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UPDATED CHECKLIST AND RED LIST OF HUNGARIAN BRYOPHYTES

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Since the publication (2004) of the last checklist of Hungarian bryoflora 27 previously unknown bryophytes (2 liverworts and 25 mosses) were recognised or discovered in the country. The recent checklist consists of 659 taxa (2 hornworts, 146 liverworts, 511 mosses). The work on the expanded list has given an opportunity to revise the conservation status of our bryoflora, resulting in an updated red list. According to the new red list presented here, 26.2% of the Hungarian bryoflora are threatened, marked by categories CR (3%), EN (13.7%), VU (9.5%), and 17.3% are near threatened (NT). In all of these categories, except CR, the percentage of liverworts (including hornworts) is higher than that of mosses. The ratio of data-deficient taxa is also high (21.1%) and a higher percentage of liverwort taxa falls in these categories, than of mosses. This reflects an unsatisfactory situation, that is, our shortcomings in field bryology. In addition, only 34.9% of the bryoflora can be regarded as non-threatened, but 20.6% of the full list requires proper attention in the future. It is also worrisome that only 15.5% of the liverworts is non-threatened; this percentage is higher in mosses (40.5%). Our list below also notes the indicator species, which by their mere presence denote the greater level of conservation value of the habitat, where they occur.

Key words: hornworts, indicator species, liverworts, mosses

INTRODUCTION

The first red list of Hungarian bryophytes was published twenty years ago (Rajczy 1990). It was mainly based on old data and only the number of localities (at which the bryophytes were recorded) was taken into

consideration. Although the Hungarian bryophyte flora is well explored thanks to the life work of earlier bryologists, Ádám Boros (1900–1973) and László Vajda (1890–1986), but their records are dating back to more than 50 to 60 years. The classical field of bryofloristics has been neglected in the last few decades of the 20th century. Bryological field studies became more numerous only the last ten years, which resulted in abundant recent information about the actual distribution of bryophytes. Earlier known bryologically important localities were re-visited by the authors. In some cases investigations on population size and monitoring of population fluctuation were also undertaken. These activities made us recognise that there is an urgent need to evaluate the conservation status of our bryophyte flora, based on recent knowledge and with the application of current usage of IUCN red list criteria (IUCN 2001). Meanwhile, revisions of herbarium material and a series of intensive field excursions resulted in the recognition of several new taxa reported for the first time in the country. Although the last checklist was published only six years ago (ERZBERGER and PAPP 2004), it turned out that numerous changes had to be made, hence the following list can also serve as an updated checklist. To provide more useful tools for the any efforts connected to nature conservation, indicator species are also marked in the list. These species are not extremely rare or threatened, but they do qualify their habitats from the aspect of its conservation value, *i.e.* by their occurrence they reflect the richness of the bryoflora and the biodiversity of the wider location. Based on the mere presence of these species, any particular area can be evaluated conservationally, and areas where many indicator species occur, can be designated as important bryophyte areas (IBrA) (ANDERSON 2002, PAPP 2008).

METHODS

For the red list, each species of the previous checklist (ERZBERGER and PAPP 2004) and the species found after 2004 were evaluated. The evaluation of threat categories is based mainly on the recent knowledge regarding their occurrences. The IUCN red list criteria were used (IUCN 2001, 2003*a*, *b*) with the application guidelines for bryophytes (HALLINGBÄCK *et al.* 1998). Main criterion used is B (current distribution, number of localities), but criterion A (decline in distribution, population size) and criterions C, D (small, fragmented populations or high fluctuation in population size) were also considered.

The evaluation according to the number of recently known localities (criterion B) is as follows: 1 (CR), < 5 (EN), < 10 (VU). The earlier known rarity or distribution, vulnerability of habitats, under-representation in recent collections and threat at European level were also taken into account.

The following abbreviations of red list categories were used:

RE = Regionally extinct. Species, which were indicated in the first red list (RAJCZY 1990) as extinct, but included in the previous checklist (ERZBERGER and PAPP 2004).

CR = Critically endangered. Taxa known only from a single locality, represented by a small population with extremely high risk of extinction.

EN = Endangered. Taxa recorded in two to five localities with high risk of extinction or in some cases on a single locality, but stable population since many decades, and when its habitat is not threatened.

VU = Vulnerable. Taxa known from six to ten localities with a high risk of extinction.

NT = Near threatened. Taxa known from more than ten localities, but with small, fragmented populations or living in endangered habitats. Great possibility to be qualified VU or EN in the future.

DD = Data-deficient. Taxa without any recent data.

DD-va = Data-deficient vanished. Taxa without any recent data, which were searched on their earlier known localities without success. This sub-category was established by KUČERA and VÁŇA (2003) for the Czech bryophyte red list and used successfully by SÉRGIO *et al.* (2006) for the bryophyte red list of the Iberian Peninsula.

DD-n = Data-deficient new. Taxa newly reported from the country and with insufficient information to evaluate its threat status. This sub-category was established by SÉRGIO *et al.* (2006) for the bryophyte red list of the Iberian Peninsula.

LC = Least concern. Taxa, which are not threatened.

LC-att = Least concern attention. Taxa, which are still not threatened, but need attention. This sub-category was established by KUČERA and VÁŇA (2003) for the Czech bryophyte red list and used successfully by SÉRGIO *et al.* (2006) for the bryophyte red list of the Iberian Peninsula.

In the case of species included in the red data book of European bryophytes (RDB) (ECCB 1995) the given categories are indicated. The threat categories according to the RDB are as follows: CR = critically endangered, E = endangered, R = rare, RT = regionally threatened, K = insufficiently known, V = vulnerable.

Species marked as indicators are those, which indicate the high nature conservation value of the habitat where they live; habitats, substrates are given in bracket.

Taxa discovered after 2004 and not included in the main list of the previous Hungarian checklist (ERZBERGER and PAPP 2004) are marked by an asterisk (*).

Nomenclature mainly follows ERZBERGER and PAPP (2004), and for *Bryum moravicum*, *Plagiothecium curvifolium*, *Schistidium helveticum*, *Tortula schimperi* and species reported for the first time in Hungary, GROLLE and LONG (2000), HILL *et al.* (2006), and SZWEYKOWSKI *et al.* (2005).

Note that our wording of "recently known locality" may refer to either recent discoveries, or old data recently confirmed.

SPECIES LIST

Hornworts

Anthoceros agrestis Paton – NT (under-represented in recent collections due to seasonal appearance)
Phaeoceros carolinianus (Michx.) Proskauer – NT (under-represented in recent collections due to seasonal appearance)

Liverworts

Anastrophyllum hellerianum (Lindenb.) R. M. Schust. – CR (recently discovered in Hungary, a single locality (ÓDOR 2000))
Anastrophyllum michauxii (F. Weber) H. Buch – DD-va
Anastrophyllum minutum (Schreb.) R. M. Schust. – EN
Aneura pinguis (L.) Dumort. – NT, indicator (wetland)
Apometzgeria pubescens (Schrank) Kuwah. – VU
Asterella saccata (Wahlenb.) A. Evans – VU (RDB: VU; in Hungary still present in almost all earlier known localities; number of populations: 13 (PAPP 2008, Papp and Németh unpublished), but populations are small.
Athalamia hyalina (Sommerf.) S. Hatt. – EN
Barbilophozia barbata (Schreb.) Loeske – LC-att, indicator (rock, grassland)
Barbilophozia floerkei (F. Weber et D. Mohr) Loeske – DD-va (a single old record (ERZBERGER and PAPP 2004))
Bazzania trilobata (L.) Gray – NT, indicator (acidic soil in forest)
Blasia pusilla L. – EN
Blepharostoma trichophyllum (L.) Dumort. – VU, indicator (decaying wood)
Calypogeia azurea Stotler et Crotz – NT, indicator (acidic soil in forest, mainly in western Hungary)
Calypogeia fissa (L.) Raddi – NT, indicator (acidic soil in forest; mainly in western Hungary)
Calypogeia integristipula Steph. – DD (a single old record (ERZBERGER and PAPP 2004))
Calypogeia muelleriana (Schiffn.) Müll. Frib. – NT, indicator (acidic soil in forest)
Calypogeia neesiana (C. Massal. et Carestia) Müll. Frib. – DD-va
Calypogeia suecica (Arnell et J. Perss.) Müll. Frib. – EN
Cephalozia bicuspidata (L.) Dumort. – LC-att, indicator (acidic soil in forest)
Cephalozia catenulata (Huebener) Lindb. – DD-va
Cephalozia lacinulata J. B. Jack ex Spruce – DD-va (RDB: VU)
Cephalozia lunulifolia (Dumort.) Dumort. – DD
Cephalozia macrostachya Kaal. – DD (a single old record (ERZBERGER and PAPP 2004))
Cephalozia pleniceps (Austin) Lindb. – DD-va
Cephaloziella divaricata (Sm.) Schiffn. – LC
Cephaloziella hampeana (Nees) Schiffn. – DD

Cephaloziella integerrima (Lindb.) Warnst. – DD
Cephaloziella rubella (Nees) Warnst. – LC-att, indicator (acidic soil in forest)
Cephaloziella spinigera (Lindb.) Warnst. – DD-va (a single old record (ERZBERGER and PAPP 2004))
Cephaloziella stellulifera (Spruce) Schiffn. – DD
Chiloscyphus pallescens (Hoffm.) Dumort. – VU
Chiloscyphus polyanthos (L.) Corda – LC-att, indicator (wet places)
Cololejeunea calcarea (Lib.) Schiffn. – NT, indicator (shaded rock)
Cololejeunea rossettiana (C. Massal.) Schiffn. – NT, indicator (shaded rock)
Conocephalum conicum (L.) Dumort. – LC
* ***Conocephalum salebrosum*** Szweykowski, Buczkowska et Odrzykoski – LC (recently recognised in Hungary taxonomically (PAPP 2009*c*); not rare)
Diplophyllum albicans (L.) Dumort. – EN (a single recently known locality; Szűcs unpublished)
Diplophyllum obtusifolium (Hook.) Dumort. – EN
Fossombronia foveolata Lindb. – DD
Fossombronia pusilla (L.) Nees – VU
Fossombronia wondraczekii (Corda) Lindb. – DD
Frullania dilatata (L.) Dumort. – LC
Frullania fragilifolia (Taylor) Gottsche, Lindenb. et Nees – EN
Frullania inflata Gottsche – EN (RDB: VU; number of populations: 3 (PAPP 2008))
Frullania jackii Gottsche – DD-va (a single old record (ERZBERGER and PAPP 2004))
Frullania tamarisci (L.) Dumort. – NT, indicator (rock, grassland)
Gymnocolea inflata (Huds.) Dumort. – EN (a single locality, but since almost 80 years having a stable population)
Jamesoniella autumnalis (DC.) Steph. – NT, indicator (acidic soil, rock in forest)
Jungermannia atrovirens Dumort. – DD
Jungermannia caespiticia Lindenb. – DD
Jungermannia gracillima Sm. – NT, indicator (acidic soil)
Jungermannia hyalina Lyell – EN
Jungermannia leiantha Grolle – EN
Jungermannia pumila With. – DD
Jungermannia sphaerocarpa Hook. – EN
Jungermannia subulata A. Evans – DD (RDB: R)
Leiocolea badensis (Gottsche) Jörg. – DD
Leiocolea collaris (Nees) Schljakov – VU
Leiocolea heterocolpos (Hartm.) H. Buch – DD-va
Lejeunea cavifolia (Ehrh.) Lindb. – NT, indicator (shaded rock)
Lepidozia reptans (L.) Dumort. – LC-att, indicator (acidic soil in forest, decaying wood)
Lophocolea bidentata (L.) Dumort. – LC-att, indicator (wet places)
Lophocolea heterophylla (Schrad.) Dumort. – LC
Lophocolea minor Nees – LC-att, indicator (shaded rock, soil)

Lophozia ascendens (Warnst.) R. M. Schust. – EN (RDB: R; number of populations: 2 (PAPP 2008))
Lophozia bicrenata (Hoffm.) Dumort. – NT
Lophozia excisa (Dicks.) Dumort. – NT
Lophozia incisa (Schrad.) Dumort. – DD-va
Lophozia longidens (Lindb.) Macoun – EN
Lophozia longiflora (Nees) Schiffn. – EN
Lophozia obtusa (Lindb.) A. Evans – DD-va (a single old record (ERZBERGER and PAPP 2004))
Lophozia sudetica (Huebener) Grolle – DD
Lophozia ventricosa (Dicks.) Dumort. – NT, indicator (shaded rock)
Lophozia wenzelii (Nees) Steph. – DD-va
Lunularia cruciata (L.) Dumort. ex Lindb. – LC-att
Mannia fragrans (Balb.) Frye et L. Clark – LC-att, indicator (open grassland)
Mannia triandra (Scop.) Grolle – EN (RDB: R, included in the EU Habitat Directives; two small populations)
Marchantia polymorpha L. subsp. ***polymorpha*** – LC
Marchantia polymorpha L. subsp. ***ruderalis*** Bischl. et Boisselier – LC
Marsupella emarginata (Ehrh.) Dumort. – DD-va
Marsupella funckii (F. Weber et D. Mohr) Dumort. – EN
Marsupella sprucei (Limpr.) Bernet – EN (mentioned as doubtful in the previous checklist (ERZBERGER and PAPP 2004), but recently re-discovered on a single locality (Erzberger unpublished))
Metzgeria conjugata Lindb. subsp. ***conjugata*** – NT, indicator (shaded rock)
Metzgeria conjugata Lindb. subsp. ***simplex*** (Müll. Frib.) R. M. Schust. – DD (a single old record (FRITSCH 1978))
Metzgeria fruticulosa (Dicks.) A. Evans – DD
Metzgeria furcata (L.) Dumort. – LC
Nardia geoscyphus (De Not.) Lindb. – DD
Nardia scalaris Gray – EN (a single recently known locality (Erzberger unpublished))
Nowellia curvifolia (Dicks.) Mitt. – VU, indicator (decaying wood)
Oxymitra incrassata (Brot.) Sergio et Sim-Sim – NT, indicator (open grassland)
Pedinophyllum interruptum (Nees) Kaal. – NT, indicator (shaded rock)
Pellia endiviifolia (Dicks.) Dumort. – LC
Pellia epiphylla (L.) Corda – DD (a single old record (ERZBERGER and PAPP 2004))
Plagiochila asplenioides (L.) Dumort. – NT, indicator (shaded rock, closed grassland)
Plagiochila porelloides (Nees) Lindenb. – LC
Porella arboris-vitae (With.) Grolle – EN
Porella baueri (Schiffn.) C. E. O. Jensen – VU (under *P. platyphylla* in the previous checklist (ERZBERGER and PAPP 2004))
Porella cordaeana (Huebener) Moore – VU
Porella platyphylla (L.) Pfeiff. – LC
Preissia quadrata (Scop.) Nees – EN

Ptilidium pulcherrimum (Weber) Vain. – NT, indicator (tree bark)
Radula complanata (L.) Dumort. – LC
Radula lindenbergiana Gottsche ex C. Hartm. – DD
Reboulia hemisphaerica (L.) Raddi – NT, indicator (shaded rock)
Riccardia chamedryfolia (With.) Grolle – DD-va
Riccardia incurvata Lindb. – DD-va (a single old record (ERZBERGER and PAPP 2004))
Riccardia latifrons (Lindb.) Lindb. – EN
Riccardia multifida (L.) Gray – EN
Riccardia palmata (Hedw.) Carruth. – NT, indicator (decaying wood)
Riccia bifurca Hoffm. – DD
Riccia canaliculata Hoffm. – DD
Riccia cavernosa Hoffm. emend. Raddi – NT
Riccia ciliata Hoffm. – VU
Riccia ciliifera Link ex Lindenb. – NT, indicator (open grassland)
Riccia crinita Taylor – VU
* ***Riccia crozalsii*** Levier – CR (recently discovered in Hungary, Erzberger unpublished)
Riccia crystallina L. emend. Raddi – DD
Riccia duplex Lorb. ex Müll. Frib. – DD (a single old record (ERZBERGER and PAPP 2004))
Riccia fluitans L. emend. Lorb. – LC-att, indicator (wet places, lakes)
Riccia frostii Austin – DD (RDB: R)
Riccia glauca L. – NT
Riccia gougetiana Durieu et Mont. – NT, indicator (open grassland)
Riccia huebeneriana Lindenb. – DD (RDB: R)
Riccia papillosa Moris – EN (a single recently known locality; Erzberger unpublished)
Riccia rhenana Lorb. ex Müll. Frib. – EN
Riccia sorocarpa Bisch. – LC-att, indicator (open grassland)
Riccia subbifurca Warnst. ex Croz. – DD
Riccia warnstorfii Limpr. ex Warnst. – DD
Ricciocarpos natans (L.) Corda – NT, indicator (wet places, lakes)
Scapania aequiloba (Schwägr.) Dumort. – EN
Scapania apiculata Spruce – DD-va (a single old record (ERZBERGER and PAPP 2004))
Scapania aspera M. Bernet et Bernet – VU
Scapania calcicola (Arnell et J. Perss.) Ingham – VU
Scapania curta (Mart.) Dumort. – EN (a single recently known locality; Erzberger unpublished)
Scapania irrigua (Nees) Nees – NT
Scapania lingulata H. Buch – EN
Scapania mucronata H. Buch – NT, indicator (shaded acidic rock)
Scapania nemorea (L.) Grolle – VU
Scapania scandica (Arnell et H. Buch) Macvicar – EN
Scapania umbrosa (Schrad.) Dumort. – DD-va (a single old record (ERZBERGER and PAPP 2004))
Scapania undulata (L.) Dumort. – VU

Sphaerocarpos texanus Austin – DD (a single old record (ERZBERGER and PAPP 2004))
Trichocolea tomentella (Ehrh.) Dumort. – EN
Tritomaria exsecta (Schmidel) Loeske – VU
Tritomaria exsectiformis (Breidl.) Loeske – DD
Tritomaria quinquedentata (Huds.) H. Buch – NT, indicator (rock, closed grassland)

Mosses

Acaulon muticum (Hedw.) Müll. Hal. – NT (under-represented in recent collections due to seasonal appearance and overlooking)
Acaulon triquetrum (Spruce) Müll. Hal. – NT (under-represented in recent collections due to seasonal appearance and overlooking)
Aloina aloides (Schultz) Kindb. – NT, indicator (open grassland, loess wall)
Aloina ambigua (Bruch et Schimp.) Limpr. – NT, indicator (open grassland, loess wall)
Aloina brevirostris (Hook. et Grev.) Kindb. – DD
Aloina rigida (Hedw.) Limpr. – NT, indicator (open grassland, loess wall)
Amblyodon dealbatus (Hedw.) Bruch et Schimp. – RE (RAJCZY 1990)
Amblystegium confervoides (Brid.) Schimp. – VU
Amblystegium fluviatile (Hedw.) Schimp. – NT, indicator (wet places, river)
Amblystegium humile (P. Beauv.) Crundw. – LC-att, indicator (wet places)
Amblystegium radicale (P. Beauv.) Schimp. – EN (RDB: R; a single recently known locality (PAPP 2008), not all of the earlier localities have been checked yet)
Amblystegium serpens (Hedw.) Schimp. – LC
Amblystegium subtile (Hedw.) Schimp. – LC
Amblystegium tenax (Hedw.) C. E. O. Jensen – LC
Amblystegium varium (Hedw.) Lindb. – LC-att, indicator (wet places)
Amphidium mougeotii (Bruch et Schimp.) Schimp. – VU, indicator (acidic rock)
Anacamptodon splachnoides (Brid.) Brid. – EN (RDB: EN, a single recent record (PAPP 2008), not all of the earlier localities have been checked yet))
Andreaea rupestris Hedw. – VU, indicator (acidic rock)
Anomodon attenuatus (Hedw.) Huebener – LC
Anomodon longifolius (Brid.) Hartm. – NT, indicator (shaded limestone rock, tree bark)
Anomodon rostratus (Hedw.) Schimp. – NT, indicator (shaded limestone rock); (RDB: R, number of populations more than 10 (PAPP 2008, NÉMETH 2007, 2008), but small populations)
Anomodon rugelii (Müll. Hal.) Keissl. – EN (a single recently known locality)
Anomodon viticulosus (Hedw.) Hook. et Taylor – LC
Antitrichia curtipendula (Hedw.) Brid. – EN
Aphanorrhegma patens (Hedw.) Lindb. – NT
Archidium alternifolium (Hedw.) Schimp. – DD
Atrichum angustatum (Brid.) Bruch et Schimp. – NT, indicator (acidic soil)
Atrichum undulatum (Hedw.) P. Beauv. – LC
Aulacomnium androgynum (Hedw.) Schwägr. – LC (expanding)

Aulacomnium palustre (Hedw.) Schwägr. – LC-att, indicator (wetland)
Barbula convoluta Hedw. – LC
Barbula indica (Hook.) Spreng. – DD
Barbula unguiculata Hedw. – LC
Bartramia halleriana Hedw. – VU, indicator (shaded rock)
Bartramia ithyphylla Brid. – VU, indicator (shaded rock)
Bartramia pomiformis Hedw. – LC-att, indicator (shaded rock)
Blindia acuta (Hedw.) Bruch et Schimp. – DD-va
Brachydontium trichodes (F. Weber) Milde – CR (RDB: R, a single recently known locality (PAPP 2008))
Brachythecium albicans (Hedw.) Schimp. – LC-att
Brachythecium campestre (Müll. Hal.) Schimp. – DD
Brachythecium capillaceum (F. Weber et D. Mohr) Giacom. – DD
Brachythecium geheebii Milde – DD-va (RDB: R)
Brachythecium glareosum (Spruce) Schimp. – NT
Brachythecium mildeanum (Schimp.) Schimp. ex Milde – LC-att, indicator (wet places)
Brachythecium laetum (Brid.) Schimp. – DD-va (RDB: R)
Brachythecium plumosum (Hedw.) Schimp. – DD
Brachythecium populeum (Hedw.) Schimp. – LC
Brachythecium reflexum (Starke) Schimp. – VU
Brachythecium rivulare Schimp. – LC-att, indicator (wet places)
Brachythecium rutabulum (Hedw.) Schimp. – LC
Brachythecium salebrosum (F. Weber et D. Mohr) Schimp. – LC
Brachythecium velutinum (Hedw.) Schimp. – LC
Bryoerythrophyllum recurvirostrum (Hedw.) P. C. Chen – LC-att, indicator (shaded limestone rock)
Bryum algovicum Sendtn. ex Müll. Hal. – LC
Bryum alpinum Huds. ex With. – LC-att
Bryum argenteum Hedw. – LC
Bryum bicolor Dicks. – LC
Bryum bornholmense Wink. et R. Ruthe – DD
Bryum caespiticium Hedw. – LC
Bryum capillare Hedw. – LC
Bryum creberrimum Taylor – DD
Bryum elegans Nees ex Brid. – LC-att
Bryum funckii Schwägr. – DD (a single old record (ERZBERGER and PAPP 2004))
Bryum gemmiferum R. Wilczek et Demaret – NT
Bryum gemmilucens R. Wilczek et Demaret – DD
Bryum imbricatum (Schwägr.) Bruch et Schimp. – DD
Bryum intermedium (Brid.) Blandow – DD
Bryum klinggraeffii Schimp. – LC-att
Bryum mildeanum Jur. – DD
Bryum moravicum Podp. – LC (as *B. laevifilum* in ERZBERGER and PAPP (2004))

Bryum neodamense Itzigs. ex Müll. Hal. – DD-va (RDB: VU)
Bryum pallens Sw. – VU, indicator (wet places)
Bryum pallescens Schleich. ex Schwägr. – DD
Bryum pseudotriquetrum (Hedw.) P. Gaertn., B. Mey. et Scherb. – LC-att, indicator (wet places)
Bryum radiculosum Brid. – LC
Bryum rubens Mitt. – LC
Bryum ruderale Crundw. et Nyholm – LC
Bryum schleicheri DC. – DD-va (a single old record (ERZBERGER and PAPP 2004))
Bryum stirtonii Schimp. – NT (RDB: DD)
Bryum torquescens Bruch et Schimp. – VU
Bryum turbinatum (Hedw.) Turner – DD
Bryum uliginosum (Brid.) Bruch et Schimp. – DD
Bryum versicolor A. Braun ex Bruch et Schimp. – DD (RDB: R)
Bryum violaceum Crundw. et Nyholm – LC-att
Bryum warneum (Röhl.) Blandow ex Brid. – DD (RDB: R)
Bryum weigelii Spreng. – DD
Buxbaumia aphylla Hedw. – VU, indicator (acidic soil)
Buxbaumia viridis (Lam. et DC.) Brid. ex Moug. et Nestl. – EN (RDB: VU, included in the EU Habitat Directives; two small populations (PAPP 2008, Ódor unpublished))
Calliergon cordifolium (Hedw.) Kindb. – NT, indicator (wetland)
Calliergon giganteum (Schimp.) Kindb. – CR (a single recent record, earlier known localities in bad condition)
Calliergon stramineum (Brid.) Kindb. – VU
Calliergonella cuspidata (Hedw.) Loeske – LC
Campylium calcareum Crundw. et Nyholm – LC
Campylium chrysophyllum (Brid.) Lange – LC
Campylium elodes (Lindb.) Kindb. – CR (RDB: RT; a single recent record, earlier known localities in bad condition)
Campylium polygamum (Schimp.) C. E. O. Jensen – NT, indicator (wetland)
Campylium stellatum (Hedw.) C. E. O. Jensen – NT, indicator (wetland)
* ***Campylopus introflexus*** (Hedw.) Brid. – LC (recently discovered in Hungary (SZŰCS 2007, 2009*a*, SZŰCS and ERZBERGER 2007), supposed expansion)
Campylopus pyriformis (Schultz) Brid. – DD
Campylostelium saxicola (F. Weber et D. Mohr) Bruch et Schimp. – CR (RDB: R; a single recently known locality (PAPP 2008))
Ceratodon conicus (Hampe) Lindb. – DD-n (recently discovered in Hungary (ZANTEN 1999, ERZBERGER and PAPP 2004); a single record)
Ceratodon purpureus (Hedw.) Brid. – LC
Cinclidotus danubicus Schiffn. et Baumgartner – DD
Cinclidotus fontinaloides (Hedw.) P. Beauv. – NT, indicator (wet places, spring, river)
Cinclidotus riparius (Host ex Brid.) Arn. – LC-att (only along the Danube and a part of the Dráva river)

Cirriphyllum piliferum (Hedw.) Grout – NT, indicator (humid forest)
Cirriphyllum tommasinii (Boulay) Grout – LC-att, indicator (shaded limestone rock)
Climacium dendroides (Hedw.) F. Weber et D. Mohr – LC-att, indicator (wet places, wetland)
Cnestrum schisti (F. Weber et D. Mohr) I. Hagen – DD-va
Conardia compacta (Müll. Hal.) H. Rob. – DD
* ***Coscinodon cribrosus*** (Hedw.) Spruce – CR (excluded taxon in the previous checklist (ERZBERGER and PAPP 2004), but a new locality was found by ERZBERGER (2009*a*, *b*))
Cratoneuron filicinum (Hedw.) Spruce – LC
Crossidium crassinerve (De Not.) Jur. – VU
Crossidium laxefilamentosum W. Frey et Kürschner – CR (recently discovered, a single record by PÓCS *et al*. (2004))
Ctenidium molluscum (Hedw.) Mitt. – LC
Cynodontium polycarpum (Hedw.) Schimp. LC-att, indicator (shaded acidic rock)
Cynodontium tenellum Limpr. – EN
Desmatodon cernuus (Huebener) Bruch et Schimp. – DD (RDB: R; erroneously reported from a recent locality in PAPP (2008))
Desmatodon heimii (Hedw.) Mitt. – EN
Dialytrichia mucronata (Brid.) Broth. – DD (a single old record (ERZBERGER and PAPP 2004))
Dichodontium pellucidum (Hedw.) Schimp. – NT, indicator (wet places, stream)
Dicranella cerviculata (Hedw.) Schimp. – CR (a single locality, but stable population more than 40 years)
Dicranella crispa (Hedw.) Schimp. – DD
Dicranella heteromalla (Hedw.) Schimp. – LC
* ***Dicranella howei*** Renauld et Cardot – NT (recently discovered in Hungary (ZANTEN 2006); probably overlooked)
Dicranella humilis R. Ruthe – DD (RDB: R)
Dicranella rufescens (Dicks.) Schimp. – NT
Dicranella schreberiana (Hedw.) Hilf. ex H. A. Crum et L. E. Anderson – LC
Dicranella staphylina H. Whitehouse – NT (under-represented in recent collections, probably overlooked)
Dicranella subulata (Hedw.) Schimp. – DD
Dicranella varia (Hedw.) Schimp. – LC
Dicranodontium denudatum (Brid.) E. Britton – EN (a single recently known locality, Erzberger unpublished)
Dicranoweisia cirrata (Hedw.) Lindb. ex Milde – LC-att, indicator (tree bark); (supposed expansion)
Dicranum bonjeanii De Not. – VU
Dicranum flagellare Hedw. – VU
Dicranum fulvum Hook. – VU
Dicranum montanum Hedw. – LC
Dicranum muehlenbeckii Bruch et Schimp. – DD

Dicranum polysetum Sw. – LC
Dicranum scoparium Hedw. – LC
Dicranum spurium Hedw. – VU
Dicranum tauricum Sapjegin – LC (expanding (NÉMETH 2009))
Dicranum viride (Sull. et Lesq.) Lindb. – VU (RDB: V, included in the EU Habitat Directives; number of localities: 8 (PAPP 2008, Papp and Ódor unpublished))
Didymodon acutus (Brid.) K. Saito – LC-att, indicator (open grassland)
Didymodon cordatus Jur. – LC-att, indicator (loess wall)
Didymodon fallax (Hedw.) R. H. Zander – LC
Didymodon ferrugineus (Besch.) M. O. Hill – VU
Didymodon glaucus Ryan – EN (RDB: R; a single recently known locality (PAPP 2008), stable population more than 40 years)
Didymodon insulanus (De Not.) M. O. Hill – NT
Didymodon luridus Hornsch. ex Spreng. – LC
Didymodon rigidulus Hedw. – LC-att, indicator (limestone rock, loess wall)
Didymodon sinuosus (Mitt.) Delogne – NT, indicator (wet places, stream)
Didymodon spadiceus (Mitt.) Limpr. – EN
Didymodon tophaceus (Brid.) Lisa – LC-att, indicator (wet places, spring, stream)
Didymodon vinealis (Brid.) R. H. Zander – LC
Diphyscium foliosum (Hedw.) D. Mohr – NT, indicator (acidic soil in forest)
Distichium capillaceum (Hedw.) Bruch et Schimp. – NT, indicator (shaded limestone rock)
Ditrichum crispatissimum (Müll. Hal.) Paris – DD-va (a single old record ERZBERGER 2001)
Ditrichum cylindricum (Hedw.) Grout – LC-att (under-represented in recent collections, overlooked)
Ditrichum flexicaule (Schwägr.) Hampe – LC
Ditrichum heteromallum (Hedw.) E. Britton – NT (a single recent record, but under-represented in recent collections)
Ditrichum pallidum (Hedw.) Hampe – LC-att
Ditrichum pusillum (Hedw.) Hampe – LC-att
Drepanocladus aduncus (Hedw.) Warnst. – LC
Drepanocladus cossonii (Schimp.) Loeske – EN
Drepanocladus lycopodioides (Brid.) Warnst. – EN (RDB: RT; two recently known localities (PAPP 2008))
Drepanocladus sendtneri (H. Müll.) Warnst. – EN (RDB: RT; two recently known localities (PAPP 2008))
Drepanocladus sordidus (Müll. Hal.) Hedenäs – DD (a single old record (ERZBERGER and PAPP 2004)
Encalypta ciliata Hedw. – VU, indicator (shaded acidic rock)
Encalypta streptocarpa Hedw. – LC
Encalypta vulgaris Hedw. – LC

* ***Entodon concinnus*** (De Not.) Paris – CR (excluded taxon in the previous checklist (ERZBERGER and PAPP 2004), but recently re-discovered due to revision of herbarium specimens (PÓCS *et al*. 2008); the single locality checked in 2010, still existing population (Erzberger unpublished))

Entosthodon fascicularis (Hedw.) Müll. Hal. – NT, indicator (open grassland)

Entosthodon hungaricus (Boros) Loeske – NT, indicator (saline grassland); (RDB: R, number of localities: 11 (PAPP 2008))

Ephemerum cohaerens (Hedw.) Hampe – DD

Ephemerum minutissimum Lindb. – NT

Ephemerum recurvifolium (Dicks.) Boulay – DD

Ephemerum serratum (Hedw.) Hampe – DD

Ephemerum sessile (Bruch) Müll. Hal. – DD (a single old record (ERZBERGER and PAPP 2004))

Eucladium verticillatum (Brid.) Bruch et Schimp. – NT, indicator (wet, shaded limestone rock)

Eurhynchium angustirete (Broth.) T. J. Kop. – LC

Eurhynchium crassinervium (Wilson) Schimp. – LC

Eurhynchium flotowianum (Sendtn.) Kartt. – VU

Eurhynchium hians (Hedw.) Sande Lac. – LC

Eurhynchium praelongum (Hedw.) Schimp. – VU

Eurhynchium pulchellum (Hedw.) Jenn. – NT, indicator (rocky grassland)

Eurhynchium pumilum (Wilson) Schimp. – NT

Eurhynchium schleicheri (R. Hedw.) Jur. – NT

Eurhynchium speciosum (Brid.) Jur. – EN

Eurhynchium striatulum (Spruce) Schimp. – LC-att, indicator (shaded rock)

Eurhynchium striatum (Hedw.) Schimp. – NT

Fabronia ciliaris (Brid.) Brid. – EN

Fabronia pusilla Raddi – EN

Fissidens adianthoides Hedw. – NT, indicator (wetland)

Fissidens arnoldii R. Ruthe – VU (RDB: R; number of localities: 5 (PAPP 2008))

Fissidens bryoides Hedw. – LC

Fissidens crassipes Wilson ex Bruch et Schimp. subsp. ***crassipes*** – LC

Fissidens crassipes Wilson ex Bruch et Schimp. subsp. ***warnstorfii*** (M. Fleisch.) Brugg.-Nann. – DD (a single old record (ERZBERGER and PAPP 2004))

Fissidens curnovii Mitt. – DD (a single old record (ERZBERGER and PAPP 2004))

Fissidens curvatus Hornsch. – DD-va (RDB: DD) (a single old record (ERZBERGER and PAPP 2004))

Fissidens dubius P. Beauv. – LC

Fissidens exiguus Sull. – EN (RDB: R; a single recently known locality from the Aggteleki-karszt Mts (PAPP and RAJCZY 1997), erroneously reported in PAPP (2009*c*) as *F. pusillus*)

Fissidens exilis Hedw. – NT

Fissidens gracilifolius Brugg.-Nann. et Nyholm – LC-att, indicator (shaded limestone rock)
Fissidens gymnandrus Büse – DD
Fissidens incurvus Starke ex Röhl. – EN
Fissidens pusillus (Wilson) Milde – LC
Fissidens taxifolius Hedw. – LC
Fissidens viridulus (Sw.) Wahlenb. – NT
Fontinalis antipyretica Hedw. – LC-att, indicator (wet places, stream)
Fontinalis hypnoides Hartm. – DD-va
Funaria hygrometrica Hedw. – LC
Funaria muehlenbergii Turner – NT, indicator (open rocky grassland)
Funaria pulchella H. Philib. – NT, indicator (open rocky grassland)
Grimmia anodon Bruch et Schimp. – LC-att, indicator (exposed limestone rock)
* ***Grimmia crinita*** Brid. – CR (recently discovered in Hungary, a single locality (PAPP 2009*b*))
* ***Grimmia decipiens*** (Schultz) Lindb. – EN (mentioned under the category of doubtful occurrence in the previous checklist (ERZBERGER and PAPP 2004), but recently re-discovered (ERZBERGER and MAIER 2008) in the field and by revision of herbarium specimens; two localities, at one still present (ERZBERGER 2009*a*)
Grimmia dissimulata E. Maier – LC-att, indicator (exposed limestone rock)
* ***Grimmia elatior*** Bruch ex Bals.-Criv. et De Not. – EN (recently discovered after taxonomic revision of herbarium specimens; a few localities, a single recently successfully checked locality (ERZBERGER 2009*a*, ERZBERGER *et al*. 2008))
Grimmia funalis (Schwägr.) Bruch et Schimp. – CR (a single locality, but stable population more than 50 years (ERZBERGER and PAPP 2004))
Grimmia hartmanii Schimp. – LC
Grimmia laevigata (Brid.) Brid. – LC
* ***Grimmia lisae*** De Not. – VU (recently discovered in Hungary after taxonomic revision of herbarium specimens; a few localities, few recent records (ERZBERGER 2009*a*, ERZBERGER and MAIER 2008, Papp unpublished)
Grimmia longirostris Hook. – EN (a single recently known locality (ERZBERGER 2009*a*))
Grimmia montana Bruch et Schimp. – CR (a single locality, but stable population for more than 50 years (ERZBERGER and PAPP 2004, ERZBERGER 2009*a*))
Grimmia muehlenbeckii Schimp. – LC-att, indicator (exposed acidic rock)
Grimmia orbicularis Bruch ex Wilson – LC-att, indicator (exposed limestone rock)
Grimmia ovalis (Hedw.) Lindb. – LC
Grimmia plagiopodia Hedw. – EN (RDB: R; number of localities 3 (PAPP 2008))
Grimmia pulvinata (Hedw.) Sm. – LC
Grimmia teretinervis Limpr. – DD-va (RDB: VU; two earlier known localities (ERZBERGER 2009*a*))
Grimmia tergestina Tomm. ex Bruch et Schimp. – LC-att, indicator (exposed limestone rock)
Grimmia trichophylla Grev. – NT, indicator (exposed acidic rock)

Gymnostomum aeruginosum Sm. – NT, indicator (shaded limestone rock)
Gymnostomum calcareum Nees et Hornsch. – NT, indicator (shaded limestone rock)
* ***Gymnostomum viridulum*** Brid. – NT (recently discovered in Hungary due to field work and herbarium revisions; few localities (PAPP 2009*b*); under-represented in collections, overlooked)
Gyroweisia tenuis (Hedw.) Schimp. – NT (under-represented in recent collections)
Hamatocaulis vernicosus (Mitt.) Hedenäs – DD-va (RDB: K, included in the EU Habitat Directives; checked in all earlier known localities without success)
Hedwigia ciliata (Hedw.) Ehrh. ex P. Beauv. – LC
Hedwigia stellata Hedenäs – EN
Helodium blandowii (F. Weber et D. Mohr) Warnst. – DD-va
Herzogiella seligeri (Brid.) Z. Iwats. – LC
Heterocladium dimorphum (Brid.) Schimp. – DD
Hilpertia velenovskyi (Schiffn.) R. H. Zander – NT, indicator (loess wall); (RDB: R, number of localities: 16 (PAPP 2008))
Homalia besseri Lobarz. – LC
Homalia trichomanoides (Hedw.) Schimp. – LC-att, indicator (tree bark, shaded rock)
Homalothecium lutescens (Hedw.) H. Rob. – LC
Homalothecium philippeanum (Spruce) Schimp. – LC
Homalothecium sericeum (Hedw.) Schimp. – LC
Homomallium incurvatum (Brid.) Loeske – LC
Hygrohypnum luridum (Hedw.) Jenn. – LC
Hylocomium brevirostre (Brid.) Schimp. – DD (a single old record (ERZBERGER and PAPP 2004))
Hylocomium splendens (Hedw.) Schimp. – LC
Hymenostylium recurvirostrum (Hedw.) Dixon – DD
Hypnum cupressiforme Hedw. – LC
* ***Hypnum jutlandicum*** Holmen et E. Warncke – NT (recently recognised in Hungary (PÉNZESNÉ KÓNYA and ORBÁN 2000, NÉMETH 2008); still few localities)
Hypnum lindbergii Mitt. – LC-att
Hypnum pallescens (Hedw.) P. Beauv. – LC-att
Hypnum vaucheri Lesq. – LC-att, indicator (open rocky grassland)
Isopterygiopsis pulchella (Hedw.) Z. Iwats. – DD-va
Isothecium alopecuroides (Dubois) Isov. – LC
Isothecium myosuroides Brid. – EN
Leptobryum pyriforme (Hedw.) Wilson – LC
Leptodictyum riparium (Hedw.) Warnst. – LC
Leptodon smithii (Hedw.) F. Weber et D. Mohr – EN
Leskea polycarpa Ehrh. ex Hedw. – LC
Leucobryum glaucum (Hedw.) Ångstr. – LC-att, indicator (acidic soil in forest); (included in the EU Habitat Directives: Annex V)
Leucobryum juniperoideum (Brid.) Müll. Hal. – LC-att, indicator (acidic soil in forest)
Leucodon sciuroides (Hedw.) Schwägr. – LC

Meesia triquetra (Richt.) Ångstr. – DD-va (a single old record (ERZBERGER and PAPP 2004))
Mnium hornum Hedw. – NT
Mnium lycopodioides Schwägr. – NT
Mnium marginatum (Dicks.) P. Beauv. – LC-att, indicator (shaded rock)
Mnium spinulosum Bruch et Schimp. – DD (a single old record (ERZBERGER and PAPP 2004))
Mnium stellare Hedw. – LC-att, indicator (shaded rock)
Mnium thomsonii Schimp. – VU (recent data only from the Sopron Mts (SZÖVÉNYI *et al*. 2001, Szűcs unpublished)
Myurella julacea (Schwägr.) Schimp. – NT, indicator (shaded limestone rock)
Neckera complanata (Hedw.) Huebener – LC
Neckera crispa Hedw. – NT, indicator (shaded rock)
Neckera pennata Hedw. – EN (RDB: V, number of localities: 4 (PAPP 2008, Purger unpublished, SZŰCS 2009*b*); small populations)
Neckera pumila Hedw. – DD
Orthothecium intricatum (Hartm.) Schimp. – NT, indicator (shaded limestone rock)
Orthotrichum affine Schrad. ex Brid. – LC
Orthotrichum anomalum Hedw. – LC
Orthotrichum cupulatum Brid. – LC-att, indicator (exposed rock, open rocky grassland)
Orthotrichum diaphanum Schrad. ex Brid. – LC
Orthotrichum gymnostomum Bruch ex Brid. – DD (a single old record (ERZBERGER and PAPP 2004))
Orthotrichum lyellii Hook. et Taylor – LC
Orthotrichum obtusifolium Brid. – NT, indicator (tree bark)
Orthotrichum pallens Bruch ex Brid. – LC
Orthotrichum patens Bruch ex Brid. – VU
Orthotrichum pumilum Sw. – NT, indicator (tree bark)
Orthotrichum rogeri Brid. – DD-va (RDB: VU, two old records)
Orthotrichum rupestre Schleich. ex Schwägr. – NT, indicator (open rocky grassland, exposed rock)
Orthotrichum scanicum Grönvall – DD (RDB: CR)
Orthotrichum speciosum Nees – LC-att, indicator (tree bark)
Orthotrichum sprucei Mont. – CR (recently discovered in Hungary (ERZBERGER and PAPP 2000); a single locality); (RDB: R)
Orthotrichum stellatum Brid. – DD (RDB: R)
Orthotrichum stramineum Hornsch. ex Brid. – LC
Orthotrichum striatum Hedw. – LC-att, indicator (tree bark)
Orthotrichum tenellum Bruch ex Brid. – DD
Orthotrichum urnigerum Myrin – EN
Oxystegus tenuirostris (Hook. et Taylor) A. J. E. Sm. – VU
Palustriella commutata (Hedw.) Ochyra – EN
Paraleucobryum longifolium (Hedw.) Loeske – LC

Phascum curvicolle Hedw. – LC-att, indicator (open rocky grassland)
Phascum cuspidatum Hedw. – LC
Phascum floerkeanum F. Weber et D. Mohr – NT, indicator (saline grassland); (RDB: K)
Phascum leptophyllum Müll. Hal. – LC-att (recently discovered in Hungary (ZANTEN 2000); supposed expansion)
Philonotis arnellii Husn. – NT, indicator (shaded rock, wet places)
Philonotis caespitosa Jur. – EN
Philonotis calcarea (Bruch et Schimp.) Schimp. – DD
Philonotis fontana (Hedw.) Brid. – VU
Philonotis marchica (Hedw.) Brid. – DD
Physcomitrium eurystomum Sendtn. – EN
Physcomitrium pyriforme (Hedw.) Brid. – LC
Physcomitrium sphaericum (C. F. Ludw.) Brid. – DD (RDB: R)
Plagiobryum zierii (Hedw.) Lindb. – VU
Plagiomnium affine (Blandow) T. J. Kop. – LC
Plagiomnium cuspidatum (Hedw.) T. J. Kop. – LC
Plagiomnium elatum (Bruch et Schimp.) T. J. Kop. – LC-att, indicator (wetland)
Plagiomnium ellipticum (Brid.) T. J. Kop. – NT
Plagiomnium medium (Bruch et Schimp.) T. J. Kop. – DD
Plagiomnium rostratum (anon.) T. J. Kop. – LC
Plagiomnium undulatum (Hedw.) T. J. Kop. – LC
Plagiopus oederianus (Sw.) H. A. Crum et L. E. Anderson – VU
Plagiothecium cavifolium (Brid.) Z. Iwats. – LC
Plagiothecium curvifolium Limpr. – LC (under *P. laetum* in ERZBERGER and PAPP (2004))
Plagiothecium denticulatum (Hedw.) Schimp. – LC
Plagiothecium laetum Schimp. – LC-att
Plagiothecium nemorale (Mitt.) A. Jaeger – LC
Plagiothecium platyphyllum Mönk. – DD
Plagiothecium ruthei Limpr. – LC-att
Plagiothecium succulentum (Wilson) Lindb. – LC
Plagiothecium undulatum (Hedw.) Schimp. – EN (a single old and two recent records)
Platydictya jungermannioides (Brid.) H. A. Crum – DD
Platygyrium repens (Brid.) Schimp. – LC
Platyhypnidium riparioides (Hedw.) Dixon – LC
Pleuridium acuminatum Lindb. – LC-att
Pleuridium subulatum (Hedw.) Rabenh. – LC-att
Pleurochaete squarrosa (Brid.) Lindb. – LC
Pleurozium schreberi (Brid.) Mitt. – LC
Pogonatum aloides (Hedw.) P. Beauv. – LC-att
Pogonatum nanum (Hedw.) P. Beauv. – EN (a single recent record, Erzberger unpublished)
Pogonatum urnigerum (Hedw.) P. Beauv. – LC

Pohlia andalusica (Höhn.) Broth. – NT (under-represented in collections, overlooked)
Pohlia annotina (Hedw.) Lindb. – DD
Pohlia camptotrachela (Renauld et Cardot) Broth. – DD (a single old record (ERZBERGER 2005))
Pohlia cruda (Hedw.) Lindb. – LC-att, indicator (shaded rock)
Pohlia elongata Hedw. – DD
* ***Pohlia lescuriana*** (Sull.) Ochi – LC (recently discovered in Hungary (PAPP 2009*b*), overlooked, misidentified)
Pohlia lutescens (Limpr.) H. Lindb. – LC-att
Pohlia melanodon (Brid.) A. J. Shaw – LC
Pohlia nutans (Hedw.) Lindb. – LC
Pohlia proligera (Breidl.) Lindb. ex Arnell – DD
* ***Pohlia schimperi*** (Müll. Hal.) A. L. Andrews – EN (recently discovered in Hungary (PAPP 2009*a*)
Pohlia wahlenbergii (F. Weber et D. Mohr) A. L. Andrews – LC-att, indicator (wet places)
Polytrichum alpinum Hedw. – EN
Polytrichum commune Hedw. – VU
Polytrichum formosum Hedw. – LC
Polytrichum juniperinum Hedw. – LC
Polytrichum longisetum Sw. ex Brid. – EN
Polytrichum piliferum Schreb. ex Hedw. – LC
Polytrichum strictum Menzies ex Brid. – VU
Pottia bryoides (Dicks.) Mitt. – LC-att, indicator (open rocky and saline grassland)
Pottia davalliana (Sm.) C. E. O. Jensen – LC-att, indicator (saline grassland)
Pottia intermedia (Turner) Fürnr. – LC-att, indicator (open rocky grassland)
Pottia lanceolata (Hedw.) Müll. Hal. – LC-att, indicator (open rocky and saline grassland)
Pottia mutica Venturi – LC-att, indicator (open rocky grassland)
Pottia starckeana (Hedw.) Müll. Hal. – DD
Pottia truncata (Hedw.) Bruch et Schimp. – LC
Pseudephemerum nitidum (Hedw.) Loeske – LC-att (under-represented in collections, overlooked)
Pseudocrossidium hornschuchianum (Schultz) R. H. Zander – LC
Pseudocrossidium revolutum (Brid.) R. H. Zander – NT
* ***Pseudoleskea incurvata*** (Hedw.) Loeske – CR (excluded taxon in the previous checklist (ERZBERGER and PAPP 2004) as the cited specimens were misidentified, later discovered following herbarium revision in a single old locality (ERZBERGER 2009*c*); existing small population after more than 50 years)
Pseudoleskea saviana (De Not.) Latzel – DD-va (RDB: RT; a single earlier known locality (ERZBERGER and PAPP 2004))
Pseudoleskeella catenulata (Brid. ex Schrad.) Kindb. – LC
Pseudoleskeella nervosa (Brid.) Nyholm – LC
Pseudotaxiphyllum elegans (Brid.) Z. Iwats. – NT

Pterigynandrum filiforme Hedw. – LC
Pterogonium gracile (Hedw.) Sm. – DD-va (old records from a single locality (ERZBERGER and PAPP 2004))
Pterygoneurum compactum M. J. Cano, J. Guerra et Ros – LC-att, indicator (loess wall)
Pterygoneurum crossidioides W. Frey, Herrnst. et Kürschner – VU (few localities (PÓCS 1999)
Pterygoneurum lamellatum (Lindb.) Jur. – EN (RDB: V; number of localities: 5 (KÜRSCHNER and PÓCS 2002, PAPP 2008), small populations)
Pterygoneurum ovatum (Hedw.) Dixon – LC-att, indicator (open rocky and saline grassland)
Pterygoneurum squamosum Segarra et Kürschner – NT, indicator (loess wall); (more than 10 localities (PÓCS 1999))
Pterygoneurum subsessile (Brid.) Jur. – NT, indicator (open rocky and saline grassland, loess wall)
Ptilium crista-castrensis (Hedw.) De Not. – EN
Pylaisia polyantha (Hedw.) Schimp. – LC
Pyramidula tetragona (Brid.) Brid. – EN (RDB: V; number of localities: 5 (PAPP 2008, Papp and Szurdoki unpublished), small populations, high fluctuation in population sizes)
Racomitrium affine (F. Weber et D. Mohr) Lindb. – DD
* ***Racomitrium aciculare*** (Hedw.) Brid. – DD (recently discovered in Hungary by revision of herbarium specimens (ERZBERGER 2009*c*), a single old record)
Racomitrium aquaticum (Schrad.) Brid. – CR (a single recently existing population)
Racomitrium canescens (Hedw.) Brid. – LC
Racomitrium heterostichum (Hedw.) Brid. – EN
* ***Racomitrium lanuginosum*** (Hedw.) Brid. – DD (recently discovered in Hungary by revision of herbarium specimens, a single old record, Erzberger unpublished)
Racomitrium obtusum (Brid.) Brid. – DD
Rhabdoweisia fugax (Hedw.) Bruch et Schimp. – NT, indicator (shaded acidic rock)
Rhizomnium punctatum (Hedw.) T. J. Kop. – LC
Rhodobryum ontariense (Kindb.) Kindb. – LC-att, indicator (shaded rock)
Rhodobryum roseum (Hedw.) Limpr. – VU
Rhynchostegiella curviseta (Brid.) Limpr. – VU
Rhynchostegiella tenella (Dicks.) Limpr. – NT, indicator (shaded and wet rock)
Rhynchostegiella teneriffae (Mont.) Dirkse et Bouman – VU (RDB: R; number of localities: 4 (PAPP 2008), not all of the earlier localities have been checked yet)
Rhynchostegiella tenuicaulis (Spruce) Kartt. – DD
Rhynchostegium confertum (Dicks.) Schimp. – NT
Rhynchostegium megapolitanum (F. Weber et D. Mohr) Schimp. – LC
Rhynchostegium murale (Hedw.) Schimp. – LC-att, indicator (shaded and wet rock)
Rhynchostegium rotundifolium (Brid.) Schimp. – VU (RDB: R; number of localities: 8 (PAPP 2008, Papp and Ódor unpublished))
Rhytidiadelphus squarrosus (Hedw.) Warnst. – LC

Rhytidiadelphus triquetrus (Hedw.) Warnst. – LC
Rhytidium rugosum (Hedw.) Kindb. – LC-att, indicator (closed grassland)
Saelania glaucescens (Hedw.) Broth. – VU
Sanionia uncinata (Hedw.) Loeske – NT, indicator (decaying wood)
Schistidium apocarpum (Hedw.) Bruch et Schimp. – LC
Schistidium brunnescens Limpr. subsp. ***brunnescens*** – LC-att, indicator (exposed limestone rock, open rocky grassland)
* ***Schistidium brunnescens*** Limpr. subsp. ***griseum*** (Nees et Hornsch.) H. H. Blom – NT (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium confertum*** (Funck) Bruch et Schimp. – DD (recently discovered in Hungary due to revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium confusum*** H. H. Blom – EN (recently discovered in Hungary; a single locality (ERZBERGER and SCHRÖDER 2008))
Schistidium crassipilum H. H. Blom – LC
* ***Schistidium dupretii*** (Thér.) W. A.Weber – VU (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium elegantulum*** H. H. Blom – LC-att (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
Schistidium flaccidum (De Not.) Ochyra – EN
Schistidium helveticum (Schkuhr) Deguchi – NT, indicator (exposed limestone rock, open rocky grassland); (as *S. singarense* in (ERZBERGER and PAPP 2004)
* ***Schistidium lancifolium*** (Kindb.) H. H. Blom – NT, indicator (shaded, moist acidic rock, but also on dolomite); (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium papillosum*** Crum. – EN (recently discovered in Hungary; a single locality (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium platyphyllum*** (Mitt.) H. Perss. – DD-va (recently discovered in Hungary due to revision of herbarium specimens; the single old locality checked without success (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium pruinosum*** (Wilson ex Schimp.) G. Roth – NT (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
* ***Schistidium robustum*** (Nees et Hornsch.) H. H. Blom – NT (recently discovered in Hungary due to recent collections and revision of herbarium specimens (ERZBERGER and SCHRÖDER 2008))
Scleropodium purum (Hedw.) Limpr. – LC
Scorpidium scorpioides (Hedw.) Limpr. – CR (a single recently known locality, earlier localities in bad condition and checked without success)
Seligeria calcarea (Hedw.) Bruch et Schimp. – DD
Seligeria campylopoda Kindb. – DD (a single old record (ERZBERGER and PAPP 2004))
Seligeria donniana (Sm.) Müll. Hal. – EN

Seligeria pusilla (Hedw.) Bruch et Schimp. – VU
Seligeria recurvata (Hedw.) Bruch et Schimp. – EN (a single recently known locality, Erzberger unpublished)
Seligeria trifaria (Brid.) Lindb. var. ***longifolia*** (Broth.) Ochyra et Gos – DD (a single old record (ERZBERGER and PAPP 2004))
Sphagnum angustifolium (Warnst.) C. E. O. Jensen – NT, indicator (wetland)
Sphagnum capillifolium (Ehrh.) Hedw. – VU
Sphagnum centrale C. E. O. Jensen – EN
Sphagnum compactum Lam. et DC. – EN
Sphagnum contortum Schultz – VU
Sphagnum cuspidatum Ehrh. ex Hoffm. – EN
Sphagnum denticulatum Brid. – EN
Sphagnum fallax (H. Klinggräff) H. Klinggräff – NT, indicator (wetland)
Sphagnum fimbriatum Wilson – NT
Sphagnum flexuosum Dozy et Molk. – VU
Sphagnum girgensohnii Russow – EN
Sphagnum inundatum Russow – EN
Sphagnum magellanicum Brid. – EN
Sphagnum obtusum Warnst. – EN
Sphagnum palustre L. – NT, indicator (wetland)
Sphagnum platyphyllum (Braithw.) Sull. ex Warnst. – VU
Sphagnum quinquefarium (Braithw.) Warnst. – VU
Sphagnum riparium Ångstr. – CR (a single recently known locality (SZURDOKI *et al.* 2000))
Sphagnum russowii Warnst. – EN
Sphagnum squarrosum Crome – NT
Sphagnum subnitens Russow et Warnst. – DD-va
Sphagnum subsecundum Nees – VU
Sphagnum teres (Schimp.) Ångstr. – CR (a single recently known locality (Fodor and Szurdoki unpublished))
Sphagnum warnstorfii Russow – RE (RAJCZY 1990, ERZBERGER and PAPP 2004)
Splachnobryum obtusum (Brid.) Müll. Hal. – DD (a single old record (ERZBERGER and PAPP 2004))
Taxiphyllum densifolium (Broth.) Reimers – VU (RDB: R; number of localities: 4 (PAPP 2008), not all of the earlier localities have been checked yet)
Taxiphyllum wissgrillii (Garov.) Wijk et Margad. – LC
Tetraphis pellucida Hedw. – LC-att, indicator (decaying wood)
Thamnobryum alopecurum (Hedw.) Gangulee – LC-att, indicator (shaded, wet rock)
Thuidium abietinum (Hedw.) Schimp. – LC
Thuidium delicatulum (Hedw.) Schimp. – LC-att
Thuidium philibertii Limpr. – LC-att
Thuidium recognitum (Hedw.) Lindb. – LC-att
Thuidium tamariscinum (Hedw.) Schimp. – LC-att

Timmia austriaca Hedw. – EN (a single known locality (ERZBERGER and PAPP 2004), but still existing population Pócs pers. com.)
Timmia bavarica Hessl. – EN
Tomentypnum nitens (Hedw.) Loeske – EN (a single recently known locality, Erzberger unpublished)
Tortella bambergeri (Schimp.) Broth. – NT (few localities, but overlooked, misidentified)
Tortella inclinata (R. Hedw.) Limpr. – LC
Tortella tortuosa (Hedw.) Limpr. – LC
Tortula atrovirens (Sm.) Lindb. – DD
Tortula brevissima Schiffn. – EN (RDB: R; number of localities: 3 (PAPP 2008))
Tortula calcicolens W. A. Kramer – LC-att, indicator (open rocky limestone grassland)
Tortula caninervis (Mitt.) Broth. subsp. ***spuria*** (J. J. Amann) W. A. Kramer – DD
Tortula crinita (De Not.) De Not. – LC-att, indicator (open rocky grassland)
Tortula inermis (Brid.) Mont. – DD
Tortula laevipila (Brid.) Schwägr. – DD
Tortula latifolia Bruch ex Hartm. – NT
Tortula mucronifolia Schwägr. – EN
Tortula muralis L. ex Hedw. – LC
Tortula norvegica (F. Weber) Wahlenb. ex Lindb. – DD-va
Tortula obtusifolia (Schwägr.) Mathieu – EN
Tortula papillosa Wilson – LC-att, indicator (tree bark)
Tortula papillosissima (Copp.) Broth. – NT
Tortula ruraliformis (Besch.) Ingham – DD
Tortula ruralis (Hedw.) P. Gaertn., B. Mey. et Scherb. – LC
Tortula schimperi M. J. Cano, O. Werner et J.Guerra – LC-att (under *T. subulata* as var. *angustata* in ERZBERGER and PAPP (2004))
Tortula subulata Hedw. – LC
Tortula virescens (De Not.) De Not. – LC-att
Trichostomum brachydontium Bruch – LC-att, indicator (open rocky grassland)
Trichostomum crispulum Bruch – LC-att, indicator (open rocky grassland)
Ulota bruchii Hornsch. ex Brid. – VU
Ulota coarctata (P. Beauv.) Hammar – DD
Ulota crispa (Hedw.) Brid. – NT, indicator (tree bark)
Ulota hutchinsiae (Sm.) Hammar – RE (RAJCZY 1990)
Warnstorfia exannulata (Schimp.) Loeske – CR
Weissia brachycarpa (Nees et Hornsch.) Jur. – LC-att
Weissia condensa (Voit) Lindb. – LC
Weissia controversa Hedw. – LC
Weissia fallax Sehlm. – NT (under-represented in collections, overlooked)
Weissia longifolia Mitt. – LC-att
Weissia rostellata (Brid.) Lindb. – EN
Weissia rutilans (Hedw.) Lindb. – NT (under-represented in collections, overlooked)
Zygodon rupestris Schimp. ex Lorentz – VU

DISCUSSION

Checklist

The previous bryophyte checklist of Hungary (ERZBERGER and PAPP 2004) contained 629 taxa (2 hornworts, 145 liverworts, 484 mosses). The recent checklist consists of 659 taxa (2 hornworts, 146 liverworts, 511 mosses). Three taxa (1 liverwort and 2 mosses) were placed under other species in the previous checklist. These are: *Porella baueri* under *P. platyphylla*, *Plagiothecium curvifolium* under *P. laetum*, *Tortula schimperi* under *T. subulata* as var. *angustata*. 27 taxa (2 liverworts, 25 mosses) were discovered in Hungary after 2004, these are as follows: *Conocephalum salebrosum*, *Riccia crozalsii*, *Campylopus introflexus*, *Coscinodon cribrosus*, *Dicranella howei*, *Entodon concinnus*, *Grimmia crinita*, *G. decipiens*, *G.elatior*, *G. lisae*, *Gymnostomum viridulum*, *Hypnum jutlandicum*, *Pohlia lescuriana*, *P. schimperi*, *Psedoleskea incurvata*, *Racomitrium aciculare*, *R. lanuginosum*, *Schistidium brunnescens* subsp. *griseum*, *S. confertum*, *S. confusum*, *S. dupretii*, *S. elongatum*, *S. lancifolium*, *S. papillosum*, *S. platyphyllum*, *S. pruinosum*, *S. robustum*. Most of these have turned up after complex revisions of herbarium materials of some large groups, in light of new taxonomic developments, *e.g.* the genus *Grimmia* (ERZBERGER 2009*a*), and *Schistidium* (ERZBERGER and SCHRÖDER 2008). In addition, some taxa are new here resulting from recent taxonomic treatments, which affected some species in concern, *e.g. Conocephalum conicum* or, taxonomic revisions of misidentified or overlooked specimens, such as *Pseudoleskeella incurvata*, *Racomitrium aciculare*, and *R. lanuginosum*. Finally, some species were found during our fieldwork on bryologically insufficiently explored areas, including *Grimmia crinita*, and *Gymnostomum viridulum*, or appeared in Hungary as immigrants like *Campylopus introflexus*.

Red List

As to current knowledge, 26.2% of the Hungarian bryoflora are threatened including categories CR (3%), EN (13.7%), and VU (9.5%), and 17.3% are near threatened (NT). In all of these categories, except CR, the percentage of liverworts (including hornworts) is higher than that of mosses (Table 1). The ratio of data-deficient taxa (DD, DD-va, DD-n) is also high (21.1%)

and a higher percentage of liverwort taxa falls into these categories, than that of mosses. This reflects the shortcomings of the state of our field bryology. On the other hand, we have to clearly state that some (or even many) of these data-deficient taxa have probably really disappeared from Hungary; these are mainly in the DD-va category, which were unsuccessfully searched on their earlier localities. And last but no least only 34.9% of the bryoflora can be regarded as non-threatened (LC, LC-att), but 20.6% of these also requires attention in the future. It is worrisome that only 15.5% of the liverworts are non-threatened; this percentage is higher at mosses (40.5%).

Table 1. Number and percentage of liverworts (including hornworts), mosses, and their total amounts, in the various categories in the Hungarian red list.

	Liverworts incl. Hornworts	Mosses	Total
RE	0	3 (0.6%	3 (0.45%)
CR	2 (1.35%)	18 (3.5%)	20 (3%)
EN	30 (20.3%)	60 (11.7)	90 (13.7%)
VU	16 (10.8%)	47 (9.2%)	63 (9.5%)
	48 (32.4%)	**125 (24.5%)**	**173 (26.2%)**
NT	**31 (20.9%)**	**83 (16.2%)**	**114 (17.3%)**
DD	29 (19.6%)	72 (14.1%)	101 (15.3%)
DD-va	17 (11.5%)	20 (3.9%)	37 (5.6%)
DD-n	0	1 (0.2%)	1 (0.15%)
	46 (31.1%)	**93 (18.2%)**	**139 (21.1%)**
LC-att	11 (7.4%)	83 (16.2%)	94 (14.3%)
LC	12 (8.1%)	124 (24.3%)	136 (20.6%)
	23 (15.5%)	**207 (40.5%)**	**230 (34.9%)**

Compared with other European bryophyte red lists, the percentage of threatened taxa in Hungary is rather similar to that in the Czech Republic (Table 2), but the ratio of near threatened (NT) and data deficient (DD) taxa is much higher in Hungary than in other European countries. This reflects the need of more fieldwork for up-to-date information about the data-deficient and near threatened taxa to help the evaluation of their

threat status. The percentage of non-threatened taxa is the lowest in Hungary compared with other European countries. This again calls our attention for greatly needed conservation efforts in order to preserve the habitats of rare bryophytes; hence the information about the localities of rarities and the knowledge about the environmental requirements of bryophytes should be properly communicated to the nature conservation authorities and national parks.

Table 2. Number and percentage of bryophytes in the various categories in recent red lists of some European countries; Iberian Peninsula (SÉRGIO *et al.* 2006), Czech Republic (KUČERA and VÁŇA 2003), Sweden (GÄRDENFORS 2005), Switzerland (SCHNYDER *et al.* 2004)

	Iberian Peninsula	Czech Republic	Sweden	Switzerland
RE	10 (0.9%)	27 (3.1%)	17 (1.5%)	15 (1.4%)
CR	18 (1.5%)	62 (7.1%)	11 (1.0%)	61 (5.6%)
EN	40 (3.6%)	68 (7.8%)	24 (2.2%)	58 (5.3%)
VU	114 (10.4%)	76 (8.7%)	57 (5.2%)	282 (25.8%)
	172 (15.5%)	**198 (25%)**	**92 (8.45%)**	**401 (36.7%**
NT	**26 (2.4%)**	**50 (5.7%)**	**69 (6.3%)**	**67 (6.1%)**
DD	**163 (14.8%)**	**141 (16.2%)**	**38 (3.5%)**	**98 (9%)**
LC-att	21 (1.9%)	88 (10.1%)	–	–
LC	711 (64.6%)	361 (41.4%)	–	–
	732 (66.5%)	**449 (51.5%)**	**777 (71.6%)**	**512 (46.8%)**
Total	1102	849	1085	1093

Indicator species

From the aspect of nature conservation, the list of indicator species can improve the evaluation of areas on the basis of their bryophyte flora. In several cases the sites rich in indicator species can be adequate for rarities as well, although sometimes the rare bryophytes can not be located on the site due to seasonality or due to small population size, scattered occurrence, or minute appearance. Still, the indicator species list provides a useful tool in selecting and assigning important bryophyte areas (IBrA) (ANDERSON 2002, PAPP 2008), which can promote the conservation of characteristic, well-developed bryophyte assemblages and rarities, even if their occurrence in the territory cannot be proved in a given time during one field excursion.

* * *

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REFERENCES

ANDERSON, S (2002): *Identifying important plant areas.* – PlantLife International, London, 51 pp.

ECCB (1995): *Red data book of European bryophytes*. – European Committee for Conservation of Bryophytes, Trondheim, 291 pp.

ERZBERGER, P. (2001): Ditrichum crispatissimum (Muell. Hal.) Paris, a new species of the Hungarian bryoflora, and Ditrichum flexicaule (Schleich. ex Schwaegr.) Hampe in Hungary. – *Studia bot. hung.* **32**: 87–105.

ERZBERGER, P. (2005): The bulbilliferous species of Pohlia (Bryaceae, Musci) in Hungary. – *Studia bot. hung.* **36**: 67–75.

ERZBERGER, P. (2009*a*): The genera Grimmia and Coscinodon (Grimmiaceae, Musci) in Hungary. – *Studia bot. hung.* **40**: 37–124.

ERZBERGER, P. (2009*b*): Coscinodon cribrosus (Hedw.) Spruce [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 20. – *J. Bryol.* **31**: 55.

ERZBERGER, P. (2009*c*): Pseudoleskea incurvata (Hedw.) Loeske, Racomitrium aciculare (Hedw.) Brid. [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 20. – *J. Bryol.* **31**: 57.

ERZBERGER, P. and MAIER, E. (2008): Grimmia decipiens (Schultz) Lindb., Grimmia lisae De Not. [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 18. – *J. Bryol.* **30**: 163.

ERZBERGER, P. and PAPP, B. (2000): Orthotrichum sprucei discovered in continental Central Europe. – *Herzogia* **14**: 213–215.

ERZBERGER, P. and PAPP, B. (2004): Annotated checklist of Hungarian bryophytes. – *Studia bot. hung.* **35**: 91–150.

ERZBERGER, P. and SCHRÖDER, W. (2008): The genus Schistidium (Grimmiaceae, Musci) in Hungary. – *Studia bot. hung.* **39**: 27–88.

ERZBERGER, P., MAIER, E. and SZŰCS, P. (2008): Grimmia elatior Bruch ex Bals.-Criv. et De Not. [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 18. – *J. Bryol.* **30**: 163.

FRITSCH, R. (1978): Chromosome numbers of some Hungarian liverworts. – *Abstracta Bot.* **5**(3): 75–78.

GÄRDENFORS, U. (2005): *Rödlistade arter i Sverie 2005*. – ArtDatabanken, Uppsala.

GROLLE, R. and LONG, D. G. (2000): An annotated check-list of the Hepaticae and Anthocerotae of Europe and Macaronesia. – *J. Bryol.* **22**: 103–140.

HALLINGBÄCK, T., HODGETTS, N., RAEYMAEKERS, G., SCHUMACKER, R., SÉRGIO, C., SÖDERSTRÖM, L., STEWART, N. and VÁŇA, J. (1998): Guidelines for application of the revised IUCN threat categories to bryophytes. – *Lindbergia* **23**: 6-12.

HILL, M. O., BELL, N., BRUGGEMANN-NANNENGA, M. A., BRUGUES, M., CANO, M. J., ENROTH, J., FLATBERG, K. I., FRAHM, J.-P., GALLEGO, M. T., GARILLETI, R., GUERRA, J., HEDENÄS, L., HOLYOAK, D. T., HYVÖNEN, J., IGNATOV, M. S., LARA, F., MAZIMPAKA, V., MUÑOZ, J. and SÖDERSTRÖM, L. (2006): An annotated checklist of the mosses of Europe and Macaronesia. – *J. Bryol.* **28**: 198–267.

IUCN (2001): *IUCN Red List categories and criteria. Version 3.1*. – IUCN Species Survival Commission, Gland, Switzerland and Cambridge, UK.

IUCN (2003*a*): *Guidelines for using the IUCN Red List categories and criteria*. – IUCN Species Survival Commission, Gland, Switzerland and Cambridge, UK.

IUCN (2003*b*): *Guidelines for application of IUCN Red List criteria at regional level: Version 3.0*. – IUCN Species Survival Commission, Gland, Switzerland and Cambridge, UK.

KUČERA, J. and VÁŇA, J. (2003): Check- and Red List of bryophytes of the Czech Republic (2003). – *Preslia*, Praha, **75**: 193–222.

KÜRSCHNER, H. and PÓCS, T. (2002): Bryophyte communities of the loess cliffs of the Pannonian basin and adjacent areas, with the description of Hilpertio velenovskyi-Pterygoneurum compacti ass. nov. Studies on the cryptogamic vegetation of loess cliffs, IV. – *Nova Hedwigia* **75**(1–2): 101–119.

NÉMETH, CS. (2007): Data on the distribution of some rare alpine-boreal bryophytes in the Vértes Mts (Hungary). – *Studia bot. hung.* **38**: 59–70.

NÉMETH, CS. (2008): Adatok a Súri-Bakonyalja, a Bakony és a Vértes mohaflórájához. [Data to the bryophyte flora of the Súri-Bakonyalja, Bakony and Vértes Mts]. – *Flora Pannonica* **6**: 79–87.

NÉMETH, CS. (2009): Adatok a Dicranum tauricum Sapjegin hazai elterjedéséhez. (Data on the distribution of Dicranum tauricum Sapjegin in Hungary). – *Flora Pannonica* **7**: 51–55.

ÓDOR, P. (2000): Új faj a hazai mohaflórában: az Anastrophyllum hellerianum (Nees ex Lindenb.) Schust. [New species in the Hungarian bryophyte flora: Anastrophyllum hellerianum (Nees ex Lindenb.) Schust.]. – *Kitaibelia* **5**(1): 111–113.

PAPP, B. (2008): Selection of important bryophyte areas in Hungary. – *Folia Cryptog. Estonica* **44**: 101–111.

PAPP, B. (2009*a*): Pohlia nutans (Hedw.) Lindb. subsp. schimperi (Müll. Hal.) Nyholm. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 20. – *J. Bryol.* **31**: 57.

PAPP, B. (2009*b*): Grimmia crinita Brid., Gymnostomum viridulum Brid., Pohlia lescuriana (Sull.) Ochi [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 21. – *J. Bryol.* **31**: 132–139.

PAPP, B. (2009*c*): *The bryophyte flora of the Aggtelek National Park*. – In: PAPP, B. (ed.): The flora of the Aggtelek National Park. Cryptogams, Natural history of the national parks of Hungary. Magyar Természettudományi Múzeum, Budapest, Vol. 14, pp. 175–230.

PAPP, B. and RAJCZY, M. (1997): *Bioindication of habitat conditions with bryophytes at some streams in Aggtelek National Park and Balaton-felvidék region, Hungary*. – In: TÓTH, E. and HORVÁTH, R. (eds): Proceedings of "Research, Conservation, Management" Conference, Aggtelek, Hungary, Vol. 2, pp. 47–57.

PÉNZESNÉ KÓNYA, E. and ORBÁN, S. (2000): A Bükk-hegység radiolarit alapkőzetű területeinek mohaflórája II. (The bryophyte flora of radiolarite bedrock in the Bükk mountains II). – *Kitaibelia* **5**: 125–130.

PÓCS, T. (1999): A löszfalak virágtalan növényzete I. Orografikus sivatag a Kárpát-medencében. (Studies on the cryptogamic vegetation of loess cliffs, I. Orographic desert in the Carpathian Basin). – *Kitaibelia* **4**: 143–156.

PÓCS, T., ZANTEN, B. O. VAN and ERZBERGER, P. (2008): Entodon concinnus (De Not.) Paris [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 18. – *J. Bryol.* **30**: 163.

PÓCS, T., SABOVLJEVIĆ, M., PUCHE, F., SEGARRA MORAGUES, J. G., GIMENO, C. and KÜRSCHNER, H. (2004): Crossidium laxefilamentosum Frey and Kürschner (Pottiaceae), new to Europe and to North Africa. (Studies on the cryptogamic vegetation on loess cliffs, VII). – *J. Bryol.* **26**: 113–124.

RAJCZY, M. (1990): *Mohák - Bryophyta*. – In: RAKONCZAI, Z. (ed.): Vörös Könyv. Akadémiai Kiadó, Budapest, pp. 322–325.

SCHNYDER, N., BERGAMINI, A. and HOFMAN, H. (2004): *Rote Liste der gefährdeten Moose der Schweiz*. – Hrsg. Buwal, Fub & Nism. Buwal-reihe, Vollzug umwelt, Bern.

SÉRGIO, C., BRUGUÉS, M., CROS, R. M., CASAS, C. and GARCIA, C. (2006): The 2006 Red List and an updated checklist of bryophytes of the Iberian Peninsula (Portugal, Spain, Andorra). – *Lindbergia* **31**: 109–125.

SZÖVÉNYI, P., GALAMBOS, I. and HOCK, ZS. (2001): A Soproni-hegység mohaflórája. (Bryophyte flora of the Sopron Mts). – *Tilia* **10**: 5–180.

SZURDOKI, E., TÓTH, Z. and PELLES, G. (2000): The Sphagnum populations of the Zemplén Mountains, NE Hungary. – *Studia bot. hung.* **30–31**: 113–125.

SZŰCS, P. (2007): Dunaalmás és Neszmély környékének mohaflórája. [Bryophyte flora of the surroundings of Dunaalmás and Neszmély, Hungary]. – *Bot. Közlem.* **94**(1–2): 91–115.

SZŰCS, P. (2009*a*): A Campylopus introflexus Hedw. új hazai előfordulása a Bockerekerdőben. [The new occurrence of Campylopus introflexus Hedw. in Hungary in the Bockerek forest]. – *Kitaibelia* **14**(1): 123.

SZŰCS, P. (2009*b*): Mohaflorisztikai vizsgálatok az Őrség területén. [Bryofloristical investigation in the territory of Őrség, Hungary]. – *Praenorica, Folia Historico-Naturalia* **11**: 13–48.

SZŰCS, P. and ERZBERGER, P. (2007): Campylopus introflexus Hedw. [Hungary]. – In: BLOCKEEL, T. L. (ed.): New national and regional bryophyte records, 16. – *J. Bryol.* **29**: 199.

SZWEYKOWSKI, J., BUCZKOWSKA, K. and ODRZYKOSKI, I. J. (2005): Conocephalum salebrosum (Marchantiopsida, Conocephalaceae) – a new Holarctic liverwort species. – *Pl. Syst. Evol.* **253**: 133–158.

ZANTEN, B. O. VAN (1999): Studies on the cryptogamic vegetation of loess cliffs, III. Ceratodon conicum (Hampe) Lindb., new to Hungary. – *Kitaibelia* **4**: 163–164.
ZANTEN, B. O. VAN (2000): Studies on the cryptogamic vegetation of loess cliffs, IV. Chenia leptophylla (C. Müll.) Zander, new to Hungary. – *Kitaibelia* **5**: 271–274.
ZANTEN, B. O. VAN (2006): Studies on the cryptogamic vegetation of loess cliffs, VIII. Dicranella howei Ren. & Card., a new addition to the Hungarian bryoflora. – *Kitaibelia* **9**: 45–47.

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