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PRELIMINARY STUDIES ON THE BRYOPHYTE AND VASCULAR PLANT SPECIES RICHNESS IN ASS. *SORBO AUCUPARIAE-ACERETUM PSEUDOPLATANI* CEL. ET WOJT. (1961 N.N.) 1978 IN THE GORGANY MTS. (THE UKRAINIAN CARPATHIANS)

Wstępne badania bogactwa gatunkowego mchów i roślin naczyniowych w zespole *Sorbo aucupariae-Aceretum pseudoplatani* Cel. et Wojt. (1961 n. n.) 1978 w Gorganach (Karpaty Ukraińskie)

Abstract: The paper presents a new locality of *Sorbo aucupariae-Aceretum pseudoplatani* association from the *Tilio platyphyllis-Acerion pseudoplatani* alliance in the Gorgany Mts. Species diversity of bryophytes and vascular plants was investigated. As a result, 35 bryophyte species and 54 species of vascular plants were discovered. The results show necessity of further study and protection of this type of forest communities.

Key words: *Sorbo aucupariae-Aceretum pseudoplatani*, bryophytes, vascular plants, the Ukrainian Carpathians.

Introduction

The plant community *Sorbo aucupariae-Aceretum pseudoplatani* belongs to the alliance *Tilio platyphyllis-Acerion pseudoplatani* Klika 1955, that is 9180* habitat according to the program “Natura 2000”. In Ukraine, this community is not included in the Green book of Ukraine, 2009. Distribution in Europe (Matuszkiewicz J. 2012) and especially in Ukraine and the structure of vegetation cover of this community are incompletely investigated. In the Ukrainian Carpathians *Sorbo aucupariae-Aceretum pseudoplatani* is rare, so the composition of bryophytes have not been studied in detail.

The study area was located in the “Grofa” nature reserve in the central part of the Gorgany Mts (Fig. 1). This region is represented mainly by steep mountain ranges higher than 1200 m a.s.l. The lower part of slopes is covered with mixed stands of fir, beech and spruce; in the middle part – mainly pure fir stands. The mountain peaks are covered with elfin wood formations with mountain pine and green alder.

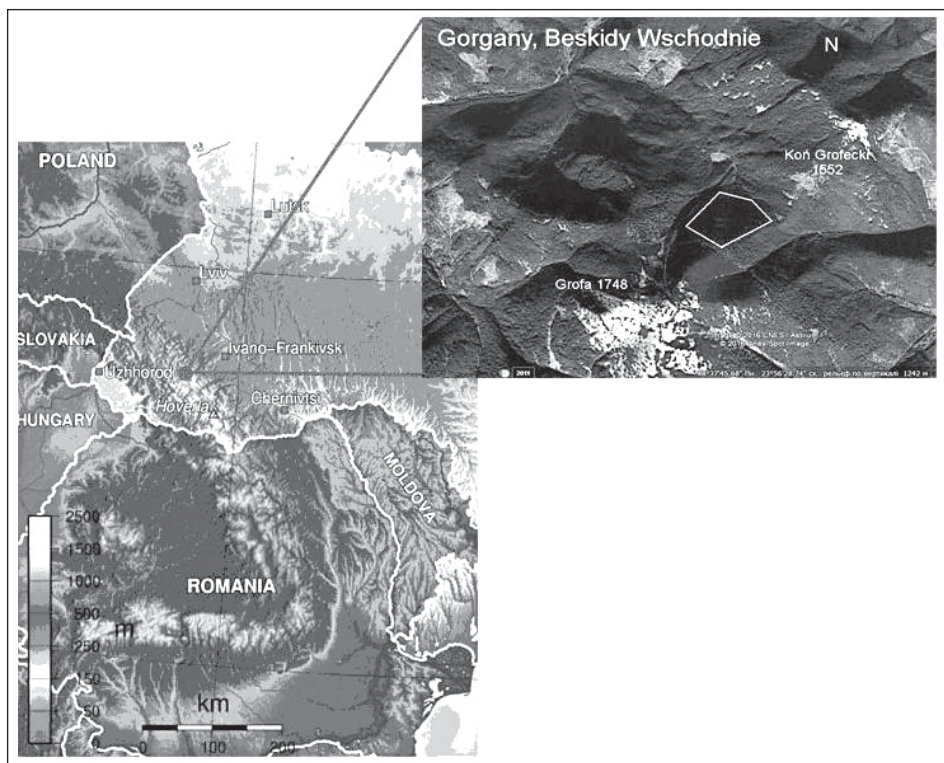


Fig. 1. Study area.

Ryc. 1. Obszar badań.

Material and methods

Two phytosociological relevés were made in June 2015 using the Braun-Blanquet approach (Braun-Blanquet 1964); the extended Braun-Blanquet cover-abundance scale was used (Dengler et al. 2008). Determination of the taxonomic ranks of plant community was conducted according to Matuszkiewicz W. (2007) and Matuszkiewicz J. (2012). The bryophyte species were determined after Ignatov M.S., Ignatova E.A. (2003). The vascular plant species were determined after *Opredelitel' vyšych rastenij Ukrainy* (Prokudin Ju. (ed.) 1987).

Results

The community studied is rich and includes 54 species of vascular plants and 35 species of bryophytes.

In the tree layer two species predominate: *Sorbus aucuparia* L. subsp. *glabrata* (Fig. 2) – 40–50 % (d 20 cm, height about 20 m) and *Picea abies* (L.) H. Karst. (d about 20 cm, height 25–30 m) – 10 %, while *Lonicera nigra* L.



Fig. 2. Ass. *Sorbo aucupariae-Aceretum pseudoplatani* and the trunk of *Sorbus aucuparia* L. subsp. *glabrata*.

Ryc. 2. Ass. *Sorbo aucupariae-Aceretum pseudoplatani* i pień *Sorbus aucuparia* L. subsp. *glabrata*.

(10%) and *Picea abies* (10%) predominate in the shrub layer, and *Petasites albus* Gaertn. (30–50%) – in the herb layer.

Characteristic species for *Sorbo-aucupariae-Aceretum pseudoplatani* association is *Sorbus aucuparia* ssp. *glabrata*, for *Tilio-platyphyllis-Acerion pseudoplatani* alliance – *Acer pseudoplatanus* and *Actaea spicata*, for *Fagetalia sylvaticae* order – *Adoxa moschatellina*, *Daphne mezereum*, *Dryopteris filix-mas*, *Lamium galeobdolon*, *Lilium martagon*, *Paris quadrifolia*, *Phyteuma spicatum*, and *Primula elatior*; and for *Querco-Fagetea* class – *Anemone nemorosa*.

The *Sorbetum-athyrietosum distentifoliae* (All. *Lunario-Acerion pseudoplatani*) plant community with mountain ash was described from the Ukrainian Carpathians. It is found at the timberline as well, but have a significantly poorer floristic composition. Mountain ash trees usually reach 4 m high (Deineka 2006).

Specific environmental conditions of the plant community contribute to significant development of bryophyte cover. Despite the richness of vascular plants, a variety of substrates, such as large rocks, bark of trees, exposed soil and fallen logs, allows mosses to occupy large surfaces and to successfully avoid competition. Since the investigated *Sorbo aucupariae-Aceretum pseudoplatani* association is located on the rocky and steep slopes, almost 70–80% of stones are

occupied by different combination of bryophyte species. *Eurhynchium angustirete* and *Hylocomiastrum umbratum*, species of genus *Plagiomnium*, cover the rocks and soil with dense carpet. Among the epiphytic bryophytes growing on the bark of the trunks of mountain ash, the most common are *Sciuro-hypnum starkei* and *Sanionia uncinata*. The bark of coniferous trees (*Picea abies*) is covered with mosses mostly only at the base of the trunks and roots under the soil; such localities are colonized mainly by *Plagiothecium laetum*, *Dicranum montanum*, and *Plagiochila asplenoides*.

Since investigated plant community location belongs to the “Grofa” nature reserve there is no active forestry management. This determines the presence of a large deadwood amount (fallen trees, stumps, large branches), which is a major substrate for mosses and liverworts. The most numerous group of species are epixylic mosses – 24 species of moss that can grow on dead or rotten wood were recorded. The majority of liverworts grow on wet, severely decomposed wood (*Tritomaria exsecta*, *Mylia taylori*, *Riccardia palmata*, *Cephalozia leucantha*, *Lepidozia reptans*, *Anastrophyllum michauxii*, *Blepharostoma trichophyllum*).

In the territory of investigation, at an altitude of 1308 m a.s.l., a new microhabitat (N 48 37 384, E 023 56 289) was found for the rare species of Eastern Europe *Buxbaumia viridis* (Plášek, Novozámská 2011). Capsules were found on a rotten log (diameter 50 cm) among other mosses (*Calypogeia azurea*, *Cephalozia sp.*, *Blepharostoma trichophyllum*, *Dicranum montanum*, *Sanionia uncinata*, *Herzogiella seligeri*).

Table 1. Ass. *Sorbo aucupariae-Aceretum pseudoplatani*.

Tabela 1. *Sorbo aucupariae-Aceretum pseudoplatani*.

Field number	1	2
Plot size (m ²)	200	200
Sampling date	10.06.2015	11.06.2015
UTM coordinates	N 48 37 384 E 023 56 289	N 48 37 340 E 023 56 231
Locality	Mt Grofa, Gorgany massif, Ukrainian Carpathians (Ivano-Frankivsk region, Rozhnyativ region, reserve „Grofa”)	Mt Grofa mt, Gorgany massif, Ukrainian Carpathians (Ivano-Frankivsk region, Rozhnyativ region, reserve „Grofa”)
Elevation (m a.s.l.)	1308	1379
Slope aspect (°)	20	20
Slope inclination (°)	40	40
Soil type	brown soil with highly disintegrated regolith	

Management	Protective forest	Protective forest
Stand age (year)	-	-
Height of tree layer (m)	<20	30
Height of shrub layer (m)	3	3
Cover of tree layer (%)	70	50
Cover of shrub layer (%)	10	10
Cover of herb layer (%)	60	50
Cover of cryptogam layer (%)	70	50
Layer a		
<i>Sorbus aucuparia</i> L.	3	3
<i>Picea abies</i> (L.) H.Karst.	2a	2a
<i>Acer pseudoplatanus</i> L.	+	.
<i>Betula pendula</i> Roth	.	r
Layer b		
<i>Lonicera nigra</i> L.	1	+
<i>Picea abies</i> (L.) H.Karst.	+	2a
<i>Sorbus aucuparia</i> L.	+	+
<i>Daphne mezereum</i> L.	+	.
<i>Rubus idaeus</i> L.	+	+
<i>Ribes petraeum</i> Wulfen	+	.
<i>Acer pseudoplatanus</i> L.	+	.
Layer c		
<i>Petasites albus</i> Gaertn.	3	3
<i>Adenostyles alliariae</i> Kern.	+	.
<i>Aconitum</i> sp.	+	+
<i>Actaea spicata</i> L.	+	.
<i>Adoxa moschatellina</i> L.	.	+
<i>Anemone nemorosa</i> L.	.	.
<i>Aruncus dioicus</i> (Walter) Fernald	.	+
<i>Athyrium filix-femina</i> (L.) Roth.	+	+
<i>Athyrium distentifolium</i> Tausch ex Opiz.	+	.
<i>Betula pendula</i> Roth	.	r
<i>Calamagrostis arundinacea</i> (L.) Roth.	+	.
<i>Cardamine</i> sp.	+	.
<i>Carduus bicolorifolius</i> Klokov	+	.
<i>Chaerophyllum temulum</i> L.	+	.
<i>Cicerbita alpina</i> Wallr.	+	+
<i>Daphne mezereum</i> L.	+	.
<i>Dentaria glandulosa</i> Waldst. & Kit.	+	.
<i>Doronicum austriacum</i> Jacq.	+	.
<i>Dryopteris carthusiana</i> (Vill.) H.P.Fuchs	.	+
<i>Dryopteris dilatata</i> (Hoffm.) A.Gray.	+	+

<i>Dryopteris filix-mas</i> (L.) Schott.	+	.
<i>Epilobium</i> sp.	+	.
<i>Gymnocarpium dryopteris</i> Ching	+	.
<i>Homogyne alpina</i> (L.) Cass.		+
<i>Lamium galeobdolon</i> (L.) L.	+	.
<i>Lilium martagon</i> Walter	+	.
<i>Luzula sylvatica</i> (Hudson) Gaudin.	+	+
<i>Lycopodium annotinum</i> L.	+	.
<i>Milium effusum</i> L.	+	.
<i>Myosotis</i> sp.	+	+
<i>Oxalis acetosella</i> L.	+	+
<i>Paris quadrifolia</i> L.	+	.
<i>Phyteuma spicatum</i> Lapeyr.	+	+
<i>Prenanthes purpurea</i> L.	+	+
<i>Primula elatior</i> Hill	+	.
<i>Ranunculus breyninus</i> Crantz	+	.
<i>Rosa pendulina</i> L.	+	+
<i>Rubus idaeus</i> L.	+	+
<i>Rubus</i> sp.	+	+
<i>Rumex</i> sp.	.	+
<i>Senecio nemorosus</i> Jord.	+	.
<i>Soldanella montana</i> Willd.		+
<i>Sorbus aucuparia</i> L.	+	+
<i>Stellaria nemorum</i> L.	.	+
<i>Symphytum cordatum</i> Willd.	+	.
<i>Thalictrum aquilegiifolium</i> L.	+	.
<i>Vaccinium myrtillus</i> L.	.	+
<i>Valeriana tripteris</i> L.	+	
<i>Veratrum lobelianum</i> Bernh.	+	+
Layer d		
<i>Plagiochila asplenioides</i> (L. emend. Taylor) Dumort.	+	.
<i>Tritomaria exsecta</i> (Schmidel) Loeske	+	+
<i>Mylia taylori</i> (Hook.) Gray	.	+
<i>Riccardia palmata</i> (Hedw.) Carruth.	.	+
<i>Cephalozia leucantha</i> Spruce	.	+
<i>C. sp.</i>	+	+
<i>Pellia endiviifolia</i> (Dicks.) Dumort.	.	+
<i>Lophocolea bidentata</i> (L.) Dumort.	+	+
<i>Lepidozia reptans</i> (L.) Dumort.	+	+
<i>Anastrophyllum michauxii</i> (F. Weber) H. Buch	+	+
<i>Calypogeia azurea</i> Stotler & Crotz	.	+

<i>Blepharostoma trichophyllum</i> (L.) Dumort.	+	+
<i>Buxbaumia viridis</i> (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.	r	.
<i>Tetraphis pellucida</i> Hedw.	+	+
<i>Polytrichastrum formosum</i> Hedw. G. Sm.	+	+
<i>Fissidens pusillus</i> (Wils.) Milde.	+	.
<i>Dicranodontium denudatum</i> (Brid.) E. Britton.	+	+
<i>Dicranum montanum</i> Hedw.	+	+
<i>D. scoparium</i> Hedw.	+	+
<i>Mnium stellare</i> Hedw.	+	.
<i>Rhizomnium punctatum</i> (Hedw.) T. Kop.	+	+
<i>Plagiomnium affine</i> (Bland. Ex Funck) T. Kop.	+	1
<i>P. medium</i> (Bruch & Schimp.) T. Kop.	+	.
<i>Eurhynchium angustirete</i> (Broth.) T. Kop.	2	2
<i>Sciuro-hypnum starkei</i> (Brid.) Ignatov & Huttunen	+	+
<i>Hylocomiastrum umbratum</i> (Hedw.) M. Fleisch.	+	+
<i>Hylocomium splendens</i> (Hedw.) Schimp.	+	1
<i>Rhytidiadelphus squarrosus</i> (Hedw.) Warnst.	+	+
<i>R. triquetrus</i> (Hedw.) Warnst.	.	+
<i>Hypnum pallescens</i> (Hedw.) P. Beauv.	+	+
<i>Sanionia uncinata</i> (Hedw.) Loeske	+	+
<i>Herzogiella seligeri</i> (Brid.) Z. Iwats.	+	+
<i>Plagiothecium laetum</i> Schimp.	+	+
<i>P. curvifolium</i> Schlieph. ex Limpr.	+	.
<i>P. undulatum</i> (Hedw.) Schimp.	.	+

Conclusions

Bryological component of *Sorbo aucupariae-Aceretum pseudoplatani* association is characterized by high species richness and considerable percentage of projective cover and high percentage of participation of liverworts, which constitute almost a third part of the species list. Usually *Sorbus aucuparia* occurs in the second storey of the tree cover and does not dominate in floristic composition in the plant cover of the Carpathians forests. But it is the main species in a tree layer of this community. *Sorbo aucupariae-Aceretum pseudoplatani* is rare asocation for Ukrainian Carpathians and this determinates the conservation status and necessity of protection for this forest community at the regional level. Interesting species composition, the presence of Red List species and rare species, which are indicators of old-growth forests are the reasons for conservation of this plant community as well.

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