

## **CONTRIBUTIONS TO THE PHYTOCOENOLOGICAL STUDY OF THE SYRINGO-FRAXINETUM ORNI ASSOCIATION IN THE BULZEȘTI VALLEY (HUNEDOARA COUNTY)**

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### **Abstract**

In this paper a phytocoenologic study of the Syringo-Fraxinetum orni association is presented Borza 1958 em. Resmeriță 1972, identified in Hunedoara County, in Bulzești Valley, at Grohot bridge. This paper is intended to complement the study conducted by Șuteu, Faur (1976) in Bulzeștilor Valley.

The study was done in June 2017, a number of 7 phytocoenological relevées being made. These relevées were centralized in a synthetic table in which information related to the floristic composition, life forms, floristic elements and ecological factors is presented.

**Key words:** association, life forms, floristic elements, ecological factors, relevées

### **INTRODUCTION**

Geographically, the area studied is located in the southern part of the Western Carpathians, the northern part of the Metaliferi Mountains, and between Crișul Alb and Găina Mountains (Bihor Mountains).

Grohot Bridge region, is a conservation area of geological type which preserves the bridge itself and the developed vegetation on limestone bedrock with many factors specific to the Mediterranean area, where the common lilac can be noticed (*Syringa vulgaris*). According to some geological information, a cave used to be here, from which only a natural bridge is left, dug by water.

*Syringo-Fraxinetum orni* association was described in Bulzești Valley by Șuteu, Faur (1976), 7 phytocoenological relevées were made downstream and upstream Grohot bridge, atop of Bulbuci Peak Hill (19.06.1972; 17. 05.1973; 21.06.1973), Vîrtop Hill (21.06.1973) and Smogea Hill (27.06.1973).

In the country this association was described from Caraș-Severin County (Berzasca and Pescarii), by Păun et al. (1970), Globului Gorge (Ilinca et al. 2008), Țarcu, Godeanu, Cernei Mountains (Boșcaiu, 1971), Danube Kazan Gorge (Boșcaiu et al., 1971), Țesnei Valley (Resmeriță, 1972), Sâmpetru Hill - Hunedoara County (Sanda et al., 1972), Crivadiei Gorge (Boșcaiu, Peterfi, 1974), Locvei Mountains (Bujorean et al., 1975), Râbiței Valley (Hodișan et al., 1976), Minișului Gorge (Peia, 1978),

Lăpuşnicul Mare, Radoşca Peak (Peia, 1981), Crişului Alb Valley (Ardelean, 1999).

The bridge at Grohot is a natural monument, formed through collapse, over time, of the ceiling of an ancient cave. One of the few natural bridges in Romania, Grohot is located in Bulzeşti Valley, the township of Bulzeştii de Sus (Fig. 1).

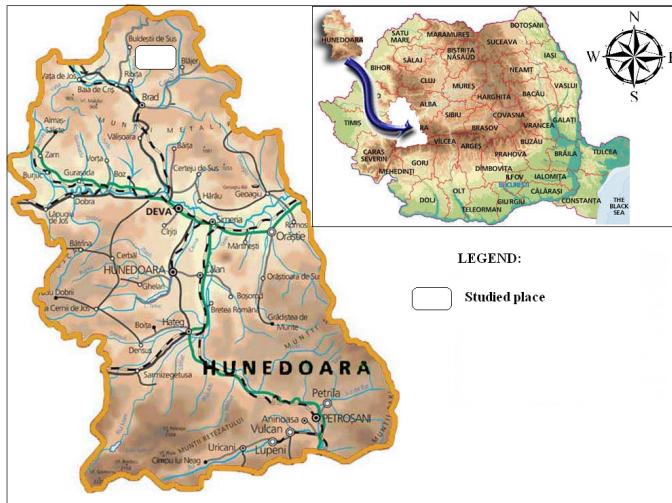


Fig. 1. Position of studied place in Romania (Hunedoara county)

This study was done in June 2017, a total of 6 phytocoenological relevées being made, 2 in the immediate vicinity of the bridge and 3 above Grohot bridge (Fig. 2).



Fig. 2. Aspects with *Syringo-Fraxinetum orni* association, from Grohotului Bridge  
(photo: Păşcuț C.G. 02.06.2017)

## MATERIAL AND METHOD

The technique of carrying out relevées and that of qualitative and quantitative assessments was made in accordance with the recommendations offered by Cristea et al., (2004). The surfaces of the relevées were chosen floristically and ecologically in as homogeneous phytocoenoses as possible, in which the combination of the species and the environmental conditions (climate, relief, soil,) vary insignificantly, areas of ecoton having been avoided. The surface of the relevées covers 50 m<sup>2</sup>.

In the fact sheet reports there was also included information about the time of the reports, the locality, GPS coordinates (altitude, latitude, longitude), tree cover layer, shrubbery layer, moss layer coverage, exposition, slope, the size of the relevées.

The phytocoenological tables include, in addition to the information collected in the field and mentioned in relevées, data on: life forms, floristic elements, ecological factors (humidity, temperature, chemical reaction of the soil), frequency (K). At the bottom of each table species that have appeared in one relevée were mentioned, as well as the locality and the date when the relevées were carried out.

Information on life forms, floristic elements and ecological factors is presented considering the work developed by the Sanda et al., (1983), Cristea et al., (2004).

The nomenclature adopted for the identified species is in accordance with the work developed by Ciocârlan (2009) and Sârbu et al. (2013).

## RESULTS AND DISCUSSION

This association lives on the limestone cliffs and steep slopes (30-40°) with mainly southern, southeastern, southwestern exhibition, found less frequently on the eastern and northern slopes (Table 1). These phytocoenoses were identified at altitudes between 390-415 m, at Grohot Bridge, within European beech forest.

The tree cover layer has poor coverage between 2-25% being made up of *Quercus cerris*, *Tilia tomentosa*, *Sorbus torminalis*, *Quercus petraea*, *Ulmus glabra*, *Carpinus betulus*, *Fagus sylvatica*, *Ulmus minor* and *Acer campestre*.

In the shrub layer that has 45-75% coverage there are particularly the *Fraxinus ornus* and *Syringa vulgaris* but also other species such as: *Rhamnus saxatilis* ssp. *tinctorius*, *Cornus mas*, *Cornus sanguinea*, *Ligustrum vulgare*, *Viburnum lantana*, *Euonymus europaeus*, *Euonymus verrucosus*, *Corylus avellana*, *Crataegus monogyna*, *Juniperus communis*.

The moss layer presents a coverage of 10-75%, where the following species can be found: *Teucrium chamaedrys*, *Poa nemoralis*, *Festuca pallens*, *Polypodium vulgare*, *Asplenium trichomanes* ssp. *quadrivalens*, *Asplenium ruta-muraria*, *Saxifraga paniculata*.

*Table 1*  
*Syringo-Fraxinetum orni* association Borza 1958 em. Resmerită 1972 (Syn.: *Syringeto-Fraxinetum orni coryletosum columnae* Borza 1958; *Asplenio-Syringetum vulgaris* Jakucs et Vida 1959), in Grohotului Bridge (Hunedoara county)

L.f.	F.e.	U.	T.	Sr.	No. relevées		1	2	3	4	5	K
						Altitude (m)	405	410	390	395	415	
						GPS coordonates	46.24690	46.24672	46.24647	46.24654	46.24650	
						Lat. N Long. E	22.75583	22.75438	22.75539	22.75568	22.75639	
						Tree cover layer(%)	25	10	5	5	2	
						Shrubbery layer(%)	70	75	40	55	45	
						Herbaceous layer coverage(%)	35	10	75	20	15	
						Moss layer coverage(%)	20	5	-	-	-	
						Exposition	SE	NE	S	S	SV	
						Slope (degree) (°)	40	35	30	35	30	
						Area (m <sup>2</sup> )	50	50	50	50	50	
0	1	2	3	4		5	6	7	8	9	10	11
<i>Car. ass.</i>												
mPh	B	1.5	4.5	4.5	<i>Syringa vulgaris</i>		1	1	2	2	1	V
mPh	M	1.5	3.5	5	<i>Fraxinus ornus</i>		3	4	2	3	3	V
<i>Syringo-Carpinion orientalis, Fraxino orni-Cotinetalia, Quercetea pubescenti-Petraeae</i>												
Ch	Ec	2	3.5	4	<i>Teucrium chamaedrys</i>		+	+	2	1	+	V
MPh	M	2	3.5	3	<i>Quercus cerris</i>		+	-	1	+	+	IV
mPh	M	1.5	4	5	<i>Rhamnus saxatilis</i> ssp. <i>tinctorius</i>		+	+	+	-	+	IV
mPh	P	2	3.5	4	<i>Cornus mas</i>		1	+	+	-	+	IV
H	E	2	4	3	<i>Fragaria viridis</i>		-	-	+	+	+	III
mPh	E	2.5	3	3	<i>Ligustrum vulgare</i>		+	+	+	-	-	III
H	Ppn	2	3.5	4	<i>Astragalus dasyanthus</i>		+	-	+	+	-	III
MPh	B	2.5	3.5	3	<i>Tilia tomentosa</i>		2	1	-	+	-	III
MPh	E	2.5	3	4	<i>Sorbus torminalis</i>		+	+	-	-	+	III
Th	DB	2.5	3	3	<i>Melampyrum bihariense</i>		-	-	+	+	+	III
H	E	2	3	4	<i>Geranium sanguineum</i>		-	-	+	-	+	II
H	M	3	4	5	<i>Aristolochia lutea</i>		+	+	-	-	-	II
H	B	1	4.5	4.5	<i>Pipitatherum holciforme</i>		+	+	-	-	-	II
MPh	M	2.5	3	0	<i>Quercus petraea</i>		+	-	-	+	-	II
H	E	2	4	4	<i>Vincetoxicum hirundinaria</i>		-	-	+	-	+	II
H	Eua	3	2	5	<i>Primula veris</i> ssp. <i>columnae</i>		-	-	+	-	-	I
<i>Querco-Fagetea</i>												
MPh	Eua	4	3	3	<i>Ulmus glabra</i>		+	+	-	+	+	IV
MPh	E	3	3	3	<i>Carpinus betulus</i>		+	+	+	-	-	III
MPh	E	3	3	0	<i>Fagus sylvatica</i>		+	+	-	+	-	III
MPh	Eua	3	3	4	<i>Ulmus minor</i>		1	+	-	+	-	III
mPh	E	2	3	4	<i>Pyrus pyraster</i>		+	-	+	-	+	III
H	Mp	2.5	3	4	<i>Glechoma hirsuta</i>		+	-	+	-	+	III
mPh	Ec	2.5	3	4.5	<i>Viburnum lantana</i>		+	+	-	-	-	II
H	Ec	4	2	4	<i>Moehringia muscosa</i>		1	+	-	-	-	II
I-nPh	Atl-M	3	3	3	<i>Hedera helix</i>		+	+	-	-	-	II
<i>Rhamno-Prunetea</i>												
mPh	E	2.5	3	4	<i>Euonymus verrucosus</i>		2	1	+	-	+	IV
mPh	E	3	3	3	<i>Corylus avellana</i>		+	-	+	+	-	III

<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>
nPh	Eua	2	3	4	<i>Rosa spinosissima</i>	+	.	+	+	.	III
mPh	E	3	3	3	<i>Euonymus europaeus</i>	+	+	+	.	.	III
mPh	E	2.5	3	3	<i>Crataegus monogyna</i>	+	.	+	.	.	II
MPh	E	2.5	3	3	<i>Acer campestre</i>	+	.	.	+	+	II
mPh	Ec	3	3	4	<i>Cornus sanguinea</i>	.	.	+	.	+	II
I-nPh	Ec	3	3	3	<i>Clematis vitalba</i>	.	+	+	.	.	II
<b><i>Asplenietea trichomanis</i></b>											
H	Cosm	3	0	4	<i>Asplenium trichomanes</i> ssp. <i>quadriovalens</i>	1	+	+	+	+	V
H	Cp	1.5	3	5	<i>Asplenium ruta-muraria</i>	+	+	+	+	+	V
H	Eua	3	3	0	<i>Poa nemoralis</i>	1	1	+	+	+	V
H	Carp	1.5	4	4.5	<i>Festuca pallens</i>	.	.	3	1	1	III
H	Eua	2	3	0	<i>Sedum maximum</i>	+	.	+	.	+	III
Ch	Eua	1.5	1.5	4.5	<i>Saxifraga paniculata</i>	.	.	+	+	+	III
Th	M	1	3.5	4	<i>Sedum hispanicum</i>	.	.	+	.	+	II
G	Cp	3.5	3	4	<i>Polypodium vulgare</i>	2	+	.	.	.	II
TH	Ec	2.5	3	4	<i>Cardaminopsis arenosa</i>	.	.	+	.	.	I
<b><i>Festuco-Brometea</i></b>											
H	Eua	2	4	2	<i>Potentilla argentea</i>	.	+	+	+	+	IV
TH	Eua	2	3	4	<i>Echium vulgare</i>	+	.	+	+	.	III
Ch	Ppn	2	4	0	<i>Thymus glabrescens</i>	.	.	+	+	+	III
H	Eua	1.5	3.5	4	<i>Potentilla recta</i> ssp. <i>recta</i>	.	.	+	.	+	II
H	Eua	2	3.5	4	<i>Sanguisorba minor</i>	.	.	+	+	.	II
H	Mp	2	4	4	<i>Stachys germanica</i>	.	.	+	+	.	II
Ch	Eua	0	3	3	<i>Sedum acre</i>	+	.	+	.	.	II
H	E	1.5	3	0	<i>Poa compressa</i>	.	.	+	.	+	II
H	Ec	2	3.5	4	<i>Seseli peucedanoides</i>	.	.	+	+	.	II
H	Eua	2.5	0	4	<i>Centaurea scabiosa</i>	.	.	+	+	.	II
G	P	1.5	4	4.5	<i>Allium albidum</i>	.	.	+	+	.	II
Th	M	2	4.5	4.5	<i>Arabis recta</i>	.	.	+	.	+	II
<b><i>Variae Syntaxa</i></b>											
mPh	Cp	2	0	0	<i>Juniperus communis</i>	+	.	+	.	.	II
H	Eua	3	0	0	<i>Veronica chamaedrys</i>	+	+	.	.	.	II
H	Eua	2	4	4	<i>Melica altissima</i>	+	.	+	.	.	II
H	Eua	3	2.5	4	<i>Agrimonia pilosa</i>	.	.	+	.	+	II
H	Eua	3	0	3	<i>Galium mollugo</i>	.	.	1	+	.	II
<b><i>Bryophyta</i></b>											
-	-	-	-	-	<i>Ctenidium molluscum</i>	2	1	.	.	.	II

where: L.f. - life forms; MPh - Megaphanerophytes; mPh - Mezophanerophytes; nPh - Nanophanerophytes; I-nPh - Climbing plants; Ch - Chamaephytes; H - Hemicryptophytes; G - Geophytes; Th - Annual therophytes; TH - Biannual therophytes; F.e. - floristic elements: B - Balkan; Cosm - Cosmopolitan; Cp - Circumpolar; E - European; Atl-M - Atlantic-Mediterranean; Mp - Mediterano-Pontic; M - Mediterranean; Ec - Central European; Ppn - Ponto-Pannonian; DB - Daco-Balkan; Carp - Carpathian; Eua - Eurasian; P - Pontic. Ecological factors: U - soil moisture, T - temperature, Sr - the chemical reaction of the soil. Synthetic phytocoenological indices: K - constancy

Species that occur in a single relevé: *Asarum europaeum* (1); *Campanula persicifolia* (3); *Campanula rapunculoides* (3); *Clinopodium vulgare* (3); *Galium schultesii* (1); *Geranium robertianum* (1); *Hepatica nobilis* (1); *Lamium purpureum* (4); *Malus sylvestris* (4); *Myosotis alpestris* (3); *Pulmonaria officinalis* (1); *Trifolium alpestre* (5); *Valeriana sambucifolia* (1).

Place and date of relevées: 1-2 – Grohotului Bridge (Hunedoara county) 01.06.2017; 3-5 – Grohotului Bridge (Hunedoara county) 02.06.2017.

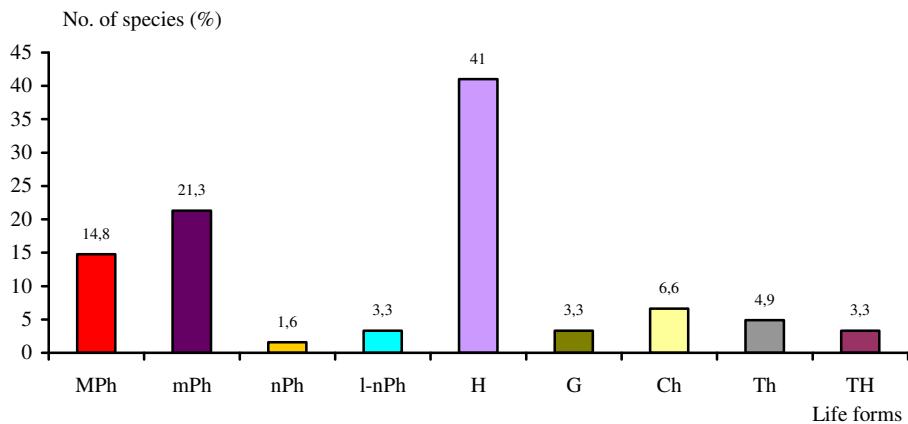


Fig. 3. The life forms spectrum of the *Syringo-Fraxinetum orni* association, on Bulzeşti Valley-Grohotului Bridge

As shown in the association of the phytocoenosis, the hemicryptophytes species (41%) are dominating, followed by phanerophytes (37.7%), with a share of less therophytes (8.2%), chamaephytes (6.6%) and geophytes (3.3%) (Fig. 3).

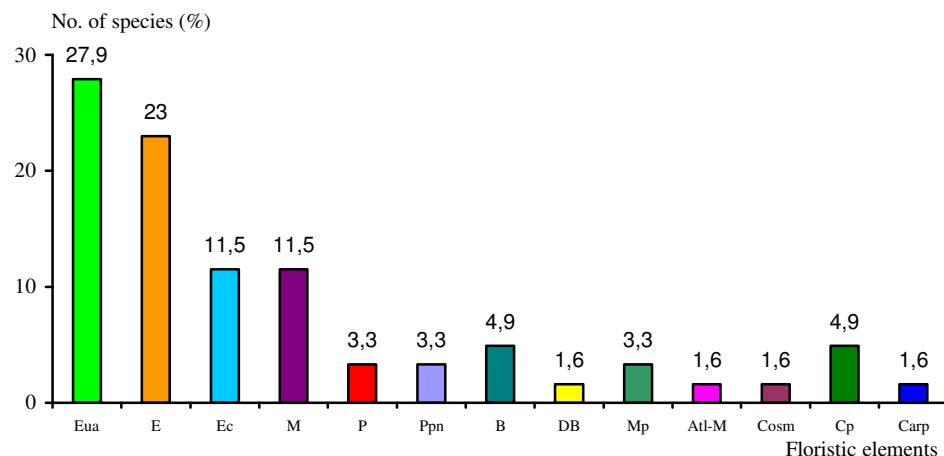


Fig. 4. Spectrum of floristic elements of the *Syringo-Fraxinetum orni* association, on Bulzeşti Valley-Grohotului Bridge

The spectrum of floristic elements (Fig. 4), is dominated by eurasian plants (27.9%), followed by the European (23%), Mediterranean (16.4%), central European (11.5%), Pontic (6.6%), Balkan (6.5%), circum polar (4.9%), cosmopolitan (1.6%) and Carpathian (1.6%) ones.

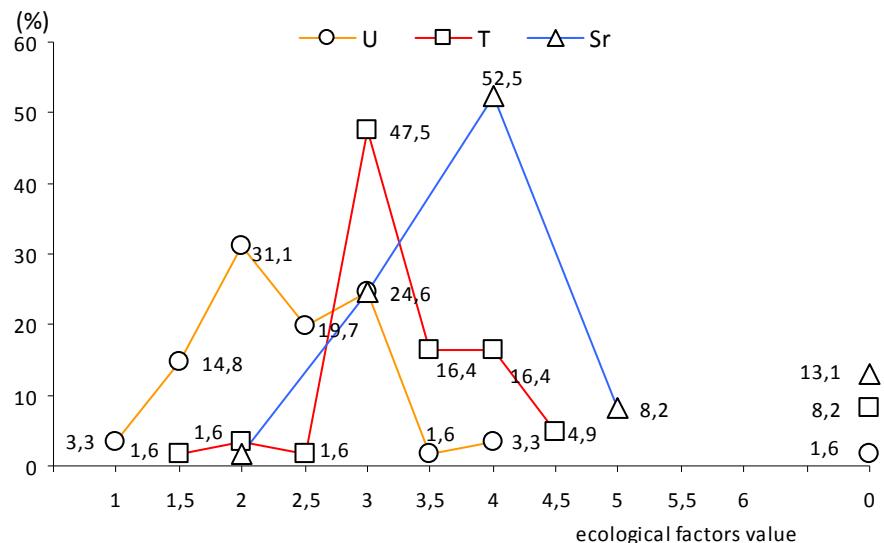


Fig. 5. Diagram of ecological factors of the *Syringo-Fraxinetum orni* association, on Bulzești Valley-Grohotului Bridge

In the analysis of the ecological factors (Fig. 5), one can notice the detached share of xero-mesothermophilous species (50.8%), followed by mesothermophilous (26.2%) and xerophilous (18.1%) ones. Considering temperature most species are micro-mesothermophilous (63.9%), supplemented by moderate-thermophilous (21.3%) ones. Considering the chemical reaction of the soil, most species are slightly acid neutrophilous (52.5%), followed by acid-neutrophilous (24.6%) and amfitolerante (13.1%) ones.

## CONCLUSIONS

The study of *Syringo-Fraxinetum orni* association Borza 1958 em. Resmeriță 1972 made on Grohot Bridge highlights the presence of a number of 74 species of plants in the 5 relevées carried out.

In the shrub layer *Fraxinus ornus* can be found, which has an average abundance-dominance is 38.5% in this phytocoenoses, under those transitional plant associations, *Syringa vulgaris*, which has an intermediate abundance-dominance of 10%. Amid these shrubs some tree species appear, mainly *Tilia tomentosa*, *Ulmus minor* and *Quercus cerris*.

The herbaceous layer consists mainly of xero-mesothermophilous, micro-mesothermophilous and weak-acid neutrophilous species, mainly *Teucrium chamaedrys*, *Festuca pallens*, *Polypodium vulgare*, *Asplenium ruta-muraria*, *Asplenium trichomanes* ssp. *quadrivalens*.

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