrychis transsilvanica</i> <i>Leontopodium alpinum</i>
37.8221 Carpathian fescue tall grass communities	E4.4 Calcareous alpine and subalpine grasslands	R3613		<i>Achillea oxyloba</i> ssp. <i>schurii</i> , <i>Carduus kernerii</i> subsp. <i>kernerii</i> , <i>Cerastium transsilvanicum</i> , <i>Doronicum carpaticum</i> , <i>Festuca carpatica</i> , <i>Leucanthemum waldsteini</i> , <i>Ligularia sibirica</i> , <i>Linum perene</i> ssp. <i>extraaxilare</i> , <i>Sesleria bielzii</i>

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Botanica SERBICA



REZIME

Prioritetna staništa Alpijske zone Bucegi masiva (Južni Karpati, Rumunija)

Claudia D. BIȚĂ-NICOLAE

Cilj ovog istraživanja je bio da se odaberu i izdvoje prirodna staništa rumunskih južnih Karpata, u alpijskoj zoni Bucegi Masiva, te da se doprinese formiranju mreže zaštićenih područja Natura 2000 u Rumuniji. Stoga su utvrđivana staništa i prioritetne vrste iz Crvene Knjige, ako i Karpatski endemiti ili arкто-alpijske vrste. Opisivana staništa su kodirana u skladu sa bazom EMERALD, a klasifikovana su prema PALERCTIC standardima i evropskoj direktivi o staništima 92/43/EEC ili na rumunskom zakonu 462/2001 Annex 2. Konsekventno, EUNIS kod za staništa je korišćenu odnosu na asocijacije, koje su opisane u rumunskoj fitocenološkoj literaturi. Rumunski kodni system pridadt je svakom od tipova staništa.

Ključne reči: Natura 2000, fitocenoze, prioritetne vrste

