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IN CELEBRATION OF PROF. DR. SÁNDOR ORBÁN: A TRIBUTE TO 45 YEARS IN BRYOLOGY

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Sándor Orbán was born on the 3rd of November 1947 in Nyíregyháza, Hungary, where he completed his elementary and secondary school studies. He graduated from Pál Vasváry Secondary school in 1966 and was admitted to the Biology Programme of the Natural Sciences Faculty of Eötvös Lóránd University (ELTE-TTK) Budapest the same year. He completed the programme and obtained a degree in 1971. In 1979 he enrolled again in Eötvös University as a correspondence student to obtain certification as Biology teacher the following year.

During his university years he developed an interest in Botany and participated in the research projects in the field station of Plant Taxonomy and Ecology Department at Csévharaszt under the supervision of Prof. Tibor Simon. He came out third at the National Scientific Student Conference in Szeged and published two articles from these projects.

He defended his doctoral degree in 1974 on the "Taxonomical revision of species of the Mniaceae family", and was granted a degree by ELTE-TTK. After graduation he was employed by Hungarian Natural History Museum in the Botanical Collection. It was here, that he began to study bryophytes and had the fortune of being taught by well-known experts Dr. Ádám Boros and László Vajda, whose work defined his later scientific career. By 1975 the team had set up a bryophyte herbarium, accommodated the Boros herbarium and arranged several exhibitions. One remarkable exhibition titled *Healing Herbs* was scripted solely by Orbán.

Along with research colleagues from the Natural History Museum, he participated in the research of Hortobágy National Park, where he conducted studies of bryophyte vegetation

dynamics, ecology and phenology and floristics. Three scientific articles and a chapter describing the bryophyte flora of Hortobágy were published based on these studies. At the suggestion of Prof. Tamás Pócs (who had offered his personal collection for study) Orbán began processing and revising species of the Calymperaceae moss family with African distribution.

After the death of Ádám Boros, per request of the editors of the journal *Revue Bryologique*, between 1974 and '77 he refereed Bryological publications from the Central European region. From 1975 to '76 he was the editor of the journal *Studia Botanica Hungarica*. In 1976 he acceped the invitation of Tamás Pócs to join the Teachers' Training College in Eger, where he soon became assistant Professor, teaching plant taxonomy for nearly forty years.

In addition to teaching he continued research with increasing focus on ecology and taxonomy of tropical mosses. In 1984 he defended his candidate dissertation titled "A Magyarországi mohák stratégiáinak ökológiai összefüggései" (*Ecological relationships of the life strategies of Hungarian bryophytes*) at the Hungarian Academy of Sciences. He is appointed senior lecturer at the College in the same year. He won College competition with compilation of Instructional Materials for Plant System Education and authors the chapter Tours in the Bükk Mountains for a Guide to Excursions for Primary and Secondary School Students.

In 1978 he was the head-organiser of the Central and Eastern European Bryological Working Group and arranged their first conference of the organisation in Eger. The conference has been held biannually ever since in various locations. It was held in Eger again in 1985 and 1993 as part of the IAB Congress and CEBWG Conference. The presentations of the conference in 1985 were published in *Abstracta Botanica* journal edited by him and János Podani.

The first results of the revision on the African members of genus *Syrrhopodon* (Calymperaceae) were published between 1977 and '81. In 1979 Orbán participated in a botanical field-trip to the Spitzbergen, expanding the collection with 150 vascular plants and 200 bryophytes.

In 1983 his book "Magyarország mohaflórájának kézikönyve" (*Handbook of Hungarian Bryophytes*) co-authored by László Vajda was published.

The significance of the volume has shown by its nearly two hundred independent citations. He published many paper from his life strategy investigations and taxonomical revisions.

In 1986 and 2005 he received an OTKA (Hungarian Science Foundation) grant for the examination of the indicator values and strategies of bryophytes. During his educational activity he introduced many new, modern scientific subjects in the Department as Exotic Medicinal and Culinary Plants (higher level programmes); Introduction to Biology, Ecology, Biomathematics, Bryology and Micology (basic level programmes); Ecology and Plant Resources and Risks (Master courses); General Bryology, Hungarian Mosses and Modern Ecological approaches in the Environmental Education (PhD courses).

In addition to teaching and scientific work at the department Orbán took part in the College's administration as Deputy General Director from 1981-89, where he was first responsible for the coordination of educational tasks and later (in 1985) he became the Deputy General Director for Scientific Matters. During this time the requirements emphasized that all lecturers must perform in scientific research and acquire scientific qualifications.

This aspiration has also been included in the promotion and appointment requirements. From 1989 to 1994 as Director he became the chief executive of the institution. This was not an easy position during the change of political regime; the tasks included managing structural changes, facilitating the processes of democratisation and liberalisation, drawing up new organisational and operational codes, establishing a party-neutral institution, and the preparation of the new Higher Education Law. His first undertaking was the changing of the name of institution to Eszterházy Károly College. The next major achievements were: the acquisition of the entirety of building „B" for the institution; the agreement on the permanent use of the Líceum building with the Eger archbishop of the Catholic Church, and the initiation of negotiations leading to the College earning University status.

During his time as General Director the development of the Natural Science Faculty on Almagyar Hill had begun by the completion of the new „D" building in which the Biology Institutions, the collections and the Natural Sciences Library were settled, creating a new Campus for the Natural Sciences on Leányka street.

From 1991 to 1994 he took part in the development of teacher education reform as the President of the General Director's College. Due to the changes in legislation he did not apply for the extension of his term to be succeeded by Éva Zám. He was re-appointed as Deputy Director-General to direct the College's scientific work, where his main task was to increase lecturers'publication rate and ensure their acquisition of scientific qualifications.

In 1998 he was appointed as the Head of the Institute of Biology and Environmental Science which consisted of four departments, he was also elected Head of the Botany Department. He became General Director of the newly established Faculty of Natural Sciences and later its dean for a shorter period in 2006. He was the Director of the newly founded Biological and Geographical Institute between 2007 and 2010.

He was habilitated as University Professor at the Janus Pannonius University, Pécs in 1996. As part of his educational and research activity he has so far tutored and supervised 55 theses and Scientific Students' Association papers.

Ten of his students came out in the first three places at National Students' Association Conferences. Many of his students became employees of the College continuing the research of bryology as: András Vojtkó College Professor, Zoltán Marschall Assistant Professor, Erika Pénzesné Kónya Associate Professor, Sándor Dulai College Professor, László Vizslán Adjunct Professor, Gabriella Kis Scientific Associate and Andrea Sass-Gyarmati, Research Associate – they have become employees of the College and continue bryological research at the College (now University). As external consultant he supervised Gusztáv Jakab's Master and István Galambos' PhD dissertation.

Two of his PhD students, have successfully defended their dissertation recently: Erika Pénzesné Kónya in 2008, and Andrea Sass-Gyarmati in 2015.

He is currently supervising the work of three students while teaching at the Doctoral School of Environmental Education. In the past forty years he has taken part on fourteen major collection trips and scientific expeditions, which in chronological order were: Semenic Mountains (1972), Retezat Mountains (1974), Spitzbergen (1979), Tanzania – East Africa (1989), USA, Phoenix (1991), Seychelles (1993), Reunion and Madagascar (1994), Reunion (1996), Transylvania and Moldova (2002), Venezuela (2005), India

(2007), Brazil (2008, 2011) and Mauritius (2016). During the above field-trips, he has collected about eight thousand bryophyte specimens, which after identification were deposited in larger Hungarian herbaria. From the tropical collections he identified many specimens of the Calymperaceae family, more than two thousands of which are now precious elements of our collection. He has held forty presentations at national and international scientific conferences and presented several posters on the results of his research.

He has been the Editor of several Journals and conference publications, such as the *Acta Academiae Pedagogicae Agriensis*. He is currently a member of the Editorial Board of the *Acta Botanica Hungarica* and *Acta Biologica Plantarum Agriensis* Journals. More than 165 pieces of his work have been published in Hungarian and in foreign languages 136 of which are papers and articles, 10 books or chapters and 19 popular science and other publications The number of independent references to his published work exceed 500. Of his books the most significant are "Magyarország mohaflórájának kézikönyve" (*Handbook of Hungarian Bryophytes*), co-authored with László Vajda and the textbook "Általános Briológia" (*General Bryology*) published in 1999.

He is a member of several Hungarian and international scientific associations such as the Hungarian Biological Society, the Botanical Committee of the Hungarian Academy of Sciences (MTA), the International Association of Bryologists, the American Bryological Society, as well as the International Association of Endangered Bryophytes. He is vice-president of the Miskolc Academic Committee since 1988, and president of the Bugát Pál Society for Dissemination of Scientific Knowledge (Bugát Pál Tudományos Ismeretterjesztő társaság – TIT) since 1991.

He was elected as a board member of the National Accreditation Committee and as member of the Scientific and Higher Education Council in 1997. In 2003 he became the member of the Hungarian Accreditation Committee's (MAB) Biological Commission; he was elected as member of the Natural Sciences Advisory Board by the Hungarian Rectors Conference (MRK). In 1994 he and his family moved to Felsőtárkány, a nearby village where fellow professor Tamás Pócs also lives since 1991. In 1996 joining in the active life of the village together with locals they founded a hiking association named after the indigenous Lady's Slipper Orchid (Boldogasszony

Papucsa Természetjáró Egyesület) of which Orbán was president of for nearly a decade. The association is still active and Orbán participates in its events as a member.

He was a principal investigator of many research grants founded by Hungarian Scientific Research Fund (OTKA), Pro Renovada Cultura Hungariae, MKM, K+F, National Reserch, Development and Innovation Office (NKFP), and other competitions for research and development text-book production. Orbán submitted his Doctor of Science thesis "Taxonomical monograph of the African species of the Calymperaceae family" to the the Hungarian Academy of Sciences on 26 February 1999. Based on a disclosed debate of Doctoral Council within the MTA (Hungarian Academy of Sciences) on the 28 April 2000, he was awarded the title Doctor of the Academy.

Throughout his career he had been awarded numerous other distinctions such as Ministerial Prize in 1975, Award for Excellent Work in 1986, Pro Academia Pedagogica Agriensis in 1993, Excellent Partner in Education in 1994. The highest of them all were the Apáczai Csere János Award which he received in the Ethnographic Museum in 1995. He also received the Eszterházy Károly Memorial Plaquette in december of 1996, the Széchenyi Scholarship for the period of 1997-2001, TIT Bugát Pál medallion in 1998.

In 2003 he recieved the Szent-Györgyi Albert award. In 2010 he received the Scientific Award of the MAB (Miskolc Scientific Committee) and in 2011 the Kiss Péter Award.

Among the above, the most prestigious is the Szent-Györgyi Albert Prize, awarded for his high-level scientific research work and science-management. In addition to his scientific and professional work, it is important to mention his family life In 1973, he married Ágnes, who still is a faithful companion and has helped his work in many ways. She took part in several scientific expeditions (Seychelles, India, Venezuela, Braziland Mauritius) and helped to prepare the collected materials. They have two sons, now adults: His older son is a pharmacist and was awarded a PhD by ELTE University. He has three sons: Bence is ten, Márton is eight, and Áron six years old. His younger son is a musician and he is a qualified music instructor. He acquired his qualification at the gordon department of the Liszt Ferenc Academy. He currently plays the double bass.

Sándor Orbán has retired and recently works as university professor of Eszterházy Károly University, Eger.

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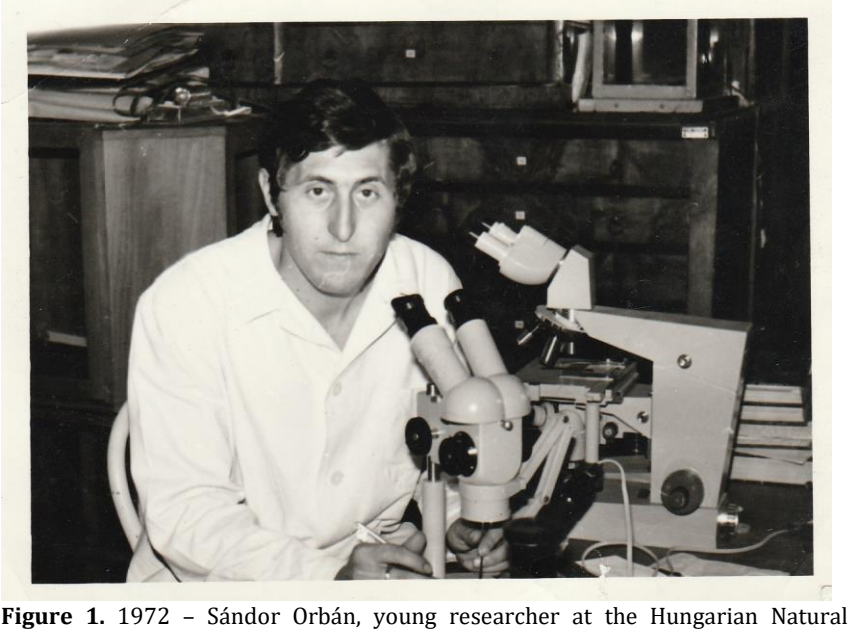

Figure 1. 1972 – Sándor Orbán, young researcher at the Hungarian Natural History Museum

Figure 2. 1978 – Fieldwork together with László Vajda

Figure 3. (left) 1993 – Morne Blanc (Seychelles Islands) bryophyte collecting together with Gabriella Kis; **Figure 4.** (right) Dr. Sándor Orbán: Director of Károly Eszterházy College (1989-1994)

Figure 5. 1991 – Inauguration of Building D –Sándor Orbán (left), Director of the Károly Eszterházy College and Imre Kubovics (middle), Minister of State

Figure 6. 1978 –Excursion after the 1st Central and East European Bryological Working Group (CEEBWG) meeting in Eger, Hungary (from left: Sándor Orbán, Riclef Grolle and Tamás Pócs)

Figure 7. 2000 – Ádám Boros's Centenary Memorial meeting – Tápiószele, Hungary

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PALEOLIMNOLOGICAL EVIDENCES FOR THE RISE AND FALL OF A STAR-LIKE PLANKTONIC DIATOM (*ASTERIONELLA FORMOSA*) DURING THE ANTHROPOCENE

Paleolimnológiai adatok egy csillagszerű, planktonikus kovaalga, az *Asterionella formosa* „tündökléséről és bukásáról" az Antropocénban

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Asterionella formosa is known as a common and often dominant planktonic diatom in mesotrophic and eutrophic lakes worldwide. The bone-shaped *Asterionella* cells often form colonies consisting usually of eight cells, but the number of cells can reach up to 20 cells. The colonies are star shaped, and this shape slowing down settling velocity can makes them dominant in low viscosity warm water. Recently the abundance of this species increases in oligotrophic lakes as well. It is a rather well established fact, that the proliferation of *A. formosa* correlates with nutrient enrichment, especially when atmospheric nitrogen deposition intensifies in the lakes. However, there are increasing numbers of paleolimnological evidence, that other factor may be responsible for the spreading of this diatom.

High-resolution, multi-proxy study was carried out on a sedimentary record obtained from Lake Ighiel (46°10'50"N, 23°22'00"E). Lake Ighiel is located in Alba County, Romania, in the south-eastern part of the Trascaului Mountains in the Romanian Carpathians. This small lake is located in a mid-altitude mountain belt at 924 m above sea level, with a maximum depth of 9 m and a catchment area of 487 hectare. The here presented results are focussing on the increase and decrease of *A. formosa* abundance. Lake Ighiel was formed ca. 6000 years ago, however the siliceous algae were able to preserve in the sediment from ca. 4800 cal yr BP. After the dominance of small fragilaroids, the Middle Holocene (ca 4800–4200 cal yr BP) is marked clearly by a relative increase in benthic *Navicula* and *Gyrosigma* taxa, indicating habitat diversification. There is an episodic return to small fragilaroids from 2600 to 2500 cal yr BP with some periphitic taxa becoming abundant. In the last 1000 years *A. formosa* increases in relative abundance, reaching dominance in the last 200 years, while before it had been only sporadic in the sedimentary record. We can assume a strong positive correlation between the abundance of *A. formosa* and global warming. Probably development of soil also influences contribution of this species to the diatom assemblage. The period of the II. World War is imprinted as a decline of *A. formosa* in the assemblage. Global warming related changes, like longer open water periods, changing mixing regimes and thermal properties of water might have contributed to the increased abundance of *A. formosa*. In the last couple of years the „star" of *Asterionella* dramatically and abruptly fell, while the small celled Centrales taxa practically replaced it in the lake sediment. To disentangle if nutrient supply and/or climate are main driving force on diatom distribution is an unsolved problem. The authors acknowledge financial support from OTKA 119208, CRYPTIC project.

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RECOVERY OF ACETONE RINSED LICHEN THALLI OF *CLADONIA FOLIACEA*

Cladonia foliacea zuzmótelepek regenerálódása acetonos kezelést követően

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The optimal period for applying acetone (best for extraction and shortest possible for avoiding detrimental effects), was established for dry lichen thalli rinsed in acetone following the methods by Solhaug and Gauslaa applied in 2001. Secondary lichen substances (usnic and fumarprotocetraric acids) were analysed by HPTLC and HPLC, the detrimental effect of acetone was tested by chlorophyll fluorescence measurement. The optimal duration for acetone rinsing proved to be around 1–2(–5) days in the samples collected in summer. The determined Fv/Fm values of *Cladonia foliacea* remained relatively high even after 1024 hours compared to any of the 12 species studied previously. A seasonal difference between summer and winter collected thalli was found. According to our results the thalli collected in winter are more sensitive to acetone rinsing. Therefore the summer period – when lichens are more frequently in dry condition and therefore photosynthetically active for a shorter period – is more advantageous for collecting samples for transplantation experiments combined with acetone rinsing. Higher concentrations of usnic acid and fumarprotocetraric acid were found in winter samples than in summer ones. The considerable variability is possibly due to a natural variability among the samples (substance content among and within thalli) and partly to the preparation methods. However, homogenised (lyophilised, then ground) samples showed no difference in usnic acid content if extracted for 15, 30, 40 or 50 minutes.

The thalli re-placed in controlled field condition after acetone rinsing experiments were observed monthly. The digital images showed serious damage already after 1–2 months at most of the treated thalli. Samples were investigated after a 6 months recovery period. The results confirm the advantage of summer collecting. Though both winter and summer collected samples rinsed in acetone less than 16/32 hours showed similar, good vitality based on Fv/Fm measurements, however photosynthetically active parts of thalli were smaller in case of winter collected samples.

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EFFECT OF FOREST MANAGEMENT ON BRYOPHYTE COMMUNITIES – A REVIEW

Az erdőgazdálkodás hatása a mohaközösségekre - áttekintés

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Bryophytes are related to the available substrates within the forest as open soil, rock outcrops, trunks and dead wood. As poikilohydric organisms, they are very sensitive to air humidity conditions. In deciduous forest, litter layer inhibit the establishment of a bryophyte layer, terricolous species are related to micro-disturbances. Epilithic bryophytes are sensitive to air humidity and dead wood accumulation beside rock surface availability. Epiphytic communities are determined mainly by tree species composition and presence of large trees. Dead wood inhabiting assemblages deteriorated in managed forest landscape because of limiting substrate (dead wood) availability. They show a clear succession during decay resulting that the continuity of dead wood of different decay stages and presence of large logs are necessary for their maintenance. Many dispersal limited epiphyte and epixylic species are influenced by forest connectivity and the temporal continuity of the appropriate substrate on landscape scale. They are very sensitive to microclimate determining structural elements like presence of secondary canopy, canopy gaps, shrub layer and presence of wetlands within the forests. Although epiphytic and epixylic assemblages are studied separately they belong to the same wood inhabiting bryophyte community related to the development and decomposition of trees as an example of primary succession. Because of the substrate and microclimate limitations of bryophytes, forest management that maintain a continuous forest cover, presence and diversity of dead wood as well as veteran trees can provide their long term sustainability.

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TRAIT BASED AND FUNCTIONAL GROUP APPROACHES IN ALGAL ECOLOGY

Jelleg-alapú (trait-based) és funkcionális csoportosítások az algaökológiában

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Trait-, guild- and functional group based methods became widespread in analyses of spatial and temporal patterns of aquatic assemblages. The extended use of such groupings can be explained by their joint feature: they decrease structural complexity of large data sets by decreasing the number of categories largely without loosing functional attributes. Thus, relating assemblages changes to environmental drivers is greatly enhanced. This lecture will review the existing trait-, guild- and functional group based methods developed for phytoplankton and attached diatoms, their common and distinctive features along with demonstration of some case studies.

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MOSSES AND LICHENS IN DYNAMICS OF ACIDIC SANDY GRASSLANDS: SPECIFIC RESPONSE TO GRAZING EXCLOSURE

Mohok és zuzmók legelelés kizárásra adott válasza savanyú homoki gyepekben

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Cryptogams, a neglected segment in vegetation dynamics, can form a large part of biomass in sandy grasslands. Since the pioneer work of Verseghy (early 1970s) their biomass and productivity has not been analyzed in Hungary. We intended to contribute to the knowledge of dynamics of cryprogams in dry acidic grasslands. Study objects were permanent plots in endangered open sandy grasslands 'Pannonic inland dunes' (EU Habitat Directive, 2340). Vegetation of CORYNEPHORETUM CANESCENTIS (CC) and FESTUCETUM VAGINATAE (FV), characteristic vegetation types of the Nyírség region (NE Hungary) has been monitored in grazed and experimentally fenced stands. Fencing was used to model the overall trend of falling stocking densities. Biomass of cryptogams has been sampled in 2013, five years after grazing exclosure then hand-sorted into species. Morphological studies, spot tests and HPTLC have also been applied to identify critical lichen taxa.

Fencing has led to an increased biomass of cryptogams. Biomass of mosses exceeded those of lichens irrespective of the community or management. Cryptogamic biomass tended to be lower in CC than in FV and lower in grazed stands compared to fenced ones. Most frequent cryptogams (*Brachythecium albicans, Cladonia rangiformis*, *C. rei, Polytrichum piliferum*) have been supported by exclosure. Lichens benefitted relatively more from exclosure than did the mosses. The only lichen favoured by moderate grazing has been *Cladonia magyarica*.

Soil traits (pH, organic material, P_2O_5) had contrasting effects on biomass fractions under different management (Spearman's rank correlation). More significant correlations have been revealed in fenced stands than in the grazed ones. FV had more correlations than the CC. The few strict correlations included preference of *Syntrichia ruralis* for higher while that of *Polytrichum piliferum* for lower pH values. Low phosphorous content has been positively correlated with *Cladonia rangiformis*, *Polytrichum piliferum*, total moss and total of cryptogams while higher values only supported *Brachythecium albicans*. This suggests more organized assemblages in ungrazed stands and in the FV, respectively. Compared to soil traits microtopography had a minor effect on cryptogam distribution. Initial establishment pattern or random patch formation seem to be as important as all above-mentioned factors together. Long-term grazing exclosure is likely to promote further spread of the dominants, *Cladonia rangiformis* and *Polytrichum piliferum*. Short spells of grazing are likely to promote cryptogam biodiversity.

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REMARKABLE RESULTS OF RECENT FIELD EXPLORATIONS IN THE KŐSZEG MTS

A mohaflóra terepi felmérésének jelentősebb eredményei
a Kőszegi-hegységben

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The Kőszeg Mts are among the best studied areas of Hungary with respect to bryophytes. Nearly 400 species were reported from the Hungarian part of the mountains, which is partly due to favourable conditions of climate, bedrock, soil, and biotope diversity. However, a large part of the data was collected at the end of the 19th or the beginning of the 20th centuries, whereas there was no extensive bryofloristic research in the past 40 years. The authors began their field work in the Hungarian part of the mountains in 2015, and since then recorded nearly 40 species new to the area. In the course of our explorations, we succeeded in finding three species new to Hungary: *Heterocladium heteropterum* (Brid.) Schimp. and *Rhabdoweisia crispata* (Dicks.) Lindb. were collected from shaded rock in the valley of 'Hármas-patak', whereas *Plagiothecium latebricola* Schimp. was detected on the partly rotting bases of alder trees (*Alnus glutinosa* (L.) Gaertn.). Further remarkable records concern species which were rated data-deficient, without recent occurrences, in the red-list of 2010: *Heterocladium dimorphum* (Brid.) Schimp., *Bryum mildeanum* Jur., *Leiocolea badensis* (Gottsche) Jörg., *Pellia epiphylla* (L.) Corda, and *Pohlia annotina* (Hedw.) Lindb. We also succeeded in finding new occurrences of the critically endangered *Warnstorfia exannulata* (Schimp.) Loeske, and of 9 more endangered and vulnerable species: *Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl., *Diplophyllum obtusifolium* (Hook.) Dumort., *Isothecium myosuroides* Brid., *Leptodon smithii* (Hedw.) F. Weber & D. Mohr, *Dicranum spurium* Hedw., *Brachythecium reflexum* (Starke) Schimp., *Leiocolea collaris* (Nees) Schljakov, *Taxiphyllum densifolium* (Broth.) Reimers, *Ulota bruchii* Hornsch. ex Brid.

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DISTRIBUTION AND HABITAT PREFERENCE OF *BUXBAUMIA* HEDW. SPECIES IN HUNGARY

A magyarországi *Buxbaumia* Hedw. fajok elterjedése és élőhelyi preferenciája

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The genus *Buxbaumia* includes two species (*B. aphylla* and *B. viridis*) in Hungary. Both of them were thought to be rare and threatened: *B. aphylla* was rated as Vulnerable (VU), while *B. viridis* as Endangered (EN) on the national Red List. The latter is a Natura 2000 species and protected by law in the country.

The aims of the research were to summarize the historical and actual distribution of these taxa and to reveal their habitat preference, population size and phenology in Hungary. During systematic surveys from 2014 to 2017, we have checked previously known localities and similar habitats in several Hungarian landscapes. In almost every newly discovered stand, phytocoenological relevés were taken in 1 m^2 plots. We recorded here the number, state and maximal density (plant/1 dm^2) of the individuals (sporophytes or setae), and listed the presence of co-occurring species. The cover values of moss layer, bare surfaces and organic debris were estimated; the exposure and the inclination were measured.

We have found some formerly known and many more newly discovered populations of *Buxbaumia* species. Although *B. viridis* is usually considered to be an epixylic bryophyte, both species occurred mostly on soil, on steep, north-facing slopes, in stands of acidophilous communities. However, *B. aphylla* was more common in drier acidophytic oak forests, while *B. viridis* preferred acidophytic beech forests. In both cases, the most frequent (fr.≥50%) co-occurring mosses were *Dicranella heteromalla*, *Dicranum scoparium*, *Hypnum cupressiforme* and *Polytrichum formosum*. According to the observed habitat preference and using MÉTA maps, we presume further potential occurrences of shield-mosses in Hungary, mainly in hilly regions. Since more than 1600 individuals and 160 (usually stable) stands of both taxa were discovered recently in the country, we suggest that their threat status should be lowered to Near Threatened (NT) in the next Bryophyte Red List of Hungary. Whereas the characteristics of *B. aphylla* are similar to those reported in the literature, our results on the habitat preference of *B. viridis* greatly differ from the Hungarian and international published accounts. Our new observations will be relevant for the protection of *B. viridis* in the future.

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REMARKABLE FINDS OF BRYOPHYTES IN HUNGARY DURING THE LAST TWO YEARS (2015-2017)

Az elmúlt két év (2015-2017) magyarországi mohaflorisztikai kutatásainak jelentősebb eredményei

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Extant occurrences of 9 species without recent data (DD, DD-va in the Hungarian bryophyte redlist of 2010) were discovered in the period 2015-2017: *Brachythecium campestre* (Börzsöny: 8180.1, Mecsek: 9875.2, Vendvidék: 9163.2, Tiszántúl: 8496.2), *B. plumosum* (Zempléni-hg.: 7594.1, Mátra: 8186.1, Vértes: 8476.3), *Bryum archangelicum* (Börzsöny: 8179.1), *Ephemerum serratum* (=*E. stoloniferum* (Hedw.) L.T. Ellis & M.J. Price) (Börzsöny: 8080.3, Őrség: 9164.3), *Jungermannia subulata* (Mecsek: 9776.4), *Marsupella emarginata* (Börzsöny: 8079.2), *Orthotrichum rogeri* (Zempléni-hg.: 7894.3), *Pseudoleskea saviana* (Mátra: 8186.1, Börzsöny: 8079.2, 8079.4), *Schistidium confertum* (Börzsöny: 8079.2, Mátra: 8186.1).
22 taxa were first recorded in Hungary since november 2015: *Barbilophozia hatcheri* (Budai-hg.: 8579.2), *Brachythecium curtum* (Zempléni-hg.: 7594.1, Börzsöny: 8079.4), *Bryum tenuisetum* (Csepel-sziget: 8679.2, Belső Somogy: 9971.1, Kemeneshát: 8768.1, Kőszegi-hg.: 8665.2), *Campylopus subulatus* (Kemeneshát: 8967.1), *Crossidium squamiferum* (Börzsöny: 8279.2), *Didymodon tophaceus* subsp. *erosus* (Duna-Tisza-köze: 9786.1), *D. tophaceus* subsp. *sicculus* (Duna-Tisza-közé: 9786.1, 9280.4, 8781.1), *Ditrichum lineare* (Zempléni-hg.: 7494.4), *Fissidens bambergeri* (Zempléni-hg.: 7494.2, Bükk: 8088.1, Börzsöny: 7979.4, 8179.1, 8180.1, Visegrádi-hg.: 8279.2, 8280.3, Budai-hg.: 8479.1, 8479.4, Gerecse: 8377.1, Vértes: 8675.2, Kőszegi-hg.: 8664.4, 8665.1, Vendvidék: 9162.2, Zala: 9166.4), *F. crispus* (Börzsöny: 8079.2), *Fossombronia incurva* (Visegrádi-hg.: 8279.3, Őrség: 9164.3, Geresdi-dombság: 9777.3), *Heterocladium heteropterum* (Kőszegi-hg.: 8664.2), *Pellia neesiana* (Vendvidék: 9062.4, 9162.2), *Plagiothecium latebricola* (Kőszegi-hg.: 8664.2), *Rhabdoweisia crispata* (Kőszegi-hg.: 8664.2), *Riccia beyrichiana* (Visegrádi-hg.: 8279.2), *Seligeria acutifolia* (Pilis: 8279.4), *Sematophyllum adnatum* (Kemeneshát: 8967.1), *Syntrichia ruralis* var. *epilosa* (Keszthelyi-hg.: 9270.1, Kőszegi-hg.: 8665.1), *Ulota crispula* (Zempléni-hg.: 7594.1, Mátra: 8085.3, Börzsöny: 8080.1, Balatonfelvidék: 9171.1, Kőszegi-hg.: 8664.2, 8664.4, 8665.1, 8565.3, Vendvidék: 9062.4, 9163.1, Őrség: 9263.2, Kemeneshát: 8967.1, Zselic: 9873.2), *U. intermedia* (Zempléni-hg.: 7594.3, Börzsöny: 8079.2, Kőszegi-hg.: 8664.2, Vas-hegycsoport: 8764.4, Vendvidék: 9062.4, Őrség: 9164.3, 9264.1, Zselic: 9873.2), and *Zygodon forsteri* (Balatonfelvidék: 9071.3, 9171.1).

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ECOPHYSIOLOGY OF BRYOPHYTES IN THE CHANGING ENVIRONMENT

Moha-ökofiziológia a változó környezetben

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Studies of the impact of climate change on plants are generally based on vascular plants. Bryophytes basically differ from tracheophytes in having a smaller size and a poikilohydric strategy for water and nutrients. Their survival and growth are highly dependent on their external environment. Bryophytes are able to lose most of their cell water without dying, and resume normal metabolism after rehydration, gaining positive carbon balance over wet-dry cycles. This is sort of adaptation is called desiccation tolerance. Desiccation tolerance is a common but not unique phenomenon among bryophytes: cells of bryophytes in exposed sunny sites can switch from full turgor to air dryness quickly, while the species of moist habitats dry more slowly, and can suffer stress by even moderate drying. They can maintain efficient photosynthesis under low light conditions, have low chl a/b ratios, and within a limited temperature range their optimum growth is possible. When certain bryophytes' CO_2 assimilation is suppressed, photorespiration activity increases and becomes the main electron sink. Bryophytes, as the sensitive components of various vegetation types, are capable of effective light absorption during their desiccation, rehydration, freezing and melting, with the help of coexisting alga and vascular plant energy dissipation mechanisms. They have relatively low optimal temperature for growth (with narrow T range for net photosynthetic gain), including only minor differences between the optimum temperatures for net photosynthesis in the same species from polar, temperate and tropical populations. Bryophytes have a low acclimatization potential for high temperatures, taking into account that they are generally drought avoiders. Temperature acclimatization potential is of high importance for the physiological basis of altitudinal distribution and the likely responses of bryophytes to climate change. Bryophytes with their small and resistant spores are able to disperse over long distances by wind, which might help their survival in the changing environment. Dominant vascular vegetation might change as temperature will increase; however, suitable microhabitats for bryophytes might still persist. The abundance and species composition of bryophytes in plant communities is predicted to be altered, as well as the function of the whole ecosystem. Based on recent literature and own data, the author makes an attempt to summarize the physiological mechanisms, morphological features and alternative strategies which make bryophytes successful in a constantly changing terrestrial environment. These plants represent a sophisticated solution to the challenges of life at their scale. Further exploration of bryophyte ecophysiology in the changing and stressful environment will provide new information that will assist bryophyte conservation. The research was supported by the grant EFOP-3.6.1-16-2016-00001 ("Complex improvement of research capacities and services at Eszterhazy Karoly University").

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CURRENT RESULTS OF BRYOPHYTE MAPPING OF BÖRZSÖNY MTS (HUNGARY)

A Börzsöny hegység mohatérképezésének aktuális eredményei

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In 1966, about half a century ago, László Vajda published his account of the Börzsöny Mts (*A Börzsöny-hegység mohaflórája*), in which he reports data on 316 bryophyte species, the results of his exploration of the region in cooperation with Ádám Boros. Later Orbán & Vajda (1983) mention another 9 species from this area. Around this time there is an intermission in the systematic bryofloristic research of the Börzsöny Mts. In the 1990-s, P. Erzberger and B. Papp took up again the bryological exploration of the area. At present, systematic recording is carried out in 19 grid cells of the Central European Mapping Scheme (KEF). 7 squares lie nearly completely in the mountain region, whereas 12 squares belong in part to neighbouring landscapes. As a consequence of systematic grid-cell based recording, research is also carried out in formerly neglected parts of the region. During our field work we focus on some formerly underexplored special sites (e.g. abandoned quarries, wetlands) and outcrops of locally rare bedrock (peripheral loess deposits, tertiary limestone). In the case of some moss genera (*Bryum, Fissidens, Grimmia, Racomitrium, Schistidium*) which were revised by P. Erzberger, collection of herbarium data in the Botanical Department of the Hungarian Natural History Museum preceded the field work. Results: In the 19 mapped grid cells taken together, we collected more than 3000 recent floristic data in a database. This corresponds to nearly 2000 localized data points, of which more than 1800 fall within the range of the mountains. The number of taxa in square 8079.2 (Királyháza) exceeds 200. More than 150 taxa each were recorded from 8079.1 (Perőcsény) and 8079.4 (Nagy-Hideg-hegy). The number of taxa which were first recorded after 1990 in the Börzsöny Mts exceeds 75. Among them three taxa are new to Hungary: *Fissidens crispus* (8079.2) was found by herbarium revision, whereas *Brachythecium curtum* (8079.4) and *Crossidium squamiferum* var. *squamiferum* (8279.2) were detected during field work. Further remarkable taxa first documented include *Anacamptodon splachnoides* (Endangered EN), *Bryum archangelicum* (Data deficient DD), *Bryum intermedium* (DD), *Bryum mildeanum* (DD), *Dicranum viride* (Vulnerable VU), *Fabronia pusilla* (EN), *Fissidens arnoldii* (VU), *Fissidens bambergeri* (Not Evaluated NE), *Frullania inflata* (EN), *Grimmia decipiens* (EN), *Grimmia lisae* (VU), *Jungermannia atrovirens* (DD), *Pseudoleskea saviana* (DD-va), *Pyramidula tetragona* (EN), *Racomitrium aciculare* (DD), *Racomitrium affine* (DD), *Rhynchostegiella curviseta* var. *laeviseta* (NE), *Rhynchostegiella teneriffae* (VU), *Syntrichia caninervis* var. *gypsophila* (DD). On the other hand, at present there are about 75 species (29 liverworts and 46 mosses) reported in the accounts of Vajda (1966) and Orbán & Vajda (1983) of which we have not yet found extant occurrences.

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BIODIVERSITY OF BRYOPHILOUS *PEZIZALES* (ASCOMYCETES) IN HUNGARY

Briofil csészegombák Magyarországon

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Because of their tiny apothecia and special habitat bryophilous species of *Pezizales* belong to the overlooked and underrecorded groups of ascomycetous fungi, and many of them are represented only with a few localities worldwide. Particularly due to the activity of the bryologist Peter Erzberger (collector) and the mycologist Dieter Benkert (determinations) in the 1990s and the first part of the 2000s Hungary is one of the few countries that have fungistical data of bryoparasitic *Pezizales* at all. During systematic surveys in the last two years about 500 new occurrences of forty obligate bryophilous fungi taxonomically classified in the genera *Lamprospora*, *Neottiella* and *Octospora* have been observed in Hungary. Twenty of the taxa found are reported for the first time in the country and two of them seem to be new to science. By means of special parasitising structures (appressoria and haustoria) they parasitise mostly the rhizoids, rarely rhizoid tubers, stems, and leaves of various moss and liverwort species. The following taxa of bryophilous *Pezizales* were collected in the last two years in Hungary (bryophyte hosts indicated in brackets): *Lamprospora dictydiola (Aloina ambigua, Tortula muralis), L. ditrichi (Ditrichum flexicaule), L. hispanica (Aloina ambigua), L. miniata* var. *miniata (Aloina ambigua*., *Phascum cuspidatum, Pottia* spp.*), L. miniata* var. *parvispora (Barbula unguiculata), L. miniata* var. *ratisbonensis (Didymodon* spp.*), L. minuta (Bryum* sp.*), L. retispora (Syntrichia ruralis), L. seaveri (Bryum* spp.*), L. tortulae-ruralis (Syntrichia ruralis), L. tuberculatella (Weissia* sp.*), Neottiella albocincta (Atrichum undulatum), N. ricciae (Riccia sorocarpa), Octospora axillaris* var. *axillaris (Phascum cuspidatum, P. curvicolle), O. axillaris* var. *tetraspora (Phascum cuspidatum), O. coccinea* var. *coccinea (Bryum* spp.*, Encalypta vulgaris,* very rarely *Ceratodon purpureus), O. erzbergeri (Pseudoleskeella nervosa), O. excipulata (Aphanorhegma patens, Funaria hygrometrica), O. gemmicola* var. *gemmicola (Bryum* spp.*), O. gemmicola* var. *tetraspora (Bryum* sp.*), O. grimmiae (Grimmia pulvinata), O. gyalectoides (Aloina rigida, Barbula* spp.*, Pottia* spp.*, Phascum cuspidatum, Pterygoneurum ovatum, Tortula muralis,* very rarely *Bryum* spp.*), O. hetieri (Ceratodon purpureus), O. itzerottii (Pterygoneurum ovatum), O. leucoloma* var. *leucoloma (Bryum argenteum,* very rarely *Bryum dichotomum), O. leucoloma* var. *tetraspora (Bryum argenteum), O. lilacina (Pleuridium* sp.), *O. musci-muralis* var. *musci-muralis (Grimmia pulvinata), O. musci-muralis* var. *neglecta (Schistidium crassipilum), O. neerlandica (Syntrichia virescens), O. orthotrichi (Orthotrichum diaphanum), O. phagospora (Pohlia lutescens), O. pseudoampezzana (Schistidium crassipilum), O. rustica (Ceratodon purpureus), O. similis (Bryum* sp.*), O. wrightii (Amblystegium serpens).*

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TAXONOMY AND DISTRIBUTION OF THE AFRICAN NON-LEUCOBRYOID *CALYMPERACEAE* SPECIES

Az afrikai nem-leucobrioid *Calymperaceae* fajok rendszere és elterjedése

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In the course of taxonomical revision were established that 52 species occur in Africa and in the neighbouring Madagascar and in the Indian Ocean Islands. The number of species and names which earlier reached more than 180 were reduced with 70 %. The non-leucobryoid *Calymperaceae* species belong to four Genera in Africa: *Syrrhopodon, Chameleion, Mitthyridium* and *Calymperes*. The richest Genera is the *Syrrhopodon* comprising 32 species which divided into 41 taxons and have 4 Subgenera and 8 Sections. The Genera *Chameleion* has only one African species – *Ch. cryptocarpos*, and the *Mitthyridium* genus have five species. The Genera *Calymperes* represented in Africa with 14 species which belongig to three Subgenera. Examining the world distribution of the 52 African species there is established that 40,5 percent of the species are endemic, 26,9 % are paleotropical, 19,2% are pantropical and 13,4 % of the species are African-American disjunct. The list of taxons, the accepted and synonym names of the species and the African distribution are presented here.

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MACROFUNGI FROM APUSENI MOUNTAINS, TRANSYLVANIA, ROMANIA

Nagygombák az Erdélyi-szigethegységből

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The Apuseni Mountains are one of the oldest mountains in the Carpathian Basin with medium-height character, but also with high plateau and peaks. However, from the mycological point of view it is less well studied. Present work's aim was to start a systematic mycological investigation, as well as to raise the mycologist's interest to this territory. The documented taxa were collected in August 2017 during a four day field trip by 30 participants. The investigated forest stands belong to mixed deciduous-coniferous and spruce associations. A total number of 131 macrofungi taxa were documented during the 4 days. The functional distribution shows 69 (52,67%) ectomycorrhizal, 32 (24,43%) wood inhabiting saprotrophic, 18 (13,74%) soil saprotrophic, 7 (5,34%) necrotrophic parasite, 2 (1,53%) moss-associated, 2 (1,53%) coprotrophic and 1 (0,76%) herbaceous saprotrophic species. Ascomycetes were represented by only two species, respectively *Elaphomyces granulatus* and *Peziza badia*. The richest genus was Russula with 16 species. Several common species were found, which are characteristic to the examined habitats, such as *Amanita fulva, Amanita muscaria, Calocera viscosa, Cantharellus cibarius, Gloeophyllum sepiarium, Laccaria amethystina, Lactarius deterrimus, Lactarius turpis.* Others, like *Cortinarius caperatus* and *Lactarius rufus* were the species characteristic to mountainous coniferous forests, while *Cantharellus amethysteus, Climacocystis borealis, Pholiota flammans* and *Pseudohydnum gelatinosum* were characteristic to mountainous spruce stands. Interesting species fructifying in the spruce stands were the saprotrophic *Pleurocybella porrigens* living on spruce trunks, and *Xeromphalina campanella* living on mossy conifer trunks. Among rare species *Amanita submembranacea* can be mentioned, which was fructifying in mountainous conifer stands with acidic soil, more rarely in acidic beech forests; *Amanita battarrae* was living in acidic deciduous and coniferous forests in the high mountains, as well as a species with typical colour, *Gliophorus psittacinus*, characteristic to grassy and mossy forest edges and clear forests. The Romanian Red List of Macrofungi contains the vulnerable (VU) *Volvariella murinella* and *Phylloporus pelletieri,* and the near threatened (NT) *Amanita regalis* and *Lactarius picinus*. Besides, it should be mentioned that *Lactarius helvus, Russula decolorans* and *Russula paludosa* are becoming rare because of their habitat retraction. Some species with indicative value were also documented, like *Ischnoderma resinosum* and *Mucidula mucida* in deciduous, *Pluteus atromarginatus* in coniferous stands, all of them indicating old, undisturbed forests. Besides, species indicating human disturbance were also collected, like *Macrolepiota procera, Bovista plumbea* and *Inocybe rimosa*. Further investigation of this territory is recommended, because the occurrence of several other interesting macrofungi is expected. That is why we plan to continue this investigation in close future.

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EXPLORATION OF THE BALKAN BRYOPHYTE FLORA WITH A SPECIAL ATTENTION TO THE RARE AND THREATENED SPECIES

A Balkán mohaflóra kutatásának eredményei különös tekintettel a ritka, védendő fajokra

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In the last 15 years a network of bryologists from SE Europe has been developed, dealing intensively with the Balkan area, from where there is still relatively few data compared to other parts of Europe. Joint field trips were organised to fill the gap. Special attention was paid to the habitats of rare, threatened species by visiting suitable sites, making collections, listing the bryophyte flora and estimating population size of rare species. More than 15.000 specimens have been deposited in the Hungarian Natural History Museum collected during these joint field trips and 72 papers have been published on the basis of the material. Voucher specimens of 527 species can also be found in HNHM, which were reported for the first time from the various countries of Balkan.

From conservation aspects wetlands are the most important habitat types in SE Europe, threatened mainly due to climate warming. Their extension is decreasing, and they are continuously losing the sensitive bryophytes of their species pool. Although the suitable bogs are small and sporadic in the Balkans, they still maintain several populations of wetland species of European conservation interest, such as *Campylium elodes, Drepanocladus polygamus, Hamatocaulis vernicosus, Scorpidium scorpioides, Tomentypnum nitens*. The alpine grasslands are also threatened due to climate warming. The Balkan high mountain areas still preserve very diverse bryoflora. Especially areas with acidic bedrock in high elevations have special conservation interest, because they are rare and scattered in the predominantly calcareous Balkan mountains. The bryophyte flora of acidic soil and siliceous outcrops contains many calcifuge species regarded as rare in this region and redlisted in many SE European countries, e.g. arctic, alpine leafy liverworts such as *Lophozia wenzelii, Marsupella sphacelata, Scapania praetervisa, Solenostoma confertissima* or saxicolous species like the members of Grimmiaceae family (*Grimmia caespiticia, G. reflexidens, Schistidium papillosum*). In shaded limestone rocky habitats the bryophyte assemblages also contain several species of European conservation interest, e.g. *Anomodon rostratus, Mannia triandra, Myurella sibirica, Taxiphyllum densifolium*.

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GENERIC CONCEPTS AND TAXONOMIC UNCERTAINTIES IN THE FAMILY MERULIACEAE (POLYPORALES, BASIDIOMYCOTA)

Nemzetség koncepciók és taxonómiai bizonytalanságok a Meruliaceae családban (Polyporales, Basidiomycota)

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The most recent phylogenetic studies demonstrated that the phlebioid clade forms three different lineages, which are accepted as Irpicaceae, Meruliaceae and Phanerochaetaceae in family rank. The family name Meruliaceae (= Climacodontaceae, = Phlebiaceae) was proposed by Petter Adolf Karsten in 1881 and published validly by Carleton Rea in 1922, based on *Merulius* as generic type. The family contains wood-inhabiting white-rot species, which microscopically characterised in general by the monomitic hyphal system with clamp-connections, the smooth, hyaline, thin-walled spores and the presence of cystidia. The annual resupinate basidiocarp form is dominated in the family, with corticioid (e.g. *Lilaceophlebia*), phlebioid (e.g. *Merulius*, *Phlebia* spp.), odontioid (e.g. *Crustodontia*, *Scopuloides*), hidnoid (e.g. *Climacodon*, *Hydnophlebia*, *Mycoacia*, *Mycoaciella*, *Sarcodontia*) or poroid (e.g. *Luteoporia*, *Phlebiporia*) trama. Furthermore, besides the resupinate basidiocarps, the pileate form also occurs in certain poroid genera (e.g. *Aurantiopileus*, *Aurantiporus*). Due to the results of the phylogenetic studies on the phlebioid clade, the former generic concepts based on morphological observations had to be revised in some cases. Based on multigene phylogenetic analyses, it seems that certain large genera (e.g. *Ceriporia*, *Ceriporiopsis*, *Phanerochaete* and *Phlebia*) created by morphological observations are polyphyletic and the species classified in these genera can be found in Meruliaceae as well as in other families within the order Polyporales. Therefore, the correct taxonomic status of many species in the phlebioid clade is uncertain and an extensive molecular sampling is necessary to establish sound generic concepts in the Meruliaceae. In this presentation (i) we aimed to discuss the taxonomic uncertainties and unsolved problems in the family Meruliaceae. Furthermore, based on morphological and phylogenetic perspectives (ii) we aimed to investigate the legitimacy of certain genus names, which formerly placed in the Meruliaceae: e.g. *Amaurohydnum*; and in addition (iii) we reported the description of a new polypore genus, typified on *Aurantiporus alborubescens* (≡ *Phaeolus alborubescens*) evidenced by morphological characteristics and multigene phylogenetic analysis.

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OLIGOTROPHIC PEAT BOGS AS MACROFUNGAL REFUGES IN THE EASTERN CARPATHIANS

Nagygomba refúgiumok a Keleti Kárpátokban: tőzeglápok

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Oligotrophic peat bogs are vulnerable, special habitats with unique funga, preserved only in small spots. The climatic extremities accelerate their degradation. Systematic field surveys have been made from 1998 on the macrofungi of six bogs: Mohos, Lucs, Ördög-lake, Fenyőkút, Veresvíz and Poiana Stampei in *Pino-Sphagnetum magellanicii* (PIN-S) and *Sphagno-Piceetum* (S-PIC) stands. A total number of 294 taxa were documented with 1063 occurrence data, the majority (264 taxa, 784 data) from S-PIC, a lower number (90 taxa, 279 data) from PIN-S. Constant character species from all stands were *Lactarius helvus*, *Russula decolorans* and *Russula paludosa*. In the S-PIC stands several widespread spruce-connected species were fructifying. Because of their high data number, *Cortinarius sanguineus, Hypholoma capnoides, Lactarius lignyotus, Lactarius picinus, Leccinum vulpinum, Pholiota flammans, Russula vinosa* and *Tylopilus felleus* can be highlighted. Some species of the surrounding beech stands can penetrate here, like *Boletus reticulatus, Lactarius vellereus, Russula solaris*. Beside in drier years, species indicating disturbance can also occur: *Chlorophyllum rachodes, Crucibulum laeve, Inocybe geophylla*. From the rare species, *Albatrellus* (*A. confluens, A. ovinus* and *A. subrubescens*) and *Hydnellum* (*H. aurantiacum, H. geogenium, H. peckii, H. scrobiculatum* and *H. suaveolens*) species can be mentioned, as well as *Bankera violascens, Lactarius repraesentaneus, Lactarius trivialis* and *Mitrula paludosa*. In the PIN-S stands frequent characteristic species were *Amanita fulva, Cortinarius caperatus, Fomitopsis betulina, Fomitopsis pinicola, Lactarius vietus* and *Suillus variegatus,* all fructifying in lower number in S-PIC, too. Constant character species for PIN-S were *Exobasidium vaccinii, E. karstenii* and *Galerina paludosa*. Rare species were *Cortinarius chrysolitus, C. tubarius, Exobasidium juelianum, Hypholoma ericaeum, Lactarius sphagneti, Pseudoplectania sphagnophila, Russula longipes* and *R. consobrina*. The functional distribution showed a mycorrhizal dominance in all stands (50-80%), followed by the wood inhabiting saprotrophic (10-30%). The proportion of the soil saprotrophic species was between 10-15% in the S-PIC, while the rare functions were occurring only in the PIN-S: moss-connected (*Arrhenia onisca*, *A. sphagnicola, Bogbodia uda, Galerina gibbosa, G. paludosa, Hypholoma elongatum* and *Rickenella fibula*); and biotrophic parasite (*Exobasidium* spp.). Ten species are stated in the Romanian Red List, three vulnerable (VU): *Catathelasma imperiale* and *Craterellus lutescens* from S-PIC, and *Suillus flavidus* from PIN-S;.seven near threatened (NT), all from S-PIC: *Amanita regalis, Clitocybe odora, Gyromitra infula, Hydnellum suaveolens, Lactarius picinus, L. uvidus* and *Rickenella fibula*. Beside *Lactarius helvus, Leccinum variicolor, Porphyrellus porphyrosporus, Russula claroflava* and *Sarcodon scabrosus* are probably endangered.

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PROTECTED SPECIES OF MACROFUNGI FROM MECSEK AND ZSELIC

Védett nagygombafajok a Mecsekből és a Zselicből

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Fungi fulfill an extremely important role in ecosystems. One of their most significant functions is breaking down organic matter, or forming mycorrhiza with their symbiotic tree partners. There are several factors that contribute to the reclining of the different fungi species, for example the changing or disappearing habitats, like the acidophilus forests, or the decrease of the amount of the substrates, or in the case of edible species, collection. Thus the conservation of the given species and their habitats is necessary.

The legislation of fungi protection in Hungary was established in 2005, when 35 fungi species received legal protection. This list has been extended in 2013, so currently there are 58 fungi species protected by law.

The aim of the current work is to present the protected fungi species that were found in Mecsek and Zselic. The collecting happened mainly in 2016 in the area of Mecsek and Zselic, from acidophilus beech (*Fagus*) forests and oak and hornbeam (*Quercus* and *Carpinus*) forests. The following 6 protected species were found: *Ganoderma cupreolaccatum, Hypsizygus ulmarius, Pogonoloma macrocephalum, Grifola frondosa, Scutiger pes-caprae* and *Volvariella bombycina*. Before 2016 other protected species were found as well, *Lycoperdon mammiforme, Gyrodon lividus, Sarcodon scabrosus, Hericium erinaceus, Craterellus melanoxeros* and *Polyporus tuberaster*.

The *Ganoderma cupreolaccatum* prefers the old trees that are characteristic of the old-growth woods, since it mainly grows on old beech trunks. It is rare throghout all Europe. It was found in the Kőszegi-forrás forest reserve in the Mecsek, in a hornbeam and oak (*Carpinus* and *Quercus*) forest.

Hypsizygus ulmarius is a species that prefers the dead, thicker stumps, especially elm (*Ulmus*), though it can be found on other deciduous trees as well. It is endangered because the area of the old-growth forests and the adequately thick stumps is declining. Also, the elm disease decimated its preferred substrate. In Mecsek it was found in the Kőszegi-forrás forest reserve.

Pogonoloma macrocephalum grows mainly under old oaks in seminatural oakwoods, that is becoming increasingly rare. Also, this large, edible mushroom may be collected for nutritional purposes. It was found in Mecsek, Kőszegi-forrás forest reserve, and also in the Zselic.

Grifola frondosa lives on the trunks of living oaks (*Quercus*) or chestnut (*Castanea*). It was also collected from the Kőszegi-forrás forest reserve.

Scutiger pes-caprae is endangered due to environmental factors: it prefers strongly acidic soil, that are reclining due to eutrophication. It was found in an acidophilus beech forest (Égervölgy, Mecsek).

Volvariella bombycina. This large mushroom grows on old, living or decaying deciduous trees, especially beech and oak. It prefers gallery forests but can also be found in human habitats. The decreasing of old, decaying wood makes it endangered.

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PHYTOPLANKTON RESPONSE TO EXPERIMENTAL THERMOCLINE DEEPENING: A MESOCOSM EXPERIMENT

A fitoplankton közösség termoklin mélyítésre adott válaszai egy mezokozmosz kísérlet során

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A number of modelling results suggested thermocline shifts as a consequence of global climate change in stratifying lakes. Abundance and composition of the phytoplankton assemblage is strongly affected by the stratification patterns, therefore, change in the thermocline position might have a substantial effect on this community or even on the whole lake ecosystem. In this study, thermocline depths in large mesocosms installed in Lake Stechlin (Germany) were deepened by 2 meters and phytoplankton changes were analysed by comparing changes to untreated mesocosms. Higher amounts of SRP were registered in the hypolimnion of treatment mesocosms than in the controls, and there were no differences in the epilimnion. Small but significant changes were observed on the phytoplankton community composition related to the effect of deepening the thermocline; however, it was weaker than the yearly successional changes. The most remarkable differences were caused by *Planktothrix rubescens* and by chlorophytes. *P. rubescens* became strongly dominant at the end of the experiment in the mesocosms, and in the open lake as well. The results of the experiment cannot clearly support the proliferation of cyanobacteria in general; however, the deepened thermocline can modify the behaviour of some species, as was observed in case of *P. rubescens*.

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BETA-DIVERSITY AND STRUCTURING FORCES OF DIATOM COMMUNITIES IN SMALL LAKES OF THE CARPATHIAN BASIN

Kovaalga közösségek beta-diverzitása és alakító tényezői Kárpát-medencei kis tavakban

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Investigating the dynamics beyond the patterns (structure, diversity) of microbial communities at regional level in different spatial scales has been a developing area in ecology and studies on diatoms with such approach receive increasing scientific interest. In this study, phytobenthos samples were collected from 41 lakes (<7 km^2) in the Carpathian Basin in August 2010 and physical and chemical parameters were also determined simultaneously. Our aim was to quantify the regional species pool (γ-diversity), the local species richness (α-diversity), the dissimilarity among diatom communities (β-diversity) and to assess whether β-diversity is supported by species replacement or richness differences (nestedness). Furthermore, we investigated the local contribution to β-diversity (LCBD) of our sampling sites and that which factors play a key role in establishment of β-diversity. In the study region, we experienced high γ- (a total of 302 diatom species) and α-diversity (average species richness of 45±13). The diatom community was characterised by high β-diversity (> 0.93 multiple-site Sørensen dissimilarity) which was explained mainly by species turnover. Although deterministic processes were more decisive based on null model analyses, stochasticity can also take part in community assembly. The degree of β-diversity (and thus assembly of communities, as well) was related significantly to the local environmental variables, especially to TP content and to the geographical distance between samplig sites. Samples from Kun-Fehér-tó, Pirtói Nagy-tó, Sárkány-tó and Vadása-tó showed significant relative contribution to β-diversity. Cl^- and HCO_3^- content were determining factors for LCBD, whereas local species richness was related to HCO_3^- and water temperature. Moreover, we found a decline in LCBD with the increase of species richness.

The study was supported by the National Scientific Research Foundation (OTKA K81599), the Széchenyi 2020 under the EFOP-3.6.1-16-2016-00015 and the ÚNKP-17-3-IV-PE-5 New National Excellence Program of the Ministry of Human Capacities.

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THE EFFECT OF DIFFERENT FOREST MANAGEMENT TYPES ON THE SURVIVAL RATE OF EPIXYLIC AND EPIPHYTIC BRYOPHYTES

Epifiton és epixyl mohafajok túlélésének kísérletes vizsgálata különböző erdészeti kezelések során

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This research investigates experimentally the effect of different forest management types on the survival of an epixylic liverwort (*Lophocolea heterophylla*) and an epiphytic-opportunistic bryophyte (*Hypnum cupressiforme*). Five different management types were applied in an 80-year-old oak-hornbeam forest: (1) Preparation cutting, (2) Gap cutting, (3) Clear-cutting, (4) Retention tree group (in the clear-cutting) and (5) Control. It was hypothesized, that the epixylic liverwort, which is more sensitive to microclimatic conditions, will show a more drastic response to the treatments than the epiphytic bryophyte. The results showed that the liverwort in the control survived moderately, poorly in the gap and preparation cutting, and became extinct in the clear-cutting and retention tree group. The survival rate of the epiphytic bryophyte showed a slight decline only in the clear-cutting, and it managed to grow larger in the retention tree group, gap and preparation cutting compared to the control. Based on our results it can be concluded that microclimate limited epixylic liverworts are very sensitive to the changes of forest canopy and therefore to the changes of air humidity. On the other hand, the survival of epiphytes, which can tolerate less humid conditions, are less threatened by forest management. The study was supported by the Hungarian Research Found (OTKA 111887).

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INTERESTING DIATOMS FROM A SPECIAL HABITAT

Egy különleges élőhely különleges kovaalgái

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The epiphytic diatoms of the soda ponds of bomb craters were sampled in 2014. The small ponds (area: 7.1-86.5 m^2, depth: 4 to 60 cm) are located in the northern part of the Kiskunság National Park (47°7.403 'N, 19°8.187'E), near the village of Apaj in Hungary. Their salinity ranges from fresh water to moderately saline levels (conductivity of 1.3 to 7.1 mS cm^{-1}). This area has patchy surface salinization, because the flow pattern of groundwater results extensive surface salinization in those discharge areas where the infiltrating freshwater does not superimpose the upwelling saline water. The salts origin from the overpressured NaCl-type water of the Pre-Neogene basement and the $NaHCO_3$-type water of the Neogene sediments. The ponds can be characterized by different areal extent, depth and salinity, various conductivity, hydroperiod (1–9 months, the deepest ones do not dry out in years with high amount of precipitation due to probably more or less continuous supply by groundwater), plant coverage and width of macrophyte belt. All of the ponds were sampled except for the ones with very short (shorter than one month) hydroperiod.

A total of 80 diatom taxa, representing 33 genera, were identified in these ponds. The genus *Nitzschia* was represented by the largest number of species (16), followed by the genus *Gomphonema* with 9 taxa. IndVal analysis identified 15 species with significant indicator values for ponds. Some interesting, rare or new diatoms for Hungarian flora have also been recorded, including *Gomphonema jadwigiae, Halamphora dominici, Navicula wiesneri, Nitzschia austriaca, N. vitrea, Surirella peisonis.*

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VILMOS PIERS' LICHEN COLLECTION IN THE SAVARIA MUSEUM, SZOMBATHELY

Piers Vilmos zuzmógyűjteménye a szombathelyi Savaria Múzeumban

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Establishing and maintaining a considerable plant herbarium Vilmos Piers (1838–1920) a famous teacher of natural history in the historical military secondary school in Kőszeg became one of the most productive plant collectors of Vas County. His famous herbarium the so-called "Piers-herbarium" deposited in the Savaria Museum (SAMU; Szombathely, Vas County, Hungary) contains a smaller lichen collection as well. His lichen collection consists of 717 specimens, 427 of them are kept in paper bags, a further 290 specimens are mounted on cardboards prepared for educational purposes. Evaluable locality data are provided for 362 specimens of those in paper bags. 155 of them represent the lichen flora of the region of Kőszeg town at that time, including also some specimens from nearby areas belonging to Austria today. Most of the specimens collected outside the Carpathian Basin are originated from exsiccates. As a result of our revision a total of 210 lichen taxa from 103 genera, furthermore six taxa of microfungi and one liverwort taxon were identified or confirmed. 170 specimens were collected by Piers himself, others were gathered by 24 collectors altogether from 14 countries. Identifications were carried out by the collectors, as well as by Viktor Cypers von Landrecy and Dr Albert Latzel. Specimens indicated by collecting dates were collected between 1875 and 1910, collections by Piers himself date back between 18 July 1889 and 6 November 1909. The lichen collection of Piers represents the most important lichenological data source of the Kőszeg Mts and adjacent areas, several lichen species are known from this region exclusively from Piers' collections (e.g., *Anaptychia ciliaris*, *Cladonia cervicornis*, *Cladonia cornuta*, *Enchylium polycarpon*, *Lathagrium auriforme*, *Nephroma parile*, *Peltigera leucophlebia*, *Tuckermannopsis chlorophylla*). A great part of the collection was revised by László Gallé more than 40 years ago, but a detailed enumeration has never been published by him. The most complete catalogue of the lichen collection based on revised specimens was published by us recently in Savaria Bulletin of Museums of County Vas 38 in 2016, Szombathely.

Chemical analyses necessary for species identifications were financed by the grant OTKA K 81232.

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THE BRYOFLORA OF THE PINKA GORGE

A Pinka-szurdok mohaflórája

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The River Pinka originates in eastern Austria and reaches the territory of Hungary at first near Felsőcsatár. The river cuts through the Nagyvilágos Hill forming a gorge. This unique landscape is home to special flora and fauna. The authors have been studying the bryophyte diversity and distribution patterns in the Pinka Gorge in April, July, and August of 2016 and in March, April and July of 2017. The examined area was ca. 2500 m long and maximum 60 m wide along the right side of the river. During the field study, altogether 140 bryophyte species – 115 Bryophyta and 25 Marchantiophyta species – were found in this highly valuable Natura 2000 territory. The main reason for the quite high bryophyte diversity may be the several different habitat types that can be found in this area. Authors succeeded in finding occurrences of several vulnerable and endangered species, such as *Isothecium myosuroides* Brid. (EN), *Porella arboris-vitae* (With.) Grolle (EN), *Amphidium mougeotii* (Bruch & Schimp.) Schimp. (VU), *Bryum pallens* Sw. ex anon. (VU), *Leiocolea collaris* (Nees) Schljakov (VU), *Nowellia curvifolia* (Dicks.) Mitt. (VU), *Eurhynchium flotowianum* (Sendtn.) Kartt. (VU), *Orthotrichum patens* Bruch ex Brid. (VU), *Ulota bruchii* Hornsch. ex Brid. (VU). The results emphasize the importance of further research in this area.

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LICHENOLOGICAL AND BRYOLOGICAL CURIOSITIES IN THE PAPUK MT (CROATIA)

Lichenológiai és bryológiai érdekességek a Papuk hegységben (Horvátország)

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In the course of continuous botanical surveys of the Papuk Mt (Slavonia, Croatia) two outstanding sites (Sokolina, near Doljanci and Svinjarevac, by Kamenski Vučjak village) with thermophilic-acidophilous forest have been discovered. This type of oak forest is rather rare in Croatia, but it is dominant at these sites, moreover, stands of the peculiar *Fagus sylvatica-Sphagnum quinquefarium* forests are also present, so these localities are very unique from the aspect of pedology and phytogeography. Despite the fact that the lichenological survey of Papuk Mt started in the middle of the 19th century the knowledge about lichen flora was very poor, probably because the previous studies focused on the epiphytic species. During our field trips in 2015 and 2016 we collected lichens from different types of substrates and recorded at least 54 taxa. Four of them (e.g. *Psilolechia lucida, Umbilicaria polyphylla*) were not found in Croatia before and 19 species are new for the lichen flora of the Papuk (e.g. *Cladonia cervicornis* subsp. *verticillata, Pertusaria coronata, Trapeliopsis pseudogranulosa*). *Umbilicaria hirsuta* was detected at Sokolina (second occurrence in Croatia) and the rare *Lobaria pulmonaria* and *Lasallia pustulata* were also observed at several new places.

During non-systematic bryological surveys in 2009, 2013, 2015 and 2016, we noticed that the phylogenetic diversity is very high at these sites: species of the classes Bryopsida, Jungermanniopsida, Marchantiopsida and Sphagnopsida (in the case of Sokolina, Andreaeopsida too) occurred together within 100 metres. Several extremely rare species, e.g. *Cynodontium polycarpon, Dicranum polysetum, Dicranum spurium, Jamesoniella autumnalis, Jungermannia pumila, Lophozia bicrenata, Pleuridium acuminatum, Rhabdoweisia fugax* and new taxa of the Croatian moss flora (e.g. *Andreaea rothii ssp. rothii, Buxbaumia aphylla*) have been found here. The importance of these sites is indisputable from the aspect of taxonomic diversity, however, the presence of the invasive *Campylopus introflexus* at Sokolina (second occurrence in Croatia) maybe threaten the taxa growing on soil, with spreading to the detriment of the native species. Since both localities represent highly valuable bryological and lichenological hot spots with very special and unique species assemblages, further research and monitoring of the area is strongly recommended.

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THE GENUS *LEPRARIA* (LICHEN-FORMING FUNGI) IN HUNGARY

Lepraria zuzmófajok Magyarországon

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The genus *Lepraria* was a neglected lichen group in Hungary for a long time. Its species were difficult to differentiate in the lack of fruit-bodies. Generally the entire thallus consists of soredia. Chemical characters were investigated by spot reactions only. However, international investigations of the last decades show fine morphological characters seen only by high magnification and resolution microscopic investigations. Furthermore lichen secondary metabolites analysed by thin-layer chromatography is a more advanced method for detecting these diagnostic characters. Application of the revised character set resulted in identification of 9 species in Hungary. These species are illustrated by micrographs, and some details of the analysis on lichen secondary metabolites are presented. So far about 350 specimens were analysed. Fresh collections from various areas within Hungary and the surrounding countries are still necessary to clear the exact distribution of the species in our region.

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DISTRIBUTION OF THE GENUS *TRAPELIOPSIS* HERTEL & GOTTH. SCHNEID. (LICHENISED ASCOMYCOTA) IN HUNGARY

A *Trapeliopsis* Hertel & Gotth. Schneid. zuzmónemzetség magyarországi elterjedése

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All *Trapeliopsis* species found in Hungary have crustose, thin, granular or minutely squamulose, greyish, greenish-grey or yellowish-green thallus covered frequently by dense soralia. Apothecia if present are sessile, adpressed, round, the discus yellowish-brown, pinkish to dark grey up to black. They usually grow on siliceous rocks, acidic soil, decaying plant debris, decaying hardwood or on rotten wood. Although most *Trapeliopsis* species are cosmopolitan, little information was available on their presence and distribution in Hungary.

Hungarian occurrences of three *Trapeliopsis* species were accepted in Klára Verseghy's "Lichen flora of Hungary" in 1994, i.e. *T. flexuosa* (Fr.) Coppins & P. James (as *Lecidea aeruginosa*) from the Mátra and Pilis Mts; *T. granulosa* (Hoffm.) Lumbsch (as *Lecidea granulosa*) from the Zemplén, the Bükk and the Bakony Mts; as well as *T. viridescens* (Schrad.) Coppins & P. James (as *Lecidea viridescens*) from the Bükk Mts. According to the available specimens and literature records of that time, all three species were regarded by her as very rare species in Hungary. As a result of our revision of the two specimens of *T. viridescens* cited in Verseghy's flora work this species turned to be *T. flexuosa*. Due to the extensive lichenological exploration in the last decades several new floristical records of *T. flexuosa* and *T. granulosa* were registered from various areas of Hungary, which support our idea that both cosmopolitan species are also frequent and widely distributed in Hungary. Our recent investigations also confirm the occurrence of *T. gelatinosa* (Flörke) Coppins & P. James from the Mecsek Mts, which had only one former specimen collected in the Bükk Mts in 1939, still waiting for revision. *T. pseudogranulosa* Coppins & P. James, another common lichen species worldwide, was discovered recently in Hungary from the Karancs, Mátra, Mecsek and Pilis Mts. Further occurrences of the two latter species are expected in Hungary from suitable habitats, i.e. from bare acidic soil.

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EFFECTS OF SALT, OXIDATIVE STRESS AND PERCHLORATE TREATMENTS ON THE ACTIVITY OF PHOTOTROPHIC ENERGY TRANSFORMING SYSTEM IN INTACT CRYPTOBIOTIC CRUSTS ORIGINATED FROM DIFFERENT HABITATS

A só, oxidáló ágensek és perklorát hatása a különböző termőhelyekről származó intakt kriptobiotikus kérgek fotoautotrof energiaátalakítására

Sándor DULAI[1], Ákos KERESZTURI[2], Zsófia RADNAI[1], Réka TARNAI[1], Dóra SZOPKÓ[1] & Tamás PÓCS[1]

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Surviving and photosynthetic activity of intact cryptobiotic crusts (CBCs) collected in different desert types was examined during exposure to different Mars-like conditions at 10, 30, 200 and 400 μE m^{-2} s^{-1} actinic light intensities. The aim was to analyse the survival rate and photochemical efficiency of the examined crusts by chlorophyll fluorescence induction method. Photochemical efficiency was expressed as effective quantum yield ($\Delta F/F_m'$). Salt, oxidative and perchloric acid treatments were realized on different samples, respectively. Several samples survived the extreme salt and oxidative stresses induced out- and inside of the cell and the aggressive perchloric acid treatments. Their photosynthetic apparatus operated at a promising level both during stress conditions and recovery time. The best survivors were those organisms which were collected from very salty and very dry habitats. Since extremophiles organise to CBCs, the results also suggest testing them in the context of their inside community and microenvironment besides the single organisms. Our results indirectly support the DDS-MSO hypothesis.

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IN VITRO MICROPROPAGATION OF 4 HUNGARIAN BRYOPHYTES AS POTENTIAL SOURCES FOR PHARMACOLOGICALLY ACTIVE SUBSTANCES

Farmakológiailag ígéretes 4 hazai mohafaj *in vitro* mikroszaporítása

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The plant kingdom is a rich source of pharmacologically active biomolecules, and bryophytes represent a relatively unexploited taxon within plants. From this point of view, Hungarian mosses are very promising, since only a small percent of the 659 species has been studied in detail. The aim of this project is to analyse Hungarian bryophyte species as potential sources of molecules for anticancer drug and antibiotic research. Important steps during the research are to identify bryophyte species with bioactivity, to isolate and to identify their active components and to characterize their effects in detail. Based on an *in vitro* screening of 58 species, the most promising species are further studied. In order to ensure sustainability of further research, *in vitro* micropropagation studies - of species regarded as the most promising - are being carried out. Optimization of surface sterilization (using 10% $CaCl_2O_2$ or 10% commercial Domestos) of *Brachythecium rutabulum*, *Oxyrrhynchium hians*, *Tortula muralis* and *Campylopus introflexus* is completed. In the selected bryophytes selection of appropriate explants (shoot tips or lateral shoots), optimization of substrates (1/2 MS without sucrose) for *in vitro* cultivation were carried out. Various explants of bryophyte species, different surface sterilization methods, various culture media with different plant hormone combinations and without hormones (1 mg l^{-1} NAA/ 1 mg l^{-1} BA/ 1 mg l^{-1} 2, 4 D/ 1 mg l^{-1} BA+ 0.1 mg l^{-1} NAA/ 2 mg l^{-1} BA/ 1 mg l^{-1} NAA) were tested for optimal growth and morphogenesis. New moss shoots or protonema developments, depending on the hormonal supply, were observed. Growth response was recorded in every selected species during *in vitro* cultivation.

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THE SECOND HUNGARIAN RECORD OF *STEREOCAULON TOMENTOSUM* FR.

A Stereocaulon tomentosum Fr. második hazai adata

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The amphipolar lichen genus, *Stereocaulon* Hoffm. (Stereocaulaceae, Ascomycota) consists of ca. 130 species typical of cold regions. In Europe its area is arctic-boreal-montane. Scandinavian countries have the most species (>30) as well as the most stable populations. In contrast, in Central Europe suitable habitats (e.g. subalpine to alpine siliceous cliffs, heaths) are scattered. Most species are endangered here while some have already become regionally extinct. In Hungary, the only proven species of the genus is *Stereocaulon tomentosum* Fr. The only specimen till now was known as *Zemplén, Erdőbénye: Nagy Sasvölgy (= Sajtház-völgy/Kő-kút-folyás); CEU: 7694.3. VERSEGHY, 1966.09.16. (BP 50582).*

Fifty years later we came across the species at a surprising, anthropogenic habitat as *Nyírség, Debrecen: Egyetem tér, Life Science Building of Debrecen University, shaded flatroof, on quartz pebbles, N47º 33.372' E21º 37.325', alt. 130 m ;CEU: 8495.2. FREYTAG and MATUS, 2016.03.23.* Two fertile specimens have been deposited in the collections DE (no. 1760) and BP while some sterile specimens have been left in situ.

Scattered data on anthropogenic occurrence of some *Stereocaulon* species [*S. nanodes* Tuck., *S. pileatum* Ach., *S. vesuvianum* (Sm.) Ach. and less frequently also for *S. tomentosum* Fr.] from pioneer habitats (e.g. industrial wastelands, railway lines, walls and gravel-covered flatroofs) are available from NW-European countries (Belgium, The Netherlands, Great Britain, Germany).

Construction of the building where the new specimens have been collected was finished in 2005. Investigation of specimens proved that development of apothecia started within these 11 yrs, however no ripe asci have yet been formed. Source of the new occurrence is unknown as natural dispersal or colonization from 80 to 100 yrs old fertile specimens preserved in the nearby Debrecen University Herbarium (DE) are both possible.

Some climatic conditions of this uncommonly low altitude habitat have also been studied. Light climate of the site has been analyzed using HemiView Hemisphaerical Canopy Analyzer (Delta-T Devices, England). Temperature and humidity data from two sensors on the roof (positioned at heights of 5 cm and 30 cm, respectively) have been compared to standard records from the University Meteorological Station (located 400 m to W). The site is strongly limited in direct sunlight due to shading of the surrounding building and receives a maximum potential direct sunlight of 75 min at the summer solstice. Summer records of the site show markedly lower temperatures and higher humidity on the gravel bed, which makes the habitat more similar to high-altitude natural ones. Chemical analysis has been supported by OTKA K81232 and NKFIH K_17/124341.

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DISTRIBUTION AND HABITAT PREFERENCE OF *LEUCOBRYUM* HAMPE SPECIES IN THE MECSEK MTS. (HUNGARY)

A *Leucobryum* Hampe fajok elterjedése és élőhelyi preferenciája a Mecsekben

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The genus *Leucobryum* includes two species (*Leucobryum glaucum* and *L. juniperoideum*) in Hungary. While *L. glaucum* is sparse, *L. juniperoideum* is rather rare in the country. The first species is protected by law in Hungary and listed in Annex V of the Habitats Directive, therefore its monitoring is obligate for all members of the EU. Because these taxa are very similar and usually occur together, it is possible to confuse them in the field.

During systematic surveys from 2016 to 2017, we have checked previously known localities and similar habitats in the Mecsek Mts. Following the standard protocol, 11 representative stands were sampled thoroughly in 1 ha quadrats. Within these quadrats five phytocoenological relevés were taken randomly in 100 m^2 plots. The cover of *Leucobryum* [dm^2] was recorded and the presence of co-occurring species per layer were listed in the 1 ha quadrats. The cover values of moss layer, bare surfaces and organic debris were estimated within the 100 m^2 plots, while the exposure, the inclination and the distance from water sources were recorded in both scale. Soil $pH_{[H2O]}$ of the upper 5 cm layer of the ground were measured by Hannah Combo pH and EC meter.

43 *Leucobryum* stands were found in 11 flora mapping units (ca. 35 km^2) in the Mecsek Mts. In 10 of these quadrats *L. glaucum*, and in 3 of them *L. juniperoideum* were recorded. The total cover of *Leucobryum* in the Mecsek is 20.500 m^2 as a minimum. Considering that the last survey estimated 16.300 m^2 as a minimum and 36.675 m^2 as a maximum in the whole country, and there are several large white moss stands in other parts of Hungary, the results indicate the bias of the former surveys. Both species occurred on steep north-facing slopes in stands of acidophytic beech and oak forests. The average pH was 4.3 in the soil. Both the cover of *Leucobryum* and the frequency of bryophyte species, which prefer moist habitats, tend to be lower Eastwards in the Mecsek. According to the survey 129 vascular plant and 84 bryophyte species were found in the *Leucobryum* stands (approx. 30% of the total bryophyte flora of the Mecsek Mts). Most of the taxa are relatively frequent in fresh acidophytic habitats, but among the bryophytes there are several threatened species (e.g. EN: *Buxbaumia viridis, Jungermannia leiantha, Marsupella funckii*; VU: *Buxbaumia aphylla, Scapania nemorea*; DD: *Campylopus pyriformis*; NT: *Bazzania trilobata, Calypogeia fissa, Diphyscium foliosum*). Although there are several large stands of white moss in the Mecsek Mts., most of them (60%) are threatened by the expansion of *Campylopus flexuosus*, a strong competitor in mesic acidophytic forests. However, their habitat preference is +/- different, *Campylopus introflexus* (probably the most dangerous invasive bryophyte species in Europe) was also found in some stands of *Leucobryum* (26%).

Since the expansion or invasion of these mosses is rather fast, monitoring of *Leucobryum* stands in the Mecsek Mts, is the problem of the present day.

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UTILIZATION OF DIATOMACEOUS EARTH IN AGRICULTRAL PRACTICE

Kovaföld felhasználása a mezőgazdaságban

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Diatomaceous earth consist of accumulated skeletons of the perished diatoms sink to the seabed, later getting to the mainland. Its utilisation is various: detoxification, slimming, anti-wrinkle, face wrinkle, skin-, hair- and nail care, industrial filter, but it can be used as natural soil conditioner, too. A series of investigations have been made in order to find the use of the diatomaceous earth in agriculture. These were: 1/ study of the soil conditioning effect; 2/ study of the insecticidal effect; and 3/ study of the stored grain drying effect.

The first experiment deals with the examination of the effect of diatomaceous earth mixed in soil on the quality and quantity of tomato yield under horticultural circumstances. The aim was to determine whether the diatomaceous earth has influence on germination, germ development, time and period of yield maturity, as well as on yield quantity. The results didn't managed to confirm the differentiation of germination ability. However the heights of the germs were significantly higher. The yield maturity period was shorter in the treatments, being more favourable for horticultural producers. Eventually the main result was the purposeful higher yield mass in the treatments. The 150 g kg^{-1} dose proved to be more efficacy than the 100 g kg^{-1}. As conclusion the utilisation of diatomaceous earth in tomato cultivation may result economic and cultivation advantages.

The second experiment focused on insecticidal effect against the granary weevil (*Sitophilus granarius*) in stored grain. The efficacy was evaluated on maize and barley in laboratory tests at three dose rates of 1‰, 2‰ and 4‰. The treated grains were infested with weevils, the mortality was estimated after 24h, 48h, 7d, 14d and 21d of exposure. After 21 days all weevils were removed and progeny production was assessed 45 days later. The longer exposure intervals increased weevil mortality in both cereal grains. The efficacy on maize was not satisfactory, even at the highest dose rate the mortality was average 20% and the progeny was relative high. On the other hand, 84.99% of weevils were dead on barley, parallel with a complete suppression of progeny. So the utilisation of diatomaceous earth as insecticide may have future in stored product industry.

The aim of the third experiment was to decrease the costs of the grain storage by the utilisation of diatomaceous earth. Three different moisture content maize have been used (19.8%; 21.0%; 28.7%) with 2‰, 4‰ and 8‰ diatomaceous earth percentages. The moisture and dry matter content were determined in accordance to the Hungarian Standard. The moisture contents of the treated grains showed an unambiguous decrease, between 2.3-4.4%. This means 1.5-1.6X higher moisture loss than the control. The higher moisture loss was observable in the case of the 2‰ samples (around 4.5% moisture decrease). The utilisation of diatomaceous earth can't replace the heat transmission grain drying but it can be used for partial drying, as well as can replace the two-step drying by heat with one-step.

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SERBIAN BRYOPHYTE DIVERSITY – AN ANALYSES OF THE NATIONAL SPECIES RICHNESS BY REGIONS

Mohadiverzitás vizsgálatok Szerbiában régiónként

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Bryophyte flora of Serbia up to current knowledge includes 751 taxa (604 mosses and 147 liverworts). However, many taxa remain doubtful while many other are added just recently. Bryological research in Serbia has revived in the last few decades, bringing many new species records and data on its ecology and distribution. All literature and herbarium data on species distribution were collected, and comprehensive Bryophyte database of Serbia was made. An analysis of species richness inside administrative regions of Serbia was performed. The region of Eastern Serbia has the highest alpha diversity as compared to the other Serbian regions. In total, 477 bryophyte taxa were recorded in this region. The other bryophyte species rich areas include Western (384) and Central (366) regions of Serbia. On the other hand, the regions of Bačka (69) and Pomoravlje (91) were distinguished as a regions with smallest number of taxa. There are two main reasons for this, northern Serbia (i.e. Vojvodina) is rather geologically and morphologically less diverse and the majority of land (ca. 90%) is transformed to agricultural surfaces. Also, this is the least bryologically investigated Serbian part. If one consider bryophyte records made by regions, the most are made in the region of Sumadija (3173), followed by Eastern Serbia (2750). The region with most liwerwort records is Western Serbia, while Sumadija is the regions with the most moss records made. The region of Pomoravlje (200), Kosovo (316) and Bačka (344) remained the regions with less bryophyte records. Although new species records and confirmations of old records are expected for the whole country and all regions, the priority of future investigation of bryophyte flora of Serbia should be given in the regions of Bačka and Pomoravlje.

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SURVEY ON THE BRYOPHYTE FLORA OF THE SURROUNDING MOUNTAINS OF THE KÁLI BASIN (BALATON-FELVIDÉK REGION, HUNGARY)

A Káli-medence környéki hegyek mohaflorisztikai feltárása

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In 2016 and 2017, exploration of the bryophyte flora was carried out in the surroundings of Kővágóörs, Köveskál and Szentbékkálla villages. In the hilly region around the basin mainly Quercetum cerris forests occur on acidic bedrock, however, some limestone outcrops can also be found at Köveskál.

Altogether 123 bryophyte taxa (8 liverworts and 115 mosses) were recorded during our survey. The most important finding was *Zygodon forsteri*, a redlisted species in Europe, which was recorded for the first time in Hungary. This atlantic-submediterranean element is a member of the Orthotrichaceae family, growing usually around knot-holes or other hollows of trees where water runs down on the bark, and often on callus tissue. Our specimens were collected in knot-holes of two *Quercus cerris* trees.

Two other species (*Anacamptodon splachnoides, Fissidens arnoldii*) are included in the Red data book of European bryophytes, which are also protected in Hungary. *Anacamptodon splachnoides* lives in the same habitat as *Zygodon forsteri,* around knot-holes. This species was detected on 57 *Quercus cerris* trees in the investigated forests. Probably the largest population in Europe lives here. *Fissidens arnoldii* was found on limestone rocks in a stream at Köveskál.

Another interesting species is *Pottia starckeana* s.s., which is in the data deficient (DD) category in he Hungarian Bryophyte Red List (without any recent records for almost 50 years). Several other species found there are redlisted in Hungary, e.g. *Eurhynchium speciosum* is endangered (EN), *Buxbaumia aphylla* and *Orthotrichum patens* are vulnerable (VU). Further 13 species are near threatened (NT) and 16 are regarded as indicators, which by their mere presence represents a greater level of conservation value of the habitat.

Habitat preference, population size of species of conservation interest and advice in their conservation management will be given.

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DNA BARCODING OF WILD *GANODERMA* SPECIMENS AND CULTIVATED STRAINS IN HUNGARY

Magyarországi *Ganoderma* minták és termesztésben használt izolátumok vizsgálata DNS-vonalkód segítségével

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The cosmopolitan polypore genus *Ganoderma* (Polyporales, Basidiomycota) has an enormous economic value, due to the caused diseases on different tree plantations (e.g. *G. boninense* in oil palms) and the medicinal properties of certain species (e.g. *G. applanatum*, *G. lingzhi* and *G. sinense*). The cultivated *Ganoderma* strains used by Hungarian growers originate both from selected wild strains or more often taxonomically not evaluated isolates with uncertain origin. However, based on morphological characteristics, the species concepts in the genus lack consensus, and the taxonomy of many *Ganoderma* taxa is thus problematic. Therefore, in addition to the morphological examination, suitable molecular methods have recently been required to the taxonomically correct identification of the wild *Ganoderma* species and cultivated strains in many cases. DNA barcode is a widely accepted tool for species identification and authentication of commercial products containing *Ganoderma* species. Among the tested fungal DNA barcoding markers, the application of the internal transcribed spacer (ITS) is the most commonly used and it was formally proposed as the primary fungal barcode marker. Besides the ITS, several other DNA barcoding markers were used by different authors to clarify taxonomic difficulties in *Ganoderma*: e.g. β-tubulin, LSU, *rpb1*, *rpb2*, *Tef1-α* or the mtSSU rDNA sequence. Formerly, the Hungarian *Ganoderma* species (viz. *G. adspersum*, *G. applanatum*, *G. carnosum*, *G. cupreolaccatum*, *G. lucidum* and *G. resinaceum*) were briefly studied by Papp and Szabó (2013, in Acta Silv. Lign. Hung. 9: 71–83.), however, based on solely morphological charactersitics. In this study we aimed (i) to generate DNA barcoding sequences for all wild *Ganoderma* species observed in Hungary; furthermore, (ii) to investigate and evaluate the Hungarian cultivated strains labelled as "*G. lucidum*" and the *Ganoderma* spp. isolates preserved in culture collections, based on DNA barcoding sequence analysis. Supported by the ÚNKP-17-4 New National Excellence Program of the Ministry of Human Capacities.

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BACK TO HUNGARY: A STORY ON REINTRODUCTION OF A EUROPEAN HABITAT DIRECTIVE MOSS SPECIES, *HAMATOCAULIS VERNICOSUS*

Visszatérés Magyarországra: egy közösségi jelentőségű mohafaj, a *Hamatocaulis vernicosus* visszatelepítési kísérletei

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Hamatocaulis vernicosus is rare and threatened species Europe-wide, and it is a member of many national red lists. The main reason for this can be regarded as habitat quality changes. The last records from Hungary comes from 1968, and in years after despite of intensive search it was not found in any historically known habitats. Thus, it was considered as extinct in Hungary.
An attempt on getting back this species to Hungary has been made. Less than one year old herbarium specimens from neighboring countries have been used to establish new population but with limited success. The same material that could be revived has been used to start axenix in vitro culture. Once the culture has been established, the optimization and propagation started. The lab originated material was grown under controlled condition but in xenic medium originated from Hungary. Finally, after two years the moss plants were reintroduced to two national parks in Hungary and two populations were established.
This is just the first report but there are continuous attempts to stabilize the populations. The problems, achievements and solutions will be discussed.

A *Hamatocaulis vernicosus,* egy ritka és veszélyeztetett faj Európában és számos nemzeti vörös listán is szerepel. A fő veszélyeztető tényező az élőhelyeinek, a lápréteknek, a visszaszorulása, illetve leromlása. Az utolsó magyarországi record 1968-ból származik és bár az utóbbi években a közösségi jelentőségű fajok monitorozása intenzíven folyik, a *Hamatocaulis vernicosus* nem került elő egyetlen korábban ismert élőhelyéről sem. Így Magyarországról kipusztultnak tekinthető.
Ennek a fajnak a visszatelepítésére tettünk kísérletet. Szomszédos országokból származó, egy éven belül gyűjtött herbáriumi példányokat próbáltunk meg felhasználni új populáció létrehozására, de ez csak korlátozott eredménnyel járt. Az egyik ilyen herbáriumi anyagból azonban sikerült in vitro kultúrát létrehozni és felszaporítani. A laborban kontrollált körülmények között tartott kultúrát magyarországi lápokról származó médiumon neveltük. Végül, két év után visszatelepítést végeztünk két nemzeti parkban és így két lápon sikerült egy-egy populációt létrehozni.
A populációk stabilizálásán folyamatosan dolgozunk, nyomonkövetjük a változásokat. Bemutatásra kerülnek az elért eredmények, a felmerült problémák és lehetséges megoldások.

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BRYOPHYTE COLLECTION OF ESZTERHÁZY KÁROLY UNIVERSITY (EGR): THE DIGITAL DATABASE OF PEAT MOSS (*SPHAGNUM*) SPECIES

Az Eszterházy Károly Egyetem Herbáriuma (EGR): a tőzegmoha (*Sphagnum*) fajok digitális adatbázisa

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The Bryophyte Herbarium of the University of Eger (EGR) is considered to be one of the most important collections of this kind in Central Europe. Bryophyte specimens held at EGR count around 200.000 specimens, of which approximately 2700 are the *Sphagnum* specimens. The first *Sphagnum* specimens arrived probably by exchange to M. Vrabélyi from prominent botanists, as K. G. Limpricht, A. W. Evans, V. Schiffner and J. E. Zetterstedt. Imortant are the duplicate specimens collected by Á. Boros and L. Vajda (their first specimens are stored in BP). Members of the Department of Botany has also increased this part of the collection during their field research, as by: T. Pócs, J. Suba, I. Bakalár, S. Dulai and A. Vojtkó. Our main aim was to digitalize and publish first information on the cryptogam herbarium in order to provide an easier access to the data.

After photographing the pages of the collection, we read the information on the photos and recorded them in an MS Excel spreadsheet. During the record process the following information could be filled: species name (Latin), section where it belongs, place of occurrence (administrative area, geographical area, coordinates), habitat, date of collection (year/month/day), substrate, name of collector and of identifier.

We choose to present here our *Sphagnum* (peat mosses) collection as the digitization process started in 2014, and based on stage from July 2017. There are 2700 *Sphagnum* samples of our bryophyte collection representing around 1.35 % of the whole bryophyte collection. Among others exsiccata specimens of *Sphagnotheca Boreali-americana* (Ed. R. E. Andrus and D.H. Vitt). Isotype of *Sphagnum amoenum* Warnst. (Bryotheca brasiliensis) and isotype of *Sphagnum squarrosiforme* Dixon and Sherrin (Bryophytorum typorum exsiccata) are also preserved in our Sphagna collection. The most active Hungarian collectors were: Á. Boros, L. Vajda, Á. Károlyi, T. Pócs and J. Suba. In addition to this, many specimens collected by foreigners can also be found: R. E. Andrus, A. M. Cleef, J. Duda, A. Stebel, etc. There are 554 specimens from today's Hungary, most of the Hungarian specimens are from the active years of Á. Boros. The oldest *Sphagnum* specimen was collected by J. E. Zetterstedt in June 23, 1860 from Sweden. The collection has been growing slowly but steadily during the XIXth century. We have specimens in the collections from more than forty countries. The peat moss collection has a great floristical significance as preserves important probative specimens of bogs from which the *Sphagnum* species have been extinct due to the decline of the wet habitats in these days. Increasing collection activity was continuous since 2010, with completion of new data enties. It is hoped that the unified inventory of cryptogam collection will be easily searcheable facilitating loans and research.

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LIFE ON SAND DUNES FROM LICHENS POINT OF VIEW – EFFECT OF MICROCLIMATE AND SEASONALITY ON ACTIVITY OF TERRICOLOUS LICHEN COMMUNITIES

Élet a homokbuckákon a zuzmók szemszögéből – mikroklíma és szezonalitás hatása talajlakó zuzmóközösségek aktivitására

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Terricolous lichen communities are widely distributed in the Kiskunság Region, however we have limited information about the photosynthetic activity of the species living in different microhabitats. In consequence of the dominant wind direction, sand dunes of this region have mainly North-East (NE) and South-West (SW) exposure. These more humid (NE) and more arid (SW) slopes ensure diverse microhabitats for terricolous lichen species with different environmental requirements. To ascertain the effect of microclimate and seasonal weather conditions beside chlorophyll fluorescence measurements and photosynthetic pigment composition analysis, two HOBO micrometeorological stations (with T_{soil}, WC_{soil}, T_{air}, RH% and PAR sensors) were placed on NE and SW facing slopes of a sand dune near Bugacpuszta. During the three year continuous data collection we got an inside view of lichen's everyday living conditions. The most considerable differences between the two microhabitat types were in T_{soil}, in irradiation and in relative humidity. In greater detail, degree and trend of variation in parameters changed during the day, and showed characteristic seasonality. We observed significant differences in all micrometeorological parameters between seasons during the years. In long-term on SW facing slope because of averagely higher air temperature (0,2 °C) and lower air humidity (0,5%) the vapour pressure deficit is higher (0,2 kPa) than that of on NE facing slopes. The higher incoming irradiation on SW side causes higher soil temperature, and lower soil water content. PAR, WC_{soil} and T_{soil} showed significant difference between microhabitats in every season. In summer probably the short active periods on both types of microhabitats cause smaller difference in Fv/Fm, meanwhile in spring the small difference between more arid and more humid microhabitats can explain with the most beneficial environmental conditions during the year.

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EFFECTS OF SELECTED BRYOPHYTE SPECIES EXTRACTS ON MICROORGANISMS

Kiválasztott mohafajok kivonatainak hatása mikroorganizmusokra

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Two dozen of bryophyte species was collected from native habitat types across Europe to test if the ethanol extract can affect the growth of various microorganisms. After start-up test the ethanol extract did not show any influence on growth and development to Gram-negative bacteria and fungi *Candida albicans* (ATCC10231). Thus, the further tests focused on the Gram-positive bactreia. The ethanol extract of 5g bryophyte material was macerated in liquid nitrogen, and then extract was evaporated till dry. The dry residue was dissolved in 5ml of methanol. This was used in further analyses by MIC and MBC techniques. The result obtained showed the most effective extracts were those made from *Pellia endiviifolia* and *Bazzania trilobata.* Phytopathogenic bacteria and fungi *C. albicans* showed resistance to extracts of any bryophyte species tested. Gram-positive bacterias, namely *Staphylococcus aureus* (ATCC25923), *Listeria monocytogenes* (ATCC19111) and *Bacilus subtilis* (ATCC6633) were intolerant to extracts of liverworts *P. endiviifolia* and *B. trilobata.* MIC value for two above mentioned liverworts extract tested were 7-12mm, while referent antibiotic (rifampicin) inhibitory zone were 15-35mm. The most resistant to any bryophyte extracts was *Escherichia coli* (ATCC25922), while the most sensitive was *B. subtilis* (ATCC6633) with MIC values obtained 0.01-0.19 mg/ml. The results obtained show clear antimicrobial potential of *P. endiviifolia* and *B. trilobata,* however further research are needed.

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ISSN 2061-6716 (Print), 2063-6725 (Online) 4th CC 2017 Abstract
http://abpa.ektf.hu/ *Poster*

PRELIMINARY RESULTS OF BRYOFLORISTICAL INVESTIGATIONS IN BALATON VILLAGE (NE-HUNGARY)

Balaton község mohaflorisztikai vizsgálatának kezdeti eredményei

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During the last decades, the bryophyte flora of several European settlements have been studied, but these bryofloristical and ecological investigations carried out in inhabited areas usually focus on the urban areas of large cities.

There are only a few publications on the bryophytes of the inhabited areas of Hungary and these works focus only on the documentation of floristic data.

The main objective of the present project is the presentation of the bryophyte flora and diversity of the village of Balaton.

The village occupies an area of 13.2 km^2 and is located in northeastern Hungary, in the so called Heves (Ózd-Egercsehi Basin) region, on the bank of the Eger stream and has about 1000 inhabitants. The settlement lies at 290 – 320 m a.s.l. (above sea level).

The field work was started in September of 2017. Random sampling was performed in different habitats and microhabitats within the administrative borders of the village including the family house, traffic, sport, garden, watercourse, cemetery and forest areas.

The bryophyte flora of Balaton is similar to that of nearby Middle European settlements, which was primarily explained by the presence of common and frequent species (e.g. *Ceratodon purpureus, Grimmia pulvinata, Barbula unguiculata, Hypnum cupressiforme)*, characteristic of urban environments.

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