FORESTS VEGETATION, FOREST HABITATS OF COMMUNITY INTEREST IN NORTH-WEST ROMANIA, INCLUDED IN THE PROJECT "PRIORITY HABITATS OF FOREST STEPPE AND HILLY PIEDMONTS", POTENTIAL THREATS AND MONITORING OF CONSERVATION STATUS (I)

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Abstract

The purpose of this paper is to identify and describe the types of natural habitats of community interest in northwestern Romania.

We have proposed to reach five working goals prior to reaching the proposed objective. The working methods we used consist in the acquisition of informative materials, preliminary evaluation of the forests, field research, and a complete evaluation that led to the elucidation of the scientific content of the proposed objectives.

The scientific information obtained regarding the floral composition, the high conservation values, the state of conservation, the potential threats and the management of the forests included in the five natural habitats of community interest in the northwest of Romania are processed and analysed besides the results and discussions thereof.

The phytocenoses of these habitats were studied from the perspective of their belonging to seven rare plant associations, described for the first time. Four conclusions were formulated summarizing the research results and the original contribution of the authors of this work.

Key words: forests, forest habitats, phytocenoses, plant associations.

INTRODUCTION

Habitats of community interest are those habitats that are of major importance for the protection and conservation of nature according to the Directive 92/43/EEC of 21.05.1992 known as the "Habitats Directive" transposed into the Romanian legislation by the Romanian Government by means of the following legal acts: Law no. 462/2001 on the endorsement of the Government Emergency Ordinance no. 236/2000, Government Decision no. 1284/2007, Emergency Ordinance no. 57/2007 on the regime of the protected natural areas, the conservation of the natural habitats, of the flora and the wildlife, and which contains detailed provisions regarding the setting up of the “Natura 2000” Network and the administration of their sites thereof.

The Habitats of Community Interest Directive is based on the document approved by the Habitats Committee in February 1994, which subsequently approved interpretation manuals as follows: EUR 12 version

from April 1995, EUR 15 from October 1999, and the EUR 25 from 14th of March 2002 "Interpretation Manual of European Union habitats" which also included the habitats in Romania. The purpose of this work is to identify and describe the types of natural habitats of community interest in northwestern Romania included in the Project "Priority forest habitat of community interest of forest steppe and hilly foothills, potential threats and monitoring of the conservation status".

In order to reach the proposed objective we set the following five goals:

(i) Finding natural habitats of Community importance in the European and Romanian version thereof;
(ii) Identification of the main plant associations and the types of ecosystems that include endangered, vulnerable, rare and endemic species, while those containing endangered species being considered priority habitats;
(iii) Identification of high conservation value forests (HCVFs) and their geographical distribution in the territory;
(iv) Assessment of the conservation status and potential threats against habitats subject to study;
(v) Establishing protection measures and management of habitats containing high conservation value forests.

In order to solve the objectives of this study we reviewed the scientific papers which have been published more recently and contain information on the habitats and sites of community interest included in the "Natura 2000 Ecological Network" of the following authors: Candrea Bozga et al., 2009; Doniță et al., 2005; Drăgulescu et al., 2007 ; Gafta, Mountford, 2008 ; Lazăr et al., 2007; Stăncioiu et al., 2008, those containing information on high conservation value forests, Biriș et al., 2002 ; Ioraș, Abrudan, 2007 ; Jennings et al., 2003; Stanciu et al., 2004 ; Stăncioiu, 2008 ; Vlad et al., 2013, and also sources providing information on habitat biodiversity and plants included in the Red lists by Angelstam et al., 2004; Boșcaiu et al., 1994 ; Coldea et al., 2008 ; Danciu et al., 2007 ; Dihoru, Negrean, 2009 ; Oltean et al., 1994; Radu, 2001; Schulze, Mooney,1993.

MATERIAL AND METHOD

We carried out our research in the north-west of Romania, the foothills of Oradea Hills, the Lăzăreni Hills and the Western Plain of Romania. The total area of the region surveyed by us is about 180 km^2.

In order to achieve the proposed goals, the research was divided into four successive stages of work.

The first stage of work included the acquisition of informative materials (i.e. tree maps, plot descriptions, Red lists for rare plant species, scientific data from published works on natural habitats and high conservation value forests reported in the area, list and maps of protected areas).

The second stage i.e. the preliminary assessment is based on the analysis of the data collected from the information sources, which acts as a "filter", excluding forests with no high conservation values (i.e. forests containing, endangered, vulnerable, relics, endemic species considered nature monuments) and focus on forest areas with potential for high conservation value forests included in natural habitats and sites of community importance.

The third stage refers to field research of selected forests as high conservation value forests included in the natural habitats of community interest, description of habitats, phytocenoses of the respective forests and their conservation status.

The fourth stage i.e. the complete evaluation aims to definitively establish the types of natural habitats of community interest and the categories of high conservation value forests (HCVFs) for each forest area in the surveyed region. We developed a table (see Table 1) that covers the forest habitats of community interest, the associations of rare plants, the types of ecosystem and the categories of high conservation value forests found in the surveyed territory.

RESULTS AND DISCUSSION

Table 1 presents and analyses seven forest habitats of community interest classified in accordance with Directive 92/43/EEC, 12 equivalent forest habitats of community importance in Romania and classified according to Doniță et al. (2005,2006), 13 plant associations, 12 ecosystems, and six categories of high conservation value forests (HCVFs).

9110. *Luzulo-Fagetum* beech forests

In Europe, the *Luzulo-Fagetum* type beech forests grow in central and northern Europe on acid soils being populated with characteristic species such as: *Luzula luzuloides, Polytrichum formosum, Deschampsia flexuosa, Calamagrostis villosa, Vaccinium myrtillus.* PALAEARTIC HAB. 41.1 D54 South Carpathian *Festuca drymeja* beech forest.

In Romania, this habitat benefited from the equivalence made according to Doniță et al (2005, 2006) with the type R4110, South-eastern Carpathian beech forests (*Fagus sylvatica*) with *Festuca drymeja*, being spread in the Eastern, Southern and Northern Carpathians, in the northwest

of Romania, the Oradea Hills, Crișul Parade Defile at Șuncuiuș, Vadu Crișului in Bihor County (see Table 1).

Ecosystem type: 4136 Medium productive beech, with mull-moder on brown hydrous luvic (podzolic) soils balanced with *Festuca drymeja*.

Plant association: *Festuco drymejae–Fagetum*, according to Morariu et al. 1968.

The phytocenoses of the association sum up a number of 65 cormophytes, of which there are highlighted the characteristic species for the sub-alliance *Symphyto - Fagenion*, the alliance *Symphyto cordati-Fagion*: *Hieracium umbellatum, Ruscus aculeatus*, the order *Fagetalia sylvaticae: Luzula luzuloides, Lamium galeobdolon, Galium odoratum, Lathyrus vernus, Lathyrus venetus, Sanicula europaea, Asarum europaeum, Stachys silvatica, Cephalanthera damasonium, Pulmonaria officinalis,* the class:*Querco-Fagetea: Hedera helix, Galium schultesii, Melica uniflora, Anemone nemorosa, Athyrium filix-femina, Dryopteris filix-mas, Carex digitata*, etc.

The tree layer is dominated by *Fagus sylvatica* with 62% overall coverage, along with *Tilia tomentosa, Quercus petraea, Carpinus betulus, Prunus avium, Acer pseudoplatanus, Quercus cerris, Sorbus torminalis.*

The shrub layer with a coverage of less than 1% consists of *Cornus mas, Corylus avellana*and *Sambucus nigra*.

High conservation values are met in the case of*Ruscus aculeatus, Cephalanthera damasonium, Cephalanthera longifolia* and *Platanthera bifolia*classified as HCVFs 1.2, HCVFs 1.3.

Conservation status and potential threats: Conservation of these forests suffers from the lack of a specific Natura 2000 management plan, illegal logging, harvesting of berries and mushrooms, grazing and transit of domestic animals.

9130 *Asperulo-Fagetum* beech forests

This type of habitat consists of beech trees (*Fagus sylvatica*) with many sycamore maple stands (*Acer pseudoplatanus*). It is a typical habitat for the oceanic climate dominating the western, central and northern Europe. These forests are populated by grass species such as *Anemone nemorosa, Lamium galeobdolon, Galium odoratum,* and*Melica uniflora,* which form a grass layer that is more populated by species than that of the *Festuco drymejae-Fagetum association*. PALAEARTIC HABITATS 41.1224 Dacian *Dentaria bulbifera* beech forests. In Romania, this type of habitat corresponds to R4118 Dacian beech forests (*Fagus sylvatic*a) and European hornbeam (*Carpinus betulus*) with *Dentaria bulbifera* and which is spread in the outlying regions of the Carpathian Mountains, especially in western Romania at the Oradea Hills, Crișul Repede Defile, Șuncuiș-Vadu Crișului, Bihor County (see Table 1).

Ecosystem type: 4216 Beech with high and medium hornbeam productive with mull on brown eumezobasic soils, populated with *Asperula odorata - Asarum europaeum - Stellaria holostea*.

Plant association:*Carpino - Fagetum* Paucă, 1941.

The physiognomy of the association is given by the characteristic species i.e. *Carpinus betulus* with a general coverage of 34% and *Fagus sylvatica* with a general coverage of 33%,and which are codominant species. Alongside the two aforementionedcharacteristic speciesthe following species are present in the tree layer: *Tilia tomentosa, Prunus avium, Acer campestre, Acer platanoides, Quercus petraea, Quercus dalechampii, Quercus robur, Quercus cerris* and *Sorbus torminalis*.

The layer of shrubs with an overall coverage of 4% is poorly represented, and consisting of the following species *Cornus mas, Crataegus monogyna, Sambucus nigra, Corylus avellana, Cornus sanguinea* and *Ligustrum vulgare*.

The herbaceous layer with a general coverage of 48% comprises a number of 59 cormophyte species, of which the most frequent are highlighted, and characteristic for the sub-alliance*Lathyro hallersteinii-Carpenion*, the alliance *Symphyto cordati-Fagion: Lathyrus vernus, Ranunculus auricomus, Stellaria holostea, Scilla bifolia, Festuca drymeja,* the order *Fagetalia sylvaticae: Allium ursinum, Sanicula europaea, Galium odoratum, Lamium galeobdolon, Pulmonaria officinalis, Carex pilosa, Asarum europaeum,* the class*Querco-Fagetea: Anemone nemorosa, Ranunculus ficaria, Viola reichenbachiana, Geum urbanum, Dentaria bulbifera, Carex digitata, Melica uniflora*, etc.

High conservation values: this habitat contains high conservation value forests classified as HCVFs1.2 and HCVFs1.3.

Potential threats: lack of a specific "Natura 2000 Management Plan", grazing and transit of domestic animals through the habitat, inadequate management of forests within the habitat.

91HO* Pannonian woods with *Quercus pubescens*

The "Interpretation Manual of European Union Habitats" EUR25 describes this type of habitat as xerophyle oak woods of the periphery and hills of the Pannonian plain dominated by *Quercus pubescens* which is an extremely dry, southern exposed location on shallow, calcareius soils. Because of these extreme site conditions, woods are often fragmentary and low-rowing, sometimes only shrubby.

In general, this habitat is associated with other dry grassland ecosystems with which it intersects and forms mosaic structures.

PALAEARCTIC HABITATS: 41.7373 Intra-Carpathian insular *Quercus virgiliana* woods.

In Romania, this habitat is equivalent to "R4160-Dacian pubescent oak forests (*Quercus pubescens*) with *Lithospermum purpurocoeruleum*" spread in the Transylvanian Plateau in the area of Aiud-Mirăslău, Copșa Mică-Petiș, in the west of Romania at Șuncuius –Vadu Crișului, Dealul Șomleu, Băile 1 Mai Oradea, Dobrești Forest District, Lunca Sprie-Valea Toplița, where the typical conditions described above are met (see Table 1).

Ecosystem type: 8771 Venetian sumach (smoke tree) stands (*Cotinus coggygria*), weakly productive with calcic mull, on rendsinic, eubasic, carbonate soils, facing a periodic water deficit, and populated with *Lithospermum purpurocoeruleum*.

Plant association: *Corno-Quercetum pubescenti* Jakucs et Zólyomi ex Máthe et Kóvacs 1962.

The physiognomy of the association is given by the two characteristic species *Quercus pubescens* and *Quercus virgiliana* which are in codominance relationship.

The habitat presents itself as a mosaic made of pubescent oak open wood (*Quercus pubescens*) with sinuous trunks, barbed crowns not exceeding 4-6 m in height and portions of closed stands that alternates with steppe mesh dominated by typical grass species (i.e. *Carex humilis, Stipa capillata, Pulsatilla montana,* ssp. *dacica, Iris aphylla, Frtillaria orientalis, Allium senescens* ssp. *montana, Allium flavum, Anthericum ramosum, Teucrium montanum, Dictamus albus, Peucedanum oreoselinum, Lithospermum purpureocoeruleum, Centaurea stoebe* ssp. *australis, Jurinea mollis* ssp. *mollis, Jurinea glycacantha, Festuca rupicola* ssp. *sulcata, Koeleria macrantha* ssp. *transsilvanica, Phleum montanum, Brachypodium pinnatum, Veronica spicata, Thymus comosus* ssp. *transsilvanicus, Sesseli oseum, Sesseli peucedanoides, Stachys recta, Inula conyza, Arabis turrita, Arabis hirsuta, Arabis recta, Peucedanum cervaria, Laserpitium latifolium, Asperula cynanchyca, Galium erectum, Clinopodium vulgare, Vincetoxicum hirundinaria*), see Table 1.

The layer of trees with a reduced consistency i.e. of 20-40% in open wood and of 40-50% in the forest consists ofpubescent oak, mainly *Quercus pubescens* and*Quercus virgiliana* mixed with *Quercus cerris*, *Acer campestre*, *Sorbus torminalis*, *Fraxinus excelsior* and *Fraxinus ornus*.

The well-developed shrub layer with an overall coverage of 30-40% consists of the following species: *Viburnum lantana, Cornus mas, Crataegus monogyna, Ligustrum vulgare, Spiraea media, Prunus tenella, Prunus fruticosa, Rhamnus catharticus, Rhamnus saxatilis* ssp. *tinctoria, Cotoneaster integerrima* and the undershrub species *Cytisus nigricans, Cytisus hirsutus* ssp. *leucotrichus*.

Pubescent oak stands have a very high biodiversity, the phytocenoses of this association bringing together 113 mostly relict, Mediterranean, xerophilic-xeromezophilic plant species.

Conservation value: very high (see Table 1). The habitat contains high conservation value forests classified as HCVFs 1.1, HCVFs 4.1, and HCVFs 4.2, containing rare, endangered, relics, species considered as monuments of nature, such as: *Pulsatilla montana* ssp. *dacica, Fritillaria orientalis, Ruscus aculeatus, Iris aphylla, Dianthus carthusianorum* ssp. *puberulus, Silena heufelii, Saxifraga paniculata, Jurinea mollis* ssp. *dacica, Centaurea stoebe* ssp. *australis, Allium flavum, Allium senescens* ssp. *montanum, Anthericum ramosum, Koeleria macrantha* ssp. *transsilvanica, Helictotrichon decorum, Cleistogene serotina, Stipa capillata, Prunus tenella, Prunus fruticosa, Rhamnus saxatilis* ssp. *tinctoria*.

Conservation status and potential threats: conservation of these forests is guaranteed by their classification in protected areas and the functional Group 1 - Forest vegetation with special protection functions.

Among the potential threat categories, we mention the following:

(i) Repeated regeneration from root shoots affecting the vitality and genetic variability of the pubescent oak population;
(ii) Changing vegetation conditions can endanger habitat stability, case3 in which pubescent oaks can be competed and eliminated by sessile oak, Turkey oak, European hornbeam and even beech stands;
(iii) Grazing and transit of domestic animals through habitat;
(iv) Fire of vegetation on the bordering agricultural lands with a possible spreading also in the pubescent oak habitat;
(v) The small size of the pubescent oak stands combined with the geographical and reproductive isolation may cause disturbance in the dynamics and evolution of these species;
(vi) Damage caused by entomofauna (phytophagous insects) phytopathogenic agents (parasitic fungi) that can cause abnormal drying in such trees.

9110*Euro-Siberian forest steppe s with *Quercus sp.*

In Europe, this habitat comprises forest steppe s enclosing different xero-thermophile oaks species that develop on the loëss sublayer in a continental climate with high temperature variations; such species are widespread in the plains of south-eastern Europe. The dominant species in the tree layer are the following: *Quercus robur, Quercus cerris, Quercus pubescens, Quercus petraea* accompanied by *Acer tataricum, Acer campestre, Sorbus torminalis, Tilia tomentosa, Prunus mahaleb, Ulmus minor, Cornus mas, Crataegus monogyna, Euonymus verrosa*. The herbaceous species specificin these forests are as follows: *Carex michelii, Dactylis polygama, Lithospermum purpureocoeruleum, Lathyrus niger,*

Geum urbanum, Tanacetum corymbosum, Polygonatum latifolium and *Pulmonaria mollis*. Currently, these forests present a very fragmented habitat (especially in Central Europe) or are degraded following the invasion of *Robinia pseudacacia* species.

In the northwest of Romania this habitat is represented by two types of forest ecosystems: R4138 Dacian sessile oak forests (*Quercus petraea*) and pedunculate (common) oak (*Quercus robur*) with *Acer tataricum*. PALAEARCTIC HABITAT 417A225, Sarmatic *Acer tataricum-Quercus robur-Quercus petraea* forest steppe s.

The Ecosystem R4148 Pannonicplain forrest of Psamophile pedunculate oak (*Quercus robur*) with ***Convallaria majalis***, PALAEARCTIC HABITAT 417A213 Pannonic sand steppe oak woods (see Table 1).

The Ecosystem R4138 Dacian sessile oak forests (*Quercus petraea*) and pedunculated oak (*Quercus robur*) with *Acer tataricum* is widespread in the northwest of Romania along the Oradea Hills, the Lăzăreni Hills and the Transylvanian Plateau.

Ecosystem type: 6716 medium productive sessile – common oak standswith mull on typical luvic and brown soils, mesobasic, hydrically balanced with *Asperula odorata-Asarum europaeum-Stellaria holostea* (see Table 1).

Plant association: *Aceri tatarico-Quercetum roboris* Zólyomi 1957, facies with *Ruscus aculeatus*.

The tree layer with a general coverage of 78% is dominated by the characteristic species *Quercus robur, Quercus petraea* and *Quercus dalechampii*, which are in different co-dominance relationships and which instil a characteristic appearance of this association.

To the afore-mentioned one add the following species: *Carpinus betulus, Prunus avium, Quercus polycarpa, Acer tataricum, Malus sylvestris, Pyrus pyraster, Staphylea pinnata*. The well-developed shrub layer consists of *Crataegus monogyna, Cornus mas, Ligustrum vulgare, Sambucus nigra* and *Prunus spinosa*.

The well-developed herbaceous and undershrub layers encompassing a floristic composition of about 70 species are made up of plants characteristic of the alliance *Genisto germanicae-Quercion*, the order *Quercetalia roboris: Lathyrus niger, Genista tinctoria* ssp. *ovata, Solidago virgaurea, Rumex acetosella,* the order *Fagetalia: Lamium galeobdolon, Asarum europaeum, Sanicula europaea, Carex sylvatica, Mercurialis perennis, Lathyrus venetus, Alliaria petiolata, Lathyrus vernus, Corydalis cava,* the class *Querco-Fagetea: Pulmonaria officinalis, Dentaria bulbifera, Anemone nemorosa, Melica uniflora, Ruscus aculeatus, Convallaria majalis, Polygonatum latifolium, Geum urbanum, Galium odoratum,*

Stellaria holostea, Arum maculatum, Pulmonaria mollis, Melittis mellisophyllum.

High conservation values: this habitat contains high conservation value forests classified asHCVFs1.1 and HCVFs 1.2, and populated by rare, endangered, relict species treated as monuments of nature: *Ruscus aculeatus* which has a boosting growth forming a facies, *Convallaria majalis, Polygonatum latifolium, Arum maculatum*.

Conservation status and potential threats:

The conservation of these forests is affected by the lack of a specific Natura 2000 Management Plan, illegal logging on large areas, reduced size of pedunculate oak surfaces combined with reproductive isolation, damage caused by entomofauna and phytopathogenic agents.

The Ecosystem R4148 psamophile Pannonic forests of pedunculate oak (*Quercus robur*) with *Convallaria majalis*.

This type of ecosystem is spread on the sands of the northwest of Romania at Săcuieni, Șimian, Valea lui Mihai in Bihor County, Carei in Satu Mare County, and across very small areas in Oradea Hills.

Plant association: *Polygonato latifolio – Quercetum roboris* (Hargitai 1940) Borhidi 1966 (Syn.: *Convallario-Quercetum roboris* Soó 1957).

The Dacian & Pannoic forests of pedunculate oak stands (*Quercus robur*) with *Polygonatum latifolium* and *Convallaria majalis* develop on a clay and sand sublayer, gleyed gumiferous, eubasic, eutrophic preluvisoilsfacing water deficient during summer time.

The tree layer with a consistency of 0.7-0.8 is dominated by *Quercus robur*, along with *Carpinus betulus, Prunus avium, Acer campestre, Quercus petraea, Quercus polycarpa, Quercus dalechampii, Quercus cerris, Tilia cordata, Acer platanoides, Ulmus minor, Fraxinus excelsior, Sorbus torminalis, Acer tataricum, Populus tremula, Malus sylvestris* and *Pyrus pyraster* (Table 1).

Table 1

Forest habitat of community interest in north-western Romania and the categories of high conservation value forests (HCVFs) they contain

No	Habitats			Plant associations	Type of forest ecosystem	High conservation values forest categories	Location
	Habitats codes according to Directive 92/43/EEC	Romanian equivalent code	PALAEARCTIC code				
1	2	3	4	5	6	7	8
1	9110. *Luzulo-Fagetum* beech forest	R4110. Southeast South-east Carpathian beech forests (*Fagus sylvatica*) with *Festuca drymeja*	41.1 D54 South Carpathian *Festuca drymeja* beech forest	*Festuco drymejae – Fagetum* Morariu et al. 1968	4136	HCVF 1.2, 1.3	Oradea Hills, Măgura Vadu Crișului Hill
2	9130. *Asperulo – Fagetum* beech forests	R4118. Dacian beech forests (*Fagus sylvatica*) and European hornbeam (*Carpinus betulus*) with*Dentaria bulbifera*	41.1D224 Dacian *Dentaria bulbifera* beech forests	*Carpino-Fagetum* Păucă 1941	4216	HCVF 1.2, 1.3	Oradea Hills, Măgura Vadu Crișului Hill, Lăzăreni Hills
3	91 HO* Pannonian woods with *Quercus pubescens*	R4160. Dacian pubescent oak forests – open wood (*Quercus pubescens*) with*Lithospermum purpurocoeruleum*	41.7373 Intra-Carpathian insular *Quercus virgliana* forests	*Corno – Quercetum pubescentis* Jakucs et Máthé et Kóvacs 1962	8771	Șeica Mică, Mirăslău Transylvanian Plateau, Crișul Repede Defile, Băile 1 Mai, HCVF 1.1, 3., 4.1, 4.2.	Măgura – Șuncuiuș Hill, Valea Toplița-Lunca Sprie Valley, Șomleu Hill – Băile 1 Mai Oradea
4	9110* Euro-Siberian forest steppeswith *Quercus sp.*	R.4138. Dacian Sessile oak forests (*Quercus petraea*) and pubescent oak(*Quercus robur*) with*Acer tatricum*. R. 4418. Psamophile Pannonic forests of pedunculate oak (*Quercus robur*) cu *Convallaria majalis*	41.7A225 Sarmatian*Acer tataricum – Quercus robur – Quercus petraea* forest steppe 41.7A213 Pannonic sand steppe oak woods	*Aceri tatarico – Quercetum roboris* Zólyomi 1957 facies with*Ruscus aculeatus, Polygonato latifolio-Quercetum roboris* (Hargitai 1940, Borhidi 1966) (Syn.: *Convallario-Quercetum roboris* Soó 1957)	6716 - -	HCVF 1.1, 1.2 HCVF 1.2, 1.3, 4.2	Oradea Hills Lăzăreni Hills, Nort-west Romania sandy areas, Șimian, Valea lui Mihai, Oradea Hills

No	Habitats			Plant associations	Type of forest ecosystem	High conservation values forest categories	Location
	Habitats codes according to Directive 92/43/EEC	Romanian equivalent code	PALAEARCTIC code				
1	2	3	4	5	6	7	8
5	91LO. Illyrian oak - hornbeam forest (*Erythronio - Carpinion*)	R4127. Mixed Dacian sessile oak (*Quercus petraea*), beech (*Fagus sylvatica*) and silve limetree (*Tilia tomentosa*) with*Erythronium dens-canis*.	41.2A12. Illyrian neutrocline sessile oak hornbeam forests.	*Tilio tomentosae - Quercetum dalechampii,* Sârbu 1979, *ruscetosum aculeati* subas. nova. *Fago-Quercetum petraeae* R.Tüxen 1955	5416 4516	HCVF 1.1, 1.2, 3, 4.2	Oradea Hills Vadu Crișului
6	91 Mo. Pannonian - Balkan Turkey oak - sessile oak forest	R4132. Pannonic and Balkan sessile oak (*Quercus petraea*), Turkey oak (*Quercus cerris*) and beech (*Fagus sylvatica*) forests with *Melittis melissophyllum*.	41.7696. Pre-Carpathian *Quercus cerris - Quercus petraea* forests.	*Quercetum petraeae - ceris* (Soó 1957)1969 - *ruscetosumaculeati* Morar - Burescu 2012	7724	HCVF 1.1, 1.2, 3, 4.2	Oradea Hills Măgura – Șuncuiuș Hill, Lăzăreni Hills
		R4140. Dacian – Balkan Sessile oak (*Quercus petraea*)forests, Turkey oak (*Quercus cerris*) and silver lime tree (*Tilia tomentosa*) forests with *Lychnis coronaria*.	41.7696. Pre-Carpathian *Quercus cerris - Quercus petraea* s.l. forests.	*Tilio argenteae - Quercetum petraeae cerris* Soó 1967 - *ruscetosum aculeati* Morar - Burescu 2012	7114	HCVF 1.1	Oradea Hills, Șomleu Hill, Băile 1 Mai Oradea
		R. 4152. Dacian Turkey oak (*Quercus cerris*) andEuropean hornbeam (*Carpinus betulus*) forests with*Digitalis grandiflora*	41.769. Getic sub-continental thermophilous oak forests	*Carpino-Quercetum cerris* Klika 1938 (Boșcaiu et al. 1969)	7214	HCVF 1.2, 1.3, 4.2	Oradea Hills, Lăzăreni Hills, Măgura Șuncuiuș Hill
		R.4154. Pannonic and Balkan of Hungarian oak (*Quercus*	41.76814. Danubian - Balkan *Festuca heterophylla* forests	*Quercetum frainetto – dalechampii* (Bârcă 1984) Chifu et al. 2006	7535	HCVF 1.2, 1.3	Oradea Hills, Lăzăreni Hills

No	Habitats			Plant associations	Type of forest ecosystem	High conservation values forest categories	Location
	Habitats codes according to Directive 92/43/EEC	Romanian equivalent code	PALAEARCTIC code				
1	2	3	4	5	6	7	8
		frainetto)					
7	91YO. Dacian oak – hornbeam forests	R 4124. Dacian sessile oak (*Quercus petraea*), beech (*Fagus sylvatica*) and European hornbeam (*Carpinus betulus*) forests with *Lathyrus hallersteinii*	41.2C12. Dacian *Lathyrus hallersteinii* oak – hornbeam forests	*Carpino – Quercetum petraeae* Borza 1941	5216	HCVF 1.2, 1.3	Oradea Hills
		R 4143. Dacian pedunculated oak (*Quercus robur*) forests with*Melampyrum biharіense*	41.2C11. *Dacian Melampyrum biharіense* oak – hornbeam forest	*Querco robori – Carpinetum* Borza 1937	6216	HCVF 1.2, 1.3	Oradea Hills, Lăzăreni Hills

The relatively well-developed shrub layer with a coverage of 15-20% consists of *Crataegus monogyna, Cornus mas, Cornus sanguinea, Ligustrum vulgare, Euonymus europaeus, Acer tataricum, Staphylea pinnata, Sambucus nigra, Fraxinus ornus, Corylus avellana, Prunus spinosa* (see Table 1). The herbaceous layer with a coverage of 75% is dominated by *Polygonatum latifolium* and *Convallaria majalis* species which are characteristic for this association, together with the recognition species for the alliance *Aceri tatarico-Quercion: Campanula rapunculus, Carex brevicollis, Pulmonaria mollis, Arum maculatum,* the order*Fraxino orni-Cotinetalia: Rubus caesius, Circaea lutetiana, Potentilla micrantha, Tamus communis, Primula veris,* the class*Quercetea pubescenti-petraeae: Melittis melissophyllum, Polygonatum odoratum, Ruscus aculeatus, Cephalanthera damasonium, Lathyrus niger, Lychnis coronaria, Platanthera chloranta, Vincetoxicum hirundinaria, Viola hirta* (see Table 1).

High conservation values:

This ecosystem contains high conservation values forests classified as HCVFs 1.2, HCVFs 1.3 and HCVFs 4.2 where the following rare and, endangered species, considered as monuments of nature found, their shelter: *Ruscus aculeatus, Cephalanthera damasonium, Platanthera chloranta, Convallaria majalis.*

Conservation status and potential threats:

Current habitat conservation status is favourable but some threats may also arise due to the lack of special legal provisions for the management of forests included in the Natura 2000 habitat ecological network, the lack of a specific Management Plan, improperly performed wood extraction, grazing and passage of animals through the habitat, afforestation with species other than dominant species of this habitat, allochthonous species such as *Quercus rubra, Prunus serotina, Robinia pseudacacia* and *Pinus nigra*, the wind erosion of the psamosoils caused by the clear cutting and the lowering of the groundwater level caused by prolonged droughts, etc.

91LO *Illyrian oak – hornbeam forest* (*Erythronio - Carpion*)

Illyric oak forests (*Quercus robur*), European hornbeam (*Carpinus betulus*) with *Erythronium dens-canis* are less known and researched in Romania being spread on small areas, western peri-Carpathian hills at Vadu Crișului, Oradea Hills and sporadically in Transylvania Plateau.

This type of habitat corresponds to R4127 mixed Dacian forests of sessile oak (*Quercus petraea*), European beech (*Fagus sylvatica*) and (European) silver lime (*Tilia tomentosa*) with *Erythronium dens-canis*. PALAEARCTIC HABITAT 41. 2A12. Illurian neutrocline sessile oak hornbeam forests (see Table 1).

Ecosystem type: 4516 medium productive mixed beech and sessile oak (silver lime, European hornbeam) with mull, on typical brown soils, luvic, eutrophic, hydrically balanced soils with *Asperula odorata - Asarum europaeum - Stellaria holostea*.

Plant associations: *Tilio tomentosae – Quercetum dalechampii* Sârbu 1979 – *ruscetosum petraeae* subas. nova, *Fago-Quercetum petraeae* Tüxen 1955. Cenosis occupies both flat lands as well as those with gently to medium slopes withsunny exposures on clay-sandy soils on the surface, clayand weakly humiferous pre-luvosoils and luvosoils present in the deep layers. The tree layer is dominated by the two Mediterranean and Balkan species i.e. *Quercus dalechampii* (Delechampsessile oak) with a coverage of 43.84% and *Tilia tomentosa* (silver lime) with a coverage of 30.96%.

Alongside these are scattered *Carpinus betulus* (European hornbeam), *Quercus petraea* (sessile oak), *Acer campestre* (field maple), *Prunus avium* (European sweet cherry), *Quercus robur* (pedunculate oak), *Tilia cordata* (small-leaved lime tree), *Fagus sylvatica* (European beech), *Acer platanoides* (Norway maple), *Fraxinus excelsior* (European ash), *Ulmus minor* (smooth-leaved elm), see Table 1.

The well-individualized shrub layer with 18% coverage consists of *Crataegus monogyna, Ligustrum vulgare, Cornus mas, Staphylea pinnata, Acer tataricum* and *Sambucus nigra* (see Table 1).

The herbaceous layer with 80% coverage comprises 60 cormophyte species subordinated to the sub-alpine alliance *Aro orientalis - Carpinenion*, the alliance *Symphyto cordati-Fagion*: *Symphyto cordati-Fagion: Ruscus aculeatus, Stellaria holostea, Dactylis polygama, Corydalis cava, Festuca drymeja, Arum maculatum,* ordinului *Fagetalia sylvaticae: Allium ursinum, Carex digitata, Euphorbia amygdaloides, Veronica hederifolia, Lamium galeobdolon, Mercurialis perennis, Symphytum tuberosum, Galium odoratum, Scrophularia nodosa, Carex sylvatica, Corydalis solida, Sanicula europaea,* clasei *Querco-Fagetea: Geum urbanum, Dentaria bulbifera, Anemone nemorosa, Melica uniflora, Melica nutans, Pulmonaria officinalis, Astragalus glycyphyllos, Polygonatum latifolium, Lathyrus niger* etc.

We have separated the population of sub-shrub, semi-evergreen plants of *Ruscus aculeatus* (butcher's-broom) with a general coverage of 18.3% spread on the plateaus and the ridges of the hills crossed by roads, Dalmatian thermophile turkey oak, silver lime tree, European hornbeam with different species i.e. *Arum maculatum, Melica nutans, Carex digitata, Isopyrum thalictroides* into the sub-association *Ruscetosum aculeate,* Sub-association nova Holotypus hoc loco, see Table 1, position no 3 that we subordinate to the basic association.

A small number of species are transgressive in the class *Quercetea pubescenti-petraeae: Sorbus torminalis, Quercus cerris, Polygonatum odoratum, Melittis melissophyllum, Vincetoxicum hirundinaria*.

High conservation values:

The ecosystem contains high conservation value forests classified asHCVFs 1.1, HCVFs 1.2, HCVFs 3 and HCVFs 4.2, which contain rare, endemic, relict species considered as monuments of nature such as butcher's-broom (*Ruscus aculeatus*), Lily of the Valley (C*onvallaria maj*), Turk's cap lily (*Lilium martagon*), *Silene nutans* ssp. *dubia*, *Smyrnium perfoliatum, Potentilla micrantha* and *Sanicula europaea.*

Conservation status and potential threats:

The conservation of these forests can be affected by the lack of a specific Natura 2000 Management Plan, improper management, improper wood extraction, inappropriate use of roads that affect the habitat, harvesting of plants in particular of *Ruscus aculeatus* for commercialization purposes, changes in vegetation conditions (deforestation, clear cutting) affecting for the mild and warm climate conditions specific for the species *Ruscus aculeatus* habitat, grazing, and transit of domestic animals through the habitat in question.

CONCLUSIONS

We identified five types of forest habitats of community interest in European version and eight types of equivalent habitats on the Romanian territory.

The phytocenoses of forests included in these habitats are subordinated to seven rare plant associations, described for the first time for that territory.

The species inventory was made establishing the floristic composition and the classification of the species by cenotaxa corresponding to each plant association.

The habitats surveyed contain high conservation value forests classified as HCVF 1.1, 1.2, 1.3, 3, and 4.2.

Notes: The classification by forest ecosystems types (4136, 4216, 4516, 5216, 5416, 6216, 6716, 7114, 7214, 7535, 7724, 8771) was done according to the Romanian typological system elaborated by Doniță, Chiriță, Stănescu (coord.) 1990, Doniță, Gafta (1992):

High conservation value forests (HCVFs) were grouped into six distinct categories after processing, with comments to the practical guidelines by Stanciu, Mihul, Dinicu (2005), Vlad, Bucur, Turtică (2013) as follows :

HCVF 1.1. Forest areas from natural areas protected with role in the conservation of natural habitats and biodiversity, including forests of scientific interest in subgroups 1.5.a, 1.5.d, 1.5.f (taken after the Ministry of Forestry 1986, with comments and notes from Stăncioiu et al. 2008)

HCVF 1.2. Forests that contain rare, threatened or endangered species;

HCVF 1.3. Forests formed in natural habitats for endemic flora species and relict species;

HCVF 3. Forests that contain rare, threatened, endangered ecosystems or species included in rare plant associations;

HCVF 4.1. Forests with special role for the protection of drinking water sources and the prevention of floods with excessive alluvium transport;

HCVF 4.2. Forests with an important role in controlling soil erosion.

The classification of habitats by types was made according to European Directive 92/43/EEC which is legal framework for the implementation of the Natura 2000 Ecological Network, (9110, 9130, 91HO, 91IO *, 91LO, 91MO, 91YO) and according to the Romanian typology (R4110, R4118, R4160, R4138, R4148, R4127, R4132, R4140, R4152, R4154, R4124, R4143) adapted to the specific conditions of our country by Doniță et al. (2005).

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