

# MUSHROOMS LIVING AMONG US: MUSHROOMS – WORLD OF BÁTORLIGET

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**REZUMAT.** La granița de est a Ungariei, în Szabolcs-Szatmár-Bereg, se află Bátorliget, sat transformat în nume internațional datorită mlaștinii glaciale și pășunii, arii ultraprotejate. La celălalt capăt al satului este pădurea Fényi - la frontiera județeană. Rezervele naturale ultraprotejate sunt formate din mlaștina glacială Bátorligeti sau ierburile Nyomási și pădurea Fényi, care constituie laolaltă rezervația naturală Bátorligeti

**Cuvinte cheie:** glacial, mlaștină, rezervație naturală

**ABSTRACT:** On the east border of Hungary in Szabolcs-Szatmár-Bereg County has been found Bátorliget which has made an international name for itself in the scientific world due to its highly protected glacial swamp and pasture. At the far end of the village reaches the Fényi-forest as far as the county-frontier. These three, with all their historical pasts and improvements carry the formation and the structural changes of the Hungarian-plain. The highly protected nature-reserve consist of the glacial Bátorligeti virgin-bog the Bátorligeti or Nyomási herbage and the Fényi-forest that we name altogether the Bátorligeti Nature Reserve.

**Key words:** glacial, swamp, natural reserve

## 1. LITERARY REVIEW

The academician JANOS TUZSON called the attention of the scientific world especially to the reservation in 1914. The exploring botanical and zoological researches began in 1928. The results later served as a basis of the three territory to become a nature reserve by law.

The remarkable richness in species diversity of the glacial swamp (BOROS 1932, SOÓ 1934, SIMON 1956, 1991) remained mainly from the swamp-plain period of the Plain, the beech-age though its birch swamps certainly come from the birch-pine-age. Some of its species (eg. the *Trollius europaeus*, the *Angelica palustris* etc.) are glacial origin (SOÓ 1953, STANOVÁR 1991 SIMON et al. 1991, PAPP et al. 1986).

The zoological research results in the Bátorliget area also prove that this is a land which preserved the original biological aspects of the Plain (SOÓS 1928, VARGA 1953, ANDRÁSSY 1953, VÁGVÖLGYI 1953, SZÉKESSY 1953, LOKSA 1953, KOVÁCS 1953, HALÁSZFI 1953, ÁDÁM 1987, CSINÁDY 1953, STILLER 1960, JENSER 1991, MAHUNKA 1991). BARTHA (1993) outlined the brief history of mushroom studies in the Nyírség area, listing some internationally recognized scientists like Frigyes Hazslinszky (1818-1896), László Hollós (1859-1940) and Raymund Rapaics involved in the work though in their studies they never referred to this area. The first mycology-related facts are found in the work of BOROS (1923). Academicist GÁBOR UBRIZSY started a significant work on mycology studies around that time from 1937 which he extended over the whole Nyírség area (UBRIZSY 1941, 1942, 1943, 1947). He recorded 86 big-fungus

species and 56 microscopic size fungi (UBRIZSY 1953) in this area. ÖTVÖS (1971) carried out mycology survey researches in the Fényi-forest listing 122 big-fungus species presented the scientific field whilst I with my colleagues surveyed the Bátorligeti „Nyomási” herbage recording 139 big-fungus species describing this biotope (LENTI et al. 2004). This number has been increased to 512 species due to the mycology studies of RIMÓCZI (2002) and his colleagues on the big-fungus species living in reservation (LENTI - MÁTÉ 1995, 1996, LENTI - RIMÓCZI - MÁTÉ 1997, 1998, LENTI - MÁTÉ - RIMÓCZI 2000).

There is a comprehensive monograph written by MAHUNKA (1991) about the Bátorligeti virgin-bog and its surroundings concerning the flora, fauna and vegetation in which data have been processed and summarized but it never refers to fungi or lichen.

Our work-plan object for the future or even decades to come is to outline the world of big-fungi with all their existing species in the Bátorligeti Nature Reserve, the later enlarged territory or may be on the overreaching borderline parts and to find relation in quantity and quality among them. We also want to know the correlation in between the vegetation so far only separately observed parts (STANOVÁR et al. 1991). We believe that the processed data gained from the fungus researches will provide us with useful information not just on the Bátorligeti region but also on the Nyírség and the Felső-Tisza region furthermore hopefully we will obtain some information about the past the present stage and the outstanding nature value of this land. Without these informations we cannot have a complete, whole picture of this economically and socially forgotten, neglected area.

## 2. SOURCE MATERIAL AND METHOD

Our data were gained during occasional field visits. We started our survey at the Bátorligeti virgin bog (1995-2000) followed by the mycology opening researches of the Bátorligeti herbage (2000-2005) while simultaneously we began to record the fungi species in the Fényi-forest (1998-2001 and 2003-2006).

We did not have regular sample areas set, we plan to do this later during our planned myco-sociological field work. For identifying the big-fungus species and to deal with the classifying questions, we used the national, international literature and a so called identifier-key available (ARNOLDS et al. 1995, BON, 1992, CAPELLI 1984, CETTO, 1970-1993, EINHELLINGER 1985, GALLI 1996, 1999, KREIGLSTEINER 1991-1993, KUYPER 1986, MOSER – JÜLICH 1985-1996, NOORDELOOS 1992, RIMÓCZI – VETTER 1990, IGMÁNDY 1991, ZEROVA et al. 1972-1979).

Species were identified either in the field or in laboratory and then they were preserved. Location, conditons and microhizza partners were reguralry noted. Pictures were taken of the species bonited on the spot.

Data is stored, processed and evaluated on computer by the German Mycological Society „Pilzkartierung 2000” PC programme (SEILT 1991, RIMÓCZI 1994). Classification is based on the categories set by FRADE–ALFONSO (2005).

## 3. RESULTS

We have bonited 712 big-fungus species from the Bátorligeti virgin bog so far out of which 692 have been precisely determined. The clarification of the rest of the 20 is in progress. This species list is rather diverse concerning that 34 species belong to the 12 genus of the *Phragmobasidiomycetidae*, 28 to the 8 genus of the *Gasteromycetes*, 110 species to the 53 genus of the *Aphylophorales*, and the most 520 to the *Boletales-Agaricales-Russulales* order.

Our data shows diverse taxon-richness of big-fungus species in this area in a way that of all the genus rich in species several (eg. the *Entoloma*, *Cortinarius*, *Coprinus*, *Clitocybe*, *Lepiota*, etc.) are not on our list.

Species of the *Melanoleuca*, *Cystolepiota*, *Gymnopilus* and the *Lyophyllum* are very few in the reservation. It is certain that these genuses and the damp *Naucoria* genus have been found in large numbers in the Bátorligeti virgin bog.

We were not able to study the big-fungus famillies of the Ascomycotina genus like the *Helvellaceae*, *Humariaceae*, *Pezizaceae*, *Geoglossaceae*, *Helotiaceae* or the *Sphaeriaceae* on the whole though their species were seen quite often on the

field. This will be the task for the years to come which as a result could be a significant addition to the list.

There are 478 so called „szaprobtonita” species among the fungi. After years of study the fungi this may will be appropriate to break the habitat-category into more 7-6 sub-category or even divide them up into eco-groups for defining and evaluating like WINTERHOFF (1993) did after long years of studying the world of the big-fungus in green woods along the Rajna river-side. In this work we separated the so called „saprobtonita” fungi by the work of KRIEGLSTEINER (1993) into decayed and/or mouldering bottom living species in where we recorded 272 species. The other group is the association of the deeply moulded bottom living species of fungi counting 232 fungus species. Various species (eg. the *Coprinus disseminatus*, *Marasmius rotula*, etc.) have been found in both groups. It is very common that the same species (*Marasminellus ramealis* or the *Tubaria furfuracea*, etc.) can be found on leaves just as much as on bigger-smaller branches or twigs. We found that the fungi we explored, bonited and described are „szaprobtonita” in large proportion. This comes from the type of the land. The mulch production is huge in green- woods as well as in the sandy oak-forest habitat. The fallen tree-trunks are decaying untouched here. The broken, fallen twigs, branches and leaves offer a rich safe heaven for the „saprobtonita” and”xilofag” fungus species.

In these leafy woods beside the regular species (eg. the *Hirneola mesenterica*, the *Cerrena unicolor*, the *Clitocybe inornata*, etc.) we can found fungi which are characteristic of the hardwood-groves among the „saprobtonita” like the *Ramicola haustellaris*, the *Pluteus phlebophorus*, the rarely occuring *Squamanita schreieri*, etc. These species were also recorded by ARNOLDS et al. (1995) and KREISEL (1987) as *Alno-Padion* species. This maybe was not a coincidence because the hardwood-groves show same characteristic feature as the willow-groves (*Salicetalia*) or rather as the vegetation of the oak-hornbeam (*Fagetalia*) mixed groves. This mentioned above have been classified into like one of the association of the *Ulmion* Simon 1954 or rather recently called *Alnion* (BORHIDI–KEVEY 1996).

The listed fungi are character of hardwood groves at the Bátorligeti virgin bog and they indeed describe these leafy forest here. Not surprisingly we can find big-fungus species as a characteristic aspect of oak-groves like the *Marasmius cohaerens*, the *Antrodiella hoehnerri*, the *Microphale foetidum* and the *M. brassicalens* species. According to KREISEL (1987) these are also the character species of the *Carici-Fagetum*. Both of these *Micromphale* species were present in large numbers in reservation almost forming an aspect not just in green-woods but in the bleak oak-forest as well. Similarly to these species

the *Macrotiophula filiformis* presented record-production in the mid september of 1996.

Interestingly that because of the cold climat of the swamp „saprobonita” species of *Fagion* or *Carpinion* associations like *Megacollyba plathyphylla* or otherwise only on the oak-tree trunks appearing *Oudemansiella mucida* here appears on the mulch of *Quercus robur* or rather on its tree-trunk. Also belong here the *Agaricus dulcidulus* which is an oak fungus species (CAPELLI 1984, ESSETTE 1964, MÖLLER 1950-1952). On the other hand KLACHBENNER (1873) bonited these species from the oak-woods over Nagyvárad.

The parasites of the living trees like *Ganoderma adspersum* and the *G. resinaceum* are also the character species of the *Fraxino pannonicae-Ulmetum* and the hill-side associations called *Fagetalia*.

The *Squamanita schreieri* have been present as a character species of groves in the reservation. (RIMÓCZI 2002). The occurrence of this species not just only a characteristic sign of the associations but also refers to the occasional warming up of the propagation area because they recorded it from the thin-groves of riversides which are rising in temperature (KREISEL 1987). The Bátorligeti virgin bog is the second listed propagation area in Hungary like the *Psathyrella silvestris* species recorded here which was found first by M. BABOS (1989) in willow-alder swamp. The *Psathyrella melanthia* recorded by us is also a typical species of the groves, characteristicly these are *Salicetalia* fungus species. We also listed the *Cytidia salicina* the *Exidia repanda* and the *Phellinus conchatus*.

We observed 30 so called obligat parasits fungus species in the reservation area which means a relatively small number. This show a good condition of the present shape of the tree-clusters in the reservation area. Unfortunately these parasites tindere have a wide host-spectrum in majority like the *Ganoderma lucidum* and the *Phellinus contiguus*. Most of these species belong to the *Quercus* genus like the *Inonotus dryadeus* and the *Phellinus robustus*. Not a suprise at all that the appearance of *Fagus*-living tindere (eg. the *Inonotus obligus*) in this region exist on the *Alnus* or the *Salix* (eg. the *Phellinus ferrus*).

The mycrohizza fungus species (204 items) take up one-third of the listed species. The 23 genus includes wide scale of the big fungus species and 80 percent of the mycrohizza species belong to the *Quercus robur*. There is no obligat-pine – mycrohizza fungus among them since there is no continuous pine woods in the Bátorligeti virgin bog area. Generally out of the pine-mycrohizza fungus species these are more tolerate under the *Quercus robur* (eg. the *Xerocomus badius*) or the *Betula pendula* (eg. the *Amanita muscaria*) in terms of wood-partner.

According to EINHELLINGER (1985) the *Russula faginea* which refers to the oakwood in its name is typically a *Carici-Fagetum* species. On the other hand KREISEL (1987) is of the opinion that these species are also show a character in hornbeam-oak mixed green woods. ARNOLDS et al. (1995) and GALLI (1996) recorded these species from oak-woods. We found them under the *Quercus robur* here in the Bátorligeti virgin bog. We listed the *Hygrophorus crysodon* species likewise from here which is also the fungus of the *Fagetalia*.

We found 22 birch mycrohizza fungus species and big-fungus species associated with alder and popler. Birch associated fungus we found them in the patches of *Calamagrosito-Salicetum cinerea* and also under the birch populations along the edges. Each of the mycrohizza-fungi living under the *Betula pendula* and the *B. pubescens* is highly protected! Out of these fungi species the *Cortinarius betuletorum* (Mos.) Mos. is worth to emphasize species which has been found first in Hungary here in this area. Till now we barely described them from the birch-swamps patches on the virgin bog vegetation map.

Therefore the grove patches are poor in mycrohizza fungus species. From our point of view more than likely this means a virgin state of the biotop. WINTERHOFF (1993) experienced the same ratio between the „saprobonita” and the mycrohizza species along the Rajna riverside and also GREILHUBER-KRISAI (1992) in the green-woods by the Danube river sides. In the Fényi-forest 628 big-fungus species have been proved to exist. Out of the 14 habitat types 356 species could be classified into the so called „Red-list” categories accepted by professionals but not settled by law.

In to the listed and used category 8 species (1,27 %) belong to the category 1, species of 47 (7,48 %) to the category 2, species of 239 (38,07 %) to the third and 62 (9,87 %) to the fourth category. Most of the recorded species can be found in virgin reservation so the 2 biotop mycologicly are very similar to each other!

The big fungus species exist in the oak-ash-elm groves of the Hungarian-plains in majority (41,6%), in the lowlands hornbeam-oak groves (19,0 %) and also the lily of the valley oak green-woods (19,0 %). Besides the open water surfaces (2,1 %) in the planted popler woods (2,1 %) and the acacia groves (3, 2%) the fungus-population is very scarce.

We have researched the fungi of the Bátorligeti herbage or as it called here of the „Nyomási” herbage for six years. The results of the fungus surveys is 139 big fungus species. These can be classified into 3 fungus classes and 10 order. The most *Populus* species of the 24 families are the *Tricholomataceae* (14 species) the *Polyporaceae* (7 species), the *Lycoperdaceae* (5 species), while the *Agaricaceae* and *Auriculariaceae* families consist of 4-4 species.

The *Coprinus* (10), *Lepiota*, *Clitocybe* (7-7), *Mycena* and the *Entoloma* (6-6), furthermore the *Agaricus* and the *Helvella* (5-5) have been listed among the most populous families in species.

These recorded species are part of the locally planned so called „Red-list” in 45,3% (63 species). The number of the highly endangered species is 5 (3,6%), the endangered is 51 (36,7%) and the potentially becoming endangered species can come to as much as 7 species (5,0%) in the future.

Superdispersion is a typical quantitative ratio of big-fungus species in this pasture since the appearance of certain species is rare. Normal dispersion is typical only for some certain species (for example the *Lepista nuda*, *Marasimus oreades*, *M. scorodoni*, *Lycoperdon foetidum* and the *Scleroderma bovista*). There are no steady big-fungus myco-associations formed in this biotope yet a small so called stadium-aspects still exist at the skirts of gallery forests and also at certain parts of open sand pastures.

The virgin habitats close to nature in the Bátorliget area examining one by one are equal or at least of the same value like other nature reserves in the country therefore worth to be declared a national park if increased with additional lands. We are of the opinion that in case of proper professional will and inclination to act we deserve a place in a future national park where natural values have been recognized. This land is unique due to its flora, fauna and fungus world. Any of these values if examined, evaluated individually cannot bear with any significant importance in results.

This is highly recommended to extend the values of the world-wide recognized flora and fauna also over to the fungus world in Bátorliget and regard that as a real value because only altogether can they form a real uniqueness.

The big fungus species recorded in forest habitats can be found in 20,0 % (RIMÓCZI et al. 1999) the pasture existing species in 45,3 % (Lenti et al. 2004) on the big fungus list of Hungary the so called „Red-list”. On the contrary, only 4 protected fungus species exist in this land protected by law KvVM 23/2005. (III. 30). This territory together with other protected regions of Szabolcs-Szatmar-Bereg County can compete with high hopes for the declaration of this land as a national park. We can say that almost all the flora hungaricum species presents itself here and concerning the fauna there are 325 new species are present and 57 species are new to the universal scientific world (RAKONCZAY 2004).

The KvVM decree mentioned here which has listed only 35 big-fungus species in Hungary as a protected species leaves out the valuable precious fungi in this region. Furthermore denies the existed nature value which is a character here and makes this land one of the most remarkable virgin state region of our country (RIMÓCZI 2006). This born to

correct decree denies what Boros, Tuzson, Ubrizsy (cit. BARTHA 1993) emphasised with persuasion about Bereg and Nyírség.

#### 4. SUMMARY

We researched the frequency ratio of big-fungus species on the zone of Nyírség and Érmellék at the east part of the great hungarian plain in Bátorliget. We have bonited fungi for more than 10 years in the associations of *Fraxino pannonicae-Ulmetum* Soó in Aszod 1935 corr. 1963, the *Convallario - Quercetum roboris* Soó (1939), 1957 the *Festuco rupicolae-Quercetum roboris* Soó (1943), 1957, the *Quercu robori-Carpinetum* Soó et Pócs 1957 em. Soó 1980, the *Calamagrostis-Salicetum cinereae* Soó et Zolyomi in Soó 1955, and the *Alnetea*, *Molinetalia*, *Phragmitetalia* and the *Magnocarietalia*. We extended our research of fungus species over to the pasture of Bátorliget too. This sand like pasture (*Potentillo arenariae - Festucetum pseudovinae* Soó (1938, 1940) was formed from sand like steppe field (*Pulsatillo hungaricae-Festucetum rupicolae* (Soó 1983) Borhidi (1996) because of the grazing and of which fungi species were utterly unknown till now.

The purpose of this work was to summarize all the mycological studies carried out ever by fungi researchers in Bátorliget and the surrounding furthermore to complete their work with our survey results. Our intention is to continue and specify their work. We would like if the picture about this palce could be more precise and complete. We hope that our work will contribute to the preservation and development of this region of virgin state and can help to maintain its richness. And besides this is not are hidden purpose to inspire further fungus researches in this biotope.

We would like to call attention to the big-fungus species that are living in wood associations or even without them. We also like to do the classification and to put them in orders then to describe the character fungus species in this land. Our purpose is to publish the nature –preservation features of the recorded fungus species then present the values of this biotope in its original virgin state in mycological respect.

On the basis of the mycological surveys carried out in the Bátorligeti Reservations we can establish that the land has not only made a national and international name for itself due to its rich flora and fauna, but the variability of its fungi is also worth paying attention to. All these mycological results definitely contribute to these protected habitats being recognized and also demand an increased protection which will hopefully lead to the opening of a new national park!

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