

A NEW SYNTAXON OF FIR FORESTS (*ABIES ALBA*) FROM SOUTH-EASTERN CARPATHIANS (ROMANIA)

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Abstract: The article describes a new woodland association with the name *Festuco drymeae-Abietetum*, comprising mixed forest dominated by fir and beech. In the tree layer *Abies alba* and *Fagus sylvatica* are co-dominants, with a coverage of up to 75%. The herb layer is dominated by *Festuca drymeja* Mert. et W.D.J.Koch. Some character species for the alliance *Abietion albae* Březina et Hadač ex Hadač 1965 also have a high frequency.

Key words: fir, new association, beech, forests

Introduction

In the South-Eastern Carpathians, fir (*Abies alba* Mill.) usually forms mixed forests with beech (*Fagus sylvatica*) and spruce (*Picea abies*). In these forests, fir is typically not the dominant tree species. Nonetheless, forests dominated by fir can be found, but they occupy much smaller areas [5].

Depending upon which tree species (spruce or beech) accompanies fir, the herb layer in these forests differs significantly. Thus, character species for the alliance *Piceion abietis* Pawl. in Pawl. et al., 1928 are present at higher altitudes (1100–1350 m), where forests are dominated by fir and spruce. At lower altitudes (800–1100 m), where forests are dominated by fir and beech, character species for *Piceion abietis* Pawl. are rare or absent [3]. In these forests dominated by fir and beech, character species for *Symphyto-Fagion* Vida 1959 have a high frequency. Also, the montane-subalpine species *Pulmonaria rubra*, *Hieracium transsilvanicum*, *Leucanthemum waldsteinii* and *Soldanella major* are absent from the species composition.

Doniță et al. [5] classified the fir forests from Romania (South-Eastern Carpathians) into 21 different types of forest ecosystem. These types were discriminated on the basis of pedo-ecological conditions and species composition.

From a phytosociological point of view, forests with fir are currently assigned to two associations, *Hieracio rotundati-Abietetum* (Borhidi 1971) Coldea 1991 and *Pulmonario rubrae-Fagetum* (Soo 1964) Tauber 1987 [10,11]. However, these forests are highly heterogeneous as regards their species composition, and cannot be assigned to only two syntaxa. In this context, we describe here a new association of fir forests in the South-Eastern Carpathians, namely acidophilous forests dominated by *Abies alba* and *Fagus sylvatica*, confined to mountain belt beech forests.

Materials and Methods

Phytosociological relevés from forests with *Abies alba* have been collected recently from various massifs of the south-eastern Carpathians (Maramureș Mountains, Vrancei, Retezat and Poiana Ruscă Mountains), using the Braun-Blanquet method [2] with improvements made by Borza [1] (i.e., local frequency of species is recorded instead of sociability).

Species were grouped in the analytic tables according to syntaxonomic units, based on coenotic affinity [6,9].

Results and Discussion

We include the mixed forests with fir and beech, localized mainly within the belt of mountain beech forests, within *Festuco drymeae-Abietetum* ass. nov. (table 1, holotype relevé no. 6). These forests develop on ridges and slopes, moderately to strongly steep, of various aspects.

Table 1: Ass. *Festuco drymeae-Abietetum* ass. nov. (rel.holotype: 6)

Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	K
Altitude (m.s.m. x 10 m)	107	103	109	109	112	95	100	95	100	95	100	95	101	
Aspect	NW	N	S	N	SE	NW	SE	N	SW	SW	NE	NE	N	
Slope (degrees)	20	10	5	10	15	50	20	30	30	40	25	30	40	
Height of trees (m)	24	29	30	32	28	24	28	22	25	20	25	23	30	
Canopy closure	0.8	0.9	0.8	0.8	0.9	0.8	0.7	0.7	0.8	0.8	0.9	0.8	0.8	
Herb cover (%)	30	20	10	15	10	25	35	35	25	40	35	25	45	
Sample area (m²)	400	400	400	400	400	400	400	400	400	400	400	400	400	
Char. ass.														
<i>Abies alba</i>	3.5	4.5	4.5	4.5	3.5	5.5	4.5	3.5	3.5	3.5	5.5	3.5	3.5	V
<i>Abies alba</i> (juv.)	2.5	+	2.5	2.3	3.5	1.2	1.5	1.3	2.5	.	3.3	1.3	1.5	V
<i>Festuca drymeja</i>	2.3	.	+	.	+	1.3	2.5	2.5	2.5	3.5	3.5	1.5	+	V
Abietion														
<i>Calamagrostis arundinacea</i>	2.5	+	1.2	1.3	+	2.5	.	+	1.5	+	.	.	2.5	IV
<i>Prenanthes purpurea</i>	+	+	+	+	+3	.	.	.	+	+	+	.	+3	IV
<i>Polygonatum verticillatum</i>	+	+3	+	+	+	.	.	.	+	+	+	.	+	IV
<i>Phaegopteris polypoides</i>	+	+	+	+	+	.	.	+	+	.	.	.	1.3	IV
<i>Rubus idaeus</i>	.	+	+	+	+	.	+	+	+	.	.	+	.	IV
<i>Blechnum spicant</i>	+	.	+	+	.	.	.	.	.	.	.	.	.	II
<i>Lonicera nigra</i>	.	.	.	.	.	.	.	.	.	+	+	.	+	II
Fagetalia														
<i>Fagus sylvatica</i>	3.5	2.5	2.5	2.5	3.5	1.3	2.5	2.5	3.5	2.5	1.5	3.5	1.5	V
<i>Fagus sylvatica</i> (juv.)	2.5	2.5	2.3	2.3	3.5	+	1.3	1.5	1.5	.	1.3	+	+	V
<i>Rubus hirtus</i>	2.5	3.5	2.5	+	2.5	+	.	2.5	.	2.5	.	+	+	IV

Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	K
<i>Luzula luzuloides</i>	+	+	+	.	+	+	+	+	+	.	.	.	1.3	IV
<i>Asperula odorata</i>	+	.	+	.	+	+	+	.	+	+	+	+	.	IV
<i>Mycelis muralis</i>	.	.	+	.	+	+	+	+	+	.	+	+	.	IV
<i>Galeobdolon luteum</i>	.	.	+	.	.	+	+	+	.	.	+	+	.	III
<i>Salvia glutinosa</i>	+	+	.	.	.	+	+	.	II
<i>Circaea lutetiana</i>	.	.	.	+	.	+	.	.	.	+	.	.	.	II
<i>Epilobium montanum</i>	+	.	.	+	.	.	+	.	II
<i>Dentaria bulbifera</i>	+	.	+	I
<i>Veronica montana</i>	.	.	+	.	.	+	I
<i>Carex sylvatica</i>	.	.	+	.	.	.	+	I
<i>Polystichum setiferum</i>	+	.	.	.	+	.	.	.	I
<i>Hordelymus europaeus</i>	+	.	.	+	.	I
<i>Veronica urticifolia</i>	+	.	.	.	+	I
<i>Viola reichenbachiana</i>	+	+	.	I
Quercus-Fagetea														
<i>Dryopteris filix-mas</i>	.	+	+	+	+	+	.	+	+	+	+	2.3	+	V
<i>Athyrium filix-femina</i>	.	2.5	+	1.5	1.3	+	1.3	2.5	.	.	+	.	2.5	IV
<i>Corylus avellana</i>	+	.	.	.	+	+	.	.	II
<i>Anemone nemorosa</i>	.	1.3	.	.	+	.	.	.	.	.	.	.	.	I
Vaccinio-Piceetea														
<i>Oxalis acetosella</i>	+	+	+	+	+	+3	2.5	+	1.5	1.5	+	+	+	V
<i>Sorbus aucuparia</i>	+	+	+	.	+	.	+	.	.	.	+	.	+	III
<i>Luzula sylvatica</i>	+	1.2	.	+	+4	+	.	.	+	III
<i>Vaccinium myrtillus</i>	.	.	+	+	.	.	+	1.3	II
<i>Picea abies</i>	1.2	1.3	.	.	+	.	1.3	II
<i>Dryopteris dilatata</i>	+	+	.	.	+	II
<i>Huperzia selago</i>	+	+	I
<i>Orthilia secunda</i>	.	+	+	I

Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	K
Companions														
<i>Betula pendula</i>	1.5	+	.	.	I
<i>Acer pseudoplatanus</i>	+	1.2	.	I
<i>Gentiana asclepiadea</i>	+	.	.	.	+	.	+	+	+	+	.	.	+	III
<i>Cystopteris montana</i>	.	+	+	+	+	+	II
<i>Polytrichum juniperinum</i>	+	+	+	+	II
<i>Veronica officinalis</i>	.	.	+	.	.	+	+	+	II
<i>Stellaria nemorum</i>	+	+	+	+	II
<i>Doronicum austriacum</i>	+	.	+	.	+	.	.	+	II
<i>Solidago virgaurea</i>	+	+	+	.	.	.	II
<i>Dicranum scoparium</i>	+	+	+	II
<i>Glechoma hirsuta</i>	.	.	+	+	.	I
<i>Fragaria vesca</i>	+	+	.	I

Species recorded in one relevé: *Maianthemum bifolium* (1.5 in relevé no. 13), *Dentaria glandulosa* (+ in relevé no. 3), *Galium schultesii*, *Neottia nidus-avis* (+ in relevé no. 9), *Melica uniflora* (+ in relevé no. 10), *Pulmonaria officinalis*, *Euphorbia amygdaloides*, *Actaea spicata*, *Poa nemoralis*, *Geranium robertianum* (+ in relevé no. 12), *Euonymus verrucosa*, *Carex digitata* (+ in relevé no. 11), *Veratrum album* (+ in relevé no. 2), *Sambucus racemosa* (+ in relevé no. 3), *Spiraea chamaedryfolia* (+ in relevé no. 10), *Polygonatum odoratum* (+ in relevé no. 13).

Relevé location: **1-5:** 08.2013 (1-2 Vadu Dobrii; 3-5 Pârâul Vlădeșei), Pădureni Poiana Ruscăi Mountains; **6-8:** 08.1989 Strâmbu-Băiuț (Țibleș Mountains); **13:** 08.2008 Vaser Valley, Maramureș Mountains; **9-10:** 09.2008 (Valea Zlătuia) Retezat Mountains; **11-12:** 08.2013 Cheile Tișitei Vrancea Mountains.

The vertical structure of this type of forest contains two different layers (synusia). In the tree-layer, *Abies alba* and *Fagus sylvatica* are dominant, reaching up to 24–30 m, whereas their cover reaches up to 75 %. Their natural regeneration by seed is very good. *Picea abies* and *Acer pseudoplatanus* are rarely present in this layer.

The shrub-layer is very poorly developed, almost non-existent in some cases. If present, it is represented by species such as: *Sorbus aucuparia*, *Rubus idaeus*, *Corylus avellana*, *Euonymus verrucosa* and *Rubus hirtus*.

The herb-layer is well developed and has a cover within the range 20–45%, depending upon the cover of the tree-layer. *Festuca drymeja*, which is characteristic of the beech forests of the South-Eastern Carpathians, has a high presence and a cover that can reach 30%. Other acidophilous species found in the herb-layer are: *Calamagrostis arundinacea*, *Prenanthes purpurea*, *Polygonatum verticillatum*, *Thelypteris phegopteris* and *Blechnum spicant*. They are also present in the beech forests. Recently, these species have been considered as characteristic for the alliance *Abietion albae* [6, 8, 12].

Almost all herb species that grow in the phytocoenoses of this association are characteristic of the order *Fagetalia* Pawl. 1928, class *Quercu-Fagetea* Br.-Bl. et Vlieg.1937. For this reason we include the association in these syntaxa.

The species that are characteristic of the alliance *Piceion abietis* Pawl. in Pawl. et al., 1928 are less represented (**Table 1**) compared to fir forests from the upper mountain range of the South-Eastern Carpathians. These forests are assigned to the class *Vaccinio-Picetea* Br.-Bl. 1939 [4].

REFERENCES

1. Borza, A., 1934, Studii fitosociologice în Munții Retezat, *Bul. Grăd. Bot. Cluj*, **14**: (1-2): 1-84.
2. Braun-Blanquet, J., 1964, *Pflanzensoziologie*, Springer, 3 Aufl., Wien.
3. Chifu, T., Ștefan, N., 1973, Cercetări fitocenologice în pădurile din valea Nemțișorului, județul Neamț, *Stud. și Comun. Șt. Nat., Muz. Jud. Suceava*, **3**: 213-253.
4. Coldea, Gh., 1991, Prodrome des associations végétales des Carpates du Sud-Ouest (Carpates roumaines), *Doc. Phytosoc.*, **13**: 317-539.
5. Doniță, N., Chiriță, C., Stănescu, V., 1990, *Tipurile de ecosisteme forestiere din România*, Ed. Tehnică Agricolă, București.
6. Jarolimek, J., Šibik, J., 2008, *Diagnostic, constant and dominant species of the higher vegetation units of Slovakia*, VEDA, Publishing house of the Slovak Acad. Of Sciences, Bratislava.
7. Morariu, I., Ularu, P., Negruș, H., Danciu, M., 1968, Făgetele de pe măgura Coldei, *Bul. Inst. Politehnic Brașov, Ser. B.-Econ. forest.*, **10**: 43-47.
8. Müller, Th., 1992, Unterverband: *Galio rotundifolii-Abietienion* Oberd. 62, In: Oberdorfer, E. (ed.), *Süddeutsche Pflanzengesellschaften*. Teil IV: Wälder und Gebüsch. Gustav Fischer Verlag Jena, Stuttgart, New York.
9. Oberdorfer, E., 2001, *Pflanzensoziologische Exkursionsflora*, Eugen Ulmer GmbH & Co., Stuttgart.
10. Sanda, V., Popescu, A., Arcuș, M., 1999, *Revizia critică a comunităților de plante din România*, Ed. Tilia Press International, Constanța.
11. Sanda, V., Vicol, I., Ștefănuț, S., 2008, *Biodiversitatea ceno-structurală a învelișului vegetal din România*, Ed. Ars Docendi, București.
12. Willner, W., Grabherr, G., 2007, *Die Wälder und Gebüsch Österreichs*, Elsevier GmbH, München.

O NOUĂ ASOCIAȚIE FORESTIERĂ CU BRAD DIN CARPAȚII SUD-ESTICI (ROMÂNESȚI)

(Rezumat)

Pe baza cercetărilor proprii din ultimii ani, în mai multe zone montane din Carpații Sud-estici, descriem o nouă asociație lemoasă de brad cu fag pe care o denumim *Festuco drymeae-Abietetum*. În stratul arborescent al asociației speciile *Abies alba* și *Fagus sylvatica* sunt codominante și realizează o acoperire medie de 75%. În stratul ierbos al asociației domină specia acidofilă *Festuca drymeja* și au o prezență ridicată câteva specii de recunoaștere (diagnostice) pentru alinața *Abietion albae*. Din structura sa floristică lipsesc speciile montane-subalpine *Pulmonaria rubra*, *Hieracium transsilvanicum*, *Leucanthemum waldsteinii* și *Soldanella major*.