

CONTRIBUTIONS TO THE BRYOPHYTE FLORA OF THE “VALEA MORII” NATURE RESERVE

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SUMMARY. The paper contribute to the species inventory of the nature reserve “Valea Morii”, with the first bryological approach. Despite its small area, a total of 63 bryophyte taxa (9 liverworts and 54 mosses) have been recorded on the available substrate, mainly on soil and tree bark. Phytogeographical analysis reveals the dominance of the temperate elements. Ecological requirements of the species show a great variability of microhabitats. Among all the approached ecological parameters, species requirements for temperature are the most stringent, lacking the moderately thermophilous and thermophilous species. The prevalence of microthermal species is related to the occurrence of glacial relicts, as a result of the particular cooler microclimatic conditions. The species sensitive to human impact: oligohemerobous and ahemerobous, reveal a low impact in the protected area and a favorable conservation status.

Keywords: bryophyte, indicator, inventory, nature reserve.

Introduction

Floristic studies contribute to the species inventories in nature reserves, to species distribution and biodiversity analyses, as instruments in nature conservation.

“Valea Morii” (Mill Valley) nature reserve has been founded in 1974, by Decision 9757 of Cluj Local Council, covering an area of 1 ha, extended in 1994 to 1.7 ha and included in the “Valea Căprioarelor” landscape reserve. It became a nature reserve of botanical interest (IUCN IV) according to the Law 5/2000. Nowadays, it is part of “Făgetul Clujului-Valea Morii” Nature 2000 site (ROSCI0074).

“Valea Morii” is located in the north – western part of Transylvania, 8 km south of Cluj-Napoca city, in the Transylvanian foothills. Administratively, it belongs to the Feleac commune. The elevation of the nature reserve is almost 630 m a.s.l. surrounded by 700-800 m hills that creates particular cooler microclimatic conditions. The climate is temperate continental, with an average annual temperature of 7.5°C and multiannual rainfalls of 782 mm.

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In “Valea Morii” nature reserve sarmatian sedimentary deposits are predominant, represented by sands or sandstones with “Feleacu concretions”, on marly to sandy clays substrate.

The vegetation of “Valea Morii” has been studied by Pop, 1960, Pop *et al.*, 1962, Csűrös-Káptalan, 1965, Ruprecht, 1998, Ruprecht and Botta- Dukát, 1999, 1999/2000, Goia *et al.*, 2005. The forest vegetation is represented on the southern slopes by *Quercus petraeae-Carpinetum* Soó *et Pocs* 1957, *Quercetum robori-petraeae* Borza 1959 phytocoenosis and on the northern ones by *Carpino-Fagetum* Paucă 1941 communities. Along the valley are patches of *Aegopodio - Alnetum glutinosae* Kárpáti *et* Jurkó 1963. In the hay meadows and pastures dominant species are *Trisetum flavescens*, *Festuca rubra*, *Agrostis capillaris* and on small stands *Nardus stricta*. According to Pop *et al.*, 1962 the nature reserve is dominated by wetland communities: *Cladietum marisci* (All. 1922) Zobrist 1935 *phragmitetosum* Pop *et al.*, 1962, *Schoenetum nigricantis* (All. 1922) W. Koch 1926, *Carici flavae-Eriophoretum latifolii* Soó 1944, *Caricetum vulpinae* Soó 1927, *Schoenoplectetum tabernaemontani* Soó 1947.

Four habitats have been identified in the protected area: 7210* - calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*, 7230 - alkaline fens, 91E0* - alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) and 6520 - mountain hay meadows.

A comprehensive vascular plant inventory of the nature reserve consist of 277 species, including some glacial relicts: *Cladium mariscus*, *Tofieldia calyculata* (the only certain population on the Romanian territory), *Schoenus nigricans*, *Swertia perennis* or threatened species: *Ophioglossum vulgatum*, *Arnica montana*, *Dactylorhiza incarnata*, *D. maculata*, *Epipactis palustris*, *Trollius europaeus*, *Salix rosmarinifolia* etc. (Oltean *et al.*, 1994, Habitats Directive, Bern Convention).

Our main object was to complete the species inventory of the nature reserve “Valea Morii” with bryophyte species, since such studies are lacking. Establishing the habitats that host the identified bryophyte species are essential for developing certain recommendations that also take into account the bryophytes as components of the vegetation and as best indicators of environmental conditions from the studied area.

Materials and methods

The bryofloristic studies have been carried out in the frame of protected area, in 2005. The bryophytes were analyzed in terms of phytogeographic, ecological and anthropic impact. The ecological behavior of taxa and phytocoenoses was estimated based on the ecological indices (U, T, R, L) according to Düll, 1992. The phytogeographical elements follow Düll, 1983, 1984, 1985. The tolerance of mosses to the anthropic impact was used according to Dierßen, 2001.

The taxonomy and nomenclature was updated according to Hill *et al.*, 2006.

Results and discussion

Despite its small area, a total of 63 bryophyte taxa (9 liverworts and 54 mosses) were on the available substrate, soil and tree bark. The alluvial forest host 41 bryophyte taxa. *Brachytheciaceae*, *Hypnaceae* and *Amblystegiaceae* were families with the largest number of species.

Species inventory

Liverworts

Leiocolea badensis (Gottsche) Jorg.
Lophocolea bidentata (L.) Dumort.
Lophocolea heterophylla (L.) Dumort.
Marchantia polymorpha L.
Pedinophyllum interruptum (Nees) Kaal.
Pellia endiviifolia (Dicks.) Dumort.
Plagiochila asplenoides (L. emed. Taylor) Dumort.
Plagiochila porelloides (Torr. ex Nees) Lindenb.
Radula complanata (L.) Dumort.

Mosses

Abietinella abietina (Hedw.) M. Fleisch.
Amblystegium serpens (Hedw.) Schimp.
Amblystegiella subtile (Hedw.) Schimp.
Atrichum undulatum (Hedw.) P. Beauv.
Brachytheciastrum velutinum (Hedw.) Ignativ & Huttunen
Brachythecium campestre (Müll.Hall) Schimp.
Brachythecium glareosum (Bruch ex Spruce) Schimp.
Brachythecium mildeanum (Schimp.) Schimp.
Brachythecium rutabulum (Hedw.) Schimp.
Brachythecium salebrosum (Hoffm ex F.Weber & D.Mohr) Schimp.
Bryum pseudotriquetrum (Hedw.) P. Gaertn. et al.
Bryum torquescens Bruch et Schimp
Calliergonella cuspidata (Hedw.) Loeske
Campylium stellatum (Hedw.) Lange & C.E.O. Jens.
Campylophyllum calcareum (Crundw. & Nyholm) Hedenäs
Ceratodon purpureus (Hedw.) Brid.
Cirriphyllum piliferum (Hedw.) Grout
Climacium dendroides (Hedw.) F.Weber & D.Mohr.
Ctenidium molluscum (Hedw.) Mitt.

Didymodon ferrugineus (Schimp. ex. Besch) M.O.Hill
Encalypta streptocarpa Hedw.
Eurhynchium angustirete (Broth.) T.J. Kop.
Fissidens dubius P.Beauv.
Fissidens taxifolius Hedw.
Homalothecium lutescens (Hedw.) H.Rob.
Homalothecium sericeum (Hedw.) Schimp.
Hygramblystegium varium (Hedw.) Mönk.
Hylocomiadelphus triquetrus (Hedw.) Ochyra & Stebecl.
Hylocomium splendens (Hedw.) Schimp.
Hypnum cupressiforme Hedw.
Hypnum cupressiforme var. *filiforme* Hedw. (Brid.)
Kindbergia praelonga (Hedw.) Ochyra
Mnium stellare Hedw.
Orthotrichum striatum Hedw.
Oxyrrhynchium hians (Hedw.) Loeske
Palustriella commutata (Hedw.) Ochyra
Plagiomnium elatum (Bruch & Schimp.) T.J.Kop.
Plagiomnium rostratum (Schrad.) T.J.Kop
Plagiomnium undulatum (Hedw.) T. Kop
Plagiothecium denticulatum (Hedw.) Schimp.
Plagiothecium laetum Schimp.
Plagiothecium latebricola Schimp.
Plagiothecium succulentum (Wilson) Lindb.
Pleurozium schreberi (Willd. ex Brid.) Mitt.
Pohlia drummondii (Müll. Hal.) A.L.Andrews
Pohlia lescuriana (Sull.) Ochi
Pohlia wahlenbergii (F.Weber & D.Mohr.) A.L.Andrews
Pseudoscleropodium purum (Hedw.) M.Fleisch
Pylaisia polyantha (Hedw.) Schimp.
Rhytidiadelphus squarrosus (Hedw.) Warnst.
Sanionia uncinata (Hedw.) Loeske
Scorpidium revolvens (Sw. ex anon.) Rubers
Thuidium assimile (Mitt.) A.Jaeger
Thuidium recognitum (Hedw.) Lindb.

Limited offer regarding the nature of the substrate is reflected by the predominance of terricolous species (39.68%). 50.79% are strictly adapted to one type of substrate, 28.57% can be recorded on two types of substrata, 14.25% occur on three types of substrate, 1.59% species can be found on 4 types of substrate and 4.76% haven't any substrate preference (Fig. 1).

Ecological requirements of the species show a great variability of microhabitats (Fig. 2), despite the small area of the nature reserve.

Regarding light preferences scio-heliophilous (L4, L5 – 33.53%) and helio-sciophilous species (L6, L7 – 33.33%) are prevalent, since most species are sheltering in the shade of the forest or in the herbaceous layer.

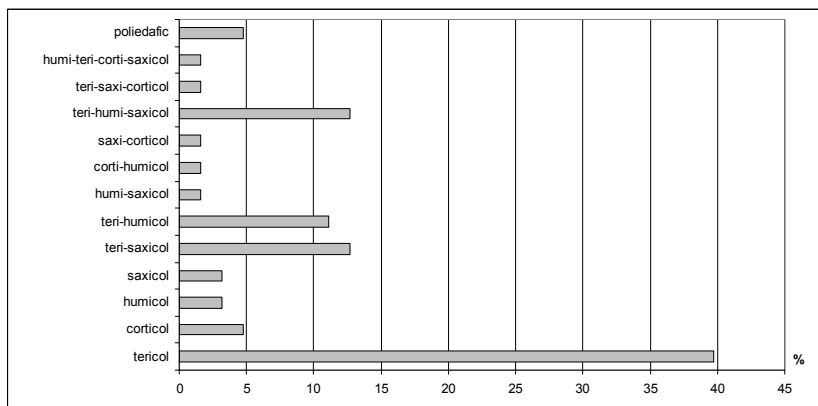


Figure 1. Species distribution regarding substrate preferences

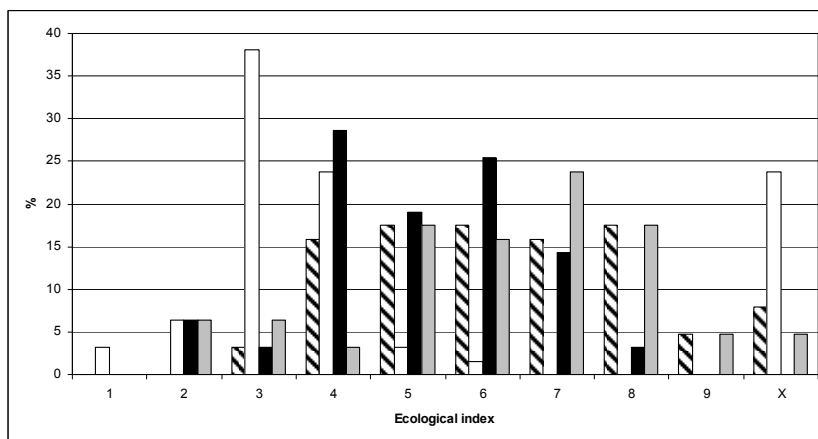


Figure 2. Ecological spectrum depending on the species preferences for light (L), temperature (T), humidity (U) and chemical reaction of the substrate (R)

The temperature requirements reveal the microthermal species prevalence (T3, T4 – 61.90%), another argument of climate peculiarities of “Valea Morii” nature reserve.

Referring to the ecological requirements for humidity most of the species are mesophilous (U5, U6 – 44.44%), but well represented are also xero-mesophytes (U4 – 28.57%) and meso-hygrophytes (U7 – 14.29%). Even if we expected a good percentage of meso-hygrophytes or hygrophytes, this fen is located at lower elevation and relatively far from similar ones. Relatively good prevalence of xero-mesophytes is a consequence of human pressure, manifested by drainage for meadows or human settlements expansion (construction of cottages, holiday or permanent houses).

Concerning the pH of the substrate, the base rich substrate is highlighted by the predominance of weak acid-neutrophilous (R5, R6 – 33.33%), followed by weak acid-neutrophilous (R7 – 23.81%) and neutro-basiphilous species (R8 – 17.46%).

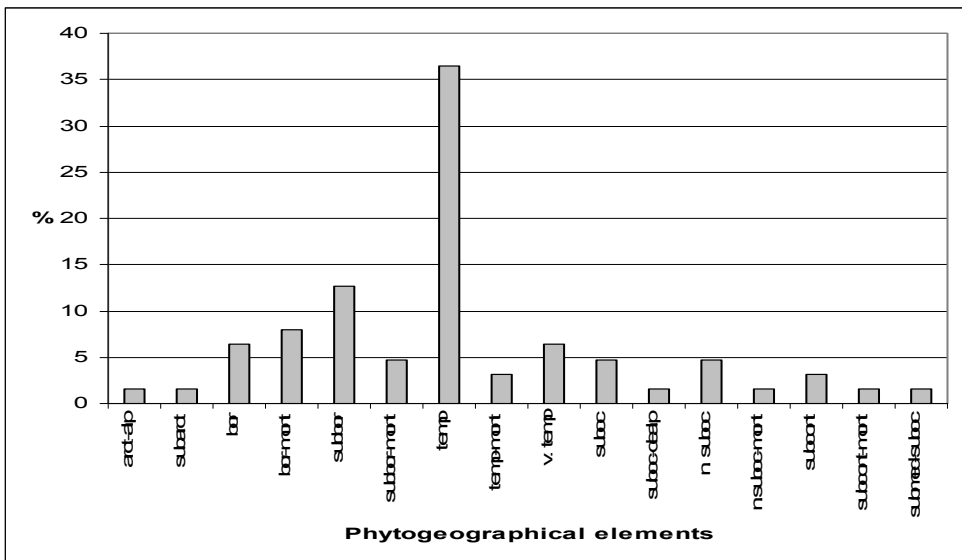


Figure 3. Phylogeographical spectrum for the bryophyte flora from “Valea Morii”

Phylogeographical analysis reveals the dominance of the temperate elements (46.03% in accordance with the region's temperate climate (Fig. 3). Arcto-alpine (1.59%), subarctic (1.59%), boreal (6.35%), boreal-montane (7.94%), subboreal (12.70%), subboreal-montane elements (4.76%) are typical for a cool microclimate, clues to the climate particularities of the nature reserve.

Regarding to the human impact the best represented are species with a mean tolerance - mesohemerobous (32.20%), but are well represented species sensitive to human impact: oligohemerobous (29.38%) and ahemerobous (20.90%), which reveal a low impact in the protected area (Fig. 4).

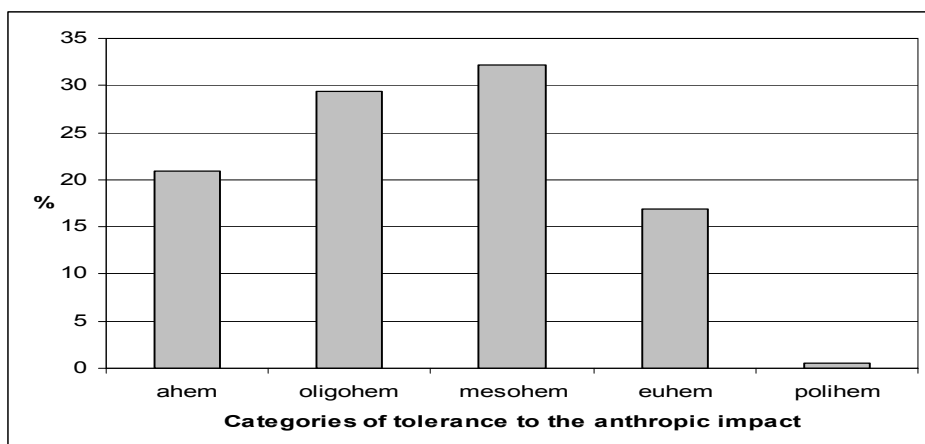


Figure 4. Distribution of bryophytes depending on their tolerance to the anthropic impact

Conclusions

The floristic inventory of “Valea Morii” consists of 63 bryophyte taxa, 9 hepatics and 54 mosses. It is a relatively small number of species compared to other small reserves (eg. Turda Gorges 136 species, Plămadă and Goia, 1993-1994; Someșul Cald Gorges 156 species, Goia and Mătase, 2001), due to low variability of the substrate types. Forest management is not considering leaving dead wood and the exposed rocks are lacking.

Even if we didn't recorded rare or relict species, bryophytes are important indicators of habitat changes. The prevalence of microthermal species is related to the occurrence of glacial relicts, as a result of the particular cooler microclimatic conditions. Among all the approached ecological parameters, species requirements for temperature are the most stringent, lacking the moderately thermophilous and thermophilous species.

The species indicator value reveals a favorable conservation status. The amount of xero-mesophilous, xerophilous, euhemerobous species, indicate an incipient degradation caused mainly by drainage and construction. This process of construction, due to the location in the vicinity of Cluj-Napoca, advances rapidly towards the middle of the valley and soon will damage the nature reserve. The upstream fens host some rare or relict species, but the nature reserve host the most important species and plant communities.

The inclusion of this protected area and the upstream marshes in the Natura 2000 site “Făgetul Clujului-Valea Morii” Nature 2000 site (ROSCI0074), is probably the most important step for “*in situ*” conservation of existing natural values.

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