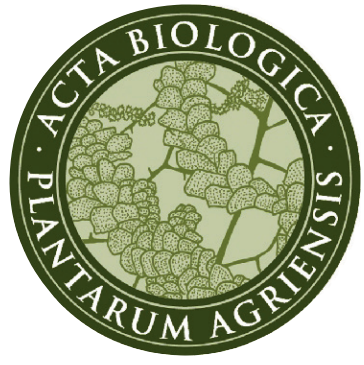
Peter Erzberger

THE BRYOPHYTES OF HUNGARY
KEYS FOR IDENTIFICATION

TOMUS 14.
NUMERUS 2.



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THE BRYOPHYTES OF HUNGARY KEYS FOR IDENTIFICATION

2nd enlarged and improved edition
including an explanation of technical terms in Hungarian

Peter Erzberger

with contributions from
Kornél Baráth, János Csiky & Beáta Papp

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Abstract: Keys for the identification of all bryophytes presently known to occur in Hungary, well over 700 taxa, are presented. The three groups: Hornworts, Liverworts, and Mosses are treated separately. Bryophyte identification using these keys proceeds in two steps: 1. Artificial keys to the genera, 2. Keys from genera to species, arranged systematically according to recent taxonomy. Each species of the Hungarian bryophyte flora is assigned to one of six frequency classes (very common: cc, common: c, sporadic to frequent: s-f, rare: r, very rare: rr, not seen: n.s.). A glossary explaining the technical terms used in the keys together with its Hungarian equivalent (Alaktani kifejezések) and an index of genera are included.

Keywords: Genera, species, glossary, mosses, liverworts, hornworts

PREFACE TO THE SECOND EDITION

After the publication of the First edition (Erzberger 2021) many bryophyte taxa were newly reported for the country. Therefore, a new edition has been prepared which should enable the identification of all Hungarian bryophytes including these additional taxa.

Table 1. Additions to the bryophyte flora of Hungary after 2020

Taxon	References
Calypogeia arguta Nees & Mont.	Papp and Szurdoki in Ellis *et al.* (2021b)
Ceratodon conicus (Hampe) Lindb.	Martin in Blockeel *et al.* (2024), Martin in Wilbraham *et al.* (2026)
Cryphaea heteromalla (Hedw.) D.Mohr	Csiky and Sipos in Ellis *et al*. (2024c)
Didymodon desertorum (J. Froehl.) J.A. Jiménez & M.J. Cano	Martin in Blockeel (2025), Martin in Wilbraham *et al.* (2026)
Encalypta spathulata Müll.Hal.	Németh and Schmotzer in Ellis *et al.* (2021c), Németh and Schmotzer (2022)
Fissidens rivularis (Spruce) Schimp.	Csiky *et al.* in Wilbraham *et al*. (2025)
Hydrogonium croceum (Brid.) Jan Kučera	Németh and Schmotzer in Ellis *et al.* (2021b), Németh and Schmotzer (2022)
Hymenoloma crispulum (Hedw.) Ochyra	Németh and Erzberger in Ellis *et al*. (2022); Németh and Erzberger (2023)
Hypnum andoi A.J.E. Smith	Csiky *et al.* in Wilbraham *et al.* (2026)
Lewinskya acuminata (H. Philib.) F. Lara, Garilleti & Goffinet	Papp in Csiky *et al* (2026).
Lewinskya fastigiata (Bruch ex Brid.) Vigalondo, F.Lara & Garilleti	Erzberger *et al.* (ined.)
Lewinskya shawii (Wilson) F. Lara, Garilleti & Goffinet	Erzberger and Szűcs in Ellis *et al*. (2023)
Marchantia polymorpha L. subsp. *montivagans* Bischl. & Boissel.- Dub.	Papp in Aszalósné Balogh *et al.* (2021)
Microbryum conicum (Schwägr.) Cl. Schneid., Th. Schneid. & Mahévas	Schneider and Schneider in Blockeel *et al.* (2024)
Orthothecium rufescens (Dicks. ex Brid.) Schimp.	Németh and Schmotzer in Ellis *et al.* (2021b), Németh and Schmotzer (2022)
Oxyrrhynchium distichum (J.E. Zetterst.) Hedenäs	Csiky and Sipos (ined.)
Oxyrrhynchium swartzii (Turner) Warnst.	Hedenäs (2024)
Physcomitrium arenicola Laz.	Papp and Erzberger in Csiky *et al*. (2025)
Pohlia bulbifera (Warnst.) Warnst.	Erzberger *et al.* in Ellis *et al.* (2021c)

Pterygoneurum kozlovii Laz.	Blockeel *et al.* (2024)
Ptychostomum touwii Bijlsma, Kruijer & M. Stech	Schneider and Schneider in Blockeel *et al.* (2024)
Rhytidiadelphus loreus (Hedw.) Warnst.	Németh in Ellis *et al.* (2021a)
Riccia pusilla subsp. *gothica (*Damsh. & Hallingb.) Pöltl & C.Berg	Pöltl *et al*. (2025)
Scleropodium touretii (Brid.) L.F. Koch	Csiky and Sipos in Ellis *et al*. (2024b)
Seligeria trifaria (Brid.) Lindb. var. *trifaria*	Németh and Schmotzer (ined.)
Sphaerocarpos michelii Bellardi	Wolf *et al*. in Ellis *et al*. (2022); Wolf *et al.* (2023)
Tortella angustifolia (Jur.) Köckinger & Hedenäs	Erzberger in Ellis *et al*. (2024a)
Tortella commutata Köckinger & Hedenäs var. *valida* Köckinger & Hedenäs	Erzberger in Ellis *et al*. (2024a)
Tortella humilis (Hedw.) Jenn.	Blockeel *et al.* (2024)

The frequencies of the newly reported taxa are not sufficiently known, many have been found in few sites only and are therefore at present classified as very rare or rare, but some can be expected to be more widespread.

For the new edition I have added a Hungarian version of the Glossary to facilitate use by Hungarian readers. This could not have been achieved without cooperation with the three Hungarian colleagues who contributed to this volume. It was not only necessary to decide on the use of Hungarian terms for the bryological vocabulary, but also to find concise definitions and easily understood explanations of these terms. In this process, a huge help was the excellent 'Növényanatómiai-Botanikai Terminológiai Szótár' by the recently deceased Professor Judit Darók from the University of Pécs (Darók 2011).

We thought it useful to give examples of species showing the character state explained in the glossary. Whenever feasible, we chose widespread or common species from the Hungarian bryophyte flora.

The core of the keys has not been profoundly changed apart from adding the newly recorded taxa. Some couplets have been amended, and many new notes have been added. Nomenclature and taxonomy, based on the comprehensive European and Hungarian checklists (Hodgetts *et al*. 2020, Erzberger and Papp 2020), are essentially unchanged with respect to the first edition of the keys, although in

the literature many new nomenclatural proposals have been published in the meantime, as was already expected at the time of writing the first edition. There are three exceptions concerning (i) the correct name of *Schistidium teretinerve* (Limpr.) Limpr. (instead of *Grimmia teretinervis*) (Kiebacher and Meier 2020), (ii) the updated name *Jochenia pallescens* (Hedw.) Hedenäs, Schlesak & D. Quandt (*Hypnum pallescens* var. *reptile*) after the clarification of a nomenclatural tangle (Berg *et al*. 2025), and (iii) the correct name *Cirriphyllum flotovianum* (Sendtn.) Ochyra instead of *Sciuro-hypnum 'flotowianum'* (Kučera and Müller 2025).

For the practical purpose of species identification based on morphological traits, I have lumped togegther some names of controversial, semicryptic or otherwise difficult taxa in aggregates (*Table 2*).

Table 2. Definition of some aggregates

Collective Taxon (aggregate)	**Constituent Taxa**
Conocephalum conicum agg.	*C. conicum, C. salebrosum*
Lophozia ventricosa agg.	*L. ventricosa, L. silvicola*
Riccia fluitans agg.	*R. fluitans, R. rhenana, R. stenophylla*
Riccia ciliifera agg.	*R. ciliifera, R. gougetiana*
Ptychostomum rubens agg.	*P. rubens, P. touwii*
Sphagnum magellanicum agg.	*S. divinum, S. medium,* and perhaps others

The introductory remarks of the 1st edition explaining some of the principles for constructing the keys will not be repeated here, nor the paragraph on recommended literature, esp. illustrations. The interested reader can find this information on the internet (Erzberger 2021).

Berlin, July 2026 Peter Erzberger

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CONSPECTUS OF CLASSIFICATION

The taxonomic hierarchy presented below is, as in the first edition, based on the most recent European checklist (Hodgetts *et al.* 2020), and the most recent Hungarian checklist (Erzberger and Papp 2020). More recent taxonomic developments deliberately have not been taken into account, except in the case of *Schistidium teretinerve, Jochenia pallescens* and *Cirriphyllum flotowianum* (see Preface). The classification will probably be outdated very soon since current concepts are in a state of flux due to ongoing molecular work. Only orders, families and genera are listed in this conspectus.

Anthocerotophyta (Hornworts)

Order	**1.**	**Anthocerotales**
Family	1.	Anthocerotaceae
	1.	*Anthoceros*
Order	**2.**	**Notothyladales**
Family	2.	Notothyladaceae
	2.	*Phaeoceros*

Marchantiophyta (Liverworts)

Order	**3.**	**Jungermanniales**
Family	3.	Adelanthaceae
	3.	*Syzygiella*
Family	4.	Anastrophyllaceae
	4.	*Anastrophyllum*
	5.	*Barbilophozia*
	6.	*Crossocalyx*
	7.	*Gymnocolea*
	8.	*Isopaches*
	9.	*Neoorthocaulis*
	10.	*Sphenolobus*
Family	5.	Cephaloziaceae
	11.	*Cephalozia*
	12.	*Fuscocephaloziopsis*
	13.	*Nowellia*
Family	6.	Cephaloziellaceae

	14.	*Cephaloziella*
	15.	*Obtusifolium*
Family	7.	Lophoziaceae
	16.	*Lophozia*
	17.	*Lophoziopsis*
	18.	*Trilophozia*
	19.	*Tritomaria*
Family	8.	Scapaniaceae
	20.	*Diplophyllum*
	21.	*Scapania*
	22.	*Schistochilopsis*
Family	9.	Calypogeiaceae
	23.	*Calypogeia*
Family	10.	Endogemmataceae
	24.	*Endogemma*
Family	11.	Gymnomitriaceae
	25.	*Marsupella*
	26.	*Nardia*
Family	12.	Jungermanniaceae
	27.	*Liochlaena*
	28.	*Jungermannia*
	29.	*Mesoptychia*
Family	13.	Solenostomataceae
	30.	*Solenostoma*
Family	14.	Blepharostomataceae
	31.	*Blepharostoma*
Family	15.	Lepidoziaceae
	32.	*Bazzania*
	33.	*Lepidozia*
Family	16.	Lophocoleaceae
	34.	*Chiloscyphus*
	35.	*Lophocolea*
Family	17.	Plagiochilaceae
	36.	*Pedinophyllum*
	37.	*Plagiochila*
Family	18.	Trichocoleaceae
	38.	*Trichocolea*
Order	**4.**	**Porellales**
Family	19.	Frullaniaceae
	39.	*Frullania*

Family	20.	Lejeuneaceae
	40.	*Cololejeunea*
	41.	*Lejeunea*
Family	21	Porellaceae
	42.	*Porella*
Family	22.	Radulaceae
	43.	*Radula*
Order	**5.**	**Ptilidiales**
Family	23.	Ptilidiaceae
	44.	*Ptilidium*
Order	**6.**	**Metzgeriales**
Family	24.	Aneuraceae
	45.	*Aneura*
	46.	*Riccardia*
Family	25.	Metzgeriaceae
	47.	*Metzgeria*
Order	**7.**	**Fossombroniales**
Family	26.	Fossombroniaceae
	48.	*Fossombronia*
Order	**8.**	**Pelliales**
Family	27.	Pelliaceae
	49.	*Apopellia*
	50.	*Pellia*
Order	**9.**	**Blasiales**
Family	28.	Blasiaceae
	51.	*Blasia*
Order	**10.**	**Lunulariales**
Family	29.	Lunulariaceae
	52.	*Lunularia*
Order	**11.**	**Marchantiales**
Family	30.	Aytoniaceae
	53.	*Asterella*
	54.	*Mannia*
	55.	*Reboulia*
Family	31.	Cleveaceae
	56.	*Clevea*
Family	32.	Conocephalaceae
	57.	*Conocephalum*
Family	33.	Marchantiaceae
	58.	*Marchantia*

Family	34.	Oxymitraceae
	59.	*Oxymitra*
Family	35.	Ricciaceae
	60.	*Riccia*
	61.	*Ricciocarpos*
Order	**12.**	**Sphaerocarpales**
Family	36.	Sphaerocarpaceae
	62.	*Sphaerocarpos*

Bryophyta (Mosses)

Order	**13.**	**Sphagnales**
Family	37.	Sphagnaceae
	63.	*Sphagnum*
Order	**14.**	**Andreaeales**
Family	38.	Andreaeaceae
	64.	*Andreaea*
Order	**15.**	**Tetraphidales**
Family	39.	Tetraphidaceae
	65.	*Tetraphis*
Order	**16.**	**Polytrichales**
Family	40.	Polytrichaceae
	66.	*Atrichum*
	67.	*Pogonatum*
	68.	*Polytrichastrum*
	69.	*Polytrichum*
Order	**17.**	**Buxbaumiales**
Family	41.	Buxbaumiaceae
	70.	*Buxbaumia*
Order	**18.**	**Diphysciales**
Family	42.	Diphysciaceae
	71.	*Diphyscium*
Order	**19.**	**Timmiales**
Family	43.	Timmiaceae
	72.	*Timmia*
Order	**20.**	**Encalyptales**
Family	44.	Encalyptaceae
	73.	*Encalypta*
Order	**21.**	**Funariales**
Family	45.	Funariaceae

	74.	*Pyramidula*
	75.	*Entosthodon*
	76.	*Funaria*
	77.	*Physcomitrium*
Order	**22.**	**Dicranales**
Family	46.	Distichiaceae
	78.	*Distichium*
Family	47	Hymenolomataceae
	79	*Hymenoloma*
Family	48.	Flexitrichaceae
	80.	*Flexitrichum*
Family	49.	Archidiaceae
	81.	*Archidium*
Family	50.	Leucobryaceae
	82.	*Campylopus*
	83.	*Dicranodontium*
	84.	*Leucobryum*
Family	51.	Amphidiaceae
	85.	*Amphidium*
Family	52.	Aongstroemiaceae
	86.	*Dichodontium*
Family	53.	Dicranellaceae
	87.	*Dicranella*
Family	54.	Fissidentaceae
	88.	*Fissidens*
Family	55.	Dicranaceae
	89.	*Dicranum*
	90.	*Paraleucobryum*
Family	56.	Rhabdoweisiaceae
	91.	*Cnestrum*
	92.	*Cynodontium*
	93.	*Dicranoweisia*
	94.	*Rhabdoweisia*
Family	57.	Bruchiaceae
	95.	*Bruchia*
Family	58.	Ditrichaceae
	96.	*Ceratodon*
	97.	*Ditrichum*
	98.	*Pleuridium*
	99.	*Pseudephemerum*

	100.	*Trichodon*
Family	59.	Pottiaceae
	101.	*Acaulon*
	102.	*Aloina*
	103.	*Barbula*
	104.	*Bryoerythrophyllum*
	105.	*Chenia*
	106.	*Cinclidotus*
	107.	*Crossidium*
	108.	*Didymodon*
	109.	*Hennediella*
	110.	*Hilpertia*
	111.	*Microbryum*
	112.	*Pseudocrossidium*
	113.	*Pterygoneurum*
	114.	*Syntrichia*
	115.	*Tortula*
	116.	*Streblotrichum*
	117.	*Chionoloma*
	118.	*Ephemerum*
	119.	*Eucladium*
	120.	*Gymnostomum*
	121.	*Gyroweisia*
	122.	*Hydrogonium*
	123.	*Hymenostylium*
	124.	*Splachnobryum*
	125.	*Tortella*
	126.	*Trichostomum*
	127.	*Weissia*
Order	**23.**	**Grimmiales**
Family	60.	Saelaniaceae
	128.	*Saelania*
Family	61.	Seligeriaceae
	129.	*Blindia*
	130.	*Blindiadelphus*
	131.	*Seligeria*
Family	62.	Ptychomitriaceae
	132.	*Brachydontium*
	133.	*Campylostelium*
Family	63.	Grimmiaceae

	134.	*Racomitrium*
	135.	*Coscinodon*
	136.	*Grimmia*
	137.	*Schistidium*
Order	**24.**	**Hedwigiales**
Family	64.	Hedwigiaceae
	138.	*Hedwigia*
Order	**25.**	**Bartramiales**
Family	65.	Bartramiaceae
	139.	*Bartramia*
	140.	*Plagiopus*
	141.	*Philonotis*
Family	66.	Meesiaceae
	142.	*Amblyodon*
	143.	*Leptobryum*
	144.	*Meesia*
Order	**26.**	**Bryales**
Family	67.	Bryaceae
	145.	*Bryum*
	146.	*Imbribryum*
	147.	*Ptychostomum*
	148.	*Rhodobryum*
Family	68.	Mniaceae
	149.	*Pohlia*
	150.	*Mnium*
	151.	*Plagiomnium*
	152.	*Rhizomnium*
Order	**27.**	**Orthotrichales**
Family	69.	Orthotrichaceae
	153.	*Codonoblepharon*
	154.	*Lewinskya*
	155.	*Nyholmiella*
	156.	*Orthotrichum*
	157.	*Pulvigera*
	158.	*Ulota*
	159.	*Zygodon*
Order	**28.**	**Orthodontiales**
Family	70.	Orthodontiaceae
	160.	*Orthodontium*
Order	**29.**	**Aulacomniales**

Family	71.	Aulacomniaceae
	161.	*Aulacomnium*
Order	**30.**	**Hookeriales**
Family	72.	Hookeriaceae
	162.	*Hookeria*
Order	**31.**	**Hypnales**
Family	73.	Fontinalaceae
	163.	*Fontinalis*
Family	74.	Plagiotheciaceae
	164.	*Herzogiella*
	165.	*Isopterygiopsis*
	166.	*Plagiothecium*
	167.	*Myurella*
	168.	*Orthothecium*
	169.	*Platydictya*
	170.	*Pseudotaxiphyllum*
Family	75.	Fabroniaceae
	171.	*Fabronia*
Family	76.	Pterigynandraceae
	172.	*Pterigynandrum*
Family	77.	Climaciaceae
	173.	*Climacium*
Family	78.	Amblystegiaceae
	174.	*Cratoneuron*
	175.	*Palustriella*
	176.	*Amblystegium*
	177.	*Anacamptodon*
	178.	*Campyliadelphus*
	179.	*Campylium*
	180.	*Campylophyllopsis*
	181.	*Conardia*
	182.	*Drepanocladus*
	183.	*Hygroamblystegium*
	184.	*Hygrohypnum*
	185.	*Leptodictyum*
	186.	*Pseudoamblystegium*
	187.	*Pseudocampylium*
	188.	*Serpoleskea*
	189.	*Tomentypnum*
Family	79.	Calliergonaceae

	190.	*Calliergon*
	191.	*Sarmentypnum*
	192.	*Straminergon*
Family	80.	Scorpidiaceae
	193.	*Hamatocaulis*
	194.	*Sanionia*
	195.	*Scorpidium*
Family	81.	Leskeaceae
	196.	*Claopodium*
	197.	*Leskea*
Family	82.	Pseudoleskeaceae
	198.	*Lescuraea*
Family	83.	Pseudoleskeellaceae
	199.	*Pseudoleskeella*
Family	84.	Thuidiaceae
	200.	*Abietinella*
	201.	*Helodium*
	202.	*Thuidium*
Family	85.	Brachytheciaceae
	203.	*Eurhynchium*
	204.	*Plasteurhynchium*
	205.	*Pseudoscleropodium*
	206.	*Rhynchostegium*
	207.	*Cirriphyllum*
	208.	*Microeurhynchium*
	209.	*Oxyrrhynchium*
	210.	*Rhynchostegiella*
	211.	*Brachytheciastrum*
	212.	*Brachythecium*
	213.	*Eurhynchiastrum*
	214.	*Homalothecium*
	215.	*Kindbergia*
	216.	*Sciuro-hypnum*
	217	*Scleropodium*
Family	86.	Hypnaceae
	218.	*Hypnum*
Family	87.	Callicladiaceae
	219.	*Callicladium*
Family	88.	Taxiphyllaceae
	220.	*Taxiphyllum*

Family	89.	Pylaisiadelphaceae
	221.	*Platygyrium*
Family	90.	Jocheniaceae
	222.	*Jochenia*
Family	91.	Pylaisiaceae
	223.	*Buckia*
	224.	*Calliergonella*
	225.	*Homomallium*
	226.	*Ptilium*
	227.	*Pylaisia*
Family	92.	Sematophyllaceae
	228.	*Sematophyllum*
Family	93.	Hylocomiaceae
	229.	*Hylocomiadelphus*
	230.	*Hylocomium*
	231.	*Loeskeobryum*
	232.	*Pleurozium*
	233.	*Rhytidiadelphus*
Family	94.	Rhytidiaceae
	234.	*Rhytidium*
Family	95.	Entodontaceae
	235.	*Entodon*
Family	96	Cryphaeaceae
	236	*Cryphaea*
Family	97.	Leucodontaceae
	237.	*Leucodon*
	238.	*Nogopterium*
Family	98.	Antitrichiaceae
	239.	*Antitrichia*
Family	99.	Neckeraceae
	240.	*Alleniella*
	241.	*Exsertotheca*
	242.	*Homalia*
	243.	*Leptodon*
	244.	*Neckera*
	245.	*Pseudanomodon*
	246.	*Thamnobryum*
Family	100	Heterocladiellaceae
	247.	*Heterocladiella*
Family	101.	Lembophyllaceae

	248.	*Heterocladium*
	249.	*Isothecium*
Family	102.	Myuriaceae
	250.	*Ctenidium*
Family	103.	Anomodontaceae
	251.	*Anomodon*

PRELIMINARY REMARKS – HOW TO USE THESE KEYS

The keys presented below require the use of a compound microscope and ideally also of a stereomicroscope, preferably equipped with micrometer eyepieces to enable measurement of small distances. Some preparation skills are also useful.

Following the directions in the keys, beginning with the key to the main groups of bryophytes (1. – *see Table of contents*), the user will eventually arrive at the name of a genus or a group of genera, which can then be looked up in the second part, keys to species of liverworts and hornworts (5.), and keys to species of mosses (6.), to obtain the name of the species in question. If there is only one species to a genus, the species name is given already in part one.

After arriving at a species name, it is essential that the result should be carefully compared with illustrations and descriptions of the species including remarks about its ecological demands. (For recommended literature the reader may consult the remarks in the first edition of these keys (Erzberger 2021)). Since numerous bryophyte taxa that were not hitherto known to occur in Hungary have been detected during the last years, it is always possible that the user might try to identify a plant that is not treated in the present keys. It is only by consulting detailed descriptions and illustrations that such a situation can be noticed. Also, the keys cannot take account of every possibility given that certain taxa show a wide range of variability.

If the user cannot decide between the alternatives in a given couplet of the key, both paths should be followed. Often taxa that may display both character states of a given couplet have been keyed out under both alternatives.

The names of taxa that have been proved to occur in the bryophyte flora of Hungary are printed in ***bold***, some taxa that have

been excluded, doubtfully recorded or may be expected have names printed in *normal case*.

As in the first edition, the frequency of 'recent' occurrences (after 1973) is indicated after the name of each taxon (see abbreviations below). These frequencies are in relation to the number of grid cells (quarter of the European mapping grid, (Niklfeld 1971, Bartha *et al.* 2015)) where the taxon has been recorded, for details see Erzberger *et al*. (2023). Due to progress in the bryophyte recording project in Hungary during the last years, some entries have changed compared with the first edition (Erzberger 2021) and Erzberger *et al*. (2023).

ABBREVIATIONS

adj.	adjective
agg.	aggregate, a group of related species (or microspecies) which are difficult to distinguish from one another
auct.	auctorum, following a taxon name that has been misapplied (see e.g. note under *Lophocolea coadunata*)
e.g.	(Latin: exempli gratia) for example
excl.	excluding
incl.	including
fo.	forma, an infraspecific rank without taxonomic value
K+	refers to colour reaction with a 2% solution of potassium hydroxide (KOH)
ld.	lásd, Hungarian for 'see'
pers. comm.	personal communication
pl.	plural
pl.	például, Hungarian meaning 'for example'
pp.	pro parte, meaning part of a taxon, e.g. only some species of a genus, not all
s.l.	sensu lato, meaning in the wider sense, when a name may denote different circumscriptions of a taxon, e.g. *Ulota crispa* s.l. (*U. crispa* s.str., *U. crispula, U. intermedia*)
s.str.	sensu stricto, meaning in the narrow sense
subsp.	subspecies, an infraspecific rank
syn.	synonymous
var.	varietas, variety, an infraspecific rank below subspecies

FREQUENCY CLASSES

cc	very common
c	common
s-f	sporadic to frequent
r	rare
rr	very rare
n.s.	not seen, i.e. without records after 1973

PART I: GENERAL KEYS

1. KEY TO THE MAIN GROUPS OF BRYOPHYTES

1 Plant a thallus, i.e. a more or less flat gametophyte, not differentiated into stem and leaves 2
– Plants not thallus-like, differentiated into stems and leaves 3
2 Thallus cells usually with a single, large chloroplast; capsule cylindrical, dehiscing by 2 valves ..... **Hornworts**
– Thallus cells with numerous chloroplasts; capsule globose, ovoid, ellipsoid or cylindrical, dehiscing by 4 valves or irregular ..... **Thalloid liverworts**
3 **Leafy liverworts**
Mosses

Differences between leafy liverworts and mosses

leafy liverworts	**mosses**
leaves often deeply lobed or segmented	leaves never deeply lobed or segmented
leaves never with costa (but beware of vitta in *Diplophyllum albicans*)	leaves with or without costa
leaf cells isodiametric, never prosenchymatous	leaf cells prosenchymatous or isodiametric
leaves arranged in 3 ranks, 2 ranks of lateral leaves and 1 rank of (smaller) underleaves, which may be lacking	leaves not in 3 or 2 ranks (but beware of *Fissidens*, *Distichium*: leaves in 2 ranks, but leaves costate)
rhizoids consisting of a single cell each	rhizoids made up of more than one cell, with oblique cross-walls
seta weak, hyaline, elongating rapidly and dying after a few days	seta stout, brown, red, yellow, elongating slowly and long persisting, usually visible for a year
spore capsule containing spores and elaters, but without peristomium	spore capsule containing spores only, with peristomium in the majority of cases
capsule globose or ovoid, without lid, splitting into 4 valves	capsule pear-shaped to cylindrical, typically with lid and peristome
capsule blackish, without chloloplasts and wall without stomata	capsule green with chloroplasts when young, usually brown when ripe, wall often with stomata

2. KEYS TO GENERA OF THALLOID BRYOPHYTES

Hornworts

– Thallus variously lobed, lobes with crispate margins; spores dark brown or blackish; mature antheridia 50–90 µm long ..... ***Anthoceros agrestis*** (r)
– Thallus lobed, but margins only rarely crispate; spores yellowish, rarely yellowish brown; proximal face of spores with weak, centrally placed papillae; mature antheridia 170–190 µm long (including stalk) ..... ***Phaeoceros carolinianus*** (r)

Thalloid liverworts

1 Thallus circular, completely covered by clavate involucres on dorsal side ..... ***Sphaerocarpos*** (p. 110)
– Thallus not as above, not covered completely by clavate involucres 2
2 Dorsal epidermis reticulate, with pores or irregular openings, and usually with air chambers visible in cross section; rhizoids dimorphic, smooth or warty, respectively; thallus with chlorenchyma and parenchyma differentiated ..... **Group 1**
– Dorsal epidermis not reticulate, without pores or air chambers; rhizoids smooth; thallus not differentiated into chlorenchyma and parenchyma ..... **Group 2**

Group 1 Thallus with internal differentiation; dorsal epidermis with pores; rhizoids smooth or warty

1 Dorsal side of thallus with gemma cups 2
– Dorsal side of thallus without gemma cups 3
2 Gemma cups semilunar ..... ***Lunularia cruciata*** (r)
– Gemma cups cup-shaped ..... ***Marchantia*** pp. (p.101)
3 Plants in incomplete or complete rosettes; chlorenchyma with air canals or with air chambers with irregular openings or small pores; capsule totally or partially immersed in thallus ..... ***Riccia*** group (p.104)

– Plants not in rosettes; chlorenchyma with air chambers with simple or barrel-shaped pores; capsule not immersed in thallus 4

4 Pores barrel-shaped (cross section), conspicuous ..... ***Marchantia*** (p.101)

– Pores simple, conspicuous or not 5

5 Epidermis conspicuously reticulate, with elongate areolae 1 mm or longer ..... ***Conocephalum*** (p.101)

– Epidermis conspicuously reticulate, with areolae less than 1 mm long, or reticulation lacking 6

6 Thallus surface indistinctly reticulate, when dry parchment-like, smooth except for the slightly elevated, simple pores; ventral scales metallic purple, with 2 filiform appendages; pores prominent, surrounded by 4–5 concentric rings of cells ..... ***Reboulia hemisphaerica*** (s-f)

– Thallus distinctly reticulate; ventral scales coloured or hyaline, with 1–2 lanceolate appendages; pores prominent or not, surrounded by 1–5 concentric rings of cells 7

7 Ventral scales lacking marginal slime hairs, triangular, hyaline, with a lanceolate appendage; air chambers high, obliquely in 2–3 layers ..... ***Clevea hyalina*** (*Athalamia hyalina*) (r)

– Ventral scales with marginal 1-celled slime hairs; air chambers low, vertically in 1–3 layers 8

8 Archegonia and sporophytes not surrounded by laciniate pseudoperianth; crushed thallus with or without smell of cedar oil; dorsal thallus epidermis with or without trigones ..... ***Mannia*** (p.101)

– Archegonia and sporophytes surrounded by laciniate pseudoperianth; crushed thallus with a faint smell of rotten freshwater fish; dorsal thallus epidermis without trigones ..... ***Asterella saccata*** (r)

Group 2 **Thallus without internal differentiation, dorsal epidermis without pores, rhizoids smooth**

1 Thallus with obliquely inserted crisped or undulate leaf-like lobes 2
– Thallus without leaf-like lobes 3
2 Gemmae dimorphic, (i) stellate, about 400 μm, (ii) globose or ellipsoidal, about 100 μm, produced in flask-like containers on the dorsal surface of the thallus ..... ***Blasia pusilla*** (r)
– Gemmae lacking ..... ***Fossombronia*** (p.100)
3 Thallus furcate, to 2 mm wide, with unicellular hairs at margins, on ventral or on both sides, sometimes glabrous; midrib narrow, clearly distinct on the dorsal side; gametangia and sporophytes on small branches on ventral side of midrib ..... ***Metzgeria*** (p.99)
– Thallus simple, furcate, pinnate, palmate or irregularly branched, more than 3 mm wide, glabrous; midrib indistinct or poorly distinct on the dorsal side; gametangia and sporophytes on dorsal side of thallus or on lateral branches 4
4 Thallus furcate; gametangia on dorsal side of thallus 5
– Thallus simple, pinnate, palmate or irregularly branched; gametangia on small lateral branches 6
5 Slime papillae restricted to ventral side of costa near apex, on stalk 1–5 (6) cells long; thalli with miniature apical branches proliferating in autumn; dioicous; involucres subhorizontal to erect, tubular, with dentate-ciliate lobes; male tubercles *ca* 200 μm wide, cells surrounding aperture not papilliform; calcicole ..... ***Apopellia endiviifolia*** (*Pellia endiviifolia*) (s-f)
– Slime papillae on stalk 1 cell long, on both ventral and dorsal sides of costa near apex; caducous branches absent; dioicous or monoicous; calcifuge ..... ***Pellia*** (p.100)
6 Thallus simple or irregularly branched, 3 mm wide or more; more than 6 oil bodies in each epidermal cell ..... ***Aneura pinguis*** (s-f)
– Thallus 1–4-pinnately branched or palmate, lobes < 2 mm wide; 0–2 oil bodies in each epidermal cell ..... ***Riccardia*** (p.98)

3. KEYS TO GENERA OF FOLIOSE LIVERWORTS

1 Leaves laciniate, divided almost to base into filiform segments, or leaves with longly ciliate or laciniate margins..... 2
– Leaves simple or lobed, without laciniate or ciliate margins..... 4
2 Leaves laciniate, divided almost to base into 3–4 uniseriate segments..... ***Blepharostoma trichophyllum*** (r)
– Leaves divided into 2–5 lobes that are not uniseriate, with longly ciliate or laciniate margins..... 3
3 Leaf lamina very reduced..... ***Trichocolea tomentella*** (rr)
– Leaf lamina well developed..... ***Ptilidium pulcherrimum*** (s-f)
4(1) Leaves simple (but sometimes apex 3-dentate)..... 5
– Leaves lobed..... 7
5 Leaves incubous..... 6
– Leaves succubous..... **Group 3**
6 Leaf apex rounded to bilobed; underleaves bilobed, retuse, emarginate or rounded..... ***Calypogeia*** (p.87)
– Leaf apex truncate, usually with 1–3 teeth; underleaves orbicular quadrate, irregularly 4–5-lobed..... ***Bazzania trilobata*** (r)
7(4) Leaves 3–5-lobed..... **Group 4**
– Leaves bilobed..... 8
8 Leaves conduplicate, ventral lobe sometimes sac-shaped or helmet-shaped..... 9
– Leaves not conduplicate..... 10
9 Underleaves lacking..... **Group 5**
– Underleaves present..... **Group 6**
10 Leaves transversely or subtransversely inserted..... **Group 7**
– Leaves obliquely or longitudinally inserted, succubous..... **Group 8**

Group 3 Leaves simple, succubous

1 Underleaves present, conspicuous, bilobed..... 2
– Underleaves lacking, minute or small, rarely bilobed..... 3
2 All leaves simple, with rounded or retuse apex..... ***Chiloscyphus*** (p.93)
– At least some lower leaves bilobed..... ***Lophocolea*** (p.93)

3 Leaf margin toothed, at least at apex.....***Plagiochila*** (p.95)
– Leaf margin entire.....4
4 Underleaves present, at least on young plants.....5
– Underleaves lacking or caducous.....6
5 Lower leaves spreading, apical leaves imbricate, pressed face to face; perianth mouth laciniate.....***Syzygiella autumnalis*** (*Jamesoniella autumnalis*) (r)
– Leaves not as above; perianth mouth at most crenulate.....***Nardia*** (p.89)
6 Leaves strongly obliquely to longitudinally inserted.....7
– Leaves transversely to obliquely inserted.....8
7 Plants prostrate; rhizoids only at stem apex; leaves plane.....***Pedinophyllum interruptum*** (s-f)
– Plants procumbent or ascending; rhizoids lacking or scarce on underground stems; leaves convex.....***Plagiochila*** (p.95)
8 Lower leaves spreading, apical leaves imbricate, pressed face to face; perianth mouth laciniate.....***Syzygiella autumnalis*** (*Jamesoniella autumnalis*) (r)
– Leaves not as above; perianth mouth at most crenulate.....**Jungermanniaceae** group (incl. ***Endogemma***, ***Jungermannia***, ***Liochlaena***, ***Solenostoma***) (p.90)

Group 4 Leaves 3–5-lobed

1 Leaves succubous.....2
– Leaves incubous or nearly transverse.....3
2 Lower leaves bilobed, upper leaves sometimes irregularly 3–5-lobed.....***Lophoziaceae*** group (p.79)
– All leaves 3–4-lobed.....***Barbilophozia*** group (incl*. Neoorthocaulis floerkei*) (p.74)
3 Underleaves lacking.....***Tritomaria*** s.l. (incl. ***Trilophozia quinquedentata***) (p.79)
– Underleaves present, similar to leaves, although smaller; leaves incubous.....***Lepidozia reptans*** (s-f)

Group 5 Leaves conduplicate, underleaves lacking

1 Dorsal lobe larger than ventral lobe 2
– Dorsal lobe similar in size to ventral lobe or smaller 3
2 Plants medium-sized, shoots *ca* 2 mm wide; rhizoids originate from the lobule ..... ***Radula*** (p.98)
– Plants minute, shoots < 0.5 mm wide; rhizoids originate from the stem ..... ***Cololejeunea*** (p.97)
3 Ventral lobe narrowly lingulate, twice as long as wide; gemmae when present angulate ..... ***Diplophyllum*** (p.83)
– Ventral lobe orbicular to widely lingulate, less than twice as long as wide; gemmae when present ovoid to ellipsoidal ..... ***Scapania*** (p.84)

Group 6 Leaves conduplicate, underleaves present

1 Ventral lobe with spinosely toothed margin ..... ***Porella arboris-vitae*** (r)
– Ventral lobe with entire margin 2
2 Lobule parallel or nearly parallel to stem, almost free from stem; keel very short; shoots mostly large, 2.5–5 mm; cells with few or numerous oil bodies 3
– Lobule parallel to ventral leaf margin; keel long; shoots 0.9–1.3 mm wide; cells with numerous small oil bodies ..... ***Lejeunea cavifolia*** (s-f)
3 Ventral lobe mostly sac-shaped or helmet-shaped (but plane in *Frullania cleistostoma*); ocelli present in dorsal lobe or not, cells with few (2–10) oil bodies ..... ***Frullania*** (p.95)
– Ventral lobe plane or convex; ocelli absent, cells with numerous (15–40) oil bodies ..... ***Porella*** (p.98)

Group 7 Leaves bilobed, transversely or subtransversely inserted

1 Underleaves present 2
– Underleaves absent or very small 3
2 Plants filiform or very small, leaves to 0.3 mm long ..... ***Cephaloziella*** (p.76)
– Plants not filiform, small to large, leaves to 1.5 mm long ..... ***Barbilophozia*** group (incl. *Neoorthocaulis floerkei*) (p.74)

3 Leaves appressed; branches julaceous or dorsiventrally compressed, often clavate.....***Marsupella*** (p.89)
– Leaves not appressed; branches not as above.....4
4 Leaves asymmetrical, with ventral margin widely incurved and saccate.....***Nowellia curvifolia*** (s-f)
– Leaves not or only slightly asymmetrical; ventral margin not saccate.....5
5 Plants filiform, very small; usually ventrally branched.....***Cephaloziella*** (p.76)
– Plants not filiform, small to medium-sized; laterally branched.....6
6 Leaves channelled or strongly concave.....7
– Leaves not channelled, ± concave.....10
7 Usually with reddish gemmae at margins of upper leaves.....8
– Gemmae lacking.....***Marsupella*** (p.89)
8 Minute species, plants only 2–10 (12) mm long and 0.2 mm wide; lateral leaves slighty concave, ± transversely inserted, 2-lobed to 1/3–1/2, sometimes 3-lobed, lobes lanceolate, acute; cell walls uniformly thickened or trigones occasionally present; underleaves absent or sparse, minute, subulate; perianths rare; on rotting wood and bark; flagelliform branches absent.....***Crossocalyx hellerianus*** (*Anastrophyllum hellerianum*) (rr)
– Larger species; if shoots only 2–6 mm long, then plants wider than 0.2 mm or lateral leaves lobed to 2/3–3/4; (compare *Lophozia ascendens* on rotting wood).....9
9 Lateral leaves conduplicate-concave (boat-shaped), nearly transversely inserted, 0.3–0.7 mm long; shoots 0.7–1.5 mm wide, leaves with regular arrangement resembling a comb; walls of leaf cells almost equally thickened, trigones very small or absent; mid-leaf cells (12) 14–18 (20) μm wide, arranged in ± concentric circles near lobe apex; gemmae angulate, 2-celled.....***Sphenolobus minutus*** (*Anastrophyllum minutum*) (rr)
– Lateral leaves as long as wide, transversely inserted on antical side of stem, obliquely on postical side, (0.5) 0.7–1.8 mm long, 2-lobed to 1/3, lobes acute, equal, slightly squarrose; plants 2.5 cm long and 1–2 mm wide; walls of leaf cells thick, trigones small to large, not bulging; shoots brownish green; gemmae ovoid to angulate.....***Anastrophyllum michauxii*** (n.s.)

10(6) Usually with gemmae at apex and margins of upper leaves; cortex not translucent, not revealing the medulla; living plants with oil bodies..... **Lophoziaceae** group (p.79)
– Usually without gemmae; cortex translucent, revealing the medulla; living plants without oil bodies..... **Cephaloziaceae** pp. (p.75)

Group 8 **Leaves bilobed, longitudinally or obliquely inserted, succubous**

1 Underleaves conspicuous..... 2
– Underleaves lacking or underleaves small, subulate or lanceolate..... 3
2 Rhizoids restricted to base of underleaves; underleaves bilobed to 1/2–3/4, with teeth on each side..... ***Lophocolea*** (p.93)
– Rhizoids scattered along the ventral surface of stem; underleaves simple, lanceolate, usually with lateral teeth..... ***Mesoptychia heterocolpos*** (*Leiocolea heterocolpos*) (n.s.)
3 Plants very small, filiform..... ***Cephaloziella*** (p.76)
– Plants small to medium-sized..... 4
4 Cortex translucent, revealing the medulla; living plants without oil bodies..... **Cephaloziaceae** pp. (p.75)
– Cortex not translucent, not revealing the medulla; living plants with oil bodies..... 5
5 Plants with gemmae..... **Lophoziaceae** group (p.79)
– Plants without gemmae..... 6
6 Underleaves small..... 7
– Underleaves lacking or rudimentary..... 8
7 Cuticle smooth..... ***Nardia*** (p.89)
– Cuticle papillose..... ***Mesoptychia*** (p.92)
8 Plants acidophilous, perianths usually caducous; underleaves absent..... ***Gymnocolea inflata*** (r)
– Plants calcicolous, perianths not caducous; underleaves present (except in *M. badensis*)..... ***Mesoptychia*** (p.92)

4. KEYS TO GENERA OF MOSSES

1 Leaf lamina consisting of a network of narrow green cells enclosing large, inflated, hyaline cells; plants with branches in fascicles ..... ***Sphagnum*** (p.111)
– Plants lacking above combination of characters 2
2 Plants dark brownish, reddish or blackish; saxicolous; fragile when dry; capsule opening with 4 longitudinal slits giving rise to 4 valves united at the top; lamina cells thick-walled, reddish to brownish ..... ***Andreaea rupestris*** (r) (p.115)
– Plants lacking above combination of characters 3
3 Basal lamina cells elongate, thick-walled, sinuose, nodulose ..... ***Racomitrium*** (p.165)
– Basal lamina cells different 4
4 Capsule with peristome of 4 triangular teeth, erect when dry and moist ..... ***Tetraphis pellucida*** (s-f)
– Capsule with peristome of more than 4 teeth, or plants without capsules 5
5 Stem leaves arranged in 2 rows, distichous, ± complanate ..... **Group 9**
– Stem leaves arranged in 3 or more rows, not complanate 6
6 Ventral (adaxial) surface of costa or lamina with filaments or lamellae ..... **Group 10**
– Ventral surface of costa or lamina without filaments or lamellae 7
7 At least upper leaves with a hyaline tip or costa excurrent in hair point ..... **Group 11**
– Leaves without hyaline tip or hair point 8
8 Leaves bordered with several rows of elongate, narrow cells or leaf margin pluristratose ..... **Group 12**
– Leaves unbordered, leaf margin 1–2-stratose 9
9 Plants acrocarpous 10
– Plants pleurocarpous 32
10 Capsule present 11
– Capsule lacking 21
11 Capsule indehiscent ..... **Group 13**
– Capsule dehiscent 12
12 Capsule immersed or emergent ..... **Group 14**
– Capsule exserted 13

13 Gametophyte minute, capsule larger than gametophyte, ovoid to ellipsoid, asymmetric, on warty stalk ... ***Buxbaumia*** (p.119)
– Plants lacking this combination of characters ... 14
14 Capsule globose or sub-globose ... **Group 15**
– Capsule ovoid, oblong, cylindrical, ellipsoid or pyriform ... 15
15 Capsule strumose ... **Group 16**
– Capsule not strumose ... 16
16 Peristome absent or rudimentary ... **Group 17**
– Peristome well developed ... 17
17 Capsule striate or sulcate when dry ... **Group 18**
– Capsule smooth or only very slightly striate when dry ... 18
18 Capsule erect or nearly so; seta straight, rarely curved ... 19
– Capsule inclined or pendulous; seta straight or curved ... 20
19 Peristome teeth 16, entire or divided at the tip only, or slightly and irregularly divided ... **Group 19**
– Peristome teeth 16, divided longitudinally to halfway or more (32 teeth) ... **Group 20**
20 Peristome single ... **Group 21**
– Peristome double ... **Group 22**
21(10) Propagules present on stem or leaves or in stalked clusters ... **Group 23**
– Propagules absent on stem or leaves or in stalked clusters ... 22
22 Leaves without costa ... ***Hedwigia*** (p.178)
– Leaves with costa ... 23
23 Costa wide, 1/3 or more of leaf base ... **Group 24**
– Costa narrow, less than 1/3 of leaf base ... 24
24 Lamina cells 18 µm wide or more ... **Group 25**
– Lamina cells less than 18 µm wide ... 25
25 Alar cells differentiated from basal cells ... **Group 26**
– Alar cells not differentiated ... 26
26 Lamina cells ± isodiametric ... 27
– Lamina cells longer than wide ... 31
27 Leaf margin denticulate or dentate, at least near apex or base ... **Group 27**
– Leaf margin entire, crenulate or papillose-crenulate ... 28
28 Costa excurrent ... **Group 28**
– Costa not excurrent ... 29
29 Leaf apex rounded or obtuse, apiculate or not ... **Group 29**

–	Leaf apex acute or acuminate……30
30	Leaf margin recurved at least on one side……**Group 30**
–	Leaf margin plane or recurved only at base……**Group 31**
31(26)	Leaf apex acuminate or subulate, formed in part or entirely by costa……**Group 32**
–	Leaf apex obtuse to acuminate, costa percurrent to excurrent, short or lacking……**Group 33**
32(9)	Costa single, extending more than 1/2 way up leaf……33
–	Costa single, extending less than 1/2 way up leaf, or if double, short or long, or lacking……37
33	Lamina cells short, to twice as long as wide, or median cells elongate and marginal cells short……**Group 34**
–	Lamina cells elongate, more than twice as long as wide……34
34	Leaves longitudinally plicate, at least at base……**Group 35**
–	Leaves plane or only slightly longitudinally plicate……35
35	Leaves squarrose, falcate or curved in a circle……**Group 36**
–	Leaves straight or nearly so……36
36	Leaf apex rounded, obtuse or apiculate……**Group 37**
–	Leaf apex acute or acuminate……**Group 38**
37(32)	Lamina cells short, to twice as long as wide, or median cells elongate and marginal cells short……**Group 39**
–	Lamina cells elongate, more than twice as long as wide……38
38	Leaf apex rounded, obtuse or apiculate……**Group 40**
–	Leaf apex acute or acuminate……39
39	Leaves distinctly falcate or squarrose……**Group 41**
–	Leaves straight or very slightly falcate or squarrose……**Group 42**

Group 9 Leaves distichous or complanate

1	Plants acrocarpous……2
–	Plants pleurocarpous……3
2	Lower part of leaf conduplicate……***Fissidens*** (p.127)
–	Leaf not conduplicate, narrowed to subulate point……***Distichium capillaceum*** (r)
3	Median lamina cells 60–80 µm wide……***Hookeria lucens*** (rr)
–	Median lamina cells 4–45 µm wide……4
4	Alar cells differentiated, hyaline, decurrent……***Plagiothecium*** (p.202)
–	Alar cells greenish or yellowish, differentiated or not……5

5 Costa single.....6
– Costa double or short and lacking.....7
6 Leaves oblong to spathulate, costa extending 1/2 – 3/4 up leaf .....***Homalia trichomanoides*** (s-f)
– Leaves lanceolate or ovate-lanceolate, costa extending 2/3 up leaf to almost to apex.....***Leptodictyum riparium*** (c)
7 Leaves mostly oblong-ovate to oblong or lingulate.....8
– Leaves mostly lanceolate, ovate or ovate-lanceolate.....9
8 Median lamina cells 8–80 µm long.....
.....***Neckera*** s.l. (incl. ***Alleniella***, ***Exsertotheca***) (p.221)
– Median lamina cells 45–160 µm long.....
.....***Taxiphyllum wissgrillii*** (s-f)
9 Flagelliform branchlets in leaf axils.....
.....***Pseudotaxiphyllum elegans*** (s-f)
– Flagelliform branchlets absent, leaves only slightly complanate.....***Isopterygiopsis pulchella*** (r)

Group 10 Costa or ventral leaf surface with filaments or lamellae

1 Costa with simple or branched filaments, at least in distal part.....2
– Costa with lamellae, at least in distal part, sometimes with a few filaments.....3
2 Leaf margin widely incurved, leaves rigid.....***Aloina*** (p.135)
– Leaf margin incurved or plane, leaves not rigid.....
.....***Crossidium*** (p.137)
3 Plants to 0.5 (1) cm tall; costa with 2–4 lamellae; peristome rudimentary or lacking.....***Pterygoneurum*** (p.143)
– Plants 0.5–6 cm tall; costa with 4 or more lamellae; peristome well developed, with 32 or 64 teeth (Polytrichaceae).....4
4 Costa narrow, with 4–7 ventral lamellae; leaves with a border of long narrow cells.....***Atrichum*** (p.116)
– Costa broad, with more than 7 lamellae on the ventral surface; leaves unbordered.....5
5 Capsule not angled, without apophysis and stomata, peristome teeth 32; leaves muticous.....***Pogonatum*** (p.116)
– Capsule angled or not, with apophysis and stomata; peristome teeth 64; leaves muticous or with hair point.....6

6 Capsule not angled; end cell of lamellae papillose, higher than wide ..... ***Polytrichastrum alpinum*** (*Polytrichum alpinum*) (n.s.)
– Capsule angled; end cell of lamellae smooth ..... ***Polytrichum*** (p.116)

Group 11 Leaves with hyaline point or costa excurrent in hair point

1 Pleurocarps with papillose cells, hyaline point only visible in microscope 2
– Acrocarps, hyaline point visible to the naked eye or with a handlens 3
2 Plants regularly 2–3-pinnate; stem leaves with a long fine acumen, consisting of 3–4 uniseriate cells ..... ***Thuidium assimile*** (*Thuidium philibertii*) (s-f)
– Plants irregularly branched, stem leaves with a long, uniseriate hyaline point ..... ***Claopodium rostratum*** (*Anomodon rostratus*) (s-f)
3 Costa lacking ..... ***Hedwigia*** (p.178)
– Costa present 4
4 Plants julaceous, silvery when dry ..... ***Bryum argenteum*** (cc), ***Ptychostomum zieri*** (*Plagiobryum zieri*) (r)
– Plants not julaceous, not silvery when dry 5
5 Capsule pale yellow, ± smooth, emergent; exostome of 16 free teeth, reflexed when dry ..... ***Orthotrichum diaphanum*** (cc)
– Capsule and peristome different 6
6 Costa wide, 1/2–1/3 of width of leaf base, hair point reflexed when dry ..... ***Campylopus introflexus*** (s-f)
– Costa narrow, less than 1/3 of width of leaf base 7
7 Lamina cells smooth or finely papillose 8
– Lamina cells strongly papillose 12
8 Capsule immersed or emergent 9
– Capsule exserted 10
9 Capsule indehiscent, calyptra cucullate ..... ***Tortula*** pp. (***Tortula acaulon*** pp.) (p.154)
– Capsule dehiscent, calyptra cucullate, mitrate or campanulate ..... Grimmiaceae pp. (p.165)
10 Lamina cells smooth in median part of leaf, papillose on strongly revolute margins ..... ***Hilpertia velenovskyi*** (r)

– Lamina cells smooth throughout 11
11 At least some lamina cells sinuose ..... Grimmiaceae pp. (p.165)
– Lamina cells not sinuose ..... ***Tortula*** pp. (*Pottia*) (p.141)
12(7) Basal cells of leaf forming a distinct ovate group of hyaline cells on both sides of costa 13
– Basal cells of leaf not forming a distinct ovate group on both sides of costa 14
13 Peristome teeth not spirally twisted or lacking; calyptra covering the whole capsule; basal hyaline cells with pale orange cross walls distinctly thickened ..... ***Encalypta*** (p.120)
– Peristome teeth spirally twisted; calyptra partially covering the capsule; basal cells different ..... ***Syntrichia*** (p.144)
14 Capsule immersed, indehiscent ..... ***Microbryum*** pp. (p.141), ***Tortula*** pp. (***Tortula acaulon*** pp.) (p.154)
– Capsule exserted or emergent, dehiscent ..... ***Tortula*** pp. (p.154)

Group 12 Leaves bordered with narrow cells or margin pluristratose

1 Marginal cells short; margin 2–5-stratose 2
– Marginal cells longer and narrower than the rest of lamina cells; margin uni- to pluristratose 3
2 Leaf margin recurved; lamina cells strongly papillose; central strand well developed ..... *Dialytrichia mucronata*
– Leaf margin plane; lamina cells smooth or faintly papillose; central strand absent ..... ***Cinclidotus*** (p.136)
3 Leaf margin unistratose 4
– Leaf margin bi- to pluristratose 7
4 Upper and median lamina cells papillose ..... ***Tortula*** (p.154)
– Upper and median lamina cells smooth 5
5 Plants rhizomatous; leaves crowded in terminal rosette ..... ***Rhodobryum*** (p.180)
– Plants not rhizomatous; leaves crowded in terminal rosette or not 6
6 Sterile shoots often creeping; leaf margin dentate or (sometimes only faintly) denticulate ..... ***Plagiomnium*** (p.191)
– Sterile shoots erect; leaf margin ± denticulate, rarely entire ..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)

7(3) Leaf margin entire; leaves less than twice as long as wide..... ***Rhizomnium punctatum*** (s-f)

– Leaf margin entire below, denticulate towards apex, or dentate ± all round; leaves more than twice as long as wide.....8

8 Lamina cells papillose, sometimes only faintly so; leaf margin entire below, denticulate towards apex..... ***Tortula*** (*cernua*, *schimperi*) (p.154)

– Lamina cells smooth; leaf margin dentate.....9

9 Leaf margin with simple teeth..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)

– Leaf margin with geminate teeth..... ***Mnium*** (p.191)

Group 13 Acrocarps with indehiscent capsule

1 Capsule exserted..... ***Tortula protobryoides*** (*Pottia bryoides*, *Protobryum bryoides*) (s-f)

– Capsule immersed or emergent.....2

2 Capsule with conspicuous neck, 1/3–1/2 of capsule length; capsule emergent..... ***Bruchia flexuosa*** (rr)

– Capsule without perceptible neck.....3

3 Plants with persistent protonema..... ***Ephemerum*** (p.157)

– Plants without persistent protonema.....4

4 Lamina cells smooth, more than 25 µm wide..... ***Physcomitrium patens*** (*Aphanorrhegma patens*, *Physcomitrella patens*) (s-f)

– Lamina cells smooth or papillose, less than 25 µm wide.....5

5 Capsule with ± differentiated lid; leaves incurved, crisped when dry..... ***Weissia*** (*longifolia*, *rostellata*) (p.162)

– Capsule without lid; leaves not crisped when dry.....6

6 Capsule globose, with translucent walls, spores mostly 16–20 in number, 100–200 µm..... ***Archidium alternifolium*** (n.s.)

– Capsule globose or ± apiculate, with opaque wall, spores numerous, < 60 µm.....7

7 Lamina cells rectangular or linear.....8

– Lamina cells quadrate, rounded, hexagonal or elliptical.....9

8 Leaves subulate, at least the upper ones; lamina cells 8 µm wide..... ***Pleuridium*** (p.133)

– Leaves acuminate; lamina cells 9–13 µm wide..... ***Pseudephemerum nitidum*** (s-f)

9 Plants bulbiform; costa with stereids only; capsule not or only minutely apiculate ..... ***Acaulon*** (p.135)
– Plants not bulbiform; costa with stereids and guide cells; capsule apiculate ..... ***Microbryum*** pp. (p.141), ***Tortula*** pp. (p.154)

Group 14 Acrocarps with immersed or emergent capsule

1 Capsule large, ovoid, asymmetrical; perichaetial leaves ciliate ..... ***Diphyscium foliosum*** (s-f)
– Capsule and perichaetial leaves not as above 2
2 Leaves without costa ..... ***Hedwigia*** (p.178)
– Leaves costate 3
3 Lid coming off attached to columella; capsule smooth ..... ***Schistidium*** (p.165)
– Lid not coming off attached to columella; capsule smooth or striate 4
4 Plants minute; growing on calcareous rocks; capsule emergent to exserted ..... ***Seligeria acutifolia*** (rr)(p.163)
– Plants medium-sized; growing on calcareous or acidic rocks or on tree trunks 5
5 Leaf cells mamillose; capsule globose ..... ***Bartramia halleriana*** (rr)
– Leaf cells papillose or smooth; capsule shortly cylindrical 6
6 Stomata phaneropore 7
– Stomata cryptopore ..... ***Orthotrichum*** (p.193)
7 Leaves concave, with erect-incurved or involute margins and obtuse or rounded apices, gemmae abundant, in particular on the ventral surface of leaves; capsules rare ..... ***Nyholmiella*** (p.193)
– Leaves not as above, with recurved margins and acute to acuminate apices; gemmae occasional; capsules frequent ..... ***Lewinskya*** (p.193)

Group 15 Acrocarps with exserted globose or subglobose capsule

1 Peristome lacking (Funariaceae pp.)..... 2
– Peristome single or double (Bartramiaceae)..... 3
2 Calyptra inflated, contracted at base, cucullate, covering all of the capsule..... ***Pyramidula tetragona*** (r)
– Calyptra small, mitriform, not covering all of the capsule..... ***Physcomitrium*** (*eurystomum*, *sphaericum*) (p.121)
3 Leaves lanceolate, not sheathing at base..... ***Philonotis*** (p.179)
– Leaves narrowly lanceolate to linear lanceolate, sheathing at base..... 4
4 Lamina cells with finely striate cuticle..... ***Plagiopus oederianus*** (r)
– Lamina cells mamillose..... ***Bartramia*** (p.179)

Group 16 Acrocarps with exserted strumose capsule

1 Costa with a central layer of green cells surrounded by hyaline cells (cross section); plants whitish or glaucous..... ***Leucobryum glaucum*** (s-f)
– Costa not as above; plants not whitish or glaucous..... 2
2 Peristome teeth divided near to base, reddish, with a paler border or not..... ***Ceratodon*** (p.133)
– Peristome teeth divided to halfway, reddish, striate in the lower part..... 3
3 Lamina cells longly rectangular, smooth; margin plane..... ***Dicranella cerviculata*** (rr)
– At least upper lamina cells quadrate or transversely elongate, mamillose; margin recurved..... ***Cynodontium*** (p.132)

Group 17 Acrocarps with exserted capsule and peristome lacking or rudimentary

1 Calyptra inflated, 4-angled; spores 50–65 µm..... ***Pyramidula tetragona*** (r)
– Calyptra not inflated or angled; spores smaller..... 2
2 Capsule striate or sulcate when dry..... 3
– Capsule smooth when dry..... 4

3 Leaves linear-lanceolate; gemmae lacking ..... ***Amphidium mougeotii*** (r)
– Leaves lanceolate to oblong-lanceolate; plants with ovoid gemmae; lamina cells papillose ..... ***Zygodon rupestris*** (r)
4(2) Median lamina cells 20–50 µm wide, thin-walled (Funariaceae pp.) 5
– Median lamina cells less than 20 µm wide, thin-walled or thick-walled 7
5 Exothecial cells longer than wide ..... ***Entosthodon hungaricus*** (s-f)
– Exothecial cells isodiametric 6
6 Calyptra mitriform ..... ***Physcomitrium*** (p.121)
– Calyptra cucullate ..... ***Entosthodon fascicularis*** (s-f)
7(4) Plants minute; lamina cells smooth ..... ***Seligeria donniana*** (r)
– Plants small to robust; lamina cells papillose 8
8 Calyptra cylindrical, covering capsule; basal leaf cells forming a well-delimited group ..... ***Encalypta*** (p.120)
– Calyptra cucullate, not covering capsule; basal leaf cells not forming a well-delimited group 9
9 Costa excurrent 10
– Costa not excurrent 12
10 Leaves linear-lanceolate or lanceolate; margin incurved to strongly involute, rarely plane ..... ***Weissia*** (p.162)
– Leaves ovate-lanceolate, ovate or obovate; margin plane or recurved 11
11 Lid conical ..... ***Microbryum*** (*conicum, davallianum*, *muticum*) (p.141)
– Lid rostrate ..... ***Tortula*** pp. (*Pottia*) (p.154)
12(9) Lid attached to columella after dehiscence 13
– Lid not attached to columella after dehiscence 14
13 Plants 1–4 (10) cm tall; leaves keeled; margin finely crenulated ..... ***Hymenostylium recurvirostrum*** (n.s.)
– Plants to 1 cm tall; leaves not keeled; margin dentate at apex ..... ***Hennediella heimii*** (*Desmatodon heimii*) (rr)
14 Annulus of capsule persistent, of large cells; stems rarely branched ..... ***Gyroweisia tenuis*** (rr)
– Annulus of capsule persistent or caducous, of small cells; stems branched ..... ***Gymnostomum*** (p.158)

Group 18 **Acrocarps with exserted capsule, striate or sulcate when dry and peristome well developed**

1 Costa with a central layer of green cells surrounded by hyaline cells (cross section); plants whitish or glaucous ..... ***Leucobryum*** (p.125)
– Costa not as above; plants glaucous or not 2
2 Plants very small, to 3.5 mm tall ..... ***Brachydontium trichodes*** (rr)
– Plants more than 3.5 mm tall 3
3 Seta curved 4
– Seta straight 6
4 Costa occupying 1/3 or more of leaf base ..... ***Campylopus*** (p.124)
– Costa occupying less than 1/3 of leaf base 5
5 Leaves ovate-lanceolate; upper lamina cells rectangular or hexagonal, 30–50 µm wide, thin-walled ..... ***Funaria hygrometrica*** (s-f)
– Leaves lanceolate; upper lamina cells quadrate or rounded, to 20 µm wide, thick-walled ..... ***Grimmia*** (p.165)
6 Peristome teeth in pairs or groups of 4 (Orthotrichaceae pp.) 7
– Peristome teeth free, not forming groups 12
7 Capsule shortly exserted 8
– Capsule longly exserted 9
8 Stomata cryptopore ..... ***Orthotrichum*** (p.193)
– Stomata phaneropore ..... ***Lewinskya*** (p.193)
9 Marginal cells at leaf base rectangular, with thickened transverse walls, ascending up margin, basal cells linear ..... ***Ulota*** (p.193)
– Marginal basal cells elongate, similar to the rest of basal cells 10
10 Lamina cells smooth; calyptra cucullate, glabrous ..... ***Codonoblepharon forsteri*** (*Zygodon forsteri*) (r)
– Lamina cells mostly papillose; calyptra mitrate, often hairy ..... ***Orthotrichum*** s.l. (incl. *Lewinskya*) pp 11
11 Stomata cryptopore ..... ***Orthotrichum*** (p.193)
– Stomata phaneropore ..... ***Lewinskya*** (p.193)
12(6) Peristome simple 13
– Peristome double 20

13 Peristome of 16 teeth, entire or slightly and irregularly divided 14
– Peristome of 16 teeth, divided to halfway or more 16
14 Capsule cylindrical, covered completely by the calyptra ..... ***Encalypta*** (p.120)
– Capsule ovoid or shortly cylindrical, not completely covered by the calyptra 15
15 Leaf margin recurved ..... ***Cnestrum schisti*** (n.s.)
– Leaf margin flat ..... ***Rhabdoweisia*** (p.132)
16 Peristome teeth divided to base 17
– Peristome teeth divided to halfway 18
17 Plants glaucous ..... ***Saelania glaucescens*** (rr)
– Plants not glaucous ..... ***Ceratodon*** (p.133)
18 Alar cells ± differentiated ..... ***Dicranum*** (p.129)
– Alar cells not differentiated 19
19 Lamina cells quadrate ..... ***Cynodontium*** (p.132)
– Lamina cells rectangular ..... ***Dicranella*** (p.125)
20(12) Median cells of lamina linear, smooth ..... ***Orthodontium lineare*** (rr)
– Median cells of lamina rounded, quadrate or hexagonal, mamillose or papillose 21
21 Leaves with dentate margins and sheathing base; marginal cells narrower and longer than median cells; plants without gemmae ..... ***Timmia*** (p.119)
– Leaves with entire or denticulate margins and the base not sheathing; marginal cells similar to median cells; gemmae in groups at the end of pseudopodia ..... ***Aulacomnium*** (p.202)

Group 19 Acrocarps with exserted erect capsule, peristome teeth 16, entire or slightly and irregularly divided

1 Lamina cells more than 20 µm wide, smooth ..... ***Entosthodon*** (p.121)
– Lamina cells less than 20 µm wide, smooth or papillose 2
2 Leaf apex acuminate or subulate, very rarely obtuse 3
– Leaf apex obtuse, acute or rounded, rarely acuminate 8
3 Alar cells differentiated, sometimes orange or brownish 4
– Alar cells not differentiated 5

4 Leaves strongly crisped when dry, cuticle longitudinally striate, alar cells not conspicuously orange.....***Hymenoloma crispulum*** (*Dicranoweisia crispula*) (rr)
– Leaves ± straight, not crisped when dry, cuticle smooth, alar and basal cells conspicuously orange.....***Blindia acuta*** (n.s.)
5 Leaves fragile; margin sinuose-undulate, notched.....***Chionoloma tenuirostre*** (*Oxystegus tenuirostris*) (r)
– Leaves not fragile; margin not sinuose, not notched.....6
6 Plants minute; growing on calcareous or siliceous rocks.....7
– Plants medium-sized; growing on siliceous rocks or tree trunks.....***Dicranoweisia cirrata*** (s-f)
7 Seta arcuate when moist, straight when dry; plants growing on siliceous rocks or small calcareous stones.....***Blindiadelphus*** (p.163)
– Seta straight when moist and dry; plants growing on calcareous rocks.....***Seligeria*** (p.163)
8(2) Leaves lingulate or spathulate; calyptra completely covering the capsule.....***Encalypta*** (p.120)
– Leaves not as above; calyptra not completely covering the capsule.....9
9 Costa excurrent.....10
– Costa percurrent.....***Didymodon*** (p.138)
10 Leaf margin with reflexed teeth at base.....***Eucladium verticillatum*** (s-f)
– Leaf margin without reflexed teeth at base.....11
11 Lamina bistratose or pluristratose in the upper part.....***Grimmia*** (p.165)
– Lamina unistratose in the upper part.....12
12 Capsule longly cylindrical or ellipsoidal.....***Trichostomum*** (p.161)
– Capsule shortly cylindrical or ovoid.....13
13 Leaves linear-lanceolate or lanceolate, strongly incurved at the apex.....***Weissia*** (p.162)
– Leaves ovate-lanceolate, ovate, obovate or lingulate.....14
14 Lid conical.....***Microbryum starckeanum*** (*Pottia starckeana*) (rr)
– Lid rostrate.....***Tortula*** pp. (p.154)

Group 20 **Acrocarps with exserted erect capsule, peristome teeth 16, divided halfway or to the base (32 teeth)**

1 Peristome teeth slightly or strongly spirally twisted....2
– Peristome teeth straight or curved....10
2 Basal lamina cells hyaline, forming a well-delimited group....3
– Basal lamina cells hyaline or not, not forming a well-delimited group....4
3 Basal hyaline cells of leaf ascending up margin in a V-shape....***Tortella*** (p.159)
– Basal hyaline cells of leaf forming an ovate group, not ascending up margin....***Syntrichia*** (p.144)
4 Peristome with well-developed basal membrane....5
– Peristome without or with low basal membrane....6
5 Leaf margin conspicuously revolute; basal membrane of peristome to 45 µm....***Hilpertia velenovskyi*** (r)
– Leaf margin not revolute; basal membrane more than 300 µm....***Tortula*** (*inermis*, *mucronifolia*, *schimperi*, *subulata*) (p.154)
6 Axillary hairs with 1–2(3) brown basal cells....***Didymodon*** (p.138)
– Axillary hairs hyaline throughout....7
7 Margin plane or recurved; costa with elongate cells on ventral side....8
– Margin recurved to strongly revolute; ventral cells of costa elongate or quadrate to shortly rectangular....9
8 Costa excurrent in a thick point; leaf margin recurved from base to apex; perichaetial leaves not much different from vegetative leaves....***Barbula unguiculata*** (cc)
– Leaf apex at most with some hyaline cells forming a short apiculus, costa not excurrent; leaf margin plane or slightly recurved at leaf base; inner perichaetial leaves with sheathing base, conspicuously different from vegetative leaves....***Streblotrichum convolutum*** (*Barbula convoluta*) (p.156)
9 Ventral cells of costa long rectangular, smooth; margin conspicuously revolute; costa excurrent in hyaline awn....***Hilpertia velenovskyi*** (r)
– Ventral cells of costa quadrate to shortly rectangular; margin recurved to strongly revolute; costa percurrent or excurrent in a short mucro....***Pseudocrossidium*** (p.143)
10(1) Lamina cells longer than wide....11

– Lamina cells ± quadrate 13
11 Peristome teeth divided to base ..... ***Ditrichum*** s.l. (incl. ***Flexitrichum***) (p.133)
– Peristome teeth divided halfway 12
12 Leaves squarrose when moist ..... ***Dichodontium pellucidum*** (s-f)
– Leaves not squarrose ..... ***Dicranella*** (p.125)
13(10) Peristome teeth irregularly divided to base or nearly so 14
– Peristome teeth regularly divided to base or nearly so 17
14 Lamina cells 15–20 µm wide ..... ***Tortula*** (p.154)
– Lamina cells to 14 um wide 15
15 Costa excurrent in mucro ..... ***Trichostomum*** (p.161)
– Costa ending in or below apex 16
16 Plants to 5 mm tall; lamina cells smooth ..... ***Campylostelium saxicola*** (rr)
– Plants more than 5 mm tall; lamina cells mamillose on both surfaces ..... ***Cynodontium*** (p.132)
17(13) Leaf margin entire or crenulate or slightly dentate near apex; lamina cells pluripapillose ..... ***Bryoerythrophyllum recurvirostrum*** (s-f)
– Leaf margin strongly dentate in upper third; lamina cells mamillose ..... ***Dichodontium pellucidum*** (s-f)

Group 21 Acrocarps with exserted capsule, inclined or pendulous, peristome simple

1 Seta curved at least when moist 2
– Seta straight 3
2 Plants minute; leaves not deciduous; growing on siliceous rocks or calcareous small stones ..... ***Blindiadelphus*** (p.163)
– Plants medium-sized to robust; leaves deciduous, plants growing on humus-rich soil or dead wood ..... ***Dicranodontium denudatum*** (rr)
3 Alar cells differentiated ..... ***Dicranum*** (p.129)
– Alar cells not differentiated 4
4 Median lamina cells rectangular, long and narrow, smooth ..... ***Dicranella*** (p.125)
– Median lamina cells quadrate, papillose or mamillose 5
5 Lamina cells papillose, sometimes only faintly so; costa excurrent ..... ***Tortula cernua*** (*Desmatodon cernuus*) (rr)

– Lamina cells mamillose; costa percurrent ..... ***Dichodontium pellucidum*** (s-f)

Group 22 **Acrocarps with exserted capsule, inclined to pendulous, peristome double**

1 Plants bluish when dry (and dead) or with bluish to golden metallic sheen 2
– Plants not bluish when dry 3
2 Plants bluish when dry and dead; lamina cells hexagonal, 20–24 µm wide ..... ***Mnium stellare*** (s-f)
– Plants with metallic sheen; lamina cells linear, 8–12 µm wide ..... ***Pohlia cruda*** (s-f)
3 Costa 1/3 or more of leaf base 4
– Costa less than 1/3 of leaf base 5
4 Upper leaves linear, subulate ..... ***Leptobryum pyriforme*** (s-f)
– Upper leaves oblong-lanceolate, not linear ..... ***Amblyodon dealbatus*** (n.s.)
5 Leaves distinctly 3-ranked, patent to squarrose, keeled, triangular-lanceolate ..... ***Meesia triquetra*** (n.s.)
– Leaves not as above 6
6 Leaves strongly imbricate, plants julaceous ..... ***Ptychostomum zieri*** (*Plagiobryum zieri*) (r)
– Leaves not strongly imbricate, plants not julaceous 7
7 Peristome teeth sigmoid; capsule asymmetrical ..... ***Entosthodon*** (p.121)
– Peristome teeth straight; capsule symmetric, cylindrical to pyriform 8
8 Leaves linear-lanceolate, more than 7 times as long as wide ..... ***Orthodontium lineare*** (rr)
– Leaves (except perichaetial leaves) less than 7 times as long as wide, lanceolate to ovate 9
9 Leaves narrowly ovate to lanceolate, unbordered or with a weak border of narrow cells, distinctly denticulate above; perichaetial leaves longer than vegetative leaves; costa rarely excurrent and then only shortly so, in section with large median guide cells; lamina cells linear to narrowly hexagonal, 5 or more times as long as wide; basal cells not differentiated ..... ***Pohlia*** (p.189)

– Leaves suborbicular to ovate, rarely lanceolate, usually with a distinct (sometimes thickened) border of narrow cells; margins entire or finely denticulate above, rarely distinctly so; perichaetial leaves hardly longer than vegetative leaves; costa often excurrent, sometimes as a long hair, in section with large ventral superficial cells; lamina cells rhomboidal to hexagonal, to 4 times as long as wide; basal cells quadrate or rectangular..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)

Group 23 **Acrocarps with propagules on stems, leaves or in stalked clusters**

1 Plants with axillary bulbils..... 2
– Plants without axillary bulbils..... 3
2 Leaves narrowly ovate to lanceolate, unbordered or with a weak border of narrow cells, distinctly denticulate above; perichaetial leaves longer than vegetative leaves; costa rarely excurrent and then only shortly so, in section with large median guide cells; lamina cells linear to narrowly hexagonal, 5 or more times as long as wide; basal cells not differentiated ..... ***Pohlia*** (p.189)
– Leaves suborbicular to ovate, rarely lanceolate, usually with a distinct (sometimes thickened) border of narrow cells; margins entire or finely denticulate above, rarely distinctly so; perichaetial leaves hardly longer than vegetative leaves; costa often excurrent, sometimes as a long hair, in section with large ventral superficial cells; lamina cells rhomboidal to hexagonal, to 4 times as long as wide; basal cells quadrate or rectangular..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)
3 Plants with foliose propagules in leaf axils..... ***Syntrichia laevipila*** (rr)
– Plants with gemmae..... 4
4 Gemmae crowded at ends of stems..... 5
– Gemmae in leaf axils or on leaves..... 6
5 Gemmae globose, ovoidal or fusiform, in globose clusters on ends of leafless prolongations of stems..... ***Aulacomnium*** (p.202)

– Gemmae lenticular or discoid, in the centre of a rosette of apical leaves ..... ***Tetraphis pellucida*** (s-f)

6 Gemmae globose or ellipsoidal on axillary filaments 7

– Gemmae globose or ellipsoidal, sessile, or filamentous 9

7 Leaves with hair point ..... ***Grimmia*** (*dissimulata*, *lisae*, *muehlenbeckii*, *trichophylla*) (p.165)

– Leaves without hair point 8

8 Gemmae clavate, few-celled, or ovoid, many-celled ..... ***Hydrogonium*** (p.159)

– Gemmae spherical, sometimes irregularly so and with protruding cells ..... ***Didymodon*** (*cordatus*, *glaucus*, *rigidulus*)

9 Gemmae globose, at tips of leaves, more than 80 µm ..... ***Grimmia hartmanii*** (s-f)

– Gemmae on costa, on leaf or in leaf axils, if at tips of leaves, then not globose or less than 70 µm 10

10 Gemmae irregularly globose, on ventral side of costa ..... ***Syntrichia*** (*latifolia*, *papillosa*, *virescens*) (p.144)

– Gemmae filamentous, fusiform, ovoid or ellipsoidal, on lamina, at tips of leaves or in leaf axils 11

11 Gemmae filamentous, branched or not 12

– Gemmae fusiform, shortly cylindrical, vermiform, ellipsoidal or ovoid 14

12 Basal cells hyaline, forming a well-delimited group ..... ***Encalypta streptocarpa*** (s-f)

– Basal cells hyaline or not, not forming a well-delimited group 13

13 Leaves bordered, with 1–3 rows of elongate cells; lamina cells rectangular-hexagonal, smooth, more than 15 µm wide ..... ***Ptychostomum*** (*moravicum*, *pallens*, *pseudotriquetrum*) (p.180)

– Leaves unbordered; lamina cells rounded, papillose, to 14 µm wide ..... ***Orthotrichum*** s.l. (incl. ***Lewinskya***, ***Nyholmiella***, ***Pulvigera***) (p.193)

14(11) Calyptra cucullate, smooth, hairless; capsule much exserted on a thin seta; gemmae in leaf axils and in the tomentum of the stem 15

– Calyptra mitrate, plicate, with or without hairs; capsule immersed to exserted on a strong seta; gemmae on the surface of leaves 16

15 Lamina cells papillose ..... ***Zygodon rupestris*** (r)

– Lamina cells smooth ..... ***Codonoblepharon forsteri*** (*Zygodon forsteri*) (r)

16 Leaves concave, with erect incurved or involute margins; apex obtuse or rounded ..... ***Nyholmiella*** (p.193)

– Leaves ± keeled, rarely concave, with recurved, revolute or plane margins; apex obtuse, acute or acuminate, rarely rounded 17

17 Marginal cells at leaf base hyaline, rectangular, with thickened walls, ascending up margin, basal cells linear ..... ***Ulota*** (p.193)

– Marginal basal cells elongate, similar to the rest of basal cells ..... ***Orthotrichum*** s.l. (incl. ***Lewinskya***, ***Pulvigera***) (p.193)

Group 24 Acrocarps with costa 1/3 or more width of leaf base

1 Costa excurrent in a hyaline hair point ..... ***Campylopus introflexus*** (s-f)

– Costa percurrent or excurrent in a coloured hair point 2

2 Alar cells differentiated 3

– Alar cells not differentiated 6

3 Costa consisting of green cells and hyaline cells (cross section) ..... ***Paraleucobryum longifolium*** (s-f)

– Costa consisting of guide cells and usually also stereids (cross section) 4

4 Lamina partly bistratose near costa ..... ***Dicranum fulvum*** (r)

– Lamina unistratose 5

5 Costa with dorsal stereids only or without stereids ..... ***Campylopus*** (p.124)

– Costa with dorsal and ventral stereids ..... ***Dicranodontium denudatum*** (rr)

6(2) Costa with a central layer of green cells surrounded by hyaline cells (cross section); plants whitish or glaucous ..... ***Leucobryum*** (p.125)

– Costa with a central layer of guide cells or not, not with outer layers of hyaline cells (cross section); plants green or brownish 7

7 Lamina cells papillose ..... ***Gymnostomum aeruginosum*** (r)

– Lamina cells smooth 8

8 Leaves oblong-lanceolate; lamina cells longly hexagonal; costa without guide cells ..... ***Amblyodon dealbatus*** (n.s.)

– Leaves linear to lanceolate; lamina cells rectangular to linear; costa with guide cells 9
9 Leaves linear, flexuose, lamina cells linear, 45–55 µm long; rhizoidal tubers abundant ..... ***Leptobryum pyriforme*** (s-f)
– Lamina cells less than 45 µm long; rhizoidal tubers lacking or rare 10
10 Costa wider than 180 µm at leaf base ..... ***Campylopus*** (p.124)
– Costa less than 180 µm wide at leaf base 11
11 Costa 80–110 µm wide at leaf base ..... ***Flexitrichum*** (p.123)
– Costa to 30 µm wide at leaf base ..... ***Dicranella*** (*heteromalla*, *cerviculata*) (p.125)

Group 25 Acrocarps with lamina cells 18 µm wide or more

1 Leaves bordered by elongate cells, denticulate (sometimes very faintly so); leaf apex acute, mostly with a short apiculus; plants often with creeping sterile shoots ..... ***Plagiomnium*** (p.202)
– Leaves not bordered or if bordered, leaf apex rounded, without apiculus; sterile shoots erect, not creeping 2
2 Lamina cells quadrate, rounded or shortly polygonal 3
– Lamina cells longly polygonal or elliptical 10
3 Costa ending below leaf apex 4
– Costa excurrent in apiculus or hair point 5
4 Leaf margin irregularly denticulate, plants bluish when dry (and dead) ..... ***Mnium stellare*** (s-f)
– Leaf margin entire; plants not bluish when dry ..... ***Orthotrichum sprucei*** (rr)
5 Leaves apiculate, with reflexed, brownish yellow apiculus formed by a single elongate cell; margin irregularly denticulate above ..... ***Chenia leptophylla*** (*Phascum leptophyllum*, *Leptophascum leptophyllum*) (r)
– Leaves not as above; margin entire 6
6 Capsule immersed ..... ***Physcomitrium patens*** (*Aphanorrhegma patens*, *Physcomitrella patens*) (s-f)
– Capsule exserted or emergent 7
7 Calyptra small, cucullate; spores less than 40 µm 8
– Calyptra large, inflated, cucullate, distinctly 4-angled; spores 50–65 µm ..... ***Pyramidula tetragona*** (r)
8 Capsule dehiscent 9

– Capsule indehiscent ..... ***Tortula protobryoides*** (*Pottia bryoides*, *Protobryum bryoides*) (s-f)

9 Peristome single, teeth 16, irregularly divided; plants growing on soil ..... ***Tortula*** pp. (*cernua*, *lindbergii*) (p.154)

– Peristome double, exostome teeth united in 8 pairs; plants growing in knot-holes ..... ***Codonoblepharon forsteri*** (*Zygodon forsteri*) (r)

10(2) Plants bulbiform 11

– Plants not bulbiform 12

11 Margin plane; costa excurrent in short apiculus ..... ***Acaulon*** (p.135)

– Margin strongly revolute, with papillose cells (median lamina cells smooth); costa excurrent in hyaline hair point ..... ***Hilpertia velenovskyi*** (r)

12 Plants rhizomatous; leaves crowded in terminal rosette ..... ***Rhodobryum*** (p.180)

– Plants not rhizomatous; leaves crowded in terminal rosette or evenly arranged along the stem 13

13 Leaf apex rounded 14

– Leaf apex obtuse, acute or acuminate, but not rounded 15

14 Costa percurrent; leaves 2–3 times as long as wide, decurrent, bordered by several rows of narrow, long cells ..... *Ptychostomum pseudotriquetrum* var. *pseudotriquetrum* fo. *neodamense* (*Bryum neodamense*) (n.s., excluded)

Note: The '*B. neodamense* phenotype' is an inconstant form of *P. pseudotriquetrum* var. *pseudotriquetrum* without taxonomic value and was therefore excluded from the Hungarian checklist.

– Costa ending several cells below leaf apex; leaves 2 times as long as wide, not decurrent, unbordered ..... ***Splachnobryum obtusum*** (n.s.)

15 Capsule sulcate; peristome teeth fused at apices ..... ***Funaria hygrometrica*** (s-f)

– Capsule smooth 16

16 Capsule immersed, indehiscent (gymnostomous) ..... ***Physcomitrium patens*** (*Aphanorrhegma patens, Physcomitrella patens*) (s-f)

– Capsule exserted, dehiscent 17

17 Capsule asymmetrical and curved 18

– Capsule symmetrical and straight 19

18 Capsule horizontal to pendulous; peristome teeth not sigmoid ..... ***Ptychostomum zieri*** (*Plagiobryum zieri*) (r)
– Capsule inclined to horizontal; peristome teeth sigmoid ..... ***Entosthodon*** (p.121)
19 Capsule pendulous 20
– Capsule erect or inclined 21
20 Leaves narrowly ovate to lanceolate, unbordered or with a weak border of narrow cells, distinctly denticulate above; perichaetial leaves longer than vegetative leaves; costa rarely excurrent and then only shortly so, in section with large median guide cells; lamina cells linear to narrowly hexagonal, 5 or more times as long as wide; basal cells not differentiated ..... ***Pohlia*** (p.189)
– Leaves suborbicular to ovate, rarely lanceolate, usually with a distinct (sometimes thickened) border of narrow cells; margins entire or finely denticulate above, rarely distinctly so; perichaetial leaves hardly longer than vegetative leaves; costa often excurrent, sometimes as a long hair, in section with large ventral superficial cells; lamina cells rhomboidal to hexagonal, to 4 times as long as wide; basal cells quadrate or rectangular ..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)
21 Exothecial cells elongate ..... ***Entosthodon*** (*hungaricus*, *muhlenbergii*, *pulchellus*) (p.121)
– Exothecial cells isodiametric 22
22 Calyptra mitriform; lid apiculate or rostellate ..... ***Physcomitrium*** (p.121)
– Calyptra cucullate or mitriform; lid convex or plane, without apiculus ..... ***Entosthodon fascicularis*** (s-f)

Group 26 Acrocarps with alar cells differentiated

1 Costa with stereids 2
– Costa without stereids 3
2 Leaf cuticle longitudinally striate ..... ***Hymenoloma crispulum*** (rr)
– Leaf cuticle smooth ..... ***Dicranum*** (p. 129)
3 Leaves rigid, fragile, mostly broken ..... ***Dicranum tauricum*** (s-f)

– Leaves different, capsule symmetrical, smooth..... ***Blindia acuta*** (n.s.)

Group 27 **Acrocarps with lamina cells isodiametric and leaf margins denticulate or dentate, at least near apex or base**

1 Leaf margin denticulate near base with reflexed, hyaline teeth..... ***Eucladium verticillatum*** (s-f)
– Leaves not as above..... 2
2 Plants glaucous..... ***Saelania glaucescens*** (rr)
– Plants not glaucous..... 3
3 Leaves squarrose..... 4
– Leaves not squarrose..... 5
4 Basal cells hyaline, ascending up margin; leaf margin dentate above; frequent plants on open, dry calcareous soil..... ***Tortella squarrosa*** (*Pleurochaete squarrosa*) (s-f)
– Basal cells not as above; leaf margin sharply serrate; very rare plants on peaty soils..... ***Meesia triquetra*** (n.s.)
5 Stem with dense brownish tomentum and usually with clusters of gemmae at the tip..... ***Aulacomnium*** (p.202)
– Stem not as above..... 6
6 Leaves linear-lanceolate, fragile, notched; margin dentate at the tip in young leaves..... ***Didymodon sinuosus*** (s-f)
– Leaves not as above..... 7
7 Leaves lanceolate to lingulate, with wide, acute or obtuse apex..... 8
– Leaves ovate or linear lanceolate, with gradually acuminate apex..... 9
8 Lamina cells smooth..... ***Rhabdoweisia*** (p.132)
– Lamina cells mamillose..... ***Dichodontium pellucidum*** (s-f)
9 Leaf margin plane or incurved..... 10
– Leaf margin recurved..... 11
10 Marginal cells with slightly thicker walls than the rest of lamina cells, some longer, but not forming a distinct border; lid attached to columella after dehiscence; lamina cells not mamillose on ventral surface of leaf..... ***Hennediella heimii*** (*Desmatodon heimii*) (rr)
– Marginal cells similar to the rest of lamina cells; lid not attached to columella after dehiscence; lamina cells mamillose on ventral surface of leaf..... ***Timmia*** (p.119)

11 Leaves crisped when dry....12
– Leaves flexuose, slightly twisted or straight when dry....16
12 Leaves lanceolate, acuminate, with unistratose margins; lamina cells mamillose or finely papillose-striate....13
– Leaves linear-lanceolate, acute, often with bistratose margins; lamina cells smooth or mamillose....14
13 Plants pale green; median lamina cells mamillose; stem circular in cross section....***Bartramia*** (p.179)
– Plants dark green; median lamina cells finely papillose-striate; stem triangular in cross section....***Plagiopus oederianus*** (r)
14 Lamina cells smooth....***Cynodontium tenellum*** (rr)
– Lamina cells mamillose....15
15 Leaves tristichous....***Cnestrum schisti*** (n.s.)
– Leaves spirally arranged....***Cynodontium*** (p.132)
16(11) Leaves with papillose-dentate margins, at least in upper half....***Bartramia*** (p.179)
– Leaves with denticulate margins only at apex....17
17 Leaf margin crenulate or papillose; apex denticulate, with few hyaline teeth; lamina cells papillose; capsule erect, smooth, not strumose....***Bryoerythrophyllum recurvirostrum*** (s-f)
– Leaf margin not crenulate or papillose; apex slightly denticulate; lamina cells smooth; capsule inclined, striate, strumose....***Ceratodon*** (p.133)

Group 28 Acrocarps with lamina cells isodiametric and excurrent costa

1 Basal cells of leaf hyaline, ascending up margins in a V-shape....***Tortella*** (p.159)
– Basal cells of leaf hyaline or not, not ascending up margins....2
2 Basal cells of leaf hyaline, forming a well-delimited group on both sides of the costa, in arch-shaped area....3
– Basal cells of leaf hyaline or not, transition to cells above gradual....4
3 Peristome teeth spirally twisted; calyptra partially covering the capsule....***Syntrichia*** (p.144)

– Peristome teeth not twisted or lacking; calyptra covering the whole capsule; basal hyaline lamina cells with pale orange cross walls distinctly thickened ..... ***Encalypta*** (p.120)

4 Leaves partially bistratose in upper part ..... ***Schistidium*** (p.165)

– Leaves unistratose or with bistratose margins 5

5 Lamina cells smooth or mamillose 6

– Lamina cells papillose 7

6 Costa excurrent in hyaline or yellowish hair point, rarely in apiculus; capsule indehiscent, or if dehiscent then leaf margin indistinctly bordered by longer cells ..... ***Tortula*** pp. (p.154)

– Costa ending below apex, percurrent or shortly excurrent; capsule dehiscent and leaf margin not bordered ..... ***Didymodon*** (p.138)

7 Leaf margin revolute or recurved on one or both sides, at least partially 8

– Leaf margin plane or incurved 15

8 Leaf margins strongly revolute 9

– Leaf margins recurved on one or both sides 10

9 Leaves lanceolate to ovate-lanceolate, triangular or lingulate ..... ***Pseudocrossidium*** (p.143)

– Leaves oblong, ovate, elliptical or obovate ..... ***Tortula*** (p.154)

10 Capsule indehiscent 11

– Capsule dehiscent 13

11 Lid differentiated, persistent ..... ***Tortula protobryoides*** (*Pottia bryoides*, *Protobryum bryoides*) (s-f)

– Lid not differentiated 12

12 Stereids numerous, in 3–5 (6) layers; capsule immersed or emergent ..... ***Tortula*** pp. (*T. acaulon*, *Phascum cuspidatum*) (p.154)

– Stereids few, in 1–2 layers or lacking; capsule emergent, rarely immersed ..... ***Microbryum*** (p.141)

13(10) Peristome teeth erect, rudimentary or lacking ..... ***Tortula*** pp. (p.154)

– Peristome teeth filiform, spirally twisted 14

14 Cells of axillary hairs hyaline ..... ***Barbula unguiculata*** (cc)

– Basal cells of axillary hairs brown ..... ***Didymodon*** (p.138)

15(7) Capsule immersed to emergent ..... ***Weissia*** (*longifolia*, *rostellata*) (p.162)

– Capsule exserted 16

16 Leaves 3–4 (6) mm long; margins plane, sinuose, notched, papillose-crenulate; apex formed by a group of smooth, hyaline cells twice as long as papillose cells below..... ***Chionoloma tenuirostre*** (*Oxystegus tenuirostris*) (r)
– Leaves 0.4–3 (4.5) mm long; margin plane or incurved, entire 17
17 Leaf margin plane or incurved, apex occasionally cucullate; capsule longly cylindrical or ellipsoidal; peristome teeth straight or twisted, perforated..... ***Trichostomum*** (p.161)
– Leaf margin incurved, at least in upper part, sometimes plane; capsule shortly cylindrical or ovoid; peristome teeth straight, entire or lacking..... ***Weissia*** (p.162)

Group 29 Acrocarps with isodiametric lamina cells, leaf apex obtuse or rounded, apiculate or not and costa not excurrent

1 Lamina cell walls sinuouse or incrassate with ± stellate lumen 2
– Lamina cell walls neither sinuouse nor incrassate with stellate lumen..... 3
2 Lamina cell walls incrassate with ± stellate lumen..... ***Aulacomnium*** (p.202)
– Lower lamina cell walls sinuose..... Grimmiaceae (p.165)
3 Leaf margins plane or incurved..... 4
– Leaf margins recurved..... 6
4 Lamina bistratose; capsule ovoid, asymmetric, immersed; perichaetial leaves ciliate..... ***Diphyscium foliosum*** (s-f)
– Lamina unistratose; capsules and perichaetial leaves not as above..... 5
5 Basal lamina cells narrowly rectangular, (14) 16–40 (50) × (5) 6–7 µm; costa 20–40 µm wide at mid-leaf; leaves only 0.5 (0.8) mm long, erect; plants 3 (10) mm long; capsule with annulus of large persistent cells; brown stalked gemmae, frequent in lower leaf axils..... ***Gyroweisia tenuis*** (rr)
– Basal lamina cells short or long rectangular, 14–18 µm long, or if longer then costa 50–70 (90) µm wide at mid-leaf; leaves various; plants sometimes taller; annulus of small cells, persistent or falling; gemmae sometimes present in upper leaf axils, greenish, not brownish..... ***Gymnostomum*** (p.158)

6(3) Costa homogeneous in cross section ..... ***Orthotrichum*** s.l. (incl. ***Lewinskya***, ***Nyholmiella***, ***Pulvigera***) (p.193)
– Costa heterogeneous in cross section 7
7 Leaves ovate-lanceolate; axillary hairs of 2–8 cells, 1–2 (3) basal cells brown ..... ***Didymodon*** (p.138)
– Leaves obovate, lingulate or elliptical; axillary hairs of 4–5 cells, all hyaline ..... ***Tortula*** (p.154)

Group 30 **Acrocarps with isodiametric cells, apex acute, subacute or acuminate, margins recurved at least on one side, costa not excurrent or lacking**

1 Costa lacking ..... ***Hedwigia*** (p.178)
– Costa present 2
2 Upper lamina cells mamillose on both sides ..... ***Cynodontium*** (p.132)
– Upper lamina cells smooth or papillose on one or both sides 3
3 Upper lamina cells smooth 4
– Upper lamina cells papillose 5
4 Leaves acute or acuminate; capsule ± cylindrical, ± sulcate, strumose or not ..... ***Ceratodon*** (p.133)
– Leaves longly acuminate; capsule ellipsoidal, smooth, not strumose ..... ***Dicranoweisia cirrata*** (s-f)
5 Marginal cells at leaf base hyaline, quadrate to shortly rectangular, with thickened walls, ascending up margin, basal cells linear ..... ***Ulota*** (p.193)
– Marginal basal cells different 6
6 Capsule immersed to emergent; calyptra glabrous or hairy 7
– Capsule exserted; calyptra glabrous 8
7 Stomata cryptopore ..... ***Orthotrichum*** (p.193)
– Stomata phaneropore ..... ***Lewinskya*** (p.193)
8 Leaves ovate, elliptical or oblong; axillary hairs completely hyaline ..... ***Tortula*** (p.154)
– Leaves linear-lanceolate to ovate-lanceolate; axillary hairs completely hyaline or with brown basal cells 9
9 Axillary hairs with brown basal cells ..... ***Didymodon*** (p.138)
– Axillary hairs completely hyaline 10

10 Clavate or ovoid gemmae in leaf axils..... ***Hydrogonium*** (p. 159)
– Axillary gemmae lacking..... ***Streblotrichum convolutum*** (*Barbula convoluta*) (p.156)

Group 31 **Acrocarps with isodiametric cells, apex acute, subacute or acuminate, margins plane or recurved at base only, costa not excurrent**

1 Leaf margin entire.....2
– Leaf margin crenulate or papillose-crenulate.....7
2 Lamina cells smooth.....3
– Lamina cells papillose.....4
3 Peristome double; lamina cells (7) 11–20 (23) µm wide..... ***Codonoblepharon forsteri*** (*Zygodon forsteri*) (r)
– Peristome simple; lamina cells 6–16 µm wide; plants to 5 mm tall..... ***Campylostelium saxicola*** (rr)
4 Plants rusty brown in lower part; lamina cells with c-shaped papillae..... ***Bryoerythrophyllum recurvirostrum*** (s-f)
– Characters not as above.....5
5 Lamina cells incrassate with ± stellate lumen; gemmae in groups at the end of pseudopodia..... ***Aulacomnium*** (p.202)
– Lamina cells not incrassate with ± stellate lumen; without gemmae in groups at the end of pseudopodia.....6
6 Lamina cells rounded or hexagonal, strongly papillose; gemmae fusiform, pluricellular..... ***Zygodon rupestris*** (r)
– Lamina cells quadrate or rounded, papillose and finely longitudinally striate; gemmae lacking..... ***Amphidium mougeotii*** (r)
7(1) Leaves fragile, upper part often lost in older leaves; leaf margin irregularly erose, notched, ± undulate or sinuose, dentate-denticulate or distinctly papillose-crenulate.....8
– Leaves not fragile; leaf margin neither sinuose, undulate nor notched, irregularly erose or dentate-denticulate.....9
8 Leaf apex formed by a group of smooth, hyaline cells, twice as long as papillose cells below..... ***Chionoloma tenuirostre*** (*Oxystegus tenuirostris*) (r)
– Leaf apex not formed by smooth, hyaline cells; dentate in young leaves or not..... ***Didymodon*** (*tophaceus* subsp. *erosus*, *D. sinuosus*) (p.138)

9 Leaves keeled.....***Hymenostylium recurvirostrum*** (n.s.)
– Leaves not keeled.....10
10 Leaf margin bistratose above.....***Cynodontium*** (p.132)
– Leaf margin unistratose.....***Rhabdoweisia*** (p.132)

Group 32 **Acrocarps with lamina cells elongate, leaves acuminate or subulate and apex consisting largely or entirely of costa**

1 Lamina cells mamillose.....***Bartramia*** (p.179)
– Lamina cells smooth.....2
2 Capsule indehiscent.....3
– Capsule dehiscent.....4
3 Capsule exserted; neck distinct, about half the length of the urn .....***Bruchia flexuosa*** (rr)
– Capsule immersed; neck indistinct.....***Pleuridium*** (p.133)
4 Plants to 2.5 mm tall; saxicolous.....5
– Plants larger; terricolous or saxicolous.....6
5 Seta arcuate when moist, straight when dry; plants growing on siliceous rocks or on small calcareous stones.....***Blindiadelphus*** (p.163)
– Seta straight when moist and dry; plants growing on calcareous rocks.....***Seligeria*** (p.163)
6 Plants often without capsules, leaves with expanded sheathing base, clasping the stem, and suddenly contracted into a narrow subula which is often squarrosely reflexed.....7
– Plants with capsules; leaves as above or otherwise.....8
7 Subula made up of prorate cells, therefore mamillose all around, not just at margin.....***Trichodon cylindricus*** (*Ditrichum cylindricum*) (s-f)
– Subula cells not prorate, mamillae only at margin, not all around.....***Dicranella schreberiana*** (s-f)
8 Peristome teeth divided to base with filiform segments.....***Ditrichum***, ***Trichodon cylindricus*** (p.133)
– Peristome teeth divided to middle.....***Dicranella*** (p.125)

Group 33 **Acrocarps with lamina cells elongate, leave apex obtuse to acuminate, costa percurrent or excurrent, short or lacking**

1 Protonema persistent; plants minute, to 2.7 mm tall ..... ***Ephemerum*** (p.157)
– Protonema not persistent; plants small to robust 2
2 Lamina cells mamillose; leaves dentate or serrate from base to apex (Bartramiaceae pp.) 3
– Lamina cells smooth or mamillose; leaves with entire margins or denticulate at apex only 4
3 Leaves narrowly or linear lanceolate, with sheathing base; margin with simple teeth ..... ***Bartramia*** (p.179)
– Leaves lanceolate to ovate-lanceolate, without sheathing base; margin with simple or geminate teeth ..... ***Philonotis*** (p.179)
4 Lamina cells quadrate to rectangular 5
– Lamina cells elongate hexagonal, rhomboidal or linear 6
5 Capsule dehiscent, exserted ..... ***Dicranella*** (p.125)
– Capsule indehiscent, immersed ..... ***Pseudephemerum nitidum*** (s-f)
6 Leaves appressed to erect when dry, imbricate ..... ***Ptychostomum zieri*** (*Plagiobryum zieri*) (r)
– Leaves erecto-patent to spreading, rarely imbricate 7
7 Lamina cells hexagonal or rhomboidal-hexagonal; costa percurrent or excurrent in long or short point ..... ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) (p.180)
– Lamina cells linear-hexagonal or linear-rhomboidal to vermicular; costa mostly not reaching leaf apex, rarely excurrent 8
8 Leaves (except perichaetial leaves) less than 7 times as long as wide; capsule inclined or horizontal to pendulous ..... ***Pohlia*** (p.189)
– Leaves more than 7 times as long as wide; capsule slightly inclined ..... ***Orthodontium lineare*** (rr)

Group 34 Pleurocarps with long costa and lamina cells short, at least at margins

1 Leaf apex rounded ..... ***Leptodon smithii*** (r)
– Leaf apex obtuse, acute or acuminate 2
2 Branch leaves strongly dentate; plants ± dendroid ..... ***Thamnobryum*** (p.222)
– Branch leaves entire or denticulate; plants pinnately or irregularly branched 3
3 Plants pinnately branched 4
– Plants irregularly branched 5
4 Stem 1-pinnate ..... ***Abietinella abietina*** (*Thuidium abietinum*) (c) (p.210)
– Stem 2–3-pinnate ..... ***Thuidium*** (p.210)
5 Leaf cells smooth 6
– Leaf cells papillose or prorate 8
6 Plants usually with sporophytes, seta short, capsules immersed, abundant on stiffly projecting shoots, all pointing to the same side; on tree bark ..... ***Cryphaea heteromalla*** (rr)
– Sporophytes absent or capsules exserted on elongate seta; on tree bark or on rock 7
7 Leaves with 2 longitudinal plicae at base, one on each side of the costa; leaf margin entire or denticulate; plants slender, often with propaguliferous branchlets at the tips of stems and branches, growing on rock or tree bark; capsules rare ..... ***Pseudoleskeella*** (p.209)
– Leaves not plicate; leaf margin entire; plants small, dark green, without propaguliferous branchlets, growing around water-filled knotholes; capsules frequent, constricted below mouth when empty ..... ***Anacamptodon splachnoides*** (s-f)
Note: For an account of this species in Hungary, see Németh and Erzberger (2015).
8 Costa extending to 1/2–2/3 up leaf 9
– Costa nearly reaching apex 10
9 Stem and branch leaves strongly dimorphic; stem leaves reflexed, abruptly contracted from broad base; branch leaves slightly concave, ovate, obtuse or shortly acute ..... ***Heterocladiella dimorpha*** (*Heterocladium dimorphum*) (rr)
Note: For an account of this species in Hungary, see Baráth *et al.* (2016).

– Stem and branch leaves similar in shape, but differing in size; leaves erecto-patent to patent, not reflexed, gradually narrowed to acute apex ..... ***Heterocladium heteropterum*** (rr)
Note: For an account of this species in Hungary, see Baráth and Erzberger (2019).

10 Leaf without longitudinal plicae; alar cells not differentiated ..... ***Anomodon*** s.l. (incl. ***Claopodium rostratum***, ***Pseudanomodon attenuatus***) (p.222)

– Leaf with 1–2 longitudinal plicae near base; alar cells differentiated 11

11 Leaf cells smooth or prorate ..... ***Lescuraea saviana*** (*Pseudoleskea saviana*) (rr)

– Leaf cells with a single central papilla each on the dorsal side ..... ***Leskea polycarpa*** (cc)

Group 35 Pleurocarps with longitudinally plicate leaves, costa long and lamina cells elongate

1 Plants dendroid ..... ***Climacium dendroides*** (s-f)

– Plants irregularly or pinnately branched 2

2 Branch leaves with reflexed teeth at apex ..... ***Antitrichia curtipendula*** (r)

– Branch leaves without reflexed teeth at apex 3

3 Stem with paraphyllia 4

– Stem without paraphyllia 6

4 Stems regularly pinnately branched; alar cells inflated or not 5

– Stems irregularly branched, alar cells not inflated, not hyaline ..... ***Lescuraea saviana*** (*Pseudoleskea saviana*) (rr)

5 Paraphyllia linear to linear-lanceolate; alar cells inflated, hyaline ..... ***Palustriella*** (p.205)

– Paraphyllia branched; alar cells not differentiated ..... ***Helodium blandowii*** (rr)

6 Stem leaves straight or only slightly falcate 7

– Stem leaves strongly falcate 12

7 Plants very small and slender; leaves with two superficial longitudinal plicae near base ..... ***Pseudoleskeella*** (p.209)

– Plants medium-sized to robust 8

8 Stem with reddish or brownish tomentum of papillose rhizoids ..... ***Tomentypnum nitens*** (rr)

– Stem without tomentum 9
9 Stem leaves triangular, gradually tapering into long fine point ..... ***Homalothecium*** (p.214)
– Stem leaves ovate to lanceolate, gradually or abruptly tapering into long or short point 10
10 Stem leaves ovate-lanceolate, gradually acuminate; costa of branch leaves ending in a dorsal projection or not; lid conical ..... ***Brachythecium*** s.l. pp. (incl. ***Sciuro-hypnum***) (p.215)
– Stem leaves ovate to lanceolate, sometimes cordate at base; costa usually ending in a projection at dorsal side of branch leaves; lid longly rostrate 11
11 Alar cells quadrate, incrassate, opaque, reaching costa ..... ***Plasteurhynchium striatulum*** (*Eurhynchium striatulum*) (s-f)
– Alar cells rectangular, thin-walled, not reaching costa ..... ***Eurhynchium*** (p.211)
12(6) Stem with hyalodermis; alar cells inflated, hyaline ..... ***Sanionia uncinata*** (r)
– Stem without hyalodermis; alar cells not differentiated ..... ***Hamatocaulis vernicosus*** (rr)

Group 36 Pleurocarps with squarrose or falcate leaves, long costa and elongated lamina cells

1 Leaves conspicuously rugose ..... ***Rhytidium rugosum*** (s-f)
– Leaves not rugose 2
2 Leaf apex acute or obtuse ..... ***Hygrohypnum luridum*** (s-f)
– Leaf apex acuminate 3
3 Stem with paraphyllia 4
– Stem without paraphyllia 5
4 Alar cells well developed, inflated, hyaline ..... ***Cratoneuron filicinum*** (s-f)
– Alar cells neither inflated nor hyaline ..... ***Lescuraea saviana*** (*Pseudoleskea saviana*) (rr)
5 Leaf acumen channelled 6
– Leaf acumen not channelled 7
6 Plants growing in dry calcareous habitats; stem leaves to 1.7 mm long; alar cells slightly inflated, the widest cells 10.5–17.5 (21) μm wide ..... ***Campyliadelphus chrysophyllus*** (*Campylium chrysophyllum*) (s-f)

– Plants growing in wetlands; stem leaves at least 1.3–1.6 mm long; alar cells strongly inflated, the widest cells 17–31.5 µm wide ..... ***Drepanocladus polygamus*** (*Campylium polygamum*) (r)

7 Leaf margin finely denticulate by protruding cell ends, most distinctly above leaf base ..... ***Sarmentypnum exannulatus*** (*Warnstorfia exannulata*) (rr)

– Leaf margin entire or obscurely denticulate 8

8 Group of alar cells large, of 2–4 rows of cells, ascending up margin and sometimes reaching costa ..... ***Drepanocladus*** (p.206)

– Group of alar cells small, of 2–10 cells, not ascending up margin and not reaching costa ..... ***Scorpidium cossonii*** (*Drepanocladus cossonii*) (rr)

Group 37 Pleurocarps with long costa, elongated lamina cells and rounded, obtuse, or obtuse and apiculate apex

1 Costa more than 40 µm wide ..... ***Hygroamblystegium fluviatile*** (*Amblystegium fluviatile*) (r)

– Costa less than 40 µm wide 2

2 Group of alar cells well differentiated 3

– Group of alar cells not or hardly differentiated 5

3 Alar cells small, opaque ..... ***Isothecium*** (p.222)

– Alar cells large, inflated and hyaline 4

4 Leaves ovate-cordate; costa reaching apex or nearly so; group of alar cells triangular, nearly reaching costa, not ascending up margins; axillary hairs frequent, long, with 2–5 apical hyaline cells ..... ***Calliergon*** (p.209)

– Leaves oblong or ovate; costa reaching 3/4 up leaf; group of alar cells ovate, extending up margin; axillary hairs scarce and short, with 2–3 apical hyaline cells; leaf apex often with rhizoids ..... ***Straminergon stramineum*** (*Calliergon stramineum*) (rr)

5 Plants with tumid julaceous branches; leaves ovate, strongly concave, with a short recurved acumen (apiculus); stems pinnately or irregularly branched; mid leaf lamina cells narrowly linear, 4–6 µm wide; capsule with elongate conical lid 6

– Plants with branches julaceous or not, leaves flat or concave, but not with recurved short acumen (except *Rh. murale*); stems irregularly, not pinnately branched; mid leaf lamina cells elongate rhomboidal to linear, 7.5–12 µm wide; lid longly rostrate ..... ***Rynchostegium*** (p.211)

6 Plants simply pinnately branched; leaves strongly concave, apex widely rounded with reflexed apiculus; costa reaching 1/2 leaf length; stem without rhizoids ..... ***Pseudoscleropodium purum*** (*Scleropodium purum*) (c)

– Plants irregularly branched; leaves concave, more gradually pointed; costa reaching 3/4 leaf length; primary stems with rhizoids ..... ***Scleropodium touretii*** (rr)

Group 38 Pleurocarps with long costa, elongated lamina cells and acute or acuminate apex

1 Branch leaves with reflexed teeth at apex ..... ***Antitrichia curtipendula*** (r)

– Branch leaves without reflexed teeth at apex 2

2 Leaf margins dentate to ciliate or laciniate ..... ***Fabronia*** (p.205)

– Leaf margins entire to denticulate 3

3 Lamina cells 2–6 (7) times as long as wide (5–7 times as long as wide in *Rhynchostegiella teneriffae* p.222) 4

– Lamina cells usually more than 7 times as long as wide 9

4 Alar cells hyaline, inflated, forming a distinct group ..... ***Cratoneuron filicinum*** (s-f)

– Alar cells forming a poorly differentiated group 5

5 Margins at leaf base with ± recurved teeth; sometimes with rhizoids on dorsal side of costa; plants small ..... ***Conardia compacta*** (r)

– Margins at leaf base without recurved teeth; never with rhizoids on dorsal side of costa; plants small to medium-sized 6

6 Costa ending in conspicuous projection at the dorsal side of branch leaves; plants small ..... ***Microeurhynchium pumilum*** (*Eurhynchium pumilum*) (r)

– Costa not ending in projection at the dorsal side of branch leaves 7

7 Costa 25–75 (100) µm wide, reaching mid-leaf or above ..... ***Hygroamblystegium*** (p.207)

– Costa 15–35 (40) µm wide, reaching above mid-leaf or not 8

8 Costa reaching mid-leaf or shorter (in *A. serpens* often longer), sometimes double or lacking, capsules not constricted below mouth when empty; habitat various (incl. knot-holes) ..... ***Amblystegium*** group (p.207)

– Costa reaching to leaf apex; plants small, dark green, growing around water-filled knot-holes; capsules frequent, constricted below mouth when empty ..... ***Anacamptodon splachnoides*** (s-f)
Note: For an account of this species in Hungary, see Németh and Erzberger (2015).

9(3) Alar cells hyaline, inflated 10

– Alar cells neither hyaline nor inflated 11

10 Leaves acuminate ..... ***Drepanocladus*** (p.206)

– Leaves acute ..... ***Brachythecium* s.l.** (p.215)

11 Alar cells small, opaque, incrassate; branches usually curved ..... ***Isothecium*** (p.222)

– Alar cells different; branches ± straight 12

12 Leaf acumen channelled ..... ***Campyliadelphus*** (p.205)

– Leaf acumen not channelled or leaves acute 13

13 Stem and branch leaves differentiated (heteromorphous) 14

– Stem and brach leaves similar (homomorphous) 15

14 Stem regularly pinnately branched; seta rough ..... ***Kindbergia praelonga*** (*Eurhynchium praelongum*) (r)

– Stem irregularly branched; seta smooth ..... ***Eurhynchiastrum pulchellum*** (*Eurhynchium pulchellum*) (s-f)

15 Costa ending in conspicuous projection at the dorsal side of branch leaves 16
Note: In *Oxyrrhynchium speciosum* this character is only occasionally developed.

– Costa not ending in projection at the dorsal side of branch leaves or projection inconspicuous 17

16 Leaves ovate to ovate-lanceolate, shortly acuminate; lid longly rostrate ..... ***Oxyrrhynchium*** (p.212)

– Leaves lanceolate to ovate-lanceolate, longly acuminate; lid mostly conical ..... ***Brachythecium*** s.l. (incl. ***Brachytheciastrum***, ***Sciuro-hypnum***) (p.215)

17 Leaves abruptly contracted or gradually narrowed into large, filiform acumen; axillary hairs with 3 short basal and 2 longer apical cells ..... ***Cirriphyllum*** (p.212)
– Leaves not abruptly contracted into large acumen; axillary hairs with 1–2 basal cells 18
18 Plants small; leaves linear-lanceolate or narrowly oblong-lanceolate ..... ***Rhynchostegiella*** (p.214)
– Plants medium-sized or large; leaves lanceolate, ovate, oblong or triangular 19
19 Shoots subcomplanate; plants aquatic ..... ***Leptodictyum riparium*** (c)
– Shoots not subcomplanate; plants aquatic or not 20
20 Lid longly rostrate ..... ***Rhynchostegium*** (p.211)
– Lid mostly conical ..... ***Brachythecium*** s.l. (incl. ***Sciuro-hypnum***) (p.215)

Group 39 Pleurocarps with short or lacking costa, short lamina cells at least at margin

1 Leaves longitudinally plicate ..... ***Leucodon sciuroides*** (c)
– Leaves with two short longitudinal plicae at base or not longitudinally plicate 2
2 Lamina cells papillose; small to medium-sized plants 3
– Lamina cells smooth; slender plants ..... ***Pseudoleskeella*** (p.209)
3 Plants ± dendroid; upper branches curved when dry ..... ***Nogopterium gracile*** (*Pterogonium gracile*) (n.s.)
– Plants not dendroid; branches not curved when dry 4
4 Stem leaves very concave, imbricate; plants julaceous ..... ***Myurella julacea*** (r)
– Stem leaves plane or slightly concave, patent to squarrose, not imbricate; plants not julaceous 5
5 Stem and branch leaves strongly dimorphic; stem leaves reflexed, abruptly contracted from broad base; branch leaves slightly concave, ovate, obtuse or shortly acute ..... ***Heterocladiella dimorpha*** (*Heterocladium dimorphum*) (rr)
Note: For an account of this species in Hungary, see Baráth *et al.* (2016).
– Stem and branch leaves similar in shape, but differing in size; leaves erecto-patent to patent, not reflexed, gradually narrowed to acute apex ..... ***Heterocladium heteropterum*** (rr)

Note: For an account of this species in Hungary, see Baráth and Erzberger (2019).

Group 40 Pleurocarps with short or lacking costa, elongated lamina cells and rounded, obtuse or apiculate apex

1 Lamina cells prorate on dorsal side; plants slender ..... ***Pterigynandrum filiforme*** (s-f)
– Lamina cells smooth; plants ± robust 2
2 Stem and branch tips conspicuously cuspidate ..... ***Calliergonella cuspidata*** (c)
– Stem and branch tips not conspicuously cuspidate 3
3 Plants pinnately branched 4
– Plants irregularly branched 5
4 Stems reddish; alar cells orange to brown ..... ***Pleurozium schreberi*** (s-f)
– Stems greenish, yellowish or light brown; alar cells hyaline or greenish ..... ***Entodon concinnus*** (rr)
5 Leaves longly decurrent; plants not aquatic ..... ***Plagiothecium*** (p.202)
– Leaves not or scarcely decurrent; aquatic plants 6
6 Plants robust, turgid; alar cells hyaline, large, forming a well-delimited small group; plants growing on water-logged soil ..... ***Scorpidium scorpioides*** (rr)
– Plants small to medium-sized, not turgid; alar cells not hyaline, not in well-delimited group; plants on rock or stones in streams ..... ***Hygrohypnum luridum*** (s-f)

Group 41 Pleurocarps with distinctly falcate or squarrose leaves, short or lacking costa, elongated lamina cells and acute or acuminate apex

1 Leaves squarrose; acumen ± channelled 2
– Leaves not squarrose; acumen flat 4
2 Stems reddish ..... ***Rhytidiadelphus*** (p.221)
– Stems greenish or brownish 3
3 Plants medium-sized to robust; margins entire to finely denticulate; alar cells inflated, well-differentiated ..... ***Campylium*** (p.206)

– Plants small; margins dentate; alar cells poorly differentiated..... ***Campylophyllopsis calcarea*** (*Campylium calcareum*) (s-f)

4(1) Leaf apex acute; aquatic plants.....5

– Leaf apex acuminate; plants not aquatic.....6

5 Plants robust, turgid, alar cells hyaline, large, forming a well-delimited small group; plants growing on water-logged soil..... ***Scorpidium scorpioides*** (rr)

– Plants small to medium-sized, not turgid; alar cells not hyaline, not in well-delimited group; plants on rock or stones in streams.....***Hygrohypnum luridum*** (s-f)

6 Leaves wide and shortly acuminate; stems with hyalodermis..... ***Calliergonella lindbergii*** (*Hypnum lindbergii*) (s-f)

– Leaves narrowly and longly acuminate; stems without hyalodermis.....7

7 Leaves strongly longitudinally plicate; plants pinnately branched.....***Ptilium crista-castrensis*** (rr)

– Leaves not or weakly longitudinally plicate; plants pinnately branched or not.....8

8 Leaves cordate at base; branch leaves differing from stem leaves; plants pinnately branched..... ***Ctenidium molluscum*** (s-f)

– Leaves not cordate at base, branch leaves similar to stem leaves; plants irregularly or pinnately branched..... ***Hypnum*** s.l. (incl. ***Buckia, Jochenia***) (p.219)

Group 42 **Pleurocarps with straight, slightly falcate or squarrose leaves, costa single, short, long and double, or lacking, elongated lamina cells and acute or acuminate apex**

1 Lamina cells distinctly papillose or prorate on dorsal side.....2

– Lamina cells smooth or only slightly prorate on dorsal side.....4

2 Plants slender, filiform.....***Pterigynandrum filiforme*** (s-f)

– Plants robust, not filiform.....3

3 Stems regularly bi-tripinnate, costa double, reaching 1/2 of leaf length.....***Hylocomium splendens*** (s-f)

– Stems irregularly branched; costa double, reaching 3/4 of leaf length.....***Hylocomiadelphus triquetrus*** (*Rhytidiadelphus triquetrus*) (s-f)

4(1) Plants aquatic; leaves keeled or not.....***Fontinalis*** (p.202)

– Plants not aquatic; leaves not keeled 5
5 Lamina cells 2–5 times as long as wide; slender plants 6
– Lamina cells more than 5 times as long as wide; plants small to robust 9
6 Leaves with 2 longitudinal plicae at base, on each side of the costa; lamina cells shorter at margin ..... ***Pseudoleskeella*** (p.209)
– Leaves not plicate; lamina cells ± homogeneous 7
7 Leaf margin entire ..... ***Amblystegium*** group (p.207)
– Leaf margin entire to denticulate, dentate or ciliate 8
8 Leaf margin entire to denticulate, perichaetial leaves with distinct distant teeth, in particular towards apex ..... ***Platydictya jungermannioides*** (rr)
– Leaf margin distinctly dentate or ciliate ..... ***Fabronia*** (p.205)
9(5) Leaves squarrose or spreading to reflexed 10
– Leaves erect to patent 11
10 Plants small; leaves to 1 mm long, spreading to reflexed ..... ***Campylophyllopsis calcarea*** (*Campylium calcareum*) (s-f)
– Plants robust, leaves 2.7–3.7 mm long, squarrose ..... ***Rhytidiadelphus squarrosus*** (s-f)
11 Stem with branched paraphyllia ..... ***Loeskeobryum brevirostre*** (*Hylocomium brevirostre*) (n.s.)
Note: Two similar species, *Hylocomiastrum pyrenaicum* and *H. umbratum*, which have not been found in Hungary but might perhaps be expected in montane habitats, have also branched paraphyllia, but much larger (200–400 µm) than those of *L. brevirostre* (100 µm and less); their stem leaves lack the auriculate, clasping base and the abruptly long-acuminate spreading to squarrose apex of *L. brevirostre*.
– Stem without paraphyllia, but sometimes with linear pseudo-paraphyllia 12
12 Alar cells poorly or not differentiated 13
– Alar cells ± well differentiated, at least in small group of (2) 3–6 cells 15
13 Plants robust, julaceous, glossy; leaves ovate, shortly pointed, concave; leaf margin distinctly denticulate, particularly near apex ..... ***Taxiphyllum densifolium*** (s-f)
– Plants small to robust, not julaceous, glossy; leaves linear lanceolate, longly acuminate, not or slightly concave; leaf margin entire or slightly denticulate, sometimes near base only 14

14 Basal cells usually porose, often brownish; axillary hairs with hyaline basal cell ..... ***Orthothecium*** (p.205)
– Basal cells not or slightly porose, concolorous with the rest of cells; axillary hairs with brown basal cell ..... ***Isopterygiopsis pulchella*** (r)
15 Alar cells inflated 16
– Alar cells not inflated 18
16 Stem with hyalodermis ..... ***Calliergonella*** (p.220)
– Stem without hyalodermis 17
17 Plants medium-sized to robust; capsule erect to slightly inclined, curved below mouth; lid conical to shortly rostrate, 0.8–1 mm long; linear pseudoparaphyllia in leaf axils ..... ***Callicladium haldanianum*** (rr)
– Plants small; capsule ± erect; lid including beak 0.5–0.6 mm long, very longly rostrate, beak 0.28–0.36 mm long, longer than conical basal part of lid; without pseudoparaphyllia ..... ***Sematophyllum adnatum*** (rr)
18 Alar cells small, opaque; branches usually curved ..... ***Isothecium*** (p.222)
– Alar cells different; branches straight 19
19 Group of alar cells concave, of incrassate cells ..... ***Hypnum*** s.l. (incl. ***Buckia, Jochenia***) (p.219)
– Group of alar cells not concave, of thin-walled or incrassate cells 20
20 Leaf margin denticulate from base to apex ..... ***Herzogiella seligeri*** (s-f)
– Leaf margin entire or denticulate only near apex 21
21 Central strand distinct; basal lamina cells elongate rectangular; external surface of exostome teeth smooth at base; corticole, rarely saxicole ..... ***Pylaisia polyantha*** (cc)
– Central strand indistinct; basal lamina cells ± rhombic, with pointed ends; external surface of exostome teeth papillose or striate-papillose at base; corticole or saxicole 22
22 Leaf margin narrowly recurved in lower 2/3; plants usually with propaguliferous branchlets at the tip of branches; capsule straight; corticole ..... ***Platygyrium repens*** (cc)
– Leaf margin plane; plants without propaguliferous branchlets; capsule curved; saxicole ..... ***Homomallium incurvatum*** (s-f)

PART II: SPECIAL KEYS

5. KEYS TO SPECIES OF LIVERWORTS

Key to species of *Barbilophozia* group

(incl. *Neoorthocaulis floerkei*)

See also key to Lophoziaceae group below

1 Lateral leaves mostly 3–4 (5)-lobed (occasionally 2-lobed leaves may occur)..... 2

– Lateral leaves mostly 2-lobed, apex lobed only to 1/3; underleaves present, small, entire, often difficult to detect; lateral leaves rounded, sinus semilunate; gemmae reddish-brown, walls ± solid; leaves sometimes with erosed margins caused by the production of gemmae; on non-calcareous rocks and soil..... ***Barbilophozia sudetica*** (*Lophozia sudetica*) (rr)
Note: This species can be recognised by clusters of red-brown ripe gemmae in combination with shallowly notched, concave leaves and small leaf cells 24–25 × 18–20 µm with (4) 6–9 (15) oil bodies per cell. *Lophoziopsis excisa*, which also produces red gemmae, differs by larger leaf cells, 30–35 (40) × (27) 28–30 (32) µm and more numerous oil bodies, 11–24 (28) per cell. *Lophoziopsis longidens*, another species with clusters of red gemmae at the tip of the leaf lobes, has also large cells, 28–35 × 23–27 (30) µm, but fewer oil bodies, 4–10 (14) per cell.

2 Postical margins of lateral leaves with basal cilia; underleaves present..... 3

– Postical margins of lateral leaves without cilia; underleaves absent; leaves (2) 4 (5)-lobed, lobes unequal; trigones small; shoots 3–8 cm long and up to 5 mm wide, procumbent..... ***Barbilophozia barbata*** (s-f)

3 Cells of cilia subquadrate, 15–30 (38) µm long; lateral leaves lobed to 1/3 with (2) 3 (4) obtuse or acute lobes; shoots mostly ascending to erect; rarely with gemmae..... *Neoorthocaulis floerkei* (*Barbilophozia floerkei*)
Note: excluded – the voucher was collected in Austria.

– Cells of cilia on underleaves and base of lateral leaves elongate, 20–80 µm long or more; gemmae usually present..... ***Barbilophozia hatcheri*** (rr)

Key to species of Cephaloziaceae

Based mainly on Damsholt (2002)

1 Lateral leaves asymmetrical, with 2 long acuminate lobes (4–7 uniseriate cells); postical margin strongly inflexed and forming inflated water sac; on rotting wood ..... ***Nowellia curvifolia*** (s-f)

– Lateral leaves not or only slightly asymmetrical; postical margin not inflexed, not forming sac 2

2 Leaves longer than wide, divided 0.5–0.7 of length, not decurrent, almost transversely inserted or not 3

– Leaves as wide as long, divided 0.25–0.5 of length, often decurrent, obliquely to horizontally inserted; stem on mature leafy shoots with antical leaf-free zone 2 cells wide 4

3 Leaves obliquely to horizontally inserted, 4–7 cells wide; cells at base of lobes 40–50 × 20–45 μm; plants whitish, small, shoots 0.4–0.6 mm wide; perianth mouth laciniate; dioicous ..... ***Cephalozia lacinulata*** (n.s.)

– Leaves almost transversely inserted, non-decurrent, 8–16 cells wide; cells at base of lobes 30–70 × 25–50 μm; plants often with secondary pigmentation, large to medium-sized, shoots 0.6–1.2 mm wide; perianth mouth denticulate, with teeth formed by 1–3 superimposed cells; autoicous; stem with antical end of leaf insertion extending to median cortical cells, sometimes almost to the antical mid-line (except in fertile or gemmiferous shoots); flagelliform shoots often present ..... ***Cephalozia bicuspidata*** (s-f)

4 Cells at base of lobes 18–36 × 16–35 μm, thin- or thick-walled; flagelliform branches lacking 5

– Cells at base of lobes (35) 40–55 (70) × (28) 33–48 μm, thin-walled; plants often with flagelliform branches; leaves usually 12–25 cells wide; apical cell on leaf lobes with wall not thickened at apex; autoicous; perianth mouth crenulated ..... ***Fuscocephaloziopsis pleniceps*** (*Cephalozia pleniceps*) (n.s.)

5 Leaves decurrent, lobes strongly connivent; cells at base of lobes 26–32 (40) × 20–28 (32) µm; plants green, stem concolorous; leaves mostly (7) 9–14 (16) cells wide; apical cell on leaf lobes with wall thicker at apex than on margins; dioicous; female bracts entire; perianth mouth shortly lobed, the lobules crenulate-dentate with teeth 1–2 cells long..... ***Fuscocephaloziopsis lunulifolia*** (*Cephalozia lunulifolia*) (n.s.)

– Leaves shortly decurrent, not or barely connivent; cells at base of lobes 20–35 × 15–30 µm; plants green to olive-green or yellowish brown, stem often also somewhat yellowish brown; leaves (12) 13–16 cells wide or wider..... 6

6 Cells at base of lobes 20–25 × 15–18 µm, thick-walled; apical cell on leaf lobes with wall not thickened at apex; dioicous; perianth mouth laciniate..... ***Fuscocephaloziopsis catenulata*** (*Cephalozia catenulata*) (rr)

– Cells at base of lobes 28–35 × 20–30 µm, thin-walled; apical cell on leaf lobes with wall thicker at apex than on margins; dioicous; female bracts dentate; perianth mouth dentate, not laciniate..... ***Fuscocephaloziopsis macrostachya*** (*Cephalozia macrostachya*) (n.s.)

Key to species of *Cephaloziella*

Reference: Meinunger and Schröder (2007)

1 Gemmae 2-celled, cubic, angulate or with warty elevations..... ***Cephaloziella integerrima*** (n.s.)

– Gemmae 2-celled, elliptical, smooth or gemmae lacking..... 2

2 Dioicous, often sterile; underleaves distinct; leaf cells small, 8–12 µm..... ***Cephaloziella divaricata*** (s-f)
Note: ***C. divaricata*** var. ***scabra*** (M. Howe) Haynes (rr) is doubtfully distinct from the typical variety and can be recognized by denticulate leaf margins, a verruculose cuticula and ± strong papilla-like outgrowths below the sinus on the abaxial surface of upper leaves.

– Monoicous, mostly fertile..... 3

3 Paroicous..... 4

– Autoicous..... 7

4 Sterile shoots with distinct, often large and 2-lobed underleaves. ***Cephaloziella stellulifera*** (n.s.)..... 5

– Sterile shoots without underleaves, but occasionally with rudimentary underleaves consisting of 2 or 3 cell rows towards the shoot apex; cells 10–16 µm wide, in lower part of leaf lobes cells of regular rectangular shape; leaf lobes only 4–5 cells wide at base. ***Cephaloziella rubella*** agg. (s-f) pp. 6
Note: Under *C. rubella* agg, several forms of unclear taxonomic value are understood; an exception is *C. rubella* var. *pulchella* (see below).

5 Cells large, 14–20 µm wide; leaves entire, patent to squarrose; female bracts partly in stellate arrangement ..... *Cephaloziella stellulifera* var. *stellulifera*

– Cells smaller, narrower, 10–15 µm wide; leaf lobes 4–9 cells wide at base; underleaves small and indistinct except in fertile shoots; plants light to yellowish green, in insolated situations also brownish, only perianths and male bracts occasionally with a light reddish hue; similar to *C. varians*, but paroicous ..... *Cephaloziella stellulifera* var. *limprichtii*

6 Female bracts often fused together forming a ring around perianth base, urn-like and extending far upward ..... *Cephaloziella rubella* var. *rubella*

– Female bracts more deeply divided nearly to base, not forming an urn around the base of the perianth (Boros (1968): on rotting wood, Bükk, Vértes) ..... *Cephaloziella rubella* var. *sullivantii*

7 Sterile shoots without underleaves 8

– Sterile shoots with distinct underleaves, at least towards shoot apex; cells medium-sized to small, 7–14 µm wide 13

8 Cells large, 14–20 µm wide 9

– Cells medium-sized, 10–15 mm wide 11

9 Female bracts with rounded, entire, often somewhat undulate lobes; perianth pyriform, free ..... ***Cephaloziella integerrima*** (n.s.)

– Female bracts with acute, ± dentate lobes 10

10 Plants light to pale green, in insolated places ± brownish; cell walls always thin to moderately thickened; leaf lobes 6–10 cells wide at base ..... *Cephaloziella hampeana* var. *subtilis*

– Plants at least partly red, especially the male bracts often deeply purplish to blackish red; cells thin- or thick-walled; female bracts often coarsely to squarrosely dentate; cells of perianth mouth conspicuously elongate; leaf lobes 4–6 cells wide at base ..... ***Cephaloziella rubella*** var. ***pulchella*** (rr)

11 Plants in calcareous habitats; [perhaps to be expected in Hungary, but not yet recorded] ..... *Cephaloziella baumgartneri*

– Calcifuge species 12

12 Plants pale green, in open places partly brownish; cells always thin-walled; leaf lobes 6–10 cells wide at base; in well developed plants cells of perianth mouths free for half their length, perianth mouth therefore denticulate ..... ***Cephaloziella hampeana*** (rr)

– Plants ± reddish, especially male bracts mostly strongly red brown; cell walls partly distinctly to strongly thickened; leaf lobes 4–6 cells wide at base; even in well developed plants cells of perianth mouth fused together for nearly all their length, perianth mouth therefore crenulated ..... *Cephaloziella rubella* var. *bifida*

13(7) Leaf lobes mostly 2–5 cells wide at base, mostly long and narrow, occasionally with a few teeth; cells mostly distinctly, sometimes strongly thickened, often papillose; older and insolated parts of plants often conspicuously copper-coloured; calcifuge, in bogs, on peat and humid, lime-free sand (Boros (1968): on rotting wood, Zemplén, Bükk) ..... ***Cephaloziella spinigera*** (n.s.)

– Leaf lobes 6–12 cells wide at base, shorter and wider than in the preceding species, mostly entire; cells mostly thin-walled to moderately thickened; plants green, yellowish, brown or red, not conspicuously copper-coloured; in base-rich, ± calcareous habitats. *Cephaloziella varians* agg 14

14 Stem at apex partly with a few hyaline teeth; leaves partly denticulate; cells at leaf base with conical mamilla on the dorsal side ..... *Cephaloziella varians* var. *scabra*

– Stem and leaves smooth, without such outgrowths 15

15 Leaf lobes ovate, rounded at apex; androecium julaceous, club-shaped ..... *Cephaloziella varians* var. *arctica*

– Leaf lobes pointed, often with two uniseriate cells at apex; androecium mostly with homomallous leaves ..... ***Cephaloziella varians*** var. ***varians*** (rr)

Key to Lophoziaceae group (incl. *Barbilophozia, Gymnocolea, Isopaches, Lophozia, Lophoziopsis, Mesoptychia, Neoorthocaulis, Obtusifolium, Schistochilopsis, Trilophozia* and *Tritomaria*)
References: Meinunger and Schröder (2007), Bakalin (2016)

1 Lateral leaves mostly 3–4 (5)-lobed (occasional 2-lobed leaves may occur in some species)..... 2
– Lateral leaves mostly 2-lobed, apex rarely emarginate or only shallowly 2-lobed (occasional 3–4 (5)-lobed leaves may occur in some species)..... 7
2 Lateral leaves obliquely inserted, mostly symmetrical or only weakly asymmetrical, (2) 3–4 (5)-lobed with sinus (1/8) 1/4–1/3 leaf length; postical leaf margins with or without basal cilia; underleaves distinctly and deeply divided into 2 lobes or often absent or minute; gemmae rare, mostly absent. ***Barbilophozia***..... 3
– Lateral leaves ± transversely inserted, distinctly asymmetrical, (2) 3-lobed with sinus to 1/4 leaf length; postical leaf margins without basal cilia; underleaves mostly absent or undivided; postical surface of stem sometimes brown or red (in *Trilophozia quinquedentata*)..... 5
3 Postical margins of lateral leaves with basal cilia; underleaves present..... 4
– Postical margins of lateral leaves without cilia; underleaves absent; leaves (2) 4 (5)-lobed, lobes unequal; trigones small; shoots 3–8 cm long and up to 5 mm wide, procumbent..... ***Barbilophozia barbata*** (s-f)
4 Cells of cilia subquadrate, 15–30 (38) µm long; lateral leaves lobed to 1/3 with (2) 3 (4) obtuse or acute lobes; shoots mostly ascending to erect; rarely with gemmae..... *Neoorthocaulis floerkei* (*Barbilophozia floerkei*)
Note: excluded – the voucher was collected in Austria.
– Cells of cilia on underleaves and base of lateral leaves elongate, 20–80 µm long or more; gemmae usually present..... ***Barbilophozia hatcheri*** (rr)
5 Leaf lobes mostly narrowly triangular; leaf cells with equally thickened walls; reddish gemmae nearly always present, often abundant and conspicuous..... 6

– Leaf lobes mostly broadly ovate-triangular; leaf cells with coarse trigones; lateral leaves as long as wide, 3-lobed in unequal lobes; lobes acute to acuminate or apiculate; gemmae rare, often sparse and inconspicuous..... ***Trilophozia quinquedentata*** (*Tritomaria quinquedentata*) (r)

6 Mid-leaf cells averaging 19–22 µm wide; gemmae obtusely angled or pyriform, 14–22 µm wide, 16–28 µm long..... ***Tritomaria exsectiformis*** (rr)

– Mid-leaf cells averaging 10–14 µm wide; gemmae ellipsoid, smooth, 8–12 µm wide, 12–19 (22) µm long..... ***Tritomaria exsecta*** (r)

7(1) Perianths often present, plicate in the upper 1/3; gemmae often present, angulate in Hungarian species; underleaves mostly absent; plants generally on non-calcareous substrates (but *Obtusifolium obtusum* and *Lophoziopsis excisa* tolerating lime or base-rich substrates).....8

– Perianths absent, or without plicae; gemmae absent or if present then smooth (in *Mesoptychia heterocolpos* with attenuate shoots); underleaves present or if absent then lateral leaves with blunt to rounded lobes (*Gymnocolea inflata*: calcifuge; *Mesoptychia badensis*: calciphilic).....19

8 Cells of lateral leaves mostly equally thick-walled; capsule wall 2-layered; paroicous; lateral leaves closely imbricate, 2-lobed to 1/5–1/3; plants smelling of cedar oil when crushed; frequently with abundant gemmae, reddish yellow to reddish brown; on sandy or peaty acid soil, occasionally on rocks..... ***Isopaches bicrenatus*** (*Lophozia bicrenata*) (s-f)
Note: This species often produces abundant perianths with a long-dentate mouth, cilia to 3–4 cells long, whereas the perianth mouth of *Lophoziopsis excisa*, with which it might be confused, is crenulate, at most with short finger-shaped marginal cells.

– Cells of lateral leaves mostly thin-walled; trigones present or not; capsule-wall 3–4-layered; plants not aromatic.....9

9 Lobes of lateral leaves mostly obtuse, sinus gibbous; young stems with lanceolate or 2-lobed underleaves; gemmae rare, mostly 2-celled, polygonous; lime-tolerant..... ***Obtusifolium obtusum*** (*Lophozia obtusa*) (n.s.)

– Plants lacking this combination of characters; leaf lobes acute, rarely obtuse (in *Lophozia wenzelii*).....10

10 Lateral leaves 2–3 (5)-lobed to 1/3–1/2, lobes dentate to spinose dentate; upper lateral leaves somewhat plicate and crispate; underleaves absent on sterile shoots; gemmae usually abundant, 1–2-celled; bright to pale green plants on rotting wood and acid soil, peat, in rock crevices and among other bryophytes.....***Schistochilopsis incisa*** (*Lophozia incisa*) (n.s.)

– Plants lacking this combination of characters.....11

11 Underleaves present, small, entire, often difficult to detect; lateral leaves rounded, lobed only to 1/3; sinus semilunate; gemmae reddish-brown, walls ± solid; leaves sometimes with erosed margins caused by the production of gemmae; on non-calcareous rocks and soil.....***Barbilophozia sudetica*** (*Lophozia sudetica*) (rr)

Note: This species can be recognised by clusters of red-brown ripe gemmae in combination with shallowly notched, concave leaves and small leaf cells 24–25 × 18–20 μm with (4) 6–9 (15) oil bodies per cell. *Lophoziopsis excisa*, which also produces red gemmae, differs by larger, thin-walled leaf cells, 30–35 (40) × (27) 28–30 (32) μm and more numerous oil bodies, 11–24 (28) per cell. *Lophoziopsis longidens*, another species with clusters of red gemmae at the tip of the leaf lobes, has also large cells, 28–35 × 23–27 (30) μm, but fewer oil bodies, 4–10 (14) per cell.

– Underleaves absent on sterile stems; lateral leaves 2-lobed, occasionally 3-lobed; mid-leaf cells 20–30 (40) μm; oil-bodies 4–8 (9) μm, smooth or granular, 8–24 per cell; lobes of female bracts mostly entire (except in *Lophoziopsis excisa*); stems 10–24 cells high in cross section; cells of medulla clearly differentiated, with antical band of wide hyaline cells and postical band of small cells infected with mycorrhiza; epidermal (cortical) cells often larger than cells of medulla.....12

12 Plants small, 3–6 (8) mm long and 0.8 mm wide, suberect, decumbent and ascending; apical leaves constantly with pale green, angulate gemmae 18–20 μm; lateral leaves ovate to oblong, with narrow, often horn-like lobes; trigones triangular, colourless; on rotting wood.....***Lophozia ascendens*** (rr)

– Plants larger; mostly on soil, humus, peat, rocks, occasionally on wood.....13

13 Apical leaves often imbricate; shoot apex resembling miniature lettuce; lateral leaves asymmetrical, lobed to 1/4; leaf cells thin-walled, trigones small or absent; paroicous; perianths common, mouth dentate, but cilia absent; gemmae frequent, reddish, angulate, on young leaves..... ***Lophoziopsis excisa*** (*Lophozia excisa*) (s-f)
Note: See the notes under *Barbilophozia sudetica* and *Isopaches bicrenatus* above.

– Plants lacking this combination of characters..... 14

14 Lower lateral leaves often somewhat reflexed, upper with narrow horn-like lobes bearing globose clusters of reddish-brown gemmae; trigones small..... ***Lophoziopsis longidens*** (*Lophozia longidens*) (r)
Note: See note under *Barbilophozia sudetica* above.

– Plants lacking this combination of characters..... 15

15 Cross section of stem in postical half with 5–20 layers of small cells reaching or extending beyond the middle..... 16

– Cross section of stem in postical half with 0–4 layers of small cells reaching at most to lower third..... 18

16 Group of small cells infected by mycorrhiza yellowish brown to brown, mostly only the postical cortex cells purplish-red; sometimes also the lower cell layers purplish-red, but always surrounded by a "halo" of brownish cells at the transition towards the larger hyaline medulla cells above; leaves rectangular to oval, widest below mid-leaf; gemmae mostly frequent. ***Lophozia ventricosa*** agg..... 17

– Group of small cells infected by mycorrhiza always dark purplish-red, without a "halo" of brownish cells; leaves often widest above mid-leaf, distinctly narrowed towards the base; gemmae sparse to lacking..... *Lophozia longiflora*
Note: Excluded, specimens revised to *L. guttulata*.

17 Oil bodies homogeneous, uniformly granular..... ***Lophozia ventricosa*** s.str. (r)

Oil bodies biconcentric, finely granular with ± central, glistening homogeneous globule, immediately fugacious, the globule fragmenting on drying..... ***Lophozia silvicola*** (rr)
Note: Plants with a mixture of the two types of oil bodies are not rare (Meinunger and Schröder 2007, Köckinger 2017).

18 Cortex cells of stem mostly yellowish brown to brown, partly tinged red; medulla cells mostly ± infected by mycorrhiza and therefore appearing grey; leaves orbicular, oval to broadly oval, often ± concave, lobe apices inflexed, leaves thus appearing imbricate or shoots appearing succulent; gemmae mostly abundant; teeth of perianth mouth consisting of 1–2 cells; on soil, rocks and among bryophytes of siliceous substrates in open to shaded habitats ..... ***Lophozia wenzelii*** (n.s.)

– Postical cortex cells vigorously purplish-red, forming a sharp contrast of colour to the adjoining wide, hyaline, transparent medulla cells mostly not infected by mycorrhiza; leaves elongate ovate to rectangular, not concave, patent to slightly squarrose; trigones mostly bulging; shoots mostly flattened; gemmae lacking or sparse; perianth mouth always distinctly spinosely dentate to ciliate, teeth mostly of 1–4 cells; on permanently moist rotting wood ..... ***Lophozia guttulata*** (rr)

19(7) Trigones small or absent; underleaves absent or only few and subulate; gemmae absent; perianth clavate; female bracts similar in size and shape to lateral leaves; plants 1–3 cm long, green to blackish; lateral leaf lobes obtuse to rounded; sterile perianths abundant, mostly caducous; plants calcifuge ..... ***Gymnocolea inflata*** (r)

– Trigones present; underleaves present, entire or 2-lobed, often difficult to detect, or absent (*Mesoptychia badensis*); gemmae present in *Mesoptychia heterocolpos*, otherwise absent; perianth cylindrical to pyriform, abruptly contracted at mouth; female bracts mostly larger than lateral leaves; plants calciphilic ..... ***Mesoptychia*** (p.103)

Key to species of *Diplophyllum* and the genus *Scapania*

1 Postical lobe 2 times as long as wide or longer, narrowly lingulate to lingulate, ± parallel-sided, nearly at right angles to stem, slightly secund; antical lobe elliptical-lingulate, forming more acute angle with stem than postical lobe (compare also *Scapania umbrosa*); median leaf cells rectangular or linear and forming a vitta; gemmae angulate or stellate; perianth ovate, plicate above, narrowed to mouth; small to medium-sized plants 1–6 cm long 2

– Postical lobe up to twice as long as wide, variously shaped, rarely lingulate or parallel-sided, not secund; antical lobe variously shaped, antical and postical lobes at similar angle to stem (except *S. umbrosa*); median leaf cells isodiametric, not differentiated; gemmae ovoid to elliptical; perianth ± compressed, mostly not plicate, truncate at mouth ..... ***Scapania***

2 Leaf lobes with conspicuous vitta of elongate cells (3–8 times as long as wide); cuticle almost smooth; stem with (2) 3–4 (5) layers of distinct, thick-walled cortical cells; dioicous ..... ***Diplophyllum albicans*** (r)

– Vitta in leaf lobes short and only poorly defined or absent; cells in middle and lower part of postical lobe 2–4 times as long as wide; cuticle papillose; stem with 1–2 layers of cortical cells hardly distinct from medullary cells; paroicous; gemmae rare ..... ***Diplophyllum obtusifolium*** (r)

Key to species of *Scapania*

Based on Damsholt (2002), Meinunger and Schröder (2007)

1 Postical lobe of leaves not conspicuously decurrent or only decurrent to the level of the insertion of the keel, or in some cases with a decurrent strip only 1 cell wide, gradually tapering and visible below the insertion of the keel 2

– Postical lobe of leaves distinctly decurrent, with the decurrent strip several cells wide, gradually tapering and visible for *ca* half of the length of the segment below the insertion of the keel; leaves often dentate 12

2 Antical lobe (0.6) 0.7–0.8 the length of the postical lobe; gemmae 2-celled; usually both lobes standing away from each other; cuticle with hemispherical papillae; calcicole ..... ***Scapania aequiloba*** (rr)

– Antical lobe 0.3–0.65 the length of the postical lobe; gemmae 1–2-celled 3

3 Postical lobes narrow, 1.3–2 times as long as wide; plants 0.5–3 mm wide and 2–18 mm long 4

– Postical lobes ovate to almost rotundate, 0.8–1.3 times as long as wide; plants 1.8–5 mm wide and 20–100 mm long; gemmae greenish ..... ***Scapania irrigua*** (r)

4 Leaves bordered by (1) 2–4 rows of equally thick-walled cells lacking trigones 5

– Marginal cells of lobes not differing from median leaf cells and thus not forming a border, except at the base of the postical lobe, where 1–2 rows of thick-walled cells may occur 7

5 Gemmae greenish to brownish; base of postical lobe never with vinaceous secondary pigmentation; cuticle with hemispherical papillae; calcicole ..... ***Scapania calcicola*** (r)

– Gemmae greenish, 2-celled; base of postical lobe often with vinaceous secondary pigmentation; leaves keeled almost to the base (Section Curtae) 6

6 Postical lobe rounded at apex; marginal cells of the leaves (15) 16–22 μm; perianth mouth with teeth 1–3 cells long; keel 0.5–0.6 the length of the postical lobe; antical lobe not directed towards shoot apex ..... ***Scapania curta*** (rr)

– Postical lobe often acute; marginal cells of the leaves 12–18 μm; perianth mouth entire; keel to 0.3–0.4 the length of the postical lobe; antical lobe directed towards shoot apex ..... ***Scapania parvifolia*** (rr)

7(4) Gemmae 1-celled, black or reddish-brown, formed at apex of erect shoots with reduced leaves; shoots to 1 mm wide and 2–3 mm long; only on decaying logs ..... ***Scapania apiculata*** (n.s.)

– Gemmae (1) 2-celled, greenish, vinaceous or brown; shoot mostly more than 1 mm wide and more than 3 mm long 8

8 Cells with 2–5 (6) large, persistent oil-bodies, 10–14 × 8–11 μm; gemmae green to brownish at maturity, 16–24 μm wide; perianth inflated and plicate towards the mouth; antical lobe large, 0.4–0.6 the size of the postical lobe, often distantly dentate; cuticle with hemispherical papillae; calcicole ..... ***Scapania calcicola*** (r)

– Cells with smaller, non-persistent oil-bodies, of which the largest are 9–10 × 5 μm, gemmae colourless or greyish or reddish to vinaceous, rarely yellow-brown (Section Curtae) 9

9 Plants pale green or reddish to purplish brown, when exposed; postical lobes mostly rounded at apex, antical lobes almost always acute; cells with 2–6 often large greyish oil-bodies, occluding lumen; gemmiparous leaves strongly dentate; perianth mouth entire (or with single, distant small teeth: var. *argutedentata*) ..... ***Scapania scandica*** (rr)

– Plants with brownish secondary pigmentation, never with vinaceous or reddish postical lobe bases or gemmiparous leaves; leaves edentate or only dentate near gemmiparous areas or distantly dentate, but the dentition never reaches the basal 0.2 of the leaf; perianth mouth laciniate to dentate 10

10 Postical lobe rounded, lingulate; marginal cells of lobes 19–25 µm; leaves often with scattered teeth; cells of leaf middle with 6–12 oil-bodies; perianth mouth with teeth of 1–7 superimposed cells; gemmiparous lobes often dentate ..... ***Scapania lingulata*** (r)

– Postical lobe apiculate, rarely rounded, marginal cells of lobes 13–20 µm; leaves edentate or only denticulate near gemmiparous areas; cells of leaf middle with 2–6 oil-bodies; perianth mouth with teeth of (1) 2–6 superimposed cells, terminating lobules 2–5 cells wide at base 11

11 Gemmae greenish, rarely reddish**,** 16–29 × 8–14 µm; antical lobe *ca* half as large as postical lobe; leaves entire; perianth mouth laciniate-dentate ..... ***Scapania mucronata*** (r)

– Gemmae yellowish-brown when ripe, 18–36 × 10–19 µm; antical lobe *ca* 0.65 the size of the postical lobe; leaves occasionally with minute dentition; perianth mouth with many teeth, each with several superimposed cells ..... ***Scapania praetervisa*** (r)

12(1) Antical lobe longly or shortly decurrent 13

– Antical lobe not decurrent, transversely inserted 14

13 Antical lobe longly decurrent; cuticle verruculose, especially at marginal teeth; gemmae 1-celled, brown ..... ***Scapania nemorea*** (s-f)

– Antical lobe shortly decurrent; cuticle coarsely verruculose, with hemispherical papillae; gemmae 1–2-celled, whitish green ..... ***Scapania aspera*** (r)

14 Shoot 5–12 mm long; gemmae reddish brown; leaf lobes elliptical-lanceolate, acuminate, coarsely dentate; keel winged; on decaying logs or humus ..... ***Scapania umbrosa*** (n.s.)

– Shoot 15–100 mm long; gemmae yellow-green or pinkish, sometimes totally lacking; leaf lobes rounded quadrate to rectangular, edentate to dentate; on wet or submerged stones in streams ..... ***Scapania undulata*** (rr)

Supplementary 'key' to species of *Scapania* according to habitats

Based on Nebel and Philippi (2005)

1 wet habitats (swamps, springs, streams):
– ***S. irrigua***: leaf lobes not decurrent, plants green
– ***S. undulata***: postical lobe long decurrent, antical lobe not decurrent, plants sometimes pigmented
2 limestone rocks:
– ***S. aequiloba***: antical lobe crossing stem; lobes entire
– ***S. aspera***: antical lobe crossing stem; lobes mostly dentate
– ***S. calcicola***: antical lobe not crossing stem; lobes edentate to serrate-dentate
3 soil:
– ***S. nemorea***: robust species with dentate lobes and mostly conspicuous brown gemmae
– ***S. curta, S. mucronata, S, praetervisa, S. scandica, S. parviflora, S. lingulata***: small species, difficult to distinguish, see key above 6 and 9–11
4 decaying wood:
– ***S. apiculata***: small plants with erect attenuate-leaved gemmiparous shoots
– ***S. umbrosa***: small plants with dentate leaf lobes
– (***S. nemorea***): large plants, usually on soil, see above

Key to species of *Calypogeia*

1 Leaves bidentate with divergent and usually very acute teeth; cuticle striolate-verruculose ..... ***Calypogeia arguta*** (rr)
– Leaves rounded at apex or bidentate, but teeth not divergent; cuticle smooth 2
2 Underleaves 2-lobed to 0.5–0.75, with 1–4 rows of cells between sinus and rhizoid area 3
– Underleaves entire, emarginate or 2-lobed to 1/3, with 4–14 rows of cells between sinus and rhizoid area 5
3 Mature shoots rarely more than 2 mm wide; on decaying coniferous wood and raw conifer humus, rarely on peat; lateral leaves imbricate; underleaves 2–3.5 times as wide as stem, 2-lobed, outer margins often with small obtuse tooth ..... ***Calypogeia suecica*** (rr)

– Mature shoots often more than 2 mm wide; on loamy or sandy-loamy soil, non-calcareous rocks, humus, peat, and in swampy or boggy habitats; if on wood then underleaves to 2.5 times as wide as stem, lacking lateral teeth 4

4 Oil-bodies colourless; lateral leaves ± acute, bidentate or lobed to 1/3 with acute lobes; leaves widest *ca* 1/3 from base except on attenuate shoots. Underleaves divided in 2 triangular lobes, outer margin often with a knob or tooth ..... ***Calypogeia fissa*** (s-f)

– Oil-bodies azure blue (when fruiting, seta therefore blue-hyaline). Lateral leaves obtuse to rounded, mostly widest near base. Underleaves divided into 2 mostly obtuse, triangular lobes, outer margins without knobs or teeth ..... ***Calypogeia azurea*** (r)

5 Lateral leaves mostly as long as wide, ± translucent; underleaves with (2) 4–6 rows of cells between sinus and rhizoid area, these cells 30–80 µm long; oil-bodies present in all underleaf cells; shoots 1.5–3.5 (4) mm wide ..... ***Calypogeia muelleriana*** (r)

– Lateral leaves 1–1.3 times as long as wide, rather opaque, often with translucent margins; underleaves with 7–14 rows of cells between sinus and rhizoid area, these cells 20–50 µm long; oil-bodies soon lost from all or most underleaf cells; shoots not > 3 mm wide 6

6 At least some lateral leaves with tangentially elongated marginal cells forming a continuous border; underleaves decurrent at base; rhizoid area shallowly linear; oil-bodies present only in 1–3 marginal cell rows of lateral leaves, stem cells lacking oil-bodies; shoots 0.7–1.8 (2.5) mm wide ..... ***Calypogeia neesiana*** (n.s.)

– Marginal cells of lateral leaves not tangentially elongated or rectangular and forming a discontinuous, ill-defined border; underleaves not or slightly decurrent; rhizoid area deeply oval or suborbicular; oil-bodies present in nearly all cells of lateral leaves and in stem cells; shoots 1.5–3.0 mm wide ..... ***Calypogeia integristipula*** (rr)

Key to species of *Marsupella*

1 Plants robust, (0.5) 1–5 cm long; lateral leaves boat-shaped, when flattened rounded-quadrate to ± orbicular; bilobed to 1/20–1/5 (1/4), basal part of leaf not sheathing stem; orientation of leaf sinus parallel to stem when viewed from side; leaf lobes obtuse or rounded and apiculate; leaf margin usually narrowly recurved or revolute on one or both sides below; polymorphic.....***Marsupella emarginata*** (rr)

– Plants small, up to 1 (1.5) cm long, lateral leaves bilobed to (1/5) 1/4-1.2; lobes of apical leaves acute; leaf margins plane.....2

2 Paroicous, plants mostly with sporophytes; lateral leaves increasing in size towards apex of stem; fertile plants clavate; plants 1–5 (7) mm long; lateral leaves erect-spreading, rounded-quadrate when flattened; trigones ± marked; sinus acute to rectangular.....***Marsupella sprucei*** (rr)

– Dioicous, plants rarely fertile; lateral leaves of ± equal size; plants larger, shoots 5–15 mm long; trigones scarcely developed; sinus acute.....***Marsupella funckii*** (r)

Key to species of *Nardia*

– Plants green, light-green to brown-green, lateral leaves rounded, orbicular, not lobed or emarginate; oil-bodies hyaline, glistening, homogeneous, persisting several years after drying, mostly 2 per cell, often segmented; perigynium not bulb-like or sac-like; dioicous.....***Nardia scalaris*** (rr)

– Plants green, brown to red-brown, lateral leaves nearly orbicular, retuse to emarginate or entire; oil-bodies granular, opaque, not persisting; perigynium bulb-like or sac-like, forming swollen and elongate pouch of stem tissue (but sometimes not); underleaves only rudimentary, except at apex of fertile shoots; paroicous.....***Nardia geoscyphus*** (rr)

Key to Jungermanniaceae group (incl. E*ndogemma, Jungermannia, Liochlaena, Nardia, Solenostoma, Syzygiella*)

1 Lateral leaves rounded-rectangular, flat (not concave), spreading in lower part of stem, appressed towards apex; perianth mouth longly ciliate; male bracts with small dentate antical lobe; plants in green to dark green, often reddish or copper-coloured patches, also on rotting wood.....***Syzygiella autumnalis*** (*Jamesoniella autumnalis*) (r)

– Leave arrangement different; perianth mouth at most crenulate; male bracts entire.....2

2 Underleaves lanceolate, distinct, usually restricted to younger parts of stem; oil-bodies large, homogeneous, weakly segmented, or granular, 1 to several per cell; perianth very short, immersed in bracts.....3

– Underleaves absent (stems of *Solenostoma hyalinum* and *Endogemma caespiticia* occasionally with a few underleaves); oil-bodies granular, not homogeneous, few or many per cell; perianth exserted from female bracts.....4

3 Plants green, light-green to brown-green, lateral leaves rounded, orbicular, not lobed or emarginate; oil-bodies hyaline, glistening, homogeneous, bean- or sausage-shaped, persisting several years after drying, mostly 2 per cell, often segmented; perigynium not bulb-like or sac-like; dioicous.....***Nardia scalaris*** (rr)

– Plants green, brown to red-brown, lateral leaves nearly orbicular, retuse to emarginate or entire; oil-bodies granular, opaque, not persisting; perigynium bulb-like or sac-like, forming swollen and elongate pouch of stem tissue (but sometimes not); underleaves only rudimentary, except at apex of fertile shoots; paroicous.....***Nardia geoscyphus*** (rr)

4 Female bracts and perianth arising from well-developed perigynium 0.2–0.6 length of perianth bearing 1 pair of bracts; perianth conical, plicate above, emergent to about 1/2 from bracts, cells in upper part 2–3 times as long as wide; at least some rhizoids purple or violet, sometimes brownish or colourless; underleaves absent, occasionally single at stem apex, lanceolate; leaves reniform to semicircular, rounded to

weakly retuse; plants procumbent; dioicous; leaf cells 25–40 µm (30–40 × 25–35 µm)..... ***Solenostoma hyalinum*** (*Jungermannia hyalina*) (r)

– Perigynium absent, or, if present, short; perianth cylindrical to ovate, with or without plicae above, exceeding bracts, cells in upper part not elongate, similar to leaf cells; rhizoids colourless to brownish, not violet; underleaves absent on sterile shoots.... 5

5 Lateral leaves ± lingulate, distinctly longer than wide (1.2–1.7 times); perianth emergent, cylindrical, smooth, abruptly contracted to beaked mouth..... 6

– Lateral leaves orbicular, ovate to reniform, cordate, as long as wide or slightly longer (1.3 times); perigynium absent or only short; perianth emergent, plicate above, not beaked (*Jungermannia*) or contracted to beaked mouth (*Solenostoma*, *Endogemma*) 7

6 Plants 4–6 mm wide, nearly always with cylindrical perianths, gemma-bearing shoots very rare or completely lacking; paroicous.... ***Liochlaena lanceolata*** (*Jungermannia leiantha*) (r)
Note: According to Meinunger and Schröder (2007), the following characters are not reliable for the distinction between *L. lanceolata* and *L. subulata*: *L. lanceolata* – only rarely with gemma-bearing shoots; leaf cells up to 50 (65) µm wide; leaves in situ resembling those of *Plagiochila,* vs. *L. subulata* – gemma-bearing shoots more frequent; leaf cells up to 40 (50) µm wide.

– Plants 2–3 mm wide, usually sterile or with young pyriform perianths not emerging from bracts; gemma-bearing shoots very frequent; dioicous..... ***Liochlaena subulata*** (*Jungermannia subulata*) (rr)

7 Plants with many small-leaved additional shoots (often only these are found), well-developed lateral leaves bordered with one row of somewhat larger, thick-walled cells, orbicular, concave (leaves of small plants and of small distant-leaved additional shoots are usually unbordered); dioicous; trigones small or absent; plants up to 1 mm wide..... ***Solenostoma gracillimum*** (*Jungermannia gracillima*) (r)

– Plants without small-leaved additional shoots; margins of lateral leaves unbordered or only indistinctly bordered, marginal cells not larger than adjoining leaf cells; dioicous or paroicous; trigones mostly present..... 8

8 Lateral leaves elliptical, ovate, cordate, mostly slightly longer than wide (up to 1.3 times); perianth weakly plicate, not beaked, mouth eventually divided into 4 short, toothed lobes..... 9

– Lateral leaves as wide as long or slightly wider than long, reniform to orbicular; perianth with 4–5 plicae above, ± abruptly contracted to beaked mouth, mouth eventually divided into 4–5 entire lobes..... 10

9 Dioicous; plants to 0.5–4 (5) cm long; lateral leaves ovate, 0.6–1.8 mm long and 0.6–1.5 mm wide..... ***Jungermannia atrovirens*** (rr)

– Paroicous; plants 0.3–1 (2) cm long; lateral leaves 0.3–1.2 mm long and 0.3–1 mm wide; perianth clavate to cylindrical, plicate above, ± acute; lateral leaves on fertile stems broadly elliptical to broadly ovate; mid-leaf cells 16–28 (32) µm wide..... ***Jungermannia pumila*** (rr)

10 Dioicous; gemmae frequent, 1-celled, forming dense mass at shoot apices; trigones absent; oil-bodies only 1 (2) per cell, fugacious; small plants, shoots < 1 cm long, in yellowish green patches; usually ephemeral, with many perianths..... ***Endogemma caespiticia*** (*Jungermannia caespiticia*) (n.s.)

– Paroicous; gemmae absent; trigones present, usually distinct; several oil-bodies per cell; plants dark green, in green to greenish-black tufts, without small-leaved shoots..... ***Solenostoma sphaerocarpum*** (*Jungermannia sphaerocarpa*) (rr)

Key to species of *Mesoptychia*

1 Brown smooth gemmae mostly present, 1–2-celled, usually on margins of appressed leaves on attenuate small-leaved shoots; lateral leaves with acutely angulate, occasionally semi-orbicular sinus; trigones large, bulging; underleaves subulate, entire or with 1–2 cilia at base or 2-lobed..... ***Mesoptychia heterocolpos*** (*Leiocolea heterocolpos*) (n.s.)

– Plants lacking both gemmae and attenuate shoots with appressed leaves; underleaves absent or with 1 to several marginal cilia..... 2

2 Underleaves absent; plants not aromatic; lateral leaves in middle part of stem 0.3–0.7 mm long; mid-leaf cells 24–32 (36) µm wide; trigones distinct; cortical stem cells 16–32 µm wide; perianths pyriform, abruptly contracted to shortly beaked mouth; on calcareous substrates..... ***Mesoptychia badensis*** (*Leiocolea badensis*) (r)
Note: Trigones may be inconspicuous in lateral leaves, but usually are more pronounced in bracts and perianths.

– Underleaves present, but hidden among the rhizoids, small and often difficult to detect; plants usually strongly aromatic; lateral leaves mostly 0.5–1.3 mm long, mid-leaf cells 20–32 µm wide; on calcareous substrates, damp soil, rocks, loess..... ***Mesoptychia collaris*** (*Leiocolea collaris*) (r)

Key to species of Lophocoleaceae

1 At least lowest lateral leaves 2-lobed or, if all lateral leaves rounded to retuse, antical margin not or hardly decurrent; perianth well developed, apical on main stems or on ± full-sized branches; calyptra shorter than perianth; paroicous or dioicous; underleaf lobes mostly divergent; underleaves free or fused with a lateral leaf; strongly aromatic. ***Lophocolea***..... 2

– Mature lateral leaves rounded to retuse, rectangular, rarely lateral leaves of side branches 2-lobed, antical margin decurrent; perianth on short side branches; calyptra protruding beyond perianth; autoicous; underleaf lobes generally nearly parallel; underleaves free; not strongly aromatic. ***Chiloscyphus***..... 5

2 Apical leaves distinctly 2-lobed or apex 2-dentate; mid-leaf cells 25–50 µm wide; leaf insertion not or scarcely arcuate postically; plants 1–6 cm long, whitish, bright or yellowish green; autoicous or dioicous. ***Lophocolea bidentata*** s.l. 3
Note: Because of the difficulties implied in assessment of sexual conditions, it is perhaps appropriate to deal with the collective taxon.

– Apical leaves ± rectangular, ovate; apex rounded, retuse, emarginate or only shortly 2-lobed; paroicous..... 4

3 Stems branched; shoots 1–3 cm long; leaf lobes ending in (2) 3–7 uniseriate cells; dioicous..... ***Lophocolea coadunata*** (*Lophocolea bidentata* auct.) (s-f)

Note: According to Köckinger (2017) and Damsholt (2002), the correct nomenclature (based on the types) implies, that the common dioicous taxon must be called *L. coadunata* (Sw.) Mont., whereas the rare autoicous taxon must be called *L. bidentata* (L.) Dumort.

– Stems hardly branched; leaf lobes ending in 1–5 (6) uniseriate cells; autoicous.....*Lophocolea bidentata*
Note: Development of antheridia appears to depend strongly on environmental conditions, which makes assessment of the sexual condition very difficult if not impossible; the gametophytic characters used in this key are probably not reliable.

4 Paroicous, perianths usually abundant; lowermost lateral leaves and leaves of branches 2-lobed to 1/3, apical leaves retuse or emarginate; gemmae rare, mostly 1-celled.....***Lophocolea heterophylla*** (c)

– Dioicous (or paroicous), but perianths rare; all lateral leaves shortly 2-lobed to 1/4–1/3, with abundant marginal gemmae.....***Lophocolea minor*** (s-f)

5(1) Plants dark to greyish green, not translucent; median leaf cells 30–35 (40) × (21) 24–30 µm; each cell with (1) 2–4 (5) oil bodies; each oil body 7–12 × 4–7 µm; lateral leaves broadly rounded to truncate or weakly retuse, those of branches rarely 2-lobed; lobes of perianth mouth entire or obscurely dentate; calyptra long emergent from perianth apex; plants closely appressed to mostly siliceous rocks by running water.....***Chiloscyphus polyanthos*** (s-f)

– Plants pale to yellowish green, translucent, rarely dark green (in submerged forms); leaf cells 45–60 × (32) 35–40 µm or larger; each cell with (3) 4–6 (12) oil bodies; each oil body 8–9 (11) × 4–5 µm; lateral leaves more narrowly rounded or frequently retuse, those of branches often 2-lobed; lobes of perianth mouth often dentate; calyptra little or hardly emergent from perianth apex; plants in lax patches, mostly in neutral mires, also on calcareous substrates.....***Chiloscyphus pallescens*** (s-f)
Note: According to Meinunger and Schröder (2007), the best differentiating character between the two species is cell size. According to Damsholt (2002), the differences in the dentition of the perianth mouth are not significant. Cell size is variable in both species, small leaves have small cells, larger leaves have larger cells.

Key to species of Plagiochilaceae

1 Lateral leaves ± plane, margin entire or retuse or with 2–4 apical teeth; underleaves small, filiform, limited to young shoots; shoots usually with rhizoids ± to apex; monoicous; leaves not inserted to the antical stem mid-line, but with a leaf-free zone 2–4 cells wide; leaves often variable in size or shape even on a single stem ..... ***Pedinophyllum interruptum*** (s-f)

– Lateral leaves usually convex, usually dentate; underleaves absent or only present at apex as cell filaments; rhizoids rare or absent; dioicous; leaves inserted to antical mid-line 2

2 Plants up to 10 cm long and 5–9 mm wide; lateral leaves 3–4.5 × 2.5–4.5 mm, mostly dentate with numerous teeth, sometimes ± entire; mid-leaf cells 30–33 (35) µm wide, trigones very small or absent; flagella absent ..... ***Plagiochila asplenioides*** (s-f)

– Plants 2–5 cm long and 1.5–5.5 mm wide; lateral leaves 3 × 2.5 mm, dentate to nearly entire; mid-leaf cells 25–30 (33) µm wide; trigones small to medium-sized; flagella present ..... ***Plagiochila porelloides*** (s-f)

Key to species of *Frullania*

1 Postical lobes (water sacs) 1.8–2.5 times as long as wide; antical lobes rounded or apiculate, antical lobes with ocelli, these either scattered or arranged in a line, sometimes only few; mid-leaf cells of antical lobe (on main stems) 12–20 µm wide; perianth trigonous, smooth; growth form variable; sometimes with a smell of roses 2

– Postical lobes as long as wide or evolute-lanceolate; antical lobes always rounded, without ocelli; mid-leaf cells of antical lobe (on main stems) 20–33 µm wide; perianth 3–5-gonous, smooth or tuberculate; growing in patches often not neatly delimited but with individual branches outside the dense central region; without smell 3

2 Antical lobes ± acute to apiculate (at least on branch leaves), concave when moist, with generally long line of ocelli, additional ocelli often present, scattered or forming small discrete group; underleaves on main stems decurrent, divided to 1/5 with rectangular sinus, margin recurved, base auriculate

to crispate; leaves not caducous; lobe cells (10) 12–23 µm wide; plants up to 10 cm long, reddish brown to copper coloured..... ***Frullania tamarisci*** (r)

– Antical lobes (even of branch leaves) always rounded, plane when moist; ocelli of antical lobes scattered, at most short line present at base of lobe, ocelli often pale brown; underleaves on main stems not decurrent, divided to 1/3 with acute sinus, often with lateral tooth on both sides, margins plane, entire; lateral leaves sometimes caducous; lobe cells 16–22 (25) µm wide; delicate species growing in neatly delimited patches; with the smell of roses when rubbed with a moist finger..... ***Frullania fragilifolia*** (rr)

3 Underleaves on main stem reniform, much wider than long, 2.5–3.5 times as wide as stem, entire or retuse; mid-leaf cells with strongly bulging trigones, colourless..... ***Frullania jackii*** (n.s.)

– Underleaves on main stem longer than wide, at most twice as wide as stem, narrowly bilobed with an acute sinus; lobes acute 4

4 Dioicous, but perianths common, trigonous, tuberculate; antical base of antical lobes on main stem auriculate; mid-leaf cells of antical lobes mostly with strongly bulging trigones and intermediary thickenings; postical lobe helmet-shaped or evolute, as long as wide or wider than long; stylus (triangular flap between lobule and stem) mostly large, lanceolate, 3–10 cells wide at base; underleaves bilobed to 1/3–2/5 with acute lobes and 1–2 blunt teeth on lateral margins; plants usually with reddish-brown to blackish secondary pigmentatio..... ***Frullania dilatata*** (cc)

– Autoicous, perianth with 5 plicae, smooth externally; antical lobes (on main stems) plane, mostly broadly ovate to ovate, base not auriculate; mid-leaf cells of antical lobes thin-walled, colourless, with small trigones and generally without intermediary thickenings; postical lobes evolute, lanceolate, < 1/2 width of antical lobe; stylus short, filiform, to 2 cells wide at base; underleaves small, only slightly wider than stem, bilobed to 1/5–1/3, without lateral teeth; plants mostly green..... ***Frullania cleistostoma*** (*Frullania inflata* auct.) (rr)

Key to species of Lejeuneaceae

1 Leaf cells smooth; oil-bodies simple, numerous, persistent..... ***Lejeunea cavifolia*** (s-f)
– At least cells of antical lobe distinctly conically mamillose.....2
2 Postical lobe with smooth cells..... ***Cololejeunea calcarea*** (r)
– Postical lobe with cells conically mamillose..... ***Cololejeunea rossettiana*** (r)

Key to species of *Porella*

1 Leaves *in situ* with antical margin neatly appressed, margins of postical lobes and underleaves ± spinose-dentate, at least on branches; antical lobes ovate, apex acute; plants with strong metallic sheen, glossy; tasting acrid..... ***Porella arboris-vitae*** (r)
– Leaves in situ with antical margin of at least some leaves elevated or recurved, postical lobes of lateral leaves and underleaves entire or only weakly dentate and distantly toothed (sometimes with toothed decurrent wings); antical lobes mostly not acute; plants dull; not tasting acrid.....2
2 Postical lobe of lateral leaves tapering to acute apex, small, not more than 0.2 times as wide as antical lobe, narrower than stem; underleaves dentate at base, longly decurrent; mid-leaf cells of antical lobe 28–40 µm wide..... ***Porella cordaeana*** (r)
– Postical lobe rounded at apex, mostly (0.2) 0.3–0.6 times as wide as antical lobe, as wide or hardly wider than stem, to about 1/2 as wide as underleaves.....3
3 Postical lobes and underleaves not longly decurrent; cells in the middle of the antical lobe 32–35 µm in diameter; perianth mouth somewhat dentate; female bracts almost edentate..... ***Porella platyphylla*** (c)
– Postical lobes and underleaves longly decurrent; cells in the middle of the antical lobe (36) 38–40 µm in diameter; perianth mouth long-dentate to densely short-ciliate; female bracts dentate..... ***Porella baueri*** (r)
Note: Intermediate plants are frequent, they are included in *P. platyphylla.*

Key to species of *Radula*

– Paroicous, perianths common; male bracts saccate at base in (1) 2–4 pairs below female bracts..... ***Radula complanata*** (cc)
– Dioicous, perianths very rare; androecium in the form of a slender spike, with 10–20 closely imbricate pairs of bracts (but male plants rare)..... ***Radula lindenbergiana*** (n.s.)

Key to species of Aneuraceae

1 Thallus 2–6 cm long and (2) 3–7 (10) mm wide; greasy in appearance; in cross section (7) 9–12 (15)-layered centrally, simple, or sparsely and irregularly pinnately branched; oil-bodies 8–15 (40) per epidermal cell, breaking down rapidly when dry..... ***Aneura pinguis*** (s-f)
– Thallus 0.5–3 cm long and 0.3–1.2 (2.6) mm wide; not greasy; in cross section (3) 4–8 (9) cell layers thick centrally; irregularly branched, pinnately or palmately lobed; oil-bodies 0–3 per epidermal cell. ***Riccardia***..... 2
2 Thallus light-green, strap-like, irregularly pinnately branched, 1–2 cm long and 0.5 mm wide; dorsal side of thallus flat to concave, typically channelled, semi-orbicular in section; gemmae often present; dioicous..... ***Riccardia incurvata*** (n.s.)
– Thallus light or dark green, palmately lobed, fan-like or ± regularly 1–3-pinnate, rarely simple, 1–3 cm long and 0.2–2 mm wide, biconvex in section or dorsal side ± plane, not channelled; monoicous or dioicous..... 3
3 Thallus palmate; thallus branches dark green, 0.2–0.3 mm wide, densely arranged; dioicous..... ***Riccardia palmata*** (r)
– Thallus ± regularly 1–3-pinnate, fan-like or palmate; monoicous..... 4
4 Upper part of thallus ± regularly 2–3-pinnate, branches strap-like, 0.3–1 mm wide, biconvex in section; thallus margins unistratose, translucent, 2–3 cells wide; epidermal and marginal cells without oil-bodies (in fresh material)..... ***Riccardia multifida*** (rr)

– Upper part of thallus irregularly pinnate or palmate, dorsal surface flat to weakly convex in section; thallus branches 1–2 mm wide; unistratose margins mostly absent or only 1–2 cells wide; epidermal and marginal cells with or without oil-bodies 5

5 Thallus irregularly 1–2 (3)-pinnate; branch apices rounded; oil-bodies 1–2 per cell ..... ***Riccardia chamedryfolia*** (rr)

– Thallus irregularly branched, branches narrowed at base; branch apices with heart-shaped incision; oil-bodies absent ..... ***Riccardia latifrons*** (r)

Key to species of *Metzgeria*

1 Thallus densely covered with hairs on both sides, without gemmae or adventive thalli ..... ***Metzgeria pubescens*** (*Apometzgeria pubescens*) (r)

– Thallus without hairs or hairs confined to margins and ventral surface of midrib; with or without gemmae and adventive thalli 2

2 Thallus 2–3 cm long and 1–2 mm wide; margins strongly down-curved; adventive thalli and/or gemmae absent; hairs of ventral surface of midrib bristly; hairs of thallus margins ± straight, often in pairs; thallus cells 45–65 µm; monoicous ..... ***Metzgeria conjugata*** (*Metzgeria conjugata* subsp. *conjugata*) (s-f)

– Thallus up to 1 (2.5) cm long and 0.4–1.0 (1.5) mm wide; adventive thalli and/or gemmae present or not; ventral surface of thallus not or hardly hairy; hairs of thallus margins single or absent; dioicous 3

3 Thallus branches linear, of equal width throughout; margins ± plane when moist; midrib 2 cells wide on dorsal surface; thallus margins sometimes with adventive thalli; thallus never blue ..... ***Metzgeria furcata*** (c)

– Thallus branches attenuate towards apices, bearing gemmae on both faces of thallus as well as on margins; margins recurved when moist; midrib to 6 cells wide on dorsal surface; thallus becoming blue upon drying after 2 months ..... *Metzgeria violacea* (*Metzgeria fruticulosa* auct.) (excluded)

Key to species of *Fossombronia*

1 Spores with 5–7 alveolae across the convex face; alveolae 8–12 µm wide, regular ..... ***Fossombronia foveolata*** (n.s.)
– Spores not alveolate, ornamented with lamellae free or anastomosing in the centre, ± parallel at least on the sides even if reticulate towards the centre 2
2 Spores in side view with 5–7 lamellae 6–10 µm apart; spore margin with 15–19 spines in profile; wing often translucent ..... ***Fossombronia pusilla*** (r)
– Spores in side view with 10–13 lamellae 6–10 µm apart and with 25–35 (40) spines in profile ..... ***Fossombronia wondraczekii*** (r)

Key to species of Pelliaceae

1 Slime papillae restricted to ventral side of costa near apex, on stalk 1–5 (6) cells long; thalli with miniature apical branches proliferating in autumn; dioicous; involucres subhorizontal to erect, tubular, with dentate-ciliate lobes; male tubercles *ca* 200 µm wide, cells surrounding aperture not papilliform; calcicole ..... ***Apopellia endiviifolia*** (*Pellia endiviifolia*) (s-f)
– Slime papillae on stalk 1 cell long, on both ventral and dorsal side of costa near apex; caducous branches absent; dioicous or monoicous; calcifuge 2
2 Monoicous and normally paroicous; involucres nearly horizontal, flap-like, subentire or irregularly lobed; male tubercles to 400 µm wide, aperture surrounded by papilliform cells ..... ***Pellia epiphylla*** (r)
– Dioicous; involucres tubular (but sometimes distally incomplete and then resembling those of *P. epiphylla*), with irregularly rounded lobes, margin subentire or crenulate or with an occasional tooth; male tubercles to 500 µm wide, with more conspicuously papilliform cells surrounding the aperture ..... ***Pellia neesiana*** (rr)

Key to Marchantiales pp. (incl. *Asterella*, *Clevea*, *Conocephalum*, *Lunularia*, *Mannia*, *Marchantia*, *Reboulia*)
References: Damsholt (2002), Szweykowski *et al.* (2005), Hugonnot and Chavoutier (2021), Berg *et al.* (2025)

1 Dorsal side of thallus nearly always with gemmae cups, distinctly reticulate; female receptacles stellate, on stalks (archegoniophores)..... 2
– Thalli without gemmae cups, reticulate or not..... 5
2 Gemma cups semilunate; air-pores volcano-shaped, simple; female receptacles cruciate, 4-rayed..... ***Lunularia cruciata*** (r)
– Gemmae cups goblet-shaped, circular; air-pores barrel-shaped, each composed of 4 (6) rings of superimposed cells; female receptacles at apex of thallus, stellate, deeply divided with usually (5) 8–9 (11) terete lobes. ***Marchantia polymorpha***..... 3
3 Thallus usually prostrate, with or without a discontinuous, dark median band on dorsal side; margins usually crenulate by protruding marginal cells; margins of appendages of median scales sharply toothed..... 4
– Thallus usually growing erect, with a conspicuous, dark median band on dorsal side; margins usually entire, margins of appendages of median scales entire or nearly so..... ***Marchantia polymorpha*** subsp. ***polymorpha*** (r)
4 Thallus dark green (young parts), 6–9 (15) mm wide, with a discontinuous darker median band on dorsal side; growing often in man-made habitats..... ***Marchantia polymorpha*** subsp. ***ruderalis*** (s-f)
– Thallus yellowish-green (young parts), 7.5–11 (20) mm wide, lacking distinct median band on dorsal side; in natural, wet habitats, in Central Europe usually at high elevations..... ***Marchantia polymorpha*** subsp***. montivagans*** (rr)
5(1) Air-pores barrel-shaped; archegonia and antheridia born on stalked receptacles; air-chambers with branched chlorenchyma; female receptacle a disc with 4 ridges (if with 8–9 lobes, see *Marchantia polymorpha*), with stalk 5–10 cm long, male receptacles with stalk 1–2 cm long; ventral scales purplish, soon vanishing; taste pepperish (after initial sweetness)..... ***Marchantia quadrata*** (*Preissia quadrata*) (r)

– Air-pores elevated and volcano-shaped, or simple, or absent, not barrel-shaped; antheridia on sessile receptacles or immersed in the thallus; female receptacles stalked, rarely nearly sessile 6

6 Air-chambers with chlorenchyma; thallus very large, up to 1–2 cm wide and 15 cm long, regularly dichotomously branched, distinctly reticulate, green to dark green, with a strong smell of turpentine; air-pores elevated, volcano-shaped, simple, with 5–6 concentric rings, each ring with 7–8 cells; female receptacles conical, stalk to 6 (10) cm long, arising at the apices of the thallus branches. ***Conocephalum conicum*** agg. (s-f) 7
Note: I follow Berg *et al*. (2025) in lumping the two unsufficiently differentiated taxa distinguished by Szweykowski *et al*. (2005).

– Air-chambers without chlorenchyma, but often with secondary walls, or air-chambers absent; if air-chambers with chlorenchyma, then thallus small and air-pores not elevated 8

7 Dorsal surface of moist thallus distinctly glossy, to the naked eye the pores are more prominent than the lines; hyaline margin of thallus 3–4 cells wide; air-chambers between costa and thallus margin usually in 6–7 rows; boundaries of air-chambers on surface of thallus level with the surface (not recessed); epidermis of air-chambers of archegoniophore heads mostly bistratose ..... ***Conocephalum conicum*** (s-f)

– Dorsal surface of moist thallus dull, to the naked eye the lines are more prominent than the pores; hyaline margin of thallus 1–2 cells wide; air-chambers between costa and thallus margin usually in 4–5 rows; boundaries of air-chambers on surface of thallus recessed (forming furrows); epidermis of air-chambers of archegoniophore heads unistratose ..... ***Conocephalum salebrosum*** (r)

8 Radial walls of air-pores thin (partially thickened in *Reboulia hemisphaerica*); stalk of female receptacle with 1 rhizoid furrow; each receptacle with (2) 3–8 sporophytes 9

– Radial walls of air-pores thickened, air-pores therefore appearing stellate; stalk of female receptacle without rhizoid furrow; each receptacle with (1) 2–6 sporophytes; archegoniophores arising from middle part of dorsal surface of thallus; thallus not coriaceous, mostly < 5 mm wide, not glaucous; ventral side of thallus pale green; ventral scales large, hyaline ..... ***Clevea hyalina*** (*Athalamia hyalina*) (r)

9 Air-pores with 4–5 rings of 6–9 guard cells, radial walls ± thickened; female receptacles 4–7-lobed; thallus coriaceous; ventral scales with 2–4 elongated appendages at least when young; air-chambers in several layers, with plate-like outgrowths; taste slightly aromatic, not pepperish (compare *Marchantia quadrata*)..... ***Reboulia hemisphaerica*** (s-f)

– Air-pores with (1) 2–4 rings of 4–8 (9) guard cells; cells thin-walled; female receptacles spherical to conical..... 10

10 Female receptacles hemispherical to conical with 3–4 bell-shaped involucres (involucral skirts), each with 1 sporophyte; archegonia and sporophytes not surrounded by a laciniate pseudoperianth; thalli mostly 2–3 (4) mm wide, cuneiform or linear and dichotomously branched; stalk of female receptacles (archegoniophores) sometimes with linear, colourless scales; cells of thallus epidermis ± thick-walled, rounded, with ± well-developed trigones, or thallus epidermis delicate becoming slightly lacunose with age..... 11

– Female receptacles ± conical; each sporophyte surrounded by involucre and laciniate pseudoperianth; colourless ventral scales projecting beyond thallus margin at thallus apex; spores brown, not alveolate; thallus 2–3 mm wide; pseudoperianth divided into 6–8 lanceolate lobes, connected at tips; crushed fresh thallus with a faint smell of rotten fish; cells of thallus epidermis thin-walled, polygonate..... ***Asterella saccata*** (r)

11 Thallus tough, strap-like, furcate, 2–3 mm wide, taking up a tubular shape when dry with the dorsal surface completely hidden; dorsal surface not becoming sponge-like with age; air-chambers narrow; walls of chlorenchyma bearing numerous, much-branched chlorophyll containing filaments; ventral scales red-violet or reddish brown, with 2–3 appendages; ventral scales at apices of female thalli projecting far beyond margin; archegoniophores with numerous long scales at base and top of stalk; epidermal cells with thickened walls and trigones; distal face of spores areolate; crushed fresh and rehydrated thallus with smell of cedar oil..... ***Mannia fragrans*** (s-f)

– Thallus 3 mm wide, delicate, ± wedge-shaped, not becoming tubular when dry; dorsal surface reticulate, becoming slightly lacunose with age; air-chambers broad; walls of chlorenchyma without lateral chlorophyll containing filaments; ventral scales small, distant, light-green or hyaline; stalk of archegoniophores almost without scales; without smell of cedar oil..... ***Mannia triandra*** (r)

Key to species of *Riccia* group (incl. *Oxymitra*, *Riccia*, *Ricciocarpos*)
References: Müller (1951–1958), Arnell (1956), Szweykowski and Mendelak (1964), Jovet-Ast (1986), Gradstein and van Melick (1996), Damsholt (2002), Schumacker and Váňa (2005), Meinunger and Schröder (2007), Hugonnot (2010), Pöltl *et al*. (2025)

1 Sporophytes in ovate colourless involucres sessile in the middle of the thallus lobes; ventral scales hyaline with lanceolate appendages projecting beyond thallus margins; margin of scales entire, air-pores surrounded by 6 cells with partially thickened radial walls..... ***Oxymitra incrassata*** (r)
– Sporophytes immersed in dorsal surface of thallus, scattered, released by decay of thallus tissue; ventral scales inconspicuous, rounded, or, if lanceolate, with denticulate margins; air-pores absent or if present, surrounding cells without thickened walls..... 2
2 Thalli floating on water; ventral scales large, in several ill-defined rows, strap-shaped, with denticulate margins, pendent in water; plants sometimes also terricolous with small ventral scales; epidermis and ventral scales with scattered dark oil cells, chlorenchyma with large air-chambers; air-pores present; sporophytes very rare..... ***Ricciocarpos natans*** (s-f)
– Plants terricolous (thalli often in rosettes) or aquatic; ventral scales inconspicuous, rounded; without oil cells; chlorenchyma chambered or consisting of parallel columns of cells separated by air-spaces; air-pores present (Subgenus *Ricciella*), or air-spaces lacking sharply delimited air-pores, opening through gaps between terminal cells (Subgenus *Riccia*). ***Riccia***..... 3

3 Dorsal tissue of thallus similar to an epidermis, consisting of fully connected cells with chlorophyll, and with air-pores above air-chambers (aquatic forms partly without either), sometimes dorsal tissue spongiose, with air-chambers becoming exposed by decay of epidermal cells; chlorenchyma mostly chambered. Subgenus *Ricciella* 4

– Dorsal chlorenchyma consisting of cell columns with an upper epithelium of one or two layers of hyaline cells, without sharply delimited air-pores (air-spaces opening through gaps between hyaline cells); dorsal tissue of lobes compact. Subgenus *Riccia* 8

4 Thallus not spongiose, with air-chambers; dorsal surface of older parts of thallus not lacunose; epidermis with inconspicuous pores; capsule protuberant and opening on ventral side of thallus. Section *Ricciella* 5

– Thallus spongiose, with ± large cavities on dorsal surface, at least in older parts; capsule immersed, or ± protuberant on ventral or dorsal surface and opening on dorsal side. Section *Spongodes* 6

5 Dorsal surface of thallus conspicuously reticulate, at least at apex of lobes; thallus lobes 0.5–1.5 (2) mm wide, dorsal surface flat, in cross section 3–8 times as wide as high, apices somewhat enlarged; thallus without or with only inconspicuous ventral scales and rhizoids ..... ***Riccia fluitans*** agg. (s-f)

Note: ***R. fluitans*** s.str., together with ***R. rhenana*** (of doubtful taxonomic value) and *R. stenophylla* (of tropical origin, doubtfully recorded in Hungary), belongs to a taxonomically insufficiently resolved complex of taxa which cannot be distinguished with certainty based on their morphology.

– Dorsal surface of thallus inconspicuously reticulate; thallus lobes up to 0.5 mm wide, in cross section 1.5–2.5 times as wide as high, with a dorsal furrow (best seen in dry material), apices somewhat narrowed; ventral scales towards thallus apices distinctly 2-rowed; rhizoids abundant; on muddy soil ..... ***Riccia canaliculata*** (n.s.)

6(4) Branches of young and adult thalli elongate, up to 1 mm wide, lobes up to 3 times as wide as high; thalli not in rosettes or rosettes indistinct; adult thalli vivid green, often tinged violet or completely violet; capsules protuberant on ventral surface of thallus and spores exiting through ventral epidermis; distal face of spores alveolate..... ***Riccia huebeneriana*** (rr)

– Lobes up to 2 mm wide, 3–6 times as wide as high; thalli in rosettes, disc-shaped or fan-shaped, pale green to bluish green, sometimes tinged with pink; capsules protuberant on dorsal surface of thallus and spores exiting through dorsal epidermis; distal face of spores with ± parallel to divergent ridges or irregularly alveolate..... 7

7 Dioicous; male thalli smaller than female; thallus lobes fan-shaped, in large (*ca* 2 cm) deeply divided rosettes often tinged pink; cavities small, in older parts only; spores 40–65 µm in diameter; distal face with irregular ridges ± parallel to divergent from the distal pole..... ***Riccia frostii*** (s-f)

– Monoicous; thallus often forming circular disc, green, rearly tinged pink; divided to half its length, with lobes 1–2 mm wide; cavities large; spores reddish brown, 60–120 µm in diameter, distal face with irregular ridges and alveolae..... ***Riccia cavernosa*** (s-f)

8(3) Thallus lobes winged, short, transversely truncated, 4–8 mm long, 2.5–3 (4) mm wide, mostly nearly as wide as high; perennial, mostly dioicous; terminal cell of columns elongate, bottle-shaped..... ***Riccia ciliifera*** (s-f)
Note: ***R. gougetiana***, reported (r) from Hungary, is doubtfully distinct from *R. ciliifera* and therefore included here.

– Thallus lobes not winged, often narrower than 2.5 mm, annual or perennial monoicous taxa, except *R. papillosa,* terminal cell of columns not bottle-shaped (but note pear-shaped epidermal cells in *R. crozalsii*)..... 9

9 Subepidermal cells incrassate (visible already in surface view of a crushed thallus), terminal cells of cell columns early collapsing..... 10

– Subepidermal cells thin-walled..... 11

10 Cross section of thallus semicircular; on dorsal surface and margins often with hook-shaped 'papillae' (bulging epidermal cells, not true papillae) to 145 µm long, these often disappearing during the summer; dioicous; sporophytes rare, spores 60–84 µm, with 5–8 alveolae across the distal face..... ***Riccia papillosa*** (r)

– Cross section of thallus not semicircular, thallus lobes up to 1.5 times as wide as high, flanks towards apex of thallus nearly vertical, but in older parts spreading laterally, median groove sharply acute, V-shaped, with sharp margins; 'papillae' lacking on dorsal side of thallus (but see var. *heegii* below); sporophytes frequent, spores 70–95 µm, with 7–14 alveolae across the distal face, proximal side of mature spores rarely with indistinct alveolae, with irregularly shaped ridges to almost smooth..... ***Riccia sorocarpa*** (s-f)

Note: *Riccia sorocarpa* var. *heegii* is doubtfully distinct from the typical variety, it is characterized by solitary or scattered straight, finger- or pear-shaped papilliform epidermal cells to 85 µm long, similar to but shorter than the 'papillae' of *R. papillosa*, on the dorsal side of the thallus.

11 Thallus with numerous cilia, cilia often crossing one another above the surface of the thallus when dry..... 12

Note: compare also *R. ciliata* var. *epilosa*, which lacks cilia.

– Thallus normally glabrous, but sparse short cilia may be rarely present in *R. glauca* var. *ciliaris, R. warnstorfii* var. *ciliaris, R. subbifurca, R. bifurca* var. *subinermis* and *R. beyrichiana*..... 13

12 Thallus glistening when fresh (not visible in herbarium specimens); margin of lobes ± densely ciliate with cilia up to 1000 µm long; spores very finely papillose (difficult to see in light microscope), dark brown to blackish; distal face with 7–12 alveolae across the diameter, each (6) 8–12 (14) µm wide, wing (at the margin of the spores) narrow or lacking..... ***Riccia ciliata*** (*Riccia crinita* auct.) (s-f)

Note: *R. ciliata* var. *epilosa*: Thallus lobes without cilia.

– Thallus dull when fresh, margins mainly on the apex of the lobes with cilia up to 550 µm long; distal face of spores with (6) 8–10 (12) alveolae across the diameter, each 12–16 µm wide, wing 3.5–7.5 µm wide..... ***Riccia crozalsii*** (rr)

Note: According to Meinunger and Schröder (2007), additional characters for the identification of *R. crozalsii* are: (i) plants small, thallus lobes 3–6 × 0.4–1 mm, growing in mostly irregular rosettes; (ii) thallus margin distinctly purple; (iii) lobe apex very thick, turgid, almost cushion-like; (iv) epidermal cells pear-shaped; (v) spores often remaining light yellowish or light brown

for a long period, but mature spores always very dark to nearly black, often all shades mixed.

13 Robust plants, thallus 1.8–3 mm wide; often with cilia; spores 95–130 µm, brown, wing mostly papillose-crenulate; thallus not decaying after ripening of spores ..... *Riccia beyrichiana*
Note: doubtfully recorded from Hungary.

– Plants medium-sized to small; spores mostly less than 100 µm, wing smooth or notched; internal thallus tissue mostly soon decaying after spore ripening 14

14 Thallus (seen in transverse section) 3–5 times as wide as high; margins thin, sharp, curved downward; thallus lobes green or bluish green without a trace of purple; ventral scales colourless, quickly vanishing; cilia mostly lacking; spores 80–100 µm, deep reddish-brown, small alveolate on proximal face, with distinct wing; medium-sized plants ..... ***Riccia glauca*** var. ***glauca*** (s-f)

– Thallus in transverse section 1–3 (4) times as wide as high; margins rounded or bulging, not decurved 15

15 Spores 60–80 µm, diffusely sculptured on proximal face, mostly without distinct alveolae; distal face with 5–7 alveolae across; ripe spores translucent brown, with conspicuous yellowish wing *ca* 5 µm wide; medium-sized plants with bulging thallus margins ..... ***Riccia bifurca*** (s-f)
Notes: (i) the plants described and illustrated in Paton (1999) under this name belong to *R. subbifurca* agg. according to Meinunger and Schröder (2007).
(ii) From *R. glauca*, which also has a rather wide thallus with a ± flat groove, in section 3–5 times as wide as high, *R. bifurca* can be distinguished by being only 3 (4) times as wide as high in section and having raised, convex margins forming small tumid ridges (sharp, ± deflexed margins in *R. glauca*). Spores of *R. glauca* are larger (80–100 µm in diameter vs. 60–80 µm in *R. bifurca*) and also differ in having usually well delimited alveolae on the proximal faces, and 6–8 (12) alveolae 6–12 µm wide across the distal face. The spores of *R. bifurca* are light brown and translucent even when old, whereas the spores of *R. glauca* are darker red brown to brown, blackish when old, opaque to hardly translucent (but light brown translucent when just ripe).
(iii) *R. bifurca* var. *subinermis*: Thallus apex with a few cilia.

– Spores with closed alveolae on proximal face; distal face with > 6 alveolae; marginal wing of spores distinct or indistinct; mostly small plants 16

16 Spores 80–100 µm, sometimes even larger, brown to dark brown, with 8–12 alveolae across distal face, red brown to dark brown, without any pink tinge, marginal wing of spores very narrow, mostly only weakly developed; thallus green to glaucous on dorsal side, margins and ventral side vigorously purple, regularly with some cilia; plants of calcareous rocky grassland, growing in irregular small patches or incomplete rosettes ..... ***Riccia subbifurca*** (r)

Notes: (i) According to Meinunger and Schröder (2007) the plants in the drawings under this name in Gradstein and van Melick (1996), Paton (1999), Damsholt (2002) and Siebel and During (2006) apparently represent *Riccia glauca* var. *subinermis* (= var. *ciliaris*).

(ii) Cilia, papillose in their upper part, 70–120 (200) µm, are not infrequently found near the thallus margin (in *R. bifurca*, smooth cilia, 120–340 µm, may be sometimes found).

– Spores 60–80 µm, wing mostly distinct to well-developed 17

17 Distal face of spores with 10–12 alveolae across, proximal face with fine reticulate pattern; mature spores reddish brown; cilia few, but regularly present; thallus 1–3 times as wide as high, margins mostly with reddish tinge, otherwise resembling *R. glauca* ..... ***Riccia glauca*** var. ***ciliaris*** (rr)

See the note under *R. subbifurca.*

– Distal face of spores with 6–12 alveolae across; mature spores light brown or coffee brown; thallus mostly without cilia 18

18 Mature spores light brown, translucent, 60–105 µm diameter; distal face of spores with 7–12 alveolae across, proximal face with alveolae of the same size, walls sometimes broken, papillae of walls mostly flat, conical to truncate; triradiate ridge poorly developed, the three proximal faces badly separating; wing narrow or missing, mostly entire, sometimes notched; plants in glaucous-green small, complete rosettes of 1–2 cm diameter (but mostly ⩾ 1.5 cm), with or without purple pigmented margins, without cilia; thalli 2–5 times dichotomously branched; terminal segment 0.5–1.5 mm wide, with round to truncate apex; thallus 3–5 times as wide as high, flanks bulging, edges round to subacute; central groove well developed, narrow at the apex, gradually widening towards the back; ventral scales inconspicuous, hyaline or slightly purple, sporophytes frequent; weakly calciphilic ..... ***Riccia pusilla*** subsp. ***gothica*** (rr)

Notes: (i) A historical collection (W) by Győrffy (1905) from Tömpös/Maros [9689.2] rev. Berg and Pöltl (Pöltl et al. 2025). (ii) In habit and spore colour similar to *R. bifurca*, but distinguished by ornamentation of proximal spore face (*R. pusilla* subsp. *gothica*: complete areolae of the same size as in the distal face; *R. bifurca*: areolae mostly incomplete in proximal face, forming vermicular pattern).

– Mature spores coffee-brown; distal face of spores with 6–10 alveolae, proximal face with reticulate pattern of wider and therefore less numerous alveolae; thallus 1.2–2 (3) times as wide as high, mostly without cilia, lobes pure green, linear, resembling terrestrial forms of *R. fluitans*..... ***Riccia warnstorfii*** (n.s.)
Note: *R. warnstorfii* var. *ciliaris*: Thallus margins with short, single cilia.

Key to species of *Sphaerocarpos*

References: Smith (1990), Paton (1999), Nebel and Philippi (2005), Schill *et al.* (2009), Xiang and Zhu (2019), Hugonnot and Chavoutier (2021), Wolf *et al.* (2022)

– Spore tetrads yellowish to dark brown, (70) 90-130 (150) µm diameter, individual spores ± distinct at maturity, their distal face with (6) 8–12 irregular to ± hexagonal areolae, (8) 10–14 (20) µm wide, across diameter, areolae delimited by smooth lamellae, 2.5–5 µm high, at junctions of areolae protruding as spines 7–10 (12) µm long, rendering spore tetrads spinulose in silhouette, each areola with a single central tubercle difficult to see in light microscope, best seen in SEM..... ***Sphaerocarpos michelii*** (rr)

– Spore tetrads light brown to red-brown, (120) 135–170 µm in diameter, individual spores indistinctly delimited at maturity, their distal face with 4–6 irregularly hexagonal areolae, (15) 20–32 (36) µm wide, across diameter, areolae delimited by papillose lamellae, 10–12.8 µm high, hardly protruding at junctions of areolae, tetrads in silhouette winged, not spinulose, central tubercle of areola lacking..... ***Sphaerocarpos europaeus*** (*Sphaerocarpos texanus*) (rr)

6. KEYS TO SPECIES OF MOSSES

Key to sections and species of *Sphagnum*

Note: Branch leaves means leaves of spreading branches unless stated otherwise.
References: Dierssen (1996), Hill in Smith (2004), Szurdoki (2000, 2003), Szurdoki and Nagy (2002), Szurdoki *et al.* (1999–2000, 2014), Laine *et al.* (2011, 2018), Hassel *et al.* (2018), Hill (2020), Shaw *et al*. (2023), Berg *et al*. (2025)

1 Hyalodermis of stems (mostly) and branches (always) with spiral fibrils, best seen on pendent branches; branch leaves large, concave, 1.5–2 times as long as wide (Subgenus *Sphagnum*)..... 6

– Hyalodermis of stems and branches without spiral fibrils; branch leaves smaller, less concave, usually more than twice as long as wide..... 2

2 Branch leaves 2–3 mm, stem leaves smaller, < 0.7 mm long; apex of branch leaves broadly truncate; upper branches often pointing upwards; chlorocysts completely enclosed between hyalocysts (like in *S. magellanicum*); hyalodermis of branches of uniform cells with 1 apical pore each (Subgenus *Rigida*)..... ***Sphagnum compactum*** (rr)

– Stem leaves usually > 0.7 mm long, often longer than branch leaves (if stem leaves small, 0.7 mm or less, then branch leaves with acute or cuspidate apex); apex of branch leaves narrowly truncate; chlorocysts not completely enclosed between hyalocysts; hyalodermis of branches consisting of 2 types of cells, short poreless cells and long cells with an apical pore on a projecting mamilla..... 3

3 Chlorocysts of branch leaves exposed on ventral side in transverse section (or exposed on both sides, but more so on ventral side); branch leaves small, lanceolate; plants often with red colours (Subgenus *Acutifolia* Section *Acutifolia*)..... 12

– Chlorocysts of branch leaves with a wider exposure on the dorsal side or ± equally exposed on both sides in transverse section; branch leaves small or large; plants green, yellow-green, yellow or brown, never with red colours..... 4

4 Chlorocysts of branch leaves ± equally exposed on both sides in transverse section; hyalocysts of branch leaves mostly with numerous small ringed pores on dorsal side arranged in rows along the adjacent cell walls of hyalocysts and chlorocysts;

spreading and pendent branches weakly differentiated, branches in capitulum often homomallous, horn-like; plants often with yellow and brown colours (Subgenus *Subsecunda*)..... 8

– Chlorocysts of branch leaves more exposed on dorsal than on ventral side; pores on dorsal side of hyalocysts of branch leaves few or numerous, but not arranged in rows; spreading and pendent branches strongly differentiated, branches in capitulum not homomallous, not horn-like..... 5

5 Stem leaves with border of several rows of elongate cells; branch leaves undulate when dry, 3–7 times as long as wide; stem hyalodermis sometimes not clearly distinguishable from sclerodermis (Subgenus *Cuspidata*) 19

– Stem leaves with few rows of elongate cells at leaf base only; branch leaves shorter, not undulate when dry, often with apices reflexed; stem hyalodermis sharply differentiated from sclerodermis (Subgenus *Acutifolia* Section *Squarrosa*)..... 24

6(1) Plants usually purplish red or tinged with red; chlorocysts elliptical in transverse section, completely enclosed by hyalocysts, centrally placed..... ***Sphagnum magellanicum*** agg. (rr) (*Sphagnum divinum, S. medium*)

Note: Hassel *et al*. (2018) stated that *S. magellanicum* s.str. is confined to the southern hemisphere, whereas holarctic taxa formerly treated under that name belong to either *S. divinum* or *S. medium*. However, recent studies (e.g. Hill 2020, Shaw *et al*. 2023, Berg *et al*. 2025) demonstrated that this appears to be an over-simplification and that the *S. magellanicum* complex possibly contains more taxa that are not easily separated morphologically. For the time being, I therefore follow Berg *et al*. (2025) in retaining *S. magellanicum* agg.

– Plants green, brown, not red; chlorocysts exposed on ventral side or if enclosed between hyalocysts then placement not central..... 7

7 Chlorocysts in transverse section narrowly triangular, exposed on ventral side..... ***Sphagnum palustre*** (r)

– Chlorocysts in transverse section centered but very narrowly exposed on both sides, lenticular or spindle-shaped to narrowly triangular with broader side close to ventral surface, cell walls thickened..... ***Sphagnum centrale*** (rr)

8(4) Hyalodermis of stem (1) 2–4-layered in transverse section..... 9

– Hyalodermis of stem unistratose, stem often ± dark..... 10

9 Hyalodermis of stem 1–2-layered; stem leaves to 2.5 mm long, broadly lingulate ..... ***Sphagnum platyphyllum*** (rr)

– Hyalodermis of stem 2–4-layered, stem leaves < 1mm long, triangular-lingulate ..... ***Sphagnum contortum*** (rr)

10 Stem leaves 0.4–0.6 (0.9) mm long; plants slender, yellowish to brownish green ..... ***Sphagnum subsecundum*** (rr)

– Stem leaves at least 0.9 mm long 11

11 Stem leaves 0.9–1.5 mm long, triangular-lingulate, widest at leaf base, fibrillose in upper third; spreading branches not or only weakly homomallous ..... ***Sphagnum inundatum*** (rr)

– Stem leaves to 2.5 mm long, lingulate to spathulate, widest above leaf base, sometimes fibrillose to base; branches often homomallous, horn-like ..... ***Sphagnum auriculatum*** (*Sphagnum denticulatum*) (rr)

12(3) Stem leaves spathulate, broadly truncate, fringed at apex; plants with distinct terminal bud; plants always green, never red 13

– Stem leaves triangular to lingulate, not fringed at apex; plants red or green 14

13 Stem leaves expanded at apex, margins fringed from apex to lower half of leaf ..... ***Sphagnum fimbriatum*** (r)

– Stem leaves not expanded, fringed only at apex ..... ***Sphagnum girgensohnii*** (rr)

14 Stem leaves lingulate, apex broadly rounded, the sides ± parallel, flat, not incurved 15

– Stem leaves triangular, with acute or obtuse apex, the sides tapering slightly at base, more strongly towards apex, flat or incurved towards apex 17

15 Outer cells of stem hyalodermis with scattered pores, not more than 1 pore per cell; branch leaf hyalocysts with numerous pores on both sides; stem leaves broadly lingulate, slightly denticulate-fringed at rounded apex ..... ***Sphagnum russowii*** (rr)

– Outer cells of stem hyalodermis without pores; branch leaf hyalocysts with numerous pores on dorsal side only 16

16 Branch leaves in 5 distinct ranks, their hyalocysts towards apex with many small (*ca* 5 μm) ringed pores on dorsal side; branch leaf apices pointing outward when dry; plants reddish violet ..... ***Sphagnum warnstorfii*** (n.s.)

– Branch leaves not in 5 ranks, their hyalocysts with larger, elliptical, less distinctly ringed pores on dorsal side; branch leaf apices not pointing outward when dry; plants reddish ..... ***Sphagnum capillifolium*** (rr)

17 Branch leaves distinctly 5-ranked in and below capitulum; fascicles with 4–5 branches in total, of which 2–3 are spreading; stem leaves triangular-acuminate, with wide zone of elongate cells at base; stem hyalodermis with scattered pores or pseudopores; sclerodermis green with red spots ..... ***Sphagnum quinquefarium*** (rr)

– Branch leaves not distinctly 5-ranked outside capitulum; fascicles with 3–4 branches in total, of which rarely more than 2 are spreading; stem hyalodermis without pores, but sometimes with pseudopores; sclerodermis reddish or brownish even in otherwise green plants 18

18 Stem leaves 1.5–1.7 mm long, apex acute with inrolled leaf margins, at base with narrow to moderately widened zone of elongate cells, hyalocysts usually without fibrils, several times septate; plants lustrous when dry, violet reddish ..... ***Sphagnum subnitens*** (rr)

– Stem leaves 0.9–1.4 mm long, triangular to triangular-lingulate, often rounded at flat apex, at base with widened zone of elongate cells, hyalocysts usually with fibrils in apical part of stem leaf, ± septate, but rarely more than once; plants not lustrous when dry, reddish, often in compact tufts ..... ***Sphagnum capillifolium*** (rr)

19(5) Stem leaves to 1.6 mm long, at apex with a cleft of 1/3 of leaf length; branch leaves to 3 mm long; very robust, green plants ..... ***Sphagnum riparium*** (rr)

– Stem leaves without apical cleft 20

20 Stem leaves triangular-lingulate to lingulate, rounded at apex 21

– Stem leaves triangular, narrowed above, rounded or acute at apex 23

21 Branch leaf hyalocysts with numerous dorsal pores arranged in 1 or 2 rows, pores often indistinct and visible only after extensive staining; stem leaves > 1 mm long; robust plants ..... ***Sphagnum obtusum*** (rr)

– Branch leaf hyalocysts with few pores in the cell corners only 22

22 Stem leaves 1 mm long or little longer, longer than wide; axes of branches and stems pale; robust plants.....***Sphagnum flexuosum*** (rr)

– Stem leaves mostly < 1 mm long, as long as wide; axes of branches and stems often pink; small to medium sized plants.....***Sphagnum angustifolium*** (r)

23 Stem leaves 1–2 mm long, triangular, longer than wide; branch leaves > 4 times as long as wide; chlorocysts trapezium-shaped in transverse section, exposed on both sides.....***Sphagnum cuspidatum*** (rr)

– Stem leaves < 1 mm long, triangular, as long as wide, apex cuspidate; chlorocysts in transverse section widely exposed on dorsal side, narrowly exposed on ventral side.....***Sphagnum fallax*** (r)

Note: A useful way to distinguish *S. fallax* from *S. cuspidatum* in the field is to tear off a capitulum and inspect the pendent branches at its underside: these are in pairs, whitish and downwards pointing in *S. fallax*, whereas in *S. cuspidatum* they are greener and stick out sideways (Godfrey and Hill 2012).

24(5) Plants mostly bright green to greenish yellow; branch leaves with apices distinctly reflexed, 1.7–3.1 × 1.0–1.8 mm; hyalocysts elongate throughout the leaf, distinctly wider in basal part.....***Sphagnum squarrosum*** (r)

– Plants yellowish brown, rarely pure green; branch leaves usually imbricate, apices rearly reflexed, 1.0–2.3 × 0.5–1.2 mm, hyalocysts shorter towards apex, of equal width throughout leaf.....***Sphagnum teres*** (rr)

Key to the varieties of *Andreaea rupestris*

References: Murray (1987, 1988)

– Leaves shortly and bluntly apiculate, 0.7–1.5 mm long; plants to 2 cm high; papillae on dorsal side of leaves less than twice as high as wide.....***Andreaea rupestris*** var. ***rupestris***

– Leaves narrow, longly pointed, to 2 mm long; plants to 3 cm high; papillae on dorsal side of leaves more than twice as high as wide.....***Andreaea rupestris*** var. ***papillosa***

Key to species of Polytrichaceae

References: Nyholm (1979), Cortini Pedrotti (2001), Brugués *et al*. (2007)
For an auxiliary key for sterile plants of *Polytrichastrum, Polytrichum* and *Pogonatum*, see below.

1 Costa narrow (< 1/5 leaf width), leaves therefore translucent, crispate when dry, bordered by long narrow cells, transversely undulate when moist; capsule usually inclined (nearly erect in *A. flavisetum*), with long operculum and cucullate, hairless calyptra. ***Atrichum*** 2

– Costa wide, filling upper part of leaf, leaves therefore opaque, not changed when dry, whithout border of narrow long cells, never transversely undulate; usually leaf base sheathing; capsule with campanulate, usually hairy calyptra 4

2 Leaves about 1 mm wide; lamina cells 10–16 (20) µm in diameter; leaves ± taut, not much transversely undulate; lamellae 5–6 (7) in number, 6–9 cells high; spores 12–14 µm ..... ***Atrichum angustatum*** (s-f)

– Leaves 1.5–2 mm wide; lamina cells 20–30 (50) µm in diameter; leaves distinctly transversely undulate; lamellae 4–5 (6) in number, to 5 cells high; spores 16–20 µm 3

3 Autoicous (antheridia terminal on first years growth, archegonia terminal on second year's growth); sporophytes mostly single, seta red, capsule red brown, inclined ..... ***Atrichum undulatum*** (cc)

– Paroicous (antheridia terminal, archegonia outside perigonial leaves, stem continuing growth for 2 or more years, so that persistent setae appear lateral); often several sporophytes in a single perichaetium, seta yellowish when young (straw-coloured to reddish-yellow), capsule dark purple to reddish, narrow, almost erect ..... ***Atrichum flavisetum*** (*Atrichum haussknechtii, A. undulatum* var. *gracilisetum*) (rr)

4(1) Capsule without apophysis and stomata, terete. ***Pogonatum*** 5

– Capsule with apophysis and stomata, 4–6-angled or terete 7

5 Plants bluish-green, > 2 cm tall, often branched or with subterranean rhizome-like stems; protonema not persistent; uppermost cells of lamellae papillose, wider than tall in cross section ..... ***Pogonatum urnigerum*** (s-f)
Note: For the difference between this species and *Polytrichastrum alpinum*, see the note under that species.

– Plants dark green, < 2 cm tall, unbranched; protonema persistent; uppermost cells of costal lamellae smooth.....6

6 Leaf margins serrate to mid-leaf or along whole blade; capsule (without lid) (1.8) 2.8–3.2 (3.8) mm long, shortly cylindrical, 2–3 times as long as wide, exothecial cells with coarse prominent mamillae.....***Pogonatum aloides*** (s-f)

– Leaf margins serrate only at apex; capsule (without lid) to 2.3 mm long, ovoid to almost globose, 1–1.5 times as long as wide, exothecial cells finely papillose.....***Pogonatum nanum*** (r)

7 Capsule cylindrical, rounded; uppermost cells of costal lamellae papillose, taller than wide in cross section.....***Polytrichastrum alpinum*** (*Polytrichum alpinum*) (n.s.)

Note: *Pogonatum urnigerum* also has papillose end cells of lamellae, but these are wider than tall. Other differences between these two species which share also round, not angled capsules, are: (i) colour: dull green in *P. alpinum*, glaucous green in *Pogonatum urnigerum*; (ii) length of sheathing part of leaf: 24–30% of total leaf length in *P. alpinum*, to 22% in *Pogonatum urnigerum;* (iii) stomata lacking in capsules of *P. urnigerum*, stomata present at base of urn in *P. alpinum*.

– Capsule angled; uppermost cells of costal lamellae smooth. ***Polytrichum***.....8

8 Leaf margins sharply serrate in upper part of leaf, plane when moist.....9

– Leaf margins almost entire (except at tip), involute when moist.....12

9 Uppermost cells of costal lamellae furrowed or flat in transverse section, at least in part.....10

– Uppermost cells of costal lamellae all rounded.....11

10 Uppermost cells of costal lamellae all grooved.....***Polytrichum commune*** (r)

– Uppermost cells of costal lamellae variable in shape, some asymmetric, some grooved, some flat-topped (especially in median part of costa), some rounded (especially in marginal part of costa).....***Polytrichum perigoniale*** (*P. commune* var. *perigoniale*) (r)

11 Lamina in upper part of leaf consisting of 3–5 rows of cells; teeth 1-celled; lamina cells 10–15 µm wide; capsule with 4–6 sharp edges; spores 12–16 µm.....***Polytrichum formosum*** (c)

Notes: (i) Fully developed leaves of *P. formosum* have a V-shaped ridge at their back formed by the prominent costa, whereas the dorsal side of the leaf is rounded in *P. commune.* (ii) The basal sheathing part of the leaf is dull in *P.*

formosum, but shiny in *P. commune*. (iii) Young leaves of *P. formosum* may be indistiunguishable from those of *P. longisetum*.

– Lamina in upper part of leaf consisting of 6–15 rows of cells; teeth formed of 1–2 cells; lamina cells 15–20 µm wide, capsule with 5–6 blunt edges; spores 18–26 µm ..... ***Polytrichum longisetum*** (rr)

12(8) Excurrent part of costa hyaline, 1/4–1/3 as long as leaf; lamellae crenulate with crenulae directed towards leaf apex ..... ***Polytrichum piliferum*** (s-f)

– Excurrent part of costa brownish; crenulae of lamellae ± erect 13

13 Plants to 7 cm tall, leaves patent when moist, stems not or slightly tomentose; capsule *ca* 5 mm long; on dry soil ..... ***Polytrichum juniperinum*** (s-f)

– Plants to 20 cm tall, leaves erect-spreading when moist, stems densely tomentose with whitish rhizoids; capsule *ca* 3 mm long; in bogs ..... ***Polytrichum strictum*** (rr)

Auxiliary key for sterile plants of *Polytrichum, Polytrichastrum* and *Pogonatum*

1 Leaf margin inflexed over blade, partly covering lamellae, appearing entire (except at leaf tip) ..... ***Polytrichum piliferum*** (s-f), ***P. juniperinum*** (s-f), ***P. strictum*** (rr)

– Leaf margin sharply serrate, not inflexed 2

2 End cell of lamellae papillose 3

– End cell of lamellae not papillose 4

3 Sheathing part of leaf relatively short, to 22% of total leaf length, plants glaucous; end cell of lamellae wider than high ..... ***Pogonatum urnigerum*** (s-f)

– Sheathing part of leaf longer, 24–30% of total leaf length, plants dull green; end cell of lamellae higher than wide ..... ***Polytrichastrum alpinum*** (n.s.)

4 End cell of lamellae grooved, at least in part of lamellae ..... ***Polytrichum commune*** (r), ***P. perigoniale*** (r)

– End cell of lamellae rounded 5

5 Plants small, to 2 cm high, with persistent protonema; costa not excurrent ..... ***Pogonatum aloides*** (s-f), ***P. nanum*** (r)

– Plants mostly much higher than 2 cm, robust; without persistent protonema; costa excurrent..... ***Polytrichum formosum*** (c), ***P. longisetum*** (rr)

Key to species of *Buxbaumia*
References: Erzberger *et al.* (2018), Deme *et al.* (2020)

– Sporophyte reddish brown, glossy, capsule ovoid, strongly flattened, with a sharp edge; capsule epidermis not peeling off on dorsal side, or only to a mostly small extent at capsule mouth; peristome teeth uniseriate; stomata (at neck of capsule) deeply immersed (cryptopore); on soil..... ***Buxbaumia aphylla*** (s-f)
– Sporophyte greenish or greenish brown, not glossy when brownish and ripe; capsule elliptic, hardly flattened; epidermis in ripe capsules peeling off partly, remaining parts conspicuous ("indusium"); peristome teeth in 4 rows; stomata only shallowly immersed, appearing phaneropore; on soil, on rotting wood..... ***Buxbaumia viridis*** (s-f)

Key to species of *Timmia*
Reference: Nyholm (1960), Mastracci (1993)

– Sheathing part of leaf orange or red brown; dorsal surface of costa in upper part of leaf serrate to obtusely dentate; costa of sheathing part of lamina without stereids; endostome cilia without appendages; dioicous, capsules rare..... ***Timmia austriaca*** (rr)
– Sheathing part pale or yellow throughout; dorsal surface of costa in upper part of leaf smooth; costa at centre of leaf sheath with stereids; endostome cilia appendiculate; monoicous, capsules frequent..... ***Timmia bavarica*** (rr)

Key to species of *Encalypta*

References: Nyholm (1998), Cortini Pedrotti (2001), Guerra *et al*. (2006), Meinunger and Schröder (2007), Berg *et al.* (2025)

1 Plants with clusters of brownish filamentous gemmae in leaf axils; plants dioicous, rarely with sporophytes; urn spirally striate, spirally furrowed when dry; uppermost leaves obtuse or subacute; costa not excurrent; spores isopolar (= apolar) ..... ***Encalypta streptocarpa*** (s-f)

– Plants without gemmae in leaf axils; urn smooth or with longitudinal, not spiral stripes or furrows; costa excurrent or not; spores heteropolar (= polar, proximal and distal sides different) 2

2 Seta yellow; base of loosened calyptra lobed ('ciliate'), calyptra shiny, smooth; capsule smooth; vaginula ± elongate, in upper part with cup-shaped remnant of base of calyptra; peristome present, single; leaves with sharp, short or slightly elongate point; spores not papillose, with numerous radial ridges on the proximal surface, distal surface with a central depression surrounded by a stout circular ridge from which 5 short radial ridges run towards equator ..... ***Encalypta ciliata*** (r)

– Seta red; base of loosened calyptra erose to apparently lacerate; vaginula short, in upper part with remnant of base of calyptra umbrella-like; peristome present or absent; leaves with or without hair point; spores with large hemispherical or S-shaped papillae on distal face 3

3 Peristome present, well-developed, red-brown; capsule with prominent longitudinal red-brown striae, deeply furrowed when dry; spores on distal surface with large hemispherical papillae; calyptra smooth or erose at base, papillose throughout ..... ***Encalypta rhaptocarpa*** (n.s.)

– Peristome absent; capsule smooth or with faint golden striae; weakly furrowed when dry 4

4 Leaves without hair point, bluntly pointed, costa ceasing below leaf apex (rarely shortly excurrent); margin usually incur ved towards leaf apex; capsule smooth or almost so; calyptra smooth or erose at base; spores with radial ridges on the proximal face and with large S-shaped papillae on the distal face ..... ***Encalypta vulgaris*** (s-f)

Note: In ***Encalypta vulgaris*** var. ***apiculata*** (rr) the costa is shortly excurrent or ending in a more or less long hair point.

– Upper leaves with ± elongate hair point; margin usually plane; capsule finely yellow striate; calyptra erose to seemingly lacerate at base; spores transparent with large hemispherical papillae ..... ***Encalypta spathulata*** (rr)

Key to species of Funariaceae

References: Lazarenko (1928), Crundwell and Nyholm (1974), Crum and Anderson (1981), Nyholm (1989), Boros *et al.* (1993), Nebel and Philippi (2000), Erzberger (2002), Guerra *et al.* (2010)

1 Seta only 1–2 mm long, capsule immersed in leaves; capsule indehiscent, without lid, globose with short apiculus; plants < 5 mm high ..... ***Physcomitrium patens*** (*Aphanorrhegma patens, Physcomitrella patens*) (s-f)

– Seta longer, capsule exserted, dehiscent 2

2 Calyptra persistent even on mature capsule, inflated, contracted at base, with four angles; capsule emergent to exserted, mostly not reached by upper leaves, ovoid to subglobose, as long as seta; spores 45–70 µm ..... ***Pyramidula tetragona*** (r)

– Calyptra small, not inflated, not persistent on mature capsule; capsule clearly exserted; subglobose or not; spores less than 45 µm 3

3 Capsule furrowed when dry and empty; seta cygneous; peristome sigmoid, teeth fused apically in a disc; calyptra cucullate ..... ***Funaria hygrometrica*** (s-f)

– Capsule smooth, not furrowed; seta not cygneous; peristome teeth not fused apically in a disc or peristome lacking or rudimentary; calyptra cucullate or mitrate 4

4 Peristome present; capsule obovoid or pyriform, inclined; exothecial cells rectangular; calyptra cucullate 5

– Peristome lacking or rudimentary; capsule subglobose or pyriform, erect; exothecial cells rectangular or isodiametric; calyptra cucullate or mitrate 6

5 Leaf margins sharply serrate in upper half of leaf by projecting cells; marginal cells usually longer and narrower than adjacent cells; seta 7–11 mm long; capsule curved, *ca* 3 mm long, with *ca* 70 stomata; spores coarsely papillose..... ***Entosthodon muhlenbergii*** (*Funaria muhlenbergii*) (r)

– Leaf margins entire to bluntly denticulate by slightly projecting cell ends; marginal cells similar to adjacent cells; seta 5–8 mm long; capsule curved, *ca* 2 mm long, with *ca* 30 stomata; spores finely papillose..... ***Entosthodon pulchellus*** (*Funaria pulchella*) (r)

6 Calyptra of ripe capsule cucullate; lid without apiculus; exothecial cells isodiametric, incrassate..... ***Entosthodon fascicularis*** (s-f)

– Calyptra of ripe, fully developed capsules mitrate, usually trilobed at base; lid with a short apiculus to rostrate; exothecial cells ± isodiametric, thin-walled or rectangular and strongly incrassate..... 7

7 Capsule pear-shaped to club-shaped, with a long neck; exothecial cells long and narrow, nearly linear, incrassate; cuneate in section; peristome present, but rudimentary, slightly protruding from the mouth of the urn and soon disappearing after dehiscence; leaves entire; spores coarsely papillose..... ***Entosthodon hungaricus*** (s-f)

– Capsule semiglobose to pear-shaped, with a short to long, ± indistinct neck; exothecial cells lax, predominantly quadrate to rectangular, not cuneate in section; peristome absent; leaf margin ± entire to crenulate or distinctly denticulate by protruding cells longer and often narrower than adjacent lamina cells; spores papillose or echinate. ***Physcomitrium*** pp. 8

8 Capsule pear-shaped, gradually narrowed into seta; capsule mouth as wide as or narrower than urn; plants (including seta) 5–10 mm tall; spores spherical or reniform, 28–40 µm..... 9

– Capsule globose or semiglobose, empty capsule hemispherical, wide-mouthed; plants 3–7 mm tall; spores spherical..... 10

9 Plants 2.5–5.5 mm tall; leaf margin entire to bluntly and obscurely denticulate by protruding cell ends; spores reniform, *ca* 40 µm long, coarsely verrucose; annulus formed by small quadrate cells *ca* 10–12 µm wide, remaining at capsule mouth after dehiscence..... ***Physcomitrium arenicola*** (r)

Note: Probably more frequent.

– Plants 3–10 mm tall; leaf margin in upper third distinctly denticulate by protruding narrow and long cells; spores spherical, smaller, 28–36 (46) µm, papillose to echinate; annulus revoluble, formed of large cells ..... ***Physcomitrium pyriforme*** (s-f)

Note: Young capsules, green and still covered by the calyptra, of this species have a rostrate lid (from a conical base gradually narrowed to a beak), whereas young capsules in the same state of *E. hungaricus* have a low conical, but not rostrate lid, through which the peristome is visible; in the process of ripening and drying, the lid of *E. hungaricus* becomes flat and shortly rostrate.

10 Leaf margin distinctly denticulate above; costa percurrent or excurrent; seta 2–5 mm long; spores 30–40 µm; plant (including sporophyte) 5–7 mm tall..... ***Physcomitrium eurystomum*** (r)

– Leaf margin ± entire, ± inrolled towards blunt, slightly cucullate apex; costa ending below leaf apex; seta 1–2 mm long; spores 24–32 µm; plant (including sporophyte) 2–5 mm tall..... ***Physcomitrium sphaericum*** (n.s.)

Key to species of *Flexitrichum*

Reference: Erzberger (2001)

– Costa in transverse section not projecting dorsally, transition to lamina continuous, cross section forming a smooth ring; basal paracostal cells narrow, elongate, distinctly porose to nodulose; plants 4–11 cm tall, leaves 4–11 mm long..... ***Flexitrichum gracile*** (*Ditrichum crispatissimum, D. flexicaule* var. *sterilis*; *D. gracile*) (rr)

Note: The specific value of *F. gracile* is doubted by some authors considering the existence of many intermediates.

– Costa in transverse section projecting dorsally, transition to lamina discontinuous; often pseudopapillose with projecting cross walls ('Pfeilerpapillen') seen in cross section; basal paracostal cells wider, rectangular, not or only indistinctly porose; plants 1–5 cm tall, leaves 1–3.5 mm long..... ***Flexitrichum flexicaule*** (*Ditrichum flexicaule* s.str.) (s-f)

Key to species of *Campylopus*

References: Erzberger and Németh (2014), Csiky *et al.* (2014, 2015)
Note: Transverse sections of the costa should be made at about 1/4 of leaf length above the base.

1 Leaves piliferous due to hyaline excurrent costa (which may be reduced in shaded habitats), hair points reflexed when dry; dorsal surface of costa ribbed; ventral cells wide, empty, occupying *ca* 25–50% of total costa thickness, about as many or slightly more numerous than median guide cells (cross section); seta cygneous before capsule maturation, calyptra fringed at base ..... ***Campylopus introflexus*** (s-f)

– Leaves without hyaline apices, not piliferous; dorsal surface of costa smooth or ribbed 2

2 Costa without stereids in transverse section; vegetative propagation by caducous shoot tips with long, erecto-patent leaves; mostly small plants ..... (stunted forms of) ***Campylopus pyriformis***, see 4.

– Costa with stereids 3

3 Ventral cells smaller and more numerous than median cells in transverse section of costa, occupying *ca* 16–36% of total costa thickness; alar cells forming conspicuous hyaline or more often brown auricles; vegetative propagation by caducous branches, small-leaved at base, but with a long-leaved apex, at stem tips ..... ***Campylopus flexuosus*** (r)

Note: *Dicranum flagellare* produces similar caducous branches, which are, however uniformly small-leaved to the tip.

– Ventral cells of at least equal size as and not more in number than median cells in costa cross sections; alar cells variable, vegetative propagation mostly by caducous leaves 4

4 Leaves widest at or almost at base; ventral cells usually smaller than guide cells (but larger in slender plants: (Smith 2004: Fig. 65,7)), occupying *ca* 32–54% of total costa thickness; alar cells usually undifferentiated, hyaline or pale red, rarely forming distinct auricles; leaf apex canaliculate, denticulate; vegetative propagation by broadly oval brood leaves at stem tips ..... ***Campylopus pyriformis*** (r)

– Leaves widest 1/8 to 1/4 distance from base, tapering downwards; ventral cells larger than median cells and about equal in number, occupying between 1/3 and 2/3 of total costa thickness, dorsal groups of stereids distinct; basal cells hyaline, not forming auricles, conspicuously shining whitish in dry and moist plants; vegetative propagation by bundles of caducous minute, linear leaves in axils of normal leaves at shoot apex..... ***Campylopus fragilis*** (rr)

Key to species of *Leucobryum*
References: Zündorf (1988), Ottley *et al.* (2023)

– Most cells in the middle of the leaf base > 30 µm wide; hyaline marginal cells (=lamina cells) mostly in 5–8 rows, at extreme margin narrow and elongate cells with an abrupt transition; capsule distinctly strumose; pores of hyalocysts (transverse section) 15–20 µm wide, many large; basal expanded part of leaf usually longer than narrowly triangular tubular apical part, transition usually ± gradual; cushions higher, more swelling than in the following species..... ***Leucobryum glaucum*** (s-f)
– Most cells in the middle of the leaf base < 30 µm wide; hyaline marginal cells in 9–14 rows, towards extreme margin gradually more elongate; capsule weakly strumose; pores of hyalocysts (transverse section) predominantly small, 10–12 (15) µm wide; basal part of leaf usually shorter than ± parallel-sided apical tubular part, transition ± abrupt; cushions and plants usually smaller than in preceding species..... ***Leucobryum juniperoideum*** (r)

Key to species of *Dicranella*

1 Leaves crispate when dry; leaf base sheathing, contracted into a squarrose acumen..... 2
– Leaves erect-spreading, or homomallous, at most weakly contorted when dry, not crispate, not squarrose, leaf base not sheathing..... 3
2 Capsule erect, symmetric, striate; lamina cells 4–6 µm wide; rhizoidal tubers absent; autoicous, always with sporophytes..... ***Dicranella crispa*** (n.s.)

– Capsule inclined, asymmetric, smooth; lamina cells 6–14 µm wide; rhizoidal tubers often present; dioicous, not often with sporophytes ..... ***Dicranella schreberiana*** (s-f)
Note: For the difference between this species and *Trichodon cylindricus*, see the note under the latter.

3 Plants almost always sterile, always with irregularly shaped, brownish rhizoidal tubers; leaves erect-spreading, shortly acuminate from broadly lanceolate base, margin plane, denticulate at apex; lamina cells 9–14 µm wide; plants to 5 mm tall ..... ***Dicranella staphylina*** (s-f)

– Plants often with sporophytes, different combination of characters 4

4 Seta yellow; costa filling 1/3 of leaf width at base or more 5
Note: Compare also *D. howei* with costa indistinctly delimited at leaf base (9).

– Seta red; costa filling up to 1/5 of leaf base 6

5 Capsule strumose, brown; leaves suberect to secund, entire except at apex; basal cells 70–115 µm long ..... ***Dicranella cerviculata*** (rr)

– Capsule not strumose, reddish brown; leaves falcate, dentate; basal cells 30–50 µm long ..... ***Dicranella heteromalla*** (c)

6 Perichaetial leaves differentiated from normal leaves, suddenly contracted into acumen from sheathing base; leaves erect or secund; leaf margins almost entire; capsule striate, lid longly rostrate; rhizoidal tubers often present, dark brown; plants 5–20 mm tall ..... ***Dicranella subulata*** (n.s.)

– Perichaetial leaves not differentiated from lower leaves, not sheathing, gradually narrowed into acumen 7

7 Capsule erect, symmetric; leaves mostly homomallous, reddish; stems and setae reddish; leaf margin plane, very weakly denticulate in upper part of leaf ..... ***Dicranella rufescens*** (r)

– Capsule curved, asymmetric; leaves erect or weakly homomallous; margins recurved or plane, entire or weakly denticulate only near the tip, plants not reddish 8

8 Leaf margins recurved; leaves erect when dry, stiff; longitudinal walls of exothecial cells more heavily thickened than transverse walls; plants in tufts to 1 cm tall ..... ***Dicranella varia*** (s-f)

– Leaf margins ± plane 9

9 Lamina cells irregularly bistratose; costa strong, filling 1/3 leaf base, indistinctly differentiated from lamina; longitudinal walls of exothecial cells hardly wider than transverse walls ..... ***Dicranella howei*** (s-f)

– Lamina cells unistratose; costa narrower, clearly differentiated ..... ***Dicranella humilis*** (n.s.)

Key to species of *Fissidens*

Reference: Erzberger (2016)

1 Leaves with a border of elongate cells (limbidium), at least in sheathing part of lamina 2
Note: *Fissidens arnoldii*, which has elongate marginal cells resembling a border on the sheathing part of perichaetial leaves, is keyed out in both alternatives.

– Leaves without a border of elongate cells 13

2 Lamina cells twice as long as wide; plants 1–3 mm long with 3–5 pairs of leaves; leaves narrowly lanceolate, tapering to apex from below middle; terricolous ..... ***Fissidens curvatus*** (*Fissidens algarvicus*) (n.s.)

– Lamina cells as long as wide; leaves tapering only at apex 3

3 Limbidium mostly confined to sheathing part of perichaetial leaves, sometimes variously reduced on stem leaves; apex rounded to obtuse, cells below apex often in concentric rows; margin slightly crenulate by protruding cell ends; plants growing on limestone or other base-rich rock in or near water ..... ***Fissidens arnoldii*** (r)

– Limbidium well developed on all laminae and all leaves except sometimes the lowermost 4

4 Leaf cells conspicuously small, usually not longer than 8 µm and not wider than 6 µm; leaves oblong to ovate-lanceolate, > 2.5 times as long as wide, median lamina cells distinctly protuberant on both sides, higher than wide (transverse section) ..... ***Fissidens crispus*** (*Fissidens limbatus*) (n.s.)
Note: European and American plants with this morphology probably form a complex of different taxa that require more detailed study; the lamina cells being protuberant seems not a constant character (Jan Kucera pers comm.).

– Leaf cells not conspicuously small, usually larger 5

5 Limbidium confluent with excurrent or percurrent costa; antheridia often in bud-like perigonia or naked in leaf axils 6

– Limbidium not confluent with costa; antheridia not axillary 9

6 Antheridia terminal in dwarf male plants; capsule asymmetric, strongly inclined ..... ***Fissidens incurvus*** (r)
– Antheridia axillary, not in dwarf male plants; capsule erect or inclined 7
7 Antheridia nearly always naked in leaf axils; plants mostly growing on periodically inundated, silt-covered tree trunks or roots (rarely also rocks or stones; in other European countries often on silt-covered stones of artificial riverbank enforcements along great rivers) ..... ***Fissidens gymnandrus*** (s-f)
– Antheridia in axillary bud-like perigonia, rarely naked 8
8 Limbidium (12) 20–30 (40) µm wide on dorsal lamina; costa excurrent in stout mucro to 150 µm long, pluristratose in its proximal part; plants hydrophilous, growing on shaded moist or submerged neutral or acidic rocks and stones, in streams ..... ***Fissidens rivularis*** (rr)
– Limbidium 7.5–12.5 (14) µm wide on dorsal lamina; costa percurrent or at most shortly excurrent; plants growing on moist loamy soil usually away from water ..... ***Fissidens bryoides*** (s-f)
9 Limbidium bi- to pluristratose on vaginant laminae; sheathing part often with intramarginal limbidium; costa ceasing below leaf apex; median lamina cells (10)12–18(20) µm long; plants 5–30 mm long; mostly on calcareous or base-rich rocks near or in water ..... ***Fissidens crassipes*** (incl. *Fissidens crassipes* subsp. *warnstorfii*) (s-f)
– Limbidium 1–2-stratose on vaginant laminae; plants often < 5 mm long, terrestrial or aquatic 10
10 Terricolous plants 11
– Plants growing on moist siliceous or calcareous rock or in streams 12
11 Capsules symmetric, erect ..... ***Fissidens viridulus*** (incl. *F. bambergeri*) (s-f)
– Capsules asymmetric, inclined ..... ***Fissidens incurvus*** (r)
12 Perichaetial leaves 4–6 times as long as wide, lanceolate, rather broad, suddenly narrowed to a short and wide, somewhat obtuse or ± acute apex; plants hydrophilous, growing on siliceous rock often close to flowing water or inundated ..... ***Fissidens pusillus*** (s-f)

– Perichaetial leaves to 6–7 (9) times as long as wide, narrower, more gradually narrowed to slightly cuspidate point; plants growing on moist to wet calcareous rock..... ***Fissidens gracilifolius*** (s-f)

13(1) Mature plants small, 1–4 (6) mm long..... 14

– Mature plants > 1 cm long..... 15

14 Leaves in 2–4 pairs, plants procumbent; margin at apex finely crenulate, margin on sheathing part of perichaetial leaves often coarsely dentate; dorsal lamina not extending to leaf base; terricolous, nearly always with capsules..... ***Fissidens exilis*** (s-f)

– Leaves in 4–5 (10) pairs, increasing in length towards stem apex, plants erect; margin at apex entire or indistinctly crenulate by protruding cells, sheathing part of leaves entire; dorsal lamina reaching leaf base; plants growing on limestone or other base-rich rock and stones in or near water..... ***Fissidens arnoldii*** (r)

15 Leaf margin dentate with large and smaller teeth alternating, particularly near apex; several rows of cells near margin forming pale band..... 16

– Leaf margin entire to crenulate, sometimes with 2–3 teeth near apex; leaf margin without pale band or just one marginal cell row paler; costa excurrent as a short apiculus; upper lamina cells 6–10 μm long, distinctly bulging to mamillose; perichaetia at the base of shoots..... ***Fissidens taxifolius*** (c)

16 Lamina cells (10) 12–20 μm wide, lamina unistratose, ± translucent; plants 2–10 cm tall..... ***Fissidens adianthoides*** (r)

– Lamina cells (5) 6–12 μm wide; lamina irregularly bistratose, opaque; plants 1–3 cm long. ***Fissidens dubius***..... 17

17 Costa ending shortly below leaf apex in uppermost leaves..... ***Fissidens dubius*** var. ***dubius*** (s-f)

– Costa shortly excurrent as mucro in uppermost leaves..... ***Fissidens dubius*** var. ***mucronatus*** (r)

Key to species of Dicranaceae

References: Erzberger (1999), Hedenäs and Bisang (2004)

1 Costa broad, 1/3–4/5 leaf width at base or more, without stereids and guide cells, but with hyalocysts on both the dorsal and ventral sides..... ***Paraleucobryum longifolium*** (s-f)

– Costa narrower, < 1/3 leaf width, with stereids and guide cells... 2

2 Leaves stiff and fragile, at least in upper part of shoot straight and erect when moist, upper leaf portions very narrow and tips frequently broken (touch cushion with moistened finger and inspect finger for broken tips); capsules straight and erect or nearly so... 3

– Leaves in upper part not at the same time fragile, straight and erect, upper leaf portions not markedly narrow... 4

3 Costa in basal portion lacking stereid bands, with up to 1–2 cell layers above and below guide cells (transverse section); basal lamina cells narrowly rectangular to linear (35–120 µm, most cells > 40 µm long), eporose; alar cells unistratose; dark green glossy dense tufts... ***Dicranum tauricum*** (s-f)

– Costa in basal portion with stereid bands, sometimes weak, with up to 2–3 (4) layers of cells above and below guide cells; basal lamina cells quadrate to short-rectangular (16–50 µm, most cells < 30 µm long), not or hardly porose; alar cells mostly bistratose, at least partially, rarely entirely unistratose; lamina above partially bistratose; plants light green, to 4 cm tall, leaves slightly curled when dry... ***Dicranum viride*** (r)

4 Cells in upper leaf mainly prosenchymatous, elongate and porose; usually robust plants... 5

– Cells in upper leaf mainly parenchymatous, quadrate or rectangular, rarely elongate-rectangular, with or without pores... 7

5 Costa above with 2 dorsal lamellae or ridges; leaves ± transversely undulate... 6

– Costa above with 4 dorsal lamellae; leaves transversely undulate or not; variable species... ***Dicranum scoparium*** (c)

6 Leaves at stem apex erect, further down spreading; leaf lamina strongly transversely undulate; costal lamellae tall; margin in upper part spinosely denticulate or dentate; margins recurved at leaf base; plants to > 10 cm high, densely whitish tomentose... ***Dicranum polysetum*** (s-f)

– Orientation of apical leaves and leaves further down not clearly different; leaf lamina ± transversely undulate (at least in some leaves); costal lamellae low or weakly developed; margin obtusely to sharply denticulate; margins flat at leaf base; plants to 10 cm high... ***Dicranum bonjeanii*** (r)

7 Upper leaf lamina in at least some leaves rugose, or ± transversely undulate; scattered cells of lamina and costa on upper dorsal surface of leaf with conical mamillae; plants in loose tufts, to 6 cm high; leaves curled when dry, appressed to the stem in basal portion and suddenly narrowed to short acumen ..... ***Dicranum spurium*** (r)

– Leaves smooth, neither rugose nor undulate 8

8 Small plants (rarely above 3 cm high, leaves up to 4 mm long and up to 0.5 mm wide); dry leaves strongly crisped; upper lamina cells mamillose, normally unistratose; costa occupying 1/5 leaf base; leaf margins denticulate from apex down to mid-leaf ..... ***Dicranum montanum*** (s-f)

Notes: (i) *D. montanum* can be distinguished from *Dicranoweisia cirrata* occurring in the same habitat (tree bark, siliceous rock) in the field by the size distribution of leaves: whereas in *D. cirrata* all leaves are of approximately the same size, in *D. montanum* leaves occur in a wider size range within one cushion, larger and in particular many smaller leaves mixed. (ii) When growing on rock, *D. montanum* could also be confused with species of *Cynodontium*, which are somewhat similar in habit (leaves crisped when dry), but distinguished by bistratose leaf margins (except the rare *C. tenellum*).

– Different combination of characters 9

9 Small plants that almost invariably have numerous easily detached erect small-leaved flagellae from upper leaf axils; alar cells unistratose; costa occupying 1/3 leaf base; leaf margins denticulate only at apices ..... ***Dicranum flagellare*** (r)

Note: For the difference to *Campylopus flexuosus*, see the note under that species.

– Plant size variable; if flagellae present, then never several on each plant; alar cells at least partially bistratose 10

10 Upper leaf lamina bistratose in large portions; costa very broad, 1/3 of basal leaf width; leaves crispate when dry; leaf margin denticulate in upper part of leaf; plants dark green, to 5 cm tall ..... ***Dicranum fulvum*** (r)

– Upper leaf lamina unistratose; costa narrower, filling < 1/4 leaf width; upper leaf tubular (cross section with circular outline); leaves strongly curled when dry; leaf margin near apex irregularly and coarsely denticulate to dentate; robust, usually tomentose plants in tufts to 6 cm tall, leaves erect-spreading, 5–7 mm long ..... ***Dicranum muehlenbeckii*** (n.s.)

Key to species of Rhabdoweisiaceae and Hymenolomataceae

References: Ellis *et al*. (2022), Németh and Erzberger (2023)

1 Lamina cells smooth, sometimes with longitudinal striae, not mamillose 2

– Lamina cells mamillose; upper leaf margin ± bistratose, mamillae of marginal cells forming double teeth 6

2 Capsules striate when dry and empty, less than 3 times as long as wide; leaf margin denticulate in upper part of leaf, sometimes only very slightly so 4

– Capsules smooth; leaf margin ± entire 3

3 Alar cells differentiated, enlarged, at least in some leaves; cuticle longitudinally striate; leaf margin plane, bistratose above; mid-leaf cells 6–8 (10) µm wide; capsules ovoid-ellipsoid; plants saxicolous ..... ***Hymenoloma crispulum*** (*Dicranoweisia crispula*) (rr)

– Alar cells not differentiated; cuticle smooth; leaves with recurved unistratose margins; mid-leaf cells 12–14 µm wide; capsules narrowly ellipsoid to subcylindrical; plants corticolous or saxicolous ..... ***Dicranoweisia cirrata*** (s-f)
Note: For the difference between this species and *Dicranum montanum* see the note under the latter species.

4 Leaves not with parallel margins, tapering from lower third; peristome teeth divided to base; annulus formed of small cells, persistent, not separating ..... ***Cynodontium tenellum*** (rr)

– Leaves with ± parallel margins, tapering only in upper 1/3 to 1/5; peristome teeth undivided; annulus not differentiated 5

5 Peristome teeth from broad base suddenly narrowed to a filiform, fragile tip; leaves almost entire or weakly denticulate; lamina mostly 3–4 cell rows wide on either side of the costa at 220 µm below apex; upper lamina cells 7–12 µm wide ..... ***Rhabdoweisia fugax*** (r)

– Peristome teeth gradually narrowed, linear-lanceolate, not fugacious; leaves mostly distinctly denticulate; lamina mostly 5–6 cell rows wide on either side of the costa at 220 µm below apex; upper lamina cells 9–12 (14) µm wide ..... ***Rhabdoweisia crispata*** (rr)

6(1) Peristome teeth undivided; perigonia on short stalks below perichaetium; capsule short, < 3 times as long as wide ..... ***Cnestrum schisti*** (n.s.)

– Peristome teeth divided halfway or below; perigonia sessile; capsules > 3 times as long as wide 7

6 Capsules erect, symmetric, not strumose ..... ***Cynodontium polycarpon*** (s-f)

– Capsules curved, asymmetric, strumose ..... ***Cynodontium strumiferum*** (rr)

Key to species of Ditrichaceae s.l. (incl. *Saelania* and *Flexitrichum*)
References: Burley and Pritchard (1990), Erzberger (2001), Martin (2014), Nieto-Lugilde *et al.* (2018a,b,c)

1 Plants bluish green with waxy surface, 2–3 cm tall; leaves lanceolate, the upper longer; costa percurrent; lamina cells quadrate or shortly rectangular ..... ***Saelania glaucescens*** (rr)

– Plants not glaucous, without waxy surface 2

2 Upper leaves squarrose, from sheathing base ± abruptly tapering to long, flexuose subula consisting of costa, cells prorate, therefore subula denticulate all around, not just at margins ..... ***Trichodon cylindricus*** (*Ditrichum cylindricum*) (s-f)

– Upper leaves not squarrose, not abruptly narrowed to subula .. 3

3 Capsules indehiscent, enclosed by the leaves; seta hardly a few millimeters long 4

– Capsules with dehiscent lid, exserted above the leaves, seta longer than capsule, or capsules lacking 6

4 Perichaetial leaves slightly differentiated from stem leaves, lanceolate; costa ending below leaf apex; plants without comal tuft, 2–4 mm tall; sometimes with yellowish-orange rhizoidal gemmae ..... ***Pseudephemerum nitidum*** (s-f)

– Perichaetial leaves strongly differentiated, leaves ending in subulate apex, costa excurrent; upper leaves crowded in comal tuft 5

5 Antheridia 1–3, enclosed in buds in leaf axils; lamina unistratose at shoulder; costa in basal part clearly delimited from lamina ..... ***Pleuridium subulatum*** (s-f)

– Antheridia single, naked in axils of comal leaves; lamina irregularly bistratose at shoulder; costa weakly delimited from lamina in basal part of leaf ..... ***Pleuridium acuminatum*** (s-f)

6(3) Upper lamina cells quadrate; capsule ribbed, inclined 7

– Upper lamina cells elongate; capsule smooth, erect. ***Ditrichum*** s.l. 8

7 Peristome teeth with pale hyaline to yellowish translucent border and 7–9 trabeculae (cross ledges); costa percurrent, rarely excurrent, with 2 stereid bands in cross section; capsule strumose, inclined; leaf shape very variable, leaf apex usually with some blunt teeth; outer layer of stem cross section with 2 layers of small, thick-walled cells; mostly on acidic substrates... ***Ceratodon purpureus*** (cc)

– Peristome teeth unbordered, with 3–5 trabeculae; costa longly excurrent, with a single stereid band in cross section; capsule ovoid-ellipsoid to cylindrical, erect to scarcely inclined, not or indistinctly strumose; stem cross section with a single outer layer of large, thin-walled cells; on open calcareous soil... ***Ceratodon conicus*** (rr)

8 Plants 1–8 cm tall, densely tomentose; leaves with long subula; upper lamina cells unistratose, predominantly oval to rounded, cells at shoulder irregularly quadrate, triangular or short rectangular; on calcareous soil. ***Flexitrichum***... 9

– Plants to 1.5 cm tall, not tomentose; leaves not subulate or if subulate, then upper lamina partially 2-stratose; upper lamina cells quadrate to rectangular, more regular; on acidic soil. ***Ditrichum***... 10

9 Costa in cross section not projecting dorsally, transition to lamina continuous, cross section forming a smooth ring; basal paracostal cells narrow, elongate, distinctly porose to nodulose; plants 4–11 cm tall, leaves 4–11 mm long... ***Flexitrichum gracile*** (*Ditrichum crispatissimum*, *D. flexicaule* var. *sterilis*, *D. gracile*) (rr)

Note: The specific value of *F. gracile* is doubted by some authors considering the existence of many intermediates.

– Costa in cross section projecting dorsally, transition to lamina discontinuous; often pseudopapillose with projecting cross walls ('Pfeilerpapillen') seen in cross section; basal paracostal cells wider, rectangular, not or only indistinctly porose; plants 1–5 cm tall, leaves 1–3.5 mm long... ***Flexitrichum flexicaule*** (*Ditrichum flexicaule* s.str.) (s-f)

10 Leaves erect to ± appressed to stem, in 3 ranks, 2–4 times as long as wide, margins entire, recurved on one or both sides; capsule and seta yellowish brown, peristome yellowish... ***Ditrichum lineare*** (rr)

– Leaves > 4 times as long as wide... 11

11 Leaf margin partially recurved, occasionally 2-stratose (cross section); leaves spreading, with somewhat channelled acumen, weakly denticulate at margins; capsule and seta reddish, peristome reddish; sterile plants with yellowish brown rhizoidal gemmae 100–150 µm in diameter.....***Ditrichum pusillum*** (r)

– Leaf margin plane; leaves from ovate base narrowed to long, canaliculate subula.....12

12 Seta red at least in lower part; leaves homomallous; leaf apex entire or with few teeth; leaf margin partially bistratose in subulate part of leaf (cross section); rhizoids brown; rhizoidal gemmae dark red-brown, consisting of 5–7 thick-walled cells arranged in a curved or helical line, rare; costa clearly delimited; plants to 1 cm tall; spores light in colour, ± smooth.....***Ditrichum heteromallum*** (r)

– Seta yellowish, long; leaf apex denticulate, in subula all around, not just at margins, often down to mid-leaf; lamina 2-stratose in lower part near costa and in subulate upper part (cross section); rhizoids yellow; rhizoidal gemmae pale yellow to yellowish-brown, in shape similar to those of *D. heteromallum*; costa very broad, indistinctly delimited; plants to 5 mm tall; spores brown, coarsely papillose.....***Ditrichum pallidum*** (s-f)

Key to species of *Acaulon*

– Costa ending in the leaf apex or shortly excurrent; leaves not keeled; plants rounded in appearance from above.....***Acaulon muticum*** (s-f)

– Costa clearly excurrent; leaves with a flat keel; plants triangular in appearance from above.....***Acaulon triquetrum*** (s-f)

Key to species of *Aloina*

References: Delgadillo (1975), Erzberger and Papp (2004), Berg *et al*. (2025)

1 Basal marginal leaf cells elongate, thin-walled, forming distinct hyaline border of 2–3 (4) cell rows, which differ conspicuously from adjacent leaf cells; annulus of inflated cells, separating; peristome teeth twisted 1–3 times.....2

– Basal marginal leaf cells quadrate or rectangular, not significantly elongate, not forming distinct membranaceous border; annulus of small cells, ± persistent; peristome teeth twisted through one turn..... 3

2 Leaves 1–2 mm long, very short and almost orbicular, only 2–3 times as long as wide; costa in transverse section with 1–2 layers of dorsal stereids; spores papillose, (15) 18–22 (33) µm in diameter; seta 5–10 mm long; lid conical or shortly rostrate, 0.5 mm long, < 1/2 as long as capsule; synoicous, rarely dioicous..... *Aloina brevirostris*
Note: This species was reported from Hungary, but the voucher specimens were misidentified.

– Leaves 4–6 times as long as wide; costa in cross section with 3–6 (8) layers of dorsal stereids; spores 11–15 (22) µm in diameter; lid half as long as the capsule; dioicous..... ***Aloina rigida*** (s-f)
Note: *Aloina obliquifolia* has been reported from Hungary as *A. rigida* var. *mucronulata* by Delgadillo (1975), but is doubtfully distinct from *A. rigida* (Hodgetts *et al.* 2020, Erzberger and Papp 2004). It differs from *A. rigida* in the leaves having an excurrent costa and the basal membrane of the peristome not projecting above the mouth of the capsule.

3 Leaf apex apiculate or mucronate, acute or obtuse, cucullate or not; spores 14–25 µm in diameter; basal membrane of peristome 1–2 cells high, not projecting above mouth of capsule; peristome teeth united in pairs at base, erect or slightly twisted; capsule slightly curved..... ***Aloina aloides*** (r)

– Leaf apex neither apiculate nor mucronate, rounded, cucullate; spores (12) 17.5–24 (27.5) µm in diameter; basal membrane of the peristome to 5 cells high, projecting above mouth of capsule; peristome teeth not united in pairs at base, usually distinctly twisted..... ***Aloina ambigua*** (s-f)

Key to species of *Cinclidotus* s.l. (including *Dialytrichia*)
Reference: Berg *et al.* (2025)

1 Leaf cells strongly papillose, leaves opaque; dorsal surface of costa not covered by epidermis, stereid cells therefore exposed; leaf margin recurved below; peristome segments free..... *Dialytrichia mucronata* (excluded)

– Leaf cells smooth or weakly papillose, translucent; dorsal surface of costa covered by quadrate to short rectangular cells 20 (100) x 10–15 µm in upper 2/3 of leaf; leaf margin plane; peristome segments linked and often with crossbars, therefore lattice-like at least towards the base.....2

2 Leaves widest at middle, elliptical, to 3 times as long as wide; costa 100–140 µm wide at leaf base, *ca* 1/10 of maximal leaf width; leaf margins moderately thickened, border internally uniform; lamina cells 8–10 µm; leaves appressed when dry, spreading when wet; setae 3–6 mm long, terminal.....***Cinclidotus riparius*** (s-f)

– Leaves widest shortly above insertion, gradually narrowed towards apex or with nearly parallel margins in lower third, mostly > 4 times as long as wide; costa 100–200 µm wide at leaf base, *ca* 1/10 of maximal leaf width or wider, 1/6–1/5; leaf margin moderately to strongly thickened, sometimes with internal cells differentiated; lamina cells 8–15 µm; leaves slightly or strongly curled when dry; setae very short, sporophytes lateral, immersed or sporophytes unknown.....3

3 Leaf border 2–5 layers thick, with differentiated internal stereids (long, thick-walled narrow cells with oblique apical walls); leaf cells 7.5–10 (12.5) µm; costa 100–140 µm wide at leaf base, *ca* 1/10 of maximal leaf width, rarely excurrent as a mucro; leaves strongly flexuose when dry; setae very short, sporophytes lateral, immersed.....***Cinclidotus fontinaloides*** (s-f)

– Leaf border usually 2 layers thick, without differentiated internal cells (in cross section all cells of equal thickness); leaf cells 12–15 (19) µm; costa 150–200 µm wide at leaf base, often excurrent as mucro; leaves slightly flexuose when dry; sporophytes unknown (perhaps a sterile hybrid *C. aquaticus* × *fontinaloides*).....***Cinclidotus danubicus*** (rr)

Key to species of *Crossidium*

Reference: Ellis *et al.* (2018)

1 Leaf margins plane to incurved, hyaline; upper lamina cells and end cells of filaments heavily incrassate; leaves with very long hair points.....***Crossidium squamiferum*** (rr)

– Leaf margins recurved, not hyaline; upper lamina cells and end cells of filaments thin-walled; hair points of variable length 2

2 Terminal cells of filaments smooth or almost so; peristome 350 µm long; cells at capsule mouth 5–10 µm wide ..... ***Crossidium laxefilamentosum*** (rr)
Note: doubtfully distinct from the following species, some authors include it in *C. crassinervium*.

– Terminal cells of filaments papillose; peristome teeth long, > 400 µm to 800 µm; cells at capsule mouth 9–15 µm wide ..... ***Crossidium crassinervium*** (r)

Key to species of *Didymodon*

References: Ahrens in Nebel and Philippi (2000), Kučera (2000), Jiménez (2006), Müller (2017), Kučera *et al.* (2018), Martin (2021), Jiménez *et al.* (2022), O'Leary and Kučera (2024), Blockeel and Gavalas (2025), Berg *et al.* (2025)

1 Ventral surface of costa with elongate cells above mid-leaf, narrower than adjacent lamina cells (near apex sometimes isodiametric) 2

– Ventral surface of costa with quadrate to transversely elongate, rarely short rectangular cells in upper 3/4 of leaf length (cells of lamina extending over costa) 5
Note: See also *Didymodon tophaceus* subsp. *sicculus* and subsp. *erosus* with short rectangular ventral costa surface cells.

2 Costa ending distinctly below leaf apex; leaf apex obtuse to rounded, sometimes with an apiculus; plants to 1 cm high, in wet places to 6 cm, olive- or brown-green ..... ***Didymodon tophaceus*** subsp. ***tophaceus*** (s-f)
Note: For a key to infraspecific taxa of *D. tophaceus*, see below.

– Costa ending in leaf apex; leaf apex gradually narrowed 3

3 Leaves strongly reflexed in a half-circle when moist, often distinctly 3-ranked, to 2 mm long; stem in transverse section with weak central strand and thick-walled parenchyma; plants in lax brown-green tufts, to 2.5 cm tall (or taller in wet habitats) ..... ***Didymodon ferrugineus*** (r)

– Leaves erect-spreading to recurved when moist, but not forming a half-circle, not arranged in distinct rows; stem in transverse section with mostly thick central strand and thin-walled parenchyma 4

4 Peristome spirally twisted, mostly more than 800 µm high; leaf margins mostly recurved to broadly recurved at 2/3–4/5 of leaf length (less in dry habitats); archegonia mostly 400–500 µm long; small to robust plants, leaves 0.8 to more than 3.5 mm long ..... ***Didymodon fallax*** (s-f)

– Peristome straight or nearly so, mostly < 500 µm high; leaf margins mostly not or only weakly recurved in upper half of leaf; archegonia mostly 700–800 µm long; robust plants, leaves mostly > 1.7 mm long ..... ***Didymodon spadiceus*** (r)

5(1) Leaf apex fragile, often notched, occasionally with teeth in youngest leaves ..... ***Didymodon sinuosus*** (s-f)

– Leaf apex not fragile, edentate (sometimes inconspicuously notched in *D. erosus*) 6

6 Leaf axils with ± globular gemmae 7

– Axillary gemmae lacking 9

7 Upper leaf margins bistratose ..... ***Didymodon rigidulus*** (s-f)

– Leaf margins unistratose 8

8 Leaf margins spirally revolute in well developed plants; leaves broadly lanceolate; costa very broad and strong, 60–120 µm wide, excurrent in a blunt point; lamina cells smooth or unipapillose; plants in brown-green cushions to 5 cm high ..... ***Didymodon cordatus*** (s-f)

Note: *Didymodon austriacus* (*Barbula austriaca*) is often included, but may represent a separate taxon which has been reported from Hungary.

– Leaf margins moderately recurved; leaves acuminate, linear lanceolate from a narrow base; costa (45) 60–90 (120) µm wide, longly excurrent; basal lamina cells hyaline, sharply differentiated from upper lamina cells; lamina cells mostly strongly papillose and mamillose; plants usually glaucous ..... ***Didymodon glaucus*** (rr)

9 Leaves broadly triangular; costa ending in or below apex ..... ***Didymodon luridus*** (s-f)

– Leaves long acuminate; costa excurrent 10

10 Lamina cells with several small papillae 11

– Lamina cells epapillose, smooth 12

11 Leaves mostly longly linear-lanceolate (margins nearly parallel in upper half of leaf), up to 3.5 mm long; margins mostly recurved only in lower half; lamina cells nearly always thin-walled, densely papillose, opaque ..... ***Didymodon insulanus*** (s-f)

– Leaves mostly from ovate base triangular-lanceolate (margins towards apex forming an angle); margins mostly recurved to above mid-leaf; lamina cells sometimes incrassate and weakly papillose (papillae often only visible in section) ..... ***Didymodon vinealis*** (s-f)

12 Costa transverse section with guide cells in 2 layers, ventral stereids lacking ..... ***Didymodon desertorum*** (rr)

– Costa transverse section with guide cells in single layer, ventral stereids in one layer ..... ***Didymodon acutus*** (s-f)

Key to infraspecific taxa of *Didymodon tophaceus*

Reference: Kučera *et al*. (2018)

Note: The key works for well-developed plants growing in non-extreme habitats in most, certainly not all cases. In particular, large hygrophytic plants of subsp. *erosus* might key out to subsp. *tophaceus*, hygrophytic morphs of subsp. *sicculus* might key out to subsp. *erosus*, while weak morphs of subsp. *tophaceus* might key out to subsp. *sicculus*. Sporophytic characters have only been observed in single cases for subsp. *sicculus* and subsp. *erosus*, respectively. Hence, barcoding using one of the molecular markers described in Kučera *et al.* (2018) is advisable in ambiguous cases.

1 Ventral superficial costa cells on all leaves elongate (> 3:1), costa on leaves of well-developed plants often > 100 µm wide, leaf base markedly and widely decurrent; rhizoidal gemmae not known ..... subsp. ***tophaceus*** 2

– Ventral superficial costa cells on most leaves short-rectangular to irregularly quadrate (< 1.5:1), costa on leaves of well-developed plants mostly < 70 µm wide, leaf base shortly, not conspicuously decurrent; rhizoidal gemmae often present (sufficient amount of substrate to be checked!) 3

2 Costa ending below apex ..... var. ***tophaceus*** (s-f)

– Costa excurrent ..... var. *anatinus*

3 Leaves ovate, ovate-lanceolate to ovate-lingulate, to 1.45 mm long, costa < 85 µm wide; peristome present ..... subsp. ***sicculus*** (r)

– Leaves lanceolate to lingulate, to 1.9 mm long, costa < 100 µm wide; peristome absent (observation on plants from Ecuador) ..... subsp. ***erosus*** (rr)

Key to species of *Microbryum* and ***Pottia* s.l.** (incl. *Hennediella heimii, Tortula caucasica, T. lindbergii, T. protobryoides, T. truncata*)
References: Pilkington (2022), Blockeel *et al.* (2024), Berg *et al.* (2025)

1 Capsule indehiscent; plants small (1–10 mm tall) 2
– Capsule with dehiscent lid; plants mostly taller 4
2 Capsule immersed; plants only 1 mm tall, brownish; costa excurrent as a brownish cusp; leaf margins crenulate at apex; spores 27–30 µm .....
Microbryum floerkeanum (*Phascum floerkeanum*) (s-f)
– Capsule emergent or exserted 3
3 Capsule emergent to exserted, ellipsoid; seta ± straight, as long as or slightly longer than capsule; peristome teeth differentiated but united with the indehiscent lid .....
Tortula protobryoides
(*Pottia bryoides*, *Protobryum bryoides*) (s-f)
– Capsule exserted to side of leaves, seta arcuate; leaves to 1 mm long; plants conspicuously reddish brown .....
Microbryum curvicollum (*Phascum curvicolle*) (s-f)
4 Peristome teeth well developed 5
– Peristome absent or rudimentary 6
5 Plants small, often less than 5 mm tall including sporophyte; lid bluntly conical or mamillate; spores raspberry-like, with coarse warts but otherwise smooth walls; calyptra distinctly papillose in upper part; upper lamina cells densely and strongly papillose; K+ red .....
Microbryum starckeanum (*Pottia starckeana*) (rr)
– Plants taller, mostly more than 5 mm tall including sporophyte; lid tall, conical, mostly obliquely and often indistinctly rostrate; spores finely papillose; calyptra mostly smooth, rarely weakly papillose; upper lamina cells weakly papillose to smooth, 13–17 µm, thin-walled; K+ yellow; costa in upper third covered by large, papillose ventral cells; leaves ± spirally twisted when dry, erecto-patent when moist, with recurved margins and excurrent costa .....
Tortula lindbergii (*Pottia lanceolata*) (s-f)
Note: Frequently as var. *gasilienii* with conspicuous, large ventral costa cells with 1–2 papillae.

6 Leaf margins denticulate in upper part of leaf; costa ending in leaf apex; lid remaining attached to ripe capsule by columella; brownish green plants to 1 (2) cm tall including seta 5–15 mm long; on soil in saline habitats.....
.....***Hennediella heimii*** (*Pottia heimii*, *Desmatodon heimii*) (rr)

– Leaf margins entire, costa mostly excurrent.....7

7 Capsule short, empty capsule wide-mouthed, widest at mouth, not (or only slightly) longer than wide; peristome absent or reduced to a basal membrane not protruding above the capsule mouth; capsule mouth with 1 (2) rows of differentiated, thin-walled cells.....8

– Capsule longer, ovoid, ellipsoid or shortly cylindrical, empty capsule not wide-mouthed, widest at middle, distinctly longer than wide; peristome rudimentary, protruding above the capsule mouth; capsule mouth with 1–4 rows of ± thick-walled small cells with roundish lumen.....9

8 Lid obliquely rostrate; peristome seemingly lacking, reduced to basal membrane not exceeding 20 µm and not protruding beyond the capsule mouth; plants (with sporophyte) mostly more than 5 mm tall; calyptra smooth; spores papillose; leaf margins mostly flat, occasionally slightly recurved; upper lamina cells smooth or slightly papillose; K+ yellow; rhizoidal gemmae unknown.....***Tortula truncata*** (*Pottia truncata*) (s-f)
Note: For the difference to *Tortula caucasica* see note under the latter.

– Lid bluntly conical, with a short (erect) mamilla; peristome completely absent; plants (with sporophyte) often less than 5 mm tall; calyptra papillose above; spores echinate; leaf margins distinctly recurved; upper lamina cells distinctly papillose; K+ red .....
.....***Microbryum davallianum*** (*Pottia davalliana*) (r)

9 Lid obliquely rostrate; plants (with sporophyte) mostly more than 5 mm tall; calyptra smooth; annulus present; upper lamina cells 12–25 µm wide, smooth or weakly papillose; costa in upper third with or without wide, smooth ventral cells; K+ yellow; leaf margins meeting at acute angle at apex; rhizoidal gemmae sometimes present.....
.....***Tortula caucasica*** (*Pottia intermedia*) (s-f)

Note: *Tortula pallida* (*Pottia littoralis*) has been recently found in Austria (Zechmeister and Kropik 2024) and might perhaps be expected in Hungary as well; it differs from *T. caucasica* mainly in leaf shape (spathulate vs. gradually tapering in *T. caucasica*), a yellow-orange seta (red in *T. caucasica*), being paroicous (*T. caucasica* autoicous) and growing only in saline habitats.

– Lid bluntly conical to mamillate; plants (with sporophyte) mostly less than 5 mm tall; calyptra papillose; upper lamina cells 6–15 µm wide, densely and strongly papillose; K+ red..... 10

10 Capsule mouth with 1(2) rows of small cells with moderately thickened walls and roundish lumen, sometimes accompanied by 1–2 rows of incrassate cells ('transitional rows'); spores papillose to shortly spinulose ..... ***Microbryum conicum*** (*Pottia conica, Microbryum davallianum* var. *conicum*) (rr)

Note: Frequency preliminary pending revision of pre-2024 records.

Capsule mouth with (1) 2–4 rows of small cells with roundish lumen and more strongly thickened walls, transitional cells not or less distinct; spores papillose with low papillae..... ***Microbryum muticum*** (*Pottia mutica*) (r)

Notes: (i) Frequency preliminary pending revision of pre-2024 records.
(ii) The separation of *M. conicum* and *M. muticum* is often difficult; some authors include these taxa in *M. davallianum* s.l., but *M. davallianum* s.str. is morphologically and ecologically distinct.

Key to species of *Pseudocrossidium*

– Leaves narrowly lanceolate to lingulate, obtuse, apiculate; stalked multicellular gemmae present in leaf axils; plants brownish green, in dense tufts..... ***Pseudocrossidium revolutum*** (s-f)

– Leaves lanceolate, the apex acute; plants dull green, without gemmae..... ***Pseudocrossidium hornschuchianum*** (s-f)

Key to species of *Pterygoneurum*

1 Capsule globose, without peristome, on short seta, ± immersed in the leaves; calyptra cucullate or mitrate..... 2

– Capsule exserted above leaves; calyptra cucullate..... 3

2 Capsule stegocarpous, immersed to somewhat exserted; hair point as long as or longer than lamina; lamellae 4–12 cells high; calyptra mitrate ..... ***Pterygoneurum subsessile*** (s-f)
– Capsule indehiscent, immersed; hair point mostly shorter than lamina; lamellae 2–6 (10) cells high; calyptra cucullate or rarely mitrate ..... ***Pterygoneurum kozlovii*** (rr)
2 Plants to 1 cm high, seta to 10 mm long; peristome present (but fugacious); cells of lid in spirally twisted rows; lamellae towards leaf apex often dissolved into filaments with papillose end cells; spores 16–20 µm ..... ***Pterygoneurum lamellatum*** (r)
– Plants low, < 3 mm high, seta short, hardly exceeding 5 mm; peristome absent; cells of lid in straight rows; spores 25–30 µm ..... ***Pterygoneurum ovatum*** (s-f)

Key to species of *Syntrichia*

Note: see also combined key to *Syntrichia* and *Tortula* below.
References: Gallego (2005), Gallego *et al.* (2018), Homm (2017), Hedenäs *et al.* (2019)

1 Leaves without hair point, with or without mucro 2
– Leaves with hyaline or sometimes coloured hair point 4
2 Costa ending in or below leaf apex, not excurrent; leaves contracted at the middle; plants often with spherical gemmae on the ventral surface of the leaf lamina ..... ***Syntrichia latifolia*** (*Tortula latifolia*) (s-f)
– Costa excurrent as a short mucro 3
3 Costa with hydroids in transverse section; leaves ± contracted in the middle; margin plane in upper third; mucro consisting of stereids only ..... ***Syntrichia montana*** var. ***calva*** (*Tortula crinita* var. *calva*) (rr)
– Costa without hydroids; leaves not contracted in the middle; margin recurved to near apex; mucro consisting of stereids and papillose outer cells similar to lamina cells ..... ***Syntrichia ruralis*** var. ***epilosa*** (rr)
4(1) Hair point spinulose to spinose, often strongly so 5
– Hair point smooth or if very weakly spinulose then costa smooth on dorsal surface 13

5 Lamina irregularly bistratose in upper third; leaves not contracted at mid-leaf; dorsal surface of costa strongly papillose, with simple or bifurcate papillae 2.5–5 µm long in the lower half, and pedicellate and branched papillae 12.5–37.5 µm long near the apex; leaf margin recurved from base to apex; costa in section generally with substereids; hair point strongly spinose, 0.3–2.6 mm long..... ***Syntrichia caninervis*** var***. gypsophila*** (*Tortula caninervis* subsp*. spuria*) (rr)

– Lamina unistratose in upper third..... 6

6 Costa in section without hydroids; leaves contracted at the middle or not..... 7

– Costa in section with hydroids; leaves contracted at the middle..... 12

7 Hair point brownish red or orange, sometimes hyaline at apex; dorsal superficial costa cells in upper third similar to lamina cells..... ***Syntrichia norvegica*** (*Tortula norvegica*) (rr)

Note: Many species of *Syntrichia* have hair points that are hyaline throughout except at the base, where they are often brownish. This is not to be confused with the hair point of *S. norvegica*, which is coloured throughout except sometimes at extreme apex. The leaf apex in *S. norvegica* is acuminate, acute to obtuse, and sometimes ascending the base of the hair point, a character also found in *S. ruraliformis* and *S. subpapillosissima*.

– Hair point hyaline; dorsal superficial costa cells (stereids) in upper third different from lamina cells..... 8

8 Costa in section with 1–2 (3) layers of dorsal stereids; leaves contracted at mid-leaf; margins plane or weakly recurved from base to mid-leaf; mid-leaf cells with 4–6 (8) papillae, papillae bifurcate, not pedicellate, 2.5 µm long; sometimes with spherical gemmae on ventral side of costa..... ***Syntrichia virescens*** (*Tortula virescens*) (s-f)

– Costa in section with (2) 3–6 layers of dorsal stereids; leaves not contracted at mid-leaf; margins recurved from base to upper third or apex..... 9

9 Margins recurved from base to upper third, rarely only to mid-leaf; mid-leaf cells 12.5–17.5 µm wide; leaves erecto-patent, not recurved when moist..... ***Syntrichia calcicola*** (*Tortula calcicolens*) (s-f)

Note: Additional characters of *S. calcicola* are: (i) a rather short hair point (0.2–1.7 mm), (ii) the short extent of the basal hyaline area (*ca* 25%), (iii) areolation of lamina cells hardly obscured by papillae, due to the predominantly central position of papillae and mamillosely-bulging cell walls on ventral and dorsal leaf surface. *S. subpapillosissima* is similar in that respect (mamillose cells with ± centrally placed papillae), however, that species has pedicellate and not sessile papillae.
S. calcicola with few stereid layers could be confused with *S. virescens*. However, apart from the characters mentioned in the key, *S. calcicola* differs (i) in relative length of the hyaline area formed by basal paracostal cells (19–25 (33)% in *S. calcicola*, 20–45% in *S. virescens*), (ii) in habitat (*S. calcicola* is saxi-terricolous, *S. virescens* mainly corticolous). Additional characters which may be used to avoid confusion with *S. montana* and *S. ruralis* are: (i) the size of mid-leaf cells (up to 17.5 µm wide in *S. calcicola*, 5–10 µm wide in *S. montana*, (5) 7.5–10 (15) µm wide in *S. ruralis*), (ii) the extent of the basal hyaline area (19–25 (33)% in *S. calcicola*, 27–45% in *S. ruralis*), (iii) the form of moist leaves in situ (patent in *S. calcicola*, squarrose in *S. ruralis*), (iv) the armation and length of the hair point (spinulose, 0.2–1.7 mm in *S. calcicola*, strongly spinose, 0.4–2.8 mm in *S. ruralis*, spinose, (0.3) 0.7–2.4 mm in *S. montana*).

– Margins recurved from base to apex, sometimes to upper third; mid-leaf cells (5) 7.5–12.5 µm wide; leaves mostly squarrosely recurved when moist 10

10 Papillae of mid-leaf cells not pedicellate, 2.5 µm long, (4) 6 (10) per cell 11

– Papillae of mid-leaf cells pedicellate, (5) 7.5–10 µm long; (2) 3–4 (6) papillae per cell, bifurcate, rarely branched and stellate at apex; papillae on dorsal surface of costa simple, 2.5–5 µm long ..... ***Syntrichia subpapillosissima*** (*Tortula papillosissima* var. *submamillosa*) (s-f)

Note: *S. subpapillosissima* resembles *S. ruraliformis* in the acuminate apex, sometimes hyaline or dentate, ascending the base of the hair point. (Compare also *Hilpertia velenovskyi*.) It differs, however, in the structure and size of the constantly pedicellate papillae of lamina cells.

11 Leaf apex not hyaline, rounded in general, not ascending the base of the hair point ..... ***Syntrichia ruralis*** (*Tortula ruralis*) (cc)

Note: Differs from *S. montana* in the following characters: (i) leaves not contracted at middle, (ii) margin recurved to near apex, (iii) lack of hydroids.

– Leaf apex in general hyaline, acuminate, ascending the base of the hair point ..... ***Syntrichia ruraliformis*** (*Tortula ruraliformis*) (r)

Note: According to some authors *S. ruraliformis* has smaller mid-leaf cells than *S. ruralis* (Nyholm (1990): *ruraliformis* (6) 8–12 µm wide versus *ruralis* 11–14 (16) µm wide, Nebel and Philippi (2000): *ruraliformis* 8–14 µm, *ruralis* 11–18 (20) µm).

12(6) Hair point smooth or only weakly spinulose, (0.2) 0.4–0.9 (1.6) mm long; dorsal surface of costa smooth; stem with large central strand of cells becoming incrassate and brownish with age; plants usually corticolous..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

Note: *S. laevipila* shares with *S. virescens* (i) the predominantly epiphytic habitat, (ii) the leaves contracted at the middle, (iii) degree of margin recurvature, (iv) lamina cell size; however, they can be separated by the following characters: (i) hair point smooth to weakly and indistinctly spinulose in *S. laevipila*, vs. distinctly spinulose in *S. virescens*, (ii) costa cross section with hydroids and 3–5 (7) layers of dorsal stereids in *S. laevipila*, lack of hydroids and only 1–2 (3) layers of stereids in *S. virescens*, (iii) leaf margin in *S. laevipila* may appear as a border of 2–5 rows of incrassate and less papillose cells, whereas this is not observed in *S. virescens*, (iv) if present, the different structure of gemmae (leaf-like in *S. laevipila*, spherical in *S. virescens*).

– Hair point spinulose, (0.3) 0.7–2.4 mm long; dorsal surface of costa papillose, rarely smooth; stem without central strand or central strand weakly developed; plants usually saxicolous..... ***Syntrichia montana*** var**.** ***montana*** (*Tortula crinita* var. *crinita*) (s-f)

Note: *S. montana* has the smallest lamina cells of all species with spinulose hair point, only 5–10 (12.5) µm wide.

13(4) Plants with gemmae..... 14

– Plants without gemmae; leaves contracted at the middle; hair point smooth or slightly spinulose, (0.2) 0.4–0.9 (1.6) mm long; costa in cross section with hydroids; mostly corticolous; dioicous or autoicous..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

14 Gemmae in the form of leaves, papillose, near the stem apex or at the base of the upper leaves; lamina cells with 4–6 (8) bifurcate papillae, on both the ventral and dorsal surface; leaf margins plane or weakly recurved to mid-leaf..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

– Gemmae globular, smooth, at the ventral face of leaves; lamina cells with 1–2 simple (sometimes bifurcate) papillae, on the dorsal surface only; leaf margins plane or incurved..... ***Syntrichia papillosa*** (*Tortula papillosa*) (cc)

Key to species of *Syntrichia* and *Tortula* pp. (excl. *T. acaulon, T. caucasica*, *T. lindbergii*, *T. protobryoides*, *T. truncata*, incl. *Tortula cernua*, *Hilpertia velenovskyi*)

1 Leaves without hair point, costa percurrent or excurrent in a mucro or apiculus 2
– Leaves with hyaline or sometimes coloured hair point 12
2 Costa ending in or below leaf apex, not excurrent; leaves contracted at the middle; plants often with spherical gemmae on the ventral surface of the leaf lamina ..... ***Syntrichia latifolia*** (*Tortula latifolia*) (s-f)
– Costa percurrent or excurrent, if ending in leaf apex then leaves not contracted at the middle; plants without gemmae 3
3 Costa widened towards leaf apex, with large, papillose ventral cells; leaf margin revolute from base to apex 4
– Costa not widened towards apex; ventral costa cells not conspicuously large 5
4 Leaves > 3 times as long as wide; mid-leaf cells 8–11 µm wide; dorsal superficial costa cells differentiated from stereids; marginal lamina cells not different from median lamina cells ..... ***Tortula muralis*** subsp. ***obtusifolia*** (*Tortula obtusifolia*) (r)
– Leaves 2.5–3 times as long as wide; mid-leaf cells 9–15 (17.5) µm wide; dorsal superficial costa cells not conspicuously different from stereids; 2–6 rows of marginal lamina cells less papillose and more incrassate than median lamina cells, but not forming distinct border ..... ***Tortula atrovirens*** (r)
5 Upper and median lamina cells smooth or inconspicuously papillose; marginal cells in upper half of leaf quadrate, similar to other lamina cells (but in general with more incrassate transverse walls) ..... ***Tortula mucronifolia*** (rr)
Note: The lack of papillae in this species is best seen in transverse sections of leaves; this should avoid confusion with weakly papillose forms of other species, e.g. *T. subulata* var. *graeffii*.
– Upper and median lamina cells papillose 6
6 Costa percurrent or excurrent in short mucro, 10–200 µm long 7
– Costa excurrent in longer apiculus 9

7 Central strand distinct; marginal cells differentiated from median lamina cells by being less papillose and having thicker walls, often transversely elongate; costa ending in or below apex or excurrent in a short mucro, 10–40 µm long; autoicous; peristome with conspicuous tubular basal membrane making up about half of peristome length; peristome teeth strongly spirally twisted; plants of warm, dry, open habitats on base-rich soil or limestone ..... ***Tortula inermis*** (rr)

– Central strand indistinct; marginal leaf cells ± from base to apex similar to median lamina cells with respect to shape, papillosity and wall thickness, not forming border; costa excurrent in short mucro 20–200 µm long 8

8 Costa with hydroids in transverse section; leaves ± contracted in the middle; margin plane in upper third; mucro 20–60 µm long, consisting of stereids only ..... ***Syntrichia montana*** var***. calva*** (*Tortula crinita* var*. calva*) (rr)

– Costa without hydroids; leaves not contracted in the middle; margin recurved to near apex; mucro 70–200 µm long, consisting of stereids and papillose outer cells similar to lamina cells ..... ***Syntrichia ruralis*** var. ***epilosa*** (rr)

9 Leaf border conspicuous, formed by elongate to linear cells, at least in lower half of leaf 10

– Marginal cells differentiated from median lamina cells by being larger and less papillose, but not forming distinct border; costa excurrent in short, yellowish awn or rarely ending in leaf apex; dioicous; peristome with low basal membrane, sometimes not visible above capsule mouth; peristome teeth not or weakly spirally twisted; plants of shady moist habitats ..... ***Tortula muralis*** subsp. ***muralis*** var. ***aestiva*** (s-f)

10 Capsule ovoid-cylindric, asymmetric, horizontal; peristome without conspicuous tubular basal membrane; leaves bordered in lower 2/3 by elongate, yellowish bistratose cells; central strand absent ..... ***Tortula cernua*** (*Desmatodon cernuus*) (rr)

– Capsule cylindric, 4–6 mm long, erect; peristome with conspicuous tubular basal membrane making up about half of peristome length; leaves bordered in lower 2/3 by rectangular to linear cells in one layer or if bistratose then reaching near apex; central strand distinct 11

11 Leaves narrowly lanceolate, acuminate, irregularly denticulate near apex; border of linear cells strongly developed, extending almost to apex, in at least one cell row bistratose ..... ***Tortula schimperi*** (s-f)

– Leaves narrowly lingulate to ovate-lanceolate, obtuse to acuminate; border extending 1/2–3/4 way up leaf, unistratose ..... ***Tortula subulata*** (s-f)

12(1) Hair point spinulose to spinose, often strongly so 13

– Hair point smooth or if very weakly spinulose then costa smooth on dorsal surface 21

13 Lamina irregularly bistratose in upper third; leaves not contracted at mid-leaf; dorsal surface of costa strongly papillose, with simple or bifurcate papillae 2.5–5 µm long in the lower half, and pedicellate and branched papillae 12.5–37.5 µm long near the apex; leaf margin recurved from base to apex; costa in section generally with substereids; hair point strongly spinose, 0.3–2.6 mm long ..... ***Syntrichia caninervis*** var. ***gypsophila*** (*Tortula caninervis* subsp. *spuria*) (rr)

– Lamina unistratose in upper third 14

14 Costa in section without hydroids; leaves contracted at the middle or not 15

– Costa in section with hydroids; leaves contracted at the middle 20

15 Hair point brownish red or orange, sometimes hyaline at apex; dorsal superficial costa cells in upper third similar to lamina cells ..... ***Syntrichia norvegica*** (*Tortula norvegica*) (rr)

Note: Many species of *Syntrichia* have hair points that are hyaline throughout except at the base, where they are often brownish. This is not to be confused with the hair point of *S. norvegica*, which is coloured throughout except sometimes at extreme apex. The leaf apex in *S. norvegica* is acuminate, acute to obtuse, and sometimes ascending the base of the hair point, a character also found in *S. ruraliformis* and *S. subpapillosissima*.

– Hair point hyaline; dorsal superficial costa cells (stereids) in upper third different from lamina cells 16

16 Costa in section with 1–2 (3) layers of dorsal stereids; leaves contracted at mid-leaf; margins plane or weakly recurved from base to mid-leaf; mid-leaf cells with 4–6 (8) papillae, papillae bifurcate, not pedicellate, 2.5 µm long; sometimes with spherical gemmae on the ventral face of the costa ..... ***Syntrichia virescens*** (*Tortula virescens*) (s-f)

– Costa in section with (2) 3–6 layers of dorsal stereids; leaves not contracted at mid-leaf; margins recurved from base to upper third or apex 17

17 Margins recurved from base to upper third, rarely only to mid-leaf; mid-leaf cells 12.5–17.5 µm wide; leaves erecto-patent, not recurved when moist .....
Syntrichia calcicola (*Tortula calcicolens*) (s-f)

Note: Additional characters of *S. calcicola* are: (i) a rather short hair point (0.2–1.7 mm), (ii) the short extent of the basal hyaline area (*ca* 25%), (iii) areolation of lamina cells hardly obscured by papillae, due to the predominantly central position of papillae and mamillosely-bulging cell walls on ventral and dorsal leaf surface. *S. subpapillosissima* is similar in that respect (mamillose cells with ± centrally placed papillae), however, that species has pedicellate and not sessile papillae.

S. calcicola with few stereid layers could be confused with *S. virescens*. However, apart from the characters mentioned in the key, *S. calcicola* differs (i) in relative length of the hyaline area formed by basal paracostal cells (19–25 (33)% in *S. calcicola*, 20–45% in *S. virescens*), (ii) in habitat (*S. calcicola* is saxi-terricolous, *S. virescens* mainly corticolous). Additional characters which may be used to avoid confusion with *S. montana* and *S. ruralis* are: (i) the size of mid-leaf cells (up to 17.5 µm wide in *S. calcicola*, 5–10 µm wide in *S. montana*, (5) 7.5–10 (15) µm wide in *S. ruralis*), (ii) the extent of the basal hyaline area (19–25 (33)% in *S. calcicola*, 27–45% in *S. ruralis*), (iii) the form of moist leaves in situ (patent in *S. calcicola*, squarrose in *S. ruralis*), (iv) the armation and length of the hair point (spinulose, 0.2–1.7 mm in *S. calcicola*, strongly spinose, 0.4–2.8 mm in *S. ruralis*, spinose, (0.3) 0.7–2.4 mm in *S. montana*).

– Margins recurved from base to apex, sometimes to upper third; mid-leaf cells (5) 7.5–12.5 µm wide; leaves mostly squarrosely recurved when moist 18

18 Papillae of mid-leaf cells not pedicellate, 2.5 µm long, (4) 6 (10) per cell 19

– Papillae of mid-leaf cells pedicellate, (5) 7.5–10 µm long; (2) 3–4 (6) papillae per cell, bifurcate, rarely branched and stellate at apex; papillae on dorsal surface of costa simple, 2.5–5 µm long ..... ***Syntrichia subpapillosissima*** (*Tortula papillosissima* var. *submamillosa*) (s-f)

Note: *S. subpapillosissima* resembles *S. ruraliformis* in the acuminate apex, sometimes hyaline or dentate, ascending the base of the hair point. (Compare also *Hilpertia velenovskyi*.) It differs, however, in the structure and size of the constantly pedicellate papillae of lamina cells.

19 Leaf apex not hyaline, rounded in general, not ascending the base of the hair point ..... ***Syntrichia ruralis*** (*Tortula ruralis*) (cc)

Note: Differs from *S. montana* in the following characters: (i) leaves not contracted at middle, (ii) margin recurved to near apex (iii) lack of hydroids.

– Leaf apex in general hyaline, acuminate, ascending the base of the hair point..... ***Syntrichia ruraliformis*** (*Tortula ruraliformis*) (r)

Note: According to some authors *S. ruraliformis* has smaller mid-leaf cells than *S. ruralis* (Nyholm 1990: *S. ruraliformis* (6) 8–12 µm wide versus *S. ruralis* 11–14 (16) µm wide, Nebel and Philippi 2000: *S. ruraliformis* 8–14 µm, *S. ruralis* 11–18 (20) µm).

20(14) Hair point smooth or only weakly spinulose, (0.2) 0.4–0.9 (1.6) mm long; dorsal surface of costa smooth; stem with large central strand of cells becoming incrassate and brownish with age; plants usually corticolous..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

Note: *S. laevipila* shares with *S. virescens* (i) the predominantly epiphytic habitat, (ii) the leaves contracted at the middle, (iii) degree of margin recurvature, (iv) lamina cell size; however, they can be separated by the following characters: (i) costa cross section with hydroids and 3–5 (7) layers of dorsal stereids in *S. laevipila*, lack of hydroids and only 1–2 (3) layers of stereids in *S. virescens*, (ii) leaf margin in *S. laevipila* may appear as a border of 2–5 rows of incrassate and less papillose cells, whereas this is not observed in *S. virescens*, (iii) if present, the different structure of gemmae (leaf-like in *S. laevipila*, spherical in *S. virescens*).

– Hair point spinulose, (0.3) 0.7–2.4 mm long; dorsal surface of costa papillose, rarely smooth; stem without central strand or central strand weakly developed; plants usually saxicolous..... ***Syntrichia montana*** var. ***montana*** (*Tortula crinita* var. *crinita*) (s-f)

Note: *S. montana* has the smallest lamina cells of all species with spinulose hair point, only 5–10 (12.5) µm wide.

21(12) Plants with gemmae..... 22

– Plants without gemmae..... 23

22 Gemmae in the form of leaves, papillose, near the stem apex or at the base of the upper leaves; lamina cells with 4–6 (8) bifurcate papillae, on both the ventral and dorsal surface; leaf margins plane or weakly recurved to mid-leaf..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

– Gemmae globular, smooth, at the ventral face of leaves; lamina cells with 1–2 simple (sometimes bifurcate) papillae, on the dorsal surface only; leaf margins plane or incurved..... ***Syntrichia papillosa*** (*Tortula papillosa*) (cc)

23 Costa widened in upper third of leaf; cells on ventral surface of costa 20–25 × (17.5) 20–25 μm, subglobose, arranged in 1–2 layers; costa in transverse section with 2–3 layers of stereids; leaves strongly concave; hair point flexuose when dry, less so when moist..... ***Tortula brevissima*** (r)

– Costa not thickened in upper third of leaf; ventral superficial cells of costa inconspicuous, smooth or if papillose then similar to lamina cells; costa with 3–6 (7) layers of dorsal stereids; leaves slightly to strongly concave; hair point not flexuose.....24

24 Leaf margins strongly revolute (to 2 times) from ± base to apex, entire or broadly toothed at or near the base of the awn, margins ascending the awn and thereby forming a ± hyaline triangle; cells of leaf apex rhomboidal to fusiform, epapillose; plants bud-like, leaves crowded, ovate to circular, 1.3–2 mm long (including the awn); costa in transverse section with a single layer of epapillose ± wide cells at the ventral surface..... ***Hilpertia velenovskyi*** (r)

– Leaf margins plane or weakly recurved to mid-leaf or recurved to revolute from base to apex; leaf apex not hyaline, rounded to obtuse or emarginate, not ascending the base of the awn, made up of isodiametric papillose cells; plants not bud-like, leaves lingulate to spathulate, or linear-lingulate to ovate-lingulate, to 3.8 mm long; costa in transverse section with guide cells in 1–2 layers, and in addition with a ventral layer of ± wide papillose cells similar to lamina cells.....25

25 Leaf margins plane or weakly recurved to mid-leaf; leaves contracted at the middle; hair point smooth or slightly spinulose, (0.2) 0.4–0.9 (1.6) mm long; costa in cross section with hydroids; plants sometimes with leaf-like gemmae; mostly corticolous; dioicous or autoicous..... ***Syntrichia laevipila*** (*Tortula laevipila*) (rr)

– Leaf margins recurved to revolute from base to near apex; leaves not contracted at the middle; hair point smooth, 0.3–2 mm long; costa in cross section without hydroids; gemmae unknown; plants mostly saxicolous; monoicous..... ***Tortula muralis*** subsp. ***muralis*** var. ***muralis*** (cc)

Key to species of *Tortula*

References: Erzberger (1998), Košnar and Kolář (2009)

1 Costa percurrent or excurrent in mucro or in greenish or yellowish hair point 2
– Costa excurrent in hyaline hair point 16
2 Costa widened towards leaf apex, with large, papillose ventral cells; leaf margin revolute from base to apex; costa percurrent to very shortly excurrent 3
– Costa not widened towards apex; ventral costa cells not conspicuously large; costa percurrent or excurrent 4
3 Leaves > 3 times as long as wide; mid-leaf cells 8–11 µm wide; dorsal superficial costa cells differentiated from stereids; marginal lamina cells not different from median lamina cells ..... ***Tortula muralis*** subsp. ***obtusifolia*** (*Tortula obtusifolia*) (r)
– Leaves 2.5–3 times as long as wide; mid-leaf cells 9–15 (17.5) µm wide; dorsal superficial costa cells not conspicuously different from stereids; 2–6 rows of marginal lamina cells less papillose and more incrassate than median lamina cells, but not forming distinct border ..... ***Tortula atrovirens*** (r)
4 Costa percurrent, in transverse section with hydroids, dorsal and ventral cells differentiated ..... ***Tortula inermis*** (rr)
– Costa excurrent in short or long point 5
5 Lamina cells smooth or very faintly papillose 6
– Lamina cells conspicuously papillose 12
6 Capsule immersed or emergent, indehiscent 7
– Capsule exserted, dehiscent 9
7 Capsule emergent, ellipsoid to ovoid ..... ***Tortula protobryoides*** (*Pottia bryoides*, *Protobryum bryoides*) (s-f)
– Capsule immersed, ovoid to shortly ovoid 8
8 Lamina cells completely smooth, occasionally ventral costa cells very weakly papillose; hair point 300–600 µm or longer; spores small, <25 (28) µm ..... ***Tortula acaulon*** var. ***pilifera*** (*Phascum cuspidatum* var. *piliferum*) (s-f)

Note: Moderately small spores (25 µm) and smooth lamina cells are sometimes also observed in var. *acaulon*, therefore the length of the hair point is diagnostic for var. *pilifera*.

– Lamina cells weakly to moderately papillose; hair point inconspicuous, shorter; spores 25–35 µm ..... ***Tortula acaulon*** var***. acaulon*** (*Phascum cuspidatum* var*. cuspidatum*) (c)

Note: In the field, small plants of this species might be confused with *Weissia longifolia*. That species, however, has perichaetial leaves that from a sheathing, ovate base (hiding the capsule), are contracted to a long, ± parallel-sided lamina with an acute to acuminate apex, whereas *T. acaulon* has ovate-oblong perichaetial leaves ending in a conspicuous mucro. When dry, confusion is precluded because the leaves of *Weissia* are strongly crisped.

9 Peristome well developed 10

– Peristome rudimentary or lacking 11

10 Peristome with inconspicuous basal membrane to 70 µm high; upper lamina cells weakly papillose to smooth, 13–17 µm, thin-walled; costa in upper third covered by large, papillose ventral cells ..... ***Tortula lindbergii*** (*Pottia lanceolata*) (s-f)

– Peristome with conspicuous basal membrane 400–800 µm high ..... ***Tortula mucronifolia*** (rr)

Note: The lack of papillae in this species is best seen in transverse sections of leaves; this should avoid confusion with weakly papillose forms of other species, e.g. *T. subulata* var. *graeffii.*

11 Capsule short, empty capsule wide-mouthed, widest at mouth, not (or only slightly) longer than wide; peristome seemingly absent (reduced to a basal membrane not protruding above the capsule mouth) ..... ***Tortula truncata*** (*Pottia truncata*) (s-f)

– Capsule longer, ovoid, ellipsoid or shortly cylindrical, empty capsule not wide-mouthed, widest at middle, distinctly longer than wide; peristome rudimentary, protruding above the capsule mouth; annulus present; upper lamina cells 12–25 µm wide, smooth or weakly papillose; costa in upper third with or without wide, smooth ventral cells; leaf margins meeting at acute angle at apex; rhizoidal gemmae sometimes present ..... ***Tortula caucasica*** (*Pottia intermedia*) (s-f)

Note: The presence (in *T. caucasica*) or absence (in *T. truncata*) of an annulus (recommended for separation of these species by Meinunger and Schröder (2007) and others, e.g. Smith (2004) and Chamberlain in Smith (1978) appears not to be a reliable character (Ros and Werner in Guerra *et al.* (2006)); however, the degree of development of the peristome (rudimentary in *T. caucasica* with usually several papillose segments prodruding above the capsule mouth; missing or reduced to a basal membrane not exceeding 20 µm and not protruding beyond the capsule mouth in *T. truncata*) appears to be more reliable; see illustrations in Ros and Werner in Guerra *et al.* (2006).

12(5) Capsule immersed..... ***Tortula acaulon*** var***. papillosa*** (*Phascum cuspidatum* var*. papillosum*, *P. cuspidatum* var*. mitraeforme*) (r)

– Capsule exserted..... 13

13 Capsule ovoid, cernuous to horizontal; leaves bordered below..... ***Tortula cernua*** (*Desmatodon cernuus*) (rr)

– Capsule cylindrical, erect; leaves bordered or not..... 14

14 Peristome with conspicuous basal membrane 400–1600 µm high, visible above the capsule mouth as a long tube..... 15

– Peristome without conspicuous basal membrane..... ***Tortula muralis*** subsp***. muralis*** var***. aestiva*** (s-f)

15 Leaves narrowly lanceolate, acuminate, irregularly denticulate near apex; border of linear cells strongly developed, extending almost to apex, in at least one cell row bistratose..... ***Tortula schimperi*** (s-f)

– Leaves narrowly lingulate to ovate-lanceolate, obtuse to acuminate; border extending 1/2–3/4 way up leaf, unistratose..... ***Tortula subulata*** (s-f)

16(1) Costa widened in upper third of leaf; cells on ventral surface of costa 20–25 × (17.5) 20–25 µm, subglobose, papillose, arranged in 1–2 layers; costa in transverse section with 2–3 layers of stereids; leaves strongly concave; leaf margin recurved at leaf base and revolute at apex; hair point flexuose when dry, less so when moist..... ***Tortula brevissima*** (r)

– Costa not thickened in upper third of leaf; ventral superficial cells of costa 10–20 × 8.8–17.5 µm, papillose, arranged in a single layer; costa with 3–6 (7) layers of dorsal stereids; leaves slightly to strongly concave; hair point not flexuose..... ***Tortula muralis*** subsp***. muralis*** var***. muralis*** (cc)

Key to varieties of *Streblotrichum convolutum*

Concerning the characters differentiating the two varieties of *S. convolutum, S. convolutum* var. *convolutum* and *S. convolutum* var. *commutatum*, there are contradictory statements in the literature. Although Frahm and Ahmed (2004), Frey *et al.* (2006) and Smith (2004) state that a central strand is lacking in the typical variety, other sources claim its presence in both varieties (Limpricht 1890, Guerra *et al.* 2006, and own observations). According to Kučera *et al*. (2013), rhizoidal tubers are present in both varieties, contrary to statements in Smith (2004) and Frey *et al.* (2006). Therefore, the following key is based only on the confirmed morphological differences.

– Leaves small, < 1 mm long; basal leaf cells quadrate, incrassate; leaf margins flat, not undulate.....***Streblotrichum convolutum*** var. ***convolutum*** (*Barbula convoluta* var. *convoluta*) (c)

– Leaves > 1 mm long; basal leaf cells rectangular, thin-walled; leaf margins undulate.....***Streblotrichum convolutum*** var. ***commutatum*** (*Barbula convoluta* var. *commutata, B. convoluta* var. *sardoa*) (s-f)

Key to species of *Ephemerum*

Reference: Ellis and Price (2015)

1 Leaves costate; leaf margin denticulate, sometimes in upper part of leaf only.....2

– Leaves ecostate; leaf margins serrate.....4

2 Upper leaves lanceolate to oblong-lanceolate, with 1–2 asymmetric shoulders; costa ending in apex; mid-leaf cells in diagonal rows; branches of protonema in fascicles; leaf margin denticulate in upper part.....***Ephemerum cohaerens*** (r)

Note: According to Infante *et al.* in Guerra *et al.* (2010), the costa may end below or in the leaf apex, or be excurrent. Orientation of leaf cells (diagonal rows vs. parallel rows) is not distinct according to the illustrations in Guerra *et al.* (2010).

– Upper leaves lanceolate to linear-lanceolate, without shoulders; costa percurrent to excurrent; mid-leaf cells in rows parallel to costa; branches of protonema divergent.....3

3 Capsule with straight apiculus; stomata all over the capsule surface; upper leaves erect; tuberous parts of rhizoid system packed with lipid drops and having oblique cross walls; leaf margin denticulate in upper part.....***Ephemerum crassinervium*** subsp. ***sessile*** (*Ephemerum sessile*) (rr)

– Capsule with curved apiculus; stomata confined to capsule base; upper leaves recurved; tuberous parts of rhizoid system packed with starch grains and having transverse cross walls; leaf margin denticulate.....***Ephemerum recurvifolium*** (rr)

4 Ripe spores finely papillose, each covered by a whitish veil.....***Ephemerum serratum*** (*Ephemerum minutissimum* Lindb.) (s-f)

Note: This is not what was hitherto named *E. serratum*, but what was named *E. minutissimum.*

– Ripe spores warty, not covered by veil..... ***Ephemerum stoloniferum*** (r)
(=*Ephemerum serratum* auct. in traditional, but incorrect use)

Key to species of *Gymnostomum* group

1 Basal lamina cells narrowly rectangular, (14) 16–40 (50) × (5) 6–7 µm, costa 20–40 µm wide at mid-leaf; leaves only 0.5 mm long, erect; plants tiny, only 2 mm tall; annulus of large, inflated cells, persistent; peristome absent; brownish ovoid to elongate rhizoidal gemmae present among the tomentum..... ***Gyroweisia tenuis*** (rr)
– Basal lamina cells short or long rectangular, 14–18 µm long, or if longer then costa 50–70 (90) µm wide at mid-leaf; leaves various; plants sometimes taller; annulus of small cells, persistent or falling..... 2
2 Plants > 5 mm high; leaves 5–7 times as long as wide..... 3
– Plants 2–5 mm high; leaves very short, 0.4–0.5 mm long, broadly ovate to oblong, sometimes lingulate or spathulate, rarely ovate-lanceolate; 2–4 times as long as wide; multicellular gemmae present in leaf axils; margins of upper leaves unistratose; plants dull green..... ***Gymnostomum viridulum*** (r)
3 Plants vivid green, fresh green; costa in transverse section with dorsal band of stereids only; lamina cells in mid-leaf irregular in shape, often longer than wide; leaves 1 mm long; plants usually only a few millimeters (to 2 cm) tall; leaf scarcely tapered, and broadly rounded or obtuse at the apex..... ***Gymnostomum calcareum*** (s-f)
– Plants dark green to brownish green or olive green; costa in transverse section with dorsal and ventral group of stereids; lamina cells in mid-leaf ± regularly quadrate or rectangular, often wider than long; plants 0.5–8 cm tall; leaf tapered to a rather narrow, blunt to acute tip..... ***Gymnostomum aeruginosum*** (s-f)

Key to species of *Hydrogonium*

References: Limpricht (1890), Nyholm (1989), Ahrens in Nebel and Philippi (2000), Garilleti in Guerra *et al*. (2006), Ellis *et al*. (2021b), Németh and Schmotzer (2022)

– Axillary gemmae numerous, clavate, consisting of few (*ca* 10) cells; dorsal side of costa with cells prorate at distal and proximal ends, appearing like paired mamillae..... ***Hydrogonium consanguineum*** (*Barbula indica* auct.) (n.s.)
– Axillary gemmae few, ovoid, pointed at both ends, consisting of many (*ca* 100) cells; dorsal side of costa with simple papillae, without doubly prorate cells..... ***Hydrogonium croceum*** (*Barbula crocea*) (rr)

Key to species of *Tortella*

References: Puche in Guerra *et al.* (2006), Köckinger and Hedenäs (2017), Erzberger and Papp (2018), Köckinger and Hedenäs (2023), Blockeel *et al*. (2024), Berg *et al.* (2025)

1 Leaf margin denticulate in upper third; leaves squarrosely reflexed from sheathing base when moist; plants growing in lax patches on soil mostly in calcareous grassland..... ***Tortella squarrosa*** (*Pleurochaete squarrosa*) (s-f)
– Leaf margin entire; leaves not squarrose when moist; plants growing in patches or forming ± well defined cushions on soil or calcareous rock..... 2
2 Cells of ventral surface of costa linear, smooth, not covered by isodiametric papillose lamina cells (but see also *Tortella angustifolia*); leaf apex ± broadly acute, cucullate..... ***Tortella inclinata*** (s-f)
– Ventral surface of costa covered by isodiametric or short rectangular papillose lamina cells, at least in upper part of leaf; leaves tapering to short acuminate or long, narrowly lanceolate apex; leaves ± undulate when moist, much contorted when dry..... 3
3 Plants autoicous, often with sporophytes, with bud-like perigonia on lower part of stem; leaf apex short acuminate, with ± flat margins..... ***Tortella humilis*** (rr)
– Plants dioicous, sporophytes occasional, perigonia terminal; leaf apex long, narrowly lanceolate..... 4

4 Cells on dorsal surface of costa near leaf apex elongate and smooth (stereids), rarely papillose; stem with or without central strand. *Tortella tortuosa* complex (s-f).....6
– Cells on dorsal surface of costa near intact leaf apex quadrate and papillose; stem mostly with central strand.....5
5 Leaves when dry curled up to the apex, intact leaf tip often like a cork-screw; individual shoots of cushion well discernible from above and shaped like a ball of wool; marginal cells transversely elongate (wider than long) or quadrate, with bulging outer walls causing the margin to be neatly crenulate; thermophilic plants growing at low elevations.....
.....***Tortella fasciculata*** (r)
Note: See illustrations and details in Köckinger and Hedenäs (2017).
– Dry leaves straight or slightly flexuose in their apical third and mostly oriented perpendicular to the shoot axis ('lying on the cushion surface'); individual shoots of cushion thereby less well discernible from above; marginal cells elongate (longer than wide) or quadrate, outer walls only slightly bulging; cryophilic plants of higher elevations.....
.....***Tortella pseudofragilis*** (r)
6 Stem central strand present.....7
– Stem central strand absent.....8
7 Leaf length-width ratio (3) 4–8 (9):1, leaves lanceolate to linear-lanceolate, distinctly keeled in upper part, lamina often rather suddenly narrowed to apex; lamina papillosity ± spaced, areolation usually not obscured in young leaves; costa occupying 12–16% of leaf width at mid-leaf; limb-sheath transition often gradual; central strand mostly thin, cylinder cells of stem cross-sections ± thin-walled, mostly yellowish to dark brown.....***Tortella commutata*** (r)
Note: Frequency preliminary, to be established, probably (s-f).
– Leaf length-width ratio 8–15:1, leaves linear-lanceolate to linear, mostly canaliculate in upper part (keeled only in deeper shade); lamina papillosity dense, obscuring areolation in young leaves; costa occupying 16–33% of leaf width at mid-leaf; limb-sheath transition abrupt; central strand occupying 20–25% of stem diameter; plants rather small-leaved and low growing, a moderately thermophilous pioneer.....*Tortella bambergeri*
Note: not yet recorded in Hungary, but perhaps to be espected.

8 Leaf length-width ratio 8–15:1, leaves linear-lanceolate to linear, canaliculate to ± keeled (in shade); abaxial face of costa covered with papillae (beside spines) or smooth; in young leaves lamina papillosity dense, obscuring areolation..... ***Tortella angustifolia*** (rr)

– Leaf length-width ratio (3) 4–8 (9):1 or 8–15:1; leaves always keeled in upper part; abaxial face of costa with spines (in *T. commutata* rarely also papillae) or smooth; in young leaves lamina papillosity ± spaced and not obscuring areolation..... 9

9 Leaf length-width ratio (3) 4–8 (9):1, at least some leaves rather suddenly short-pointed; mucro mostly short and few-celled; stem cross-sections brown to redbrown with cylinder cells ± thin-walled; limb papillae in xeromorphic plants usually ± c-shaped in groups of (3) 4 (5) concentrated over the lumina, in hygromorphic simple, low and more evenly distributed; plants in full sun brown..... ***Tortella commutata*** (r)
Note: Frequency preliminary, to be established, probably (s-f).

– Leaf length-width ratio 8–15:1, all leaves narrow-pointed; mucro usually long and narrow; stem cross-sections redbrown to red with cylinder cells ± thick-walled; limb papillae in xeromorphic plants mostly coarse and forked (rarely ± c-shaped), in hygromorphic rod-like, rather evenly distributed over the lamina; plants in full sun ferrugineous..... ***Tortella tortuosa*** s.str. (rr)
Note: Frequency preliminary, to be established, probably (s-f).

Key to species of *Trichostomum*

References: Ros *et al*. (2022), Pilkington (2024), Berg *et al*. (2025)

– Leaf apex cucullate, cuspidate; costa slightly excurrent; capsule elliptical, brownish, on a red seta; plants 1–2 cm tall; dioicous..... ***Trichostomum crispulum*** (s-f)
Note: *T. viridulum* = *T. crispulum* var. *angustifolium* might merit specific rank; it produces often sporophytes and has very narrow, longly acuminate leaves (Meinunger and Schröder 2007: as species; illustrated in Schlüsslmayr 2005); taxonomic status controversial (Caspari *et al.* 2018, Berg *et al.* 2025).

– Leaf apex not cucullate; costa usually excurrent as a mucro; capsule reddish brown, on a yellow seta..... ***Trichostomum brachydontium*** (r)

Note: Ros *et al*. (2022) showed that *T. brachdontium* consists of several species; Hungarian herbarium specimens have not yet been examined according to the new concept. In Austria all records of *T. brachydontium* seem to belong to *T. herzogii*, possibly the situation is similar in Hungary.

Key to species of *Weissia*

1 Capsule immersed in perichaetial leaves, on very short seta, without peristome; leaves strongly crispate when dry 2
– Capsule clearly exserted above the leaves; peristome developed, rudimentary or lacking 3
2 Seta shorter than the capsule; lid not dehiscent; plants to 10 mm tall ..... ***Weissia longifolia*** (s-f)
– Seta *ca* 1 mm long, longer than the capsule, mostly 2 capsules in a single perichaetium, clearly overtopped by the comal leaves; capsule without a peristome, closed by an epiphragm; lid differentiated but often not dehiscent; plants to 5 mm tall ..... ***Weissia rostellata*** (rr)
3 Spores > 20 µm in diameter 4
– Spores < 20 µm in diameter 5
4 Capsule with peristome (but peristome mostly rudimentary); upper leaf margins hardly involute; capsule shortly cylindric, sulcate when dry (similar to *Cynodontium*) ..... ***Weissia rutilans*** (r)
– Capsule without a peristome, closed by an epiphragm, sometimes incomplete; exothecial cells with incrassate walls ..... ***Weissia brachycarpa*** (s-f)
Note: Attention should be paid to var. *obliqua* with leaves strongly incurved above and capsule ellipsoid-ovoid on short seta, when young often just emergent.
5 Peristome well developed, reddish-brown to yellowish brown (but may become pale with age); costa 30–80 µm wide ..... ***Weissia controversa*** var***. controversa*** (s-f)
– Peristome rudimentary and pale or lacking 6
6 Peristome rudimentary, always pale, often not extending above capsule mouth; costa 70–100 µm wide near leaf base ..... ***Weissia controversa*** var***. crispata*** (*Weissia fallax*) (r)
– Peristome completely lacking, capsule closed by an epiphragm 7
7 Costa 70–130 µm wide near leaf base ..... ***Weissia condensa*** (s-f)

Note: The leaf apex in *W. condensa* is cucullate like in *Trichostomum crispulum*, however, in that species the leaf margin is plane and not strongly inrolled as in *W. condensa*. *T. crispulum* is also a larger plant.

– Costa up to 50 µm wide near leaf base; spores 17–34 µm..... ***Weissia brachycarpa*** (s-f)

Key to species of Seligeriaceae

References: Nyholm (1987), Blockeel *et al.* (2000), Brugués and Guerra (2015)

1 Plants commonly > 1 cm tall; leaves with distinct alar cells..... ***Blindia acuta*** (n.s.)

– Plants usually < 1 cm tall, often minute; alar cells not distinct..... 2

2 Leaves ± distinctly 3-ranked..... 3

– Leaves not 3-ranked..... 5

3 Spores 24–33 µm; peristome well-developed or reduced; columella not lengthened after dehiscence; plants to 5 mm long, blackish or dark brownish; leaves ± trifarious, with smooth subula. *Seligeria trifaria*..... 4

– Spores 16–22 µm, smooth to slightly papillose; peristome well-deveolped, teeth lanceolate-triangular, 70–100 µm long; columella lengthened after dehiscence; plants 1–2.5 mm, light green; leaves indistinctly trifarious, with ± scabrous subula, ± recurved; ventral costa superficial cells in section 6–9 µm, dorsal superficial costa cells in section 4–6 µm..... ***Seligeria patula*** (n.s.)

4 Peristome well developed; leaves needle-shaped, tightly appressed to the stem, imbricate, distinctly arranged in three rows, measuring (0.3) 0.45–0.8 (0.9) mm in length..... ***Seligeria trifaria*** var. ***trifaria*** (rr)

– Peristome strongly reduced; leaves less distinctly trifarious, rather loosely arranged in three rows along the stem and irregularly curved at the apex when dry, becoming erecto-patent or slightly falcate when moist; vegetative leaves 0.8–1.1 (1.4) mm long, from a small, oblong or lanceolate base narrowed into a long, stout, acute and smooth or sinuate subula; apical leaf cells (15) 20–40 × 5.5–6.5 (8) µm; ventral superficial costa cells in section 8–11 µm, dorsal superficial costa cells in section 6–8 µm..... ***Seligeria trifaria*** var***. longifolia*** (rr)

5 Capsules without peristome, widened at mouth; leaf margins denticulate in lower third; seta to 2 mm long ..... ***Seligeria donniana*** (r)

– Capsules with peristome 6

6 Seta arcuate when moist; mature capsules ovoid to shortly cylindrical, narrowed at mouth when dry and empty. ***Blindiadelphus*** 7

– Seta straight when moist; mature capsules semiglobose, becoming wide-mouthed when dry and empty 8

7 Leaves abruptly narrowed into long, fine subula completely filled by the excurrent costa; costa usually 45–65 µm wide at base; plants mostly in crevices of moist siliceous rock protected by overhangs ..... ***Blindiadelphus recurvatus*** (*Seligeria recurvata*) (r)

– Leaves gradually narrowed to broad acumen; costa ending in leaf apex, lamina extending into the leaf apex; costa usually 20–30 (40) µm wide at base; plants exclusively on small dolomitic stones at ground level below shaded rock walls in Corno-Quercetum ..... ***Blindiadelphus campylopodus*** (*Seligeria campylopoda*) (rr)

8 Narrow and linear leaves mixed with broader leaves; spores (9) 10–14 µm 9

– Leaves from ovate-lanceolate base narrowed into stout point, formed by excurrent costa; leaf lamina opaque in upper part; spores 14–18 µm ..... ***Seligeria calcarea*** (rr)

9 Perichaetial leaves long, reaching or almost reaching capsule, longly excurrent costa filling subula; seta surface cells short rectangular, mostly 15–26 µm long, 2–4 times as long as wide ..... ***Seligeria acutifolia*** (rr)

– Seta much longer than perichaetial leaves, percurrent costa not filling subula, lamina extending to apex; seta surface cells narrow, linear, mostly 28–50 µm long, 4–8 times as long as wide ..... ***Seligeria pusilla*** (s-f)

Key to species of Grimmiaceae

(*Coscinodon*: 3, 30, 60; *Grimmia*: 24–64; *Racomitrium*: 4–9; *Schistidium*: 10–23)
References: Blom (1996), Blom in Nyholm (1998), Erzberger and Schröder (2008), Erzberger (2009, 2022), Maier (2010), Larraín *et al.* (2013), Muñoz *et al.* (2015), Erzberger *et al.* (2016), Kiebacher and Meier (2020),

1 Basal leaf cells elongate, with incrassate nodulose-sinuose walls; seta elongate (capsules exserted), mostly sinistrorse (forming a left-handed helix unlike a normal screw) when dry (dextrorse in *R. canescens, R. lanuginosum*); stem without central strand. ***Racomitrium*** 4
Note: See Erzberger (2022) for controversial terms of seta torsion.

– Basal leaf cells never at the same time elongate and incrassate nodulose-sinuose; seta often short, untwisted or dextrorse; stem with or without central strand 2

2 Costa in transverse section nearly homogeneous, composed of cells of ± equal size; seta short, capsule immersed; columella attached to operculum, both fall off the capsule together; stem (of sporophyte-bearing plants) often with central strand (central strand lacking or narrow and indistinct in *S. apocarpum, S. brunnescens* subsp*. griseum, S. elegantulum, S. flaccidum, S. lancifolium, S. papillosum*). ***Schistidium*** 10

– Costa in transverse section composed of cells of different size, usually with large guide cells, often with stereids or hydroids; capsules immersed to exserted; columella not attached to lid, remaining in the urn when the capsule opens; stem mostly with central strand 3

3 Leaves plicate, often at leaf base with additional costa-like structures of several layers; calyptra large, campanulate-mitrate, covering nearly all of ripe urn; peristome teeth extensively perforated; stem with a central strand of few cells ..... ***Coscinodon cribrosus*** (rr)

– Leaves plicate or not, rarely with additional costa-like structures; calyptra smaller, mostly mitrate (cucullate in *G. ovalis, G. montana, G. crinita, G. orbicularis*), peristome teeth usually not or only slightly perforated; stem with central strand (absent in *G. hartmanii* and sometimes *G. elatior*). ***Grimmia*** 24

4(1) Hair point present, papillose; seta dextrorse when dry 5

– Hair point absent or present, not papillose, but often denticulate; seta sinistrorse when dry 6

5 Lamina smooth; hair point papillose and sinuose-erose dentate, decurrent at margins; seta strongly papillose..... ***Racomitrium lanuginosum*** (rr)

– Lamina papillose; hair point not sinuose-erose dentate, decurrent or not; seta smooth..... ***Racomitrium canescens*** (*Niphotrichum canescens*) (s-f)

6 Hair point absent; lamina cells papillose, but papillae flat and inconspicuous (best seen in cross section). Subgenus *Codriophorus*..... 7

– Hair point usually present, but sometimes lacking; lamina cells not papillose (but sometimes pseudopapillose with projecting cell walls). Subgenus *Bucklandiella*..... 8

7 Leaves broadly lanceolate; leaf apex broadly rounded with distant teeth; alar cells forming distinct ± decurrent auricles; supra-alar cells not differentiated..... ***Racomitrium aciculare*** (*Codriophorus acicularis*) (n.s.)

– Leaves narrow lanceolate with obtuse apex, without teeth, at most very slightly denticulate by prominent cell corners; alar cells not differentiated; supra-alar cells hyaline or yellowish-hyaline, incrassate and non-sinuose, forming a distinct marginal band..... ***Racomitrium aquaticum*** (*Codriophorus aquaticus*) (rr)

8 Basal lamina cells nodulose; ventral surface of costa in cross section flat towards base, not canaliculate; 4–8 guide cells free at ventral surface in the median part; hair point (if present) with wide insertion, often slightly decurrent..... 9

– Basal lamina cells thick-walled and porose, but not nodulose; ventral side of costa in cross section canaliculate (with a ± rounded profile); 2–4 guide cells free at ventral surface; costa in mid-leaf mostly bistratose, narrow (60–80 µm) in lower part (costa 2 (3)-stratose with 3–4 ventral cells in basal part, 2-stratose with 2–3 ventral cells in mid-leaf, 2-stratose with 2 ventral cells in upper part); hair point lacking or short (< 0.4 mm); marginal supra-alar cells in conspicuous row consisting of 10–15 hyaline or yellowish-hyaline, thin-walled, non-sinuose cells..... ***Racomitrium microcarpon*** (*Bucklandiella microcarpa*) (n.s.)

9 Costa predominantly bistratose, weakly convex on dorsal side; reaching to hair point; 4–8 guide cells free at ventral surface; hair point usually well developed and flexuose, but absent in some Hungarian populations; leaf margin unistratose, narrowly revolute to 3/4 leaf length; innermost perichaetial leaf ovate, epilose, hyaline..... ***Racomitrium heterostichum*** (*Bucklandiella heterosticha*) (rr)

– Costa predominantly 3–4-stratose, prominently convex on the dorsal side; (3) 4 (5) guide cells free at ventral surface; hair point often short; leaf margin recurved on both sides towards the apex, in upper part with or without bistratose spots or sometimes predominantly bistratose; innermost perichaetial leaf epilose, usually hyaline, apex obtuse with lax, wide, smooth cells..... ***Racomitrium affine*** (*Bucklandiella affinis*) (rr)

10(2) Leaf lamina with scattered papillae on one or both sides..... 11

– Leaf lamina not papillose, but dorsal side of costa and / or margins sometimes papillose or denticulate with projecting cell ends..... 13

11 Leaf lamina unistratose; plants often with red spots in insolated parts; ventral side of leaf not or only weakly papillose; central strand absent or indistinct; usually > 8 stomata per capsule..... ***Schistidium papillosum*** (r)

– Leaf lamina usually with bistratose patches; plants never with red spots; papillae nearly equally frequent on ventral and dorsal sides of leaf or not; central strand distinct; up to 8 stomata per capsule..... 12

12 Perichaetial leaves broadly elliptical to broadly ovate, distinctly wider than upper stem leaves; lamina cells small, rounded, 6–9 µm in upper part of leaf; central strand of 3–10 cells; papillae frequent on dorsal and ventral sides of lamina; plants of siliceous substrates..... ***Schistidium pruinosum*** (r)

– Perichaetial leaves not distinctly wider than upper stem leaves; lamina cells larger, ± sinuose, 10–12 µm in upper part of leaf; central strand of 20–30 cells; papillae usually more frequent on dorsal than on ventral side of lamina; plants of usually calcareous substrates..... ***Schistidium confusum*** (rr)

13(10) Exothecial cells in lower third of capsule predominantly isodiametric, but sometimes mixed with patches of elongate cells; urn length: width ratio often less or equal to 1.3; leaf margins or back of costa mostly denticulate with papillae or projecting cells in upper third of leaf 14

– Exothecial cells predominantly elongate; urn length: width ratio usually > 1.3; leaf margins and dorsal side of costa smooth or denticulate (*S. crassipilum*, *S. helveticum*; for *S. dupretii* see 15) 17

14 Spores 16–24 µm; hair point lacking or consisting of few hyaline cells only; plants on stones near running water (Danube) ..... ***Schistidium platyphyllum*** (rr)

– Spores smaller, 8–13 µm; hair point various, but usually present; plants not specifically riverine 15

15 Exothecial cells irregular in size and shape, forming an irregular pattern; perichaetial leaves narrow, 0.5–0.6 mm wide, hardly concealing the urn; hair point narrow at insertion, consisting of few cells, up to 0.15 (0.25) mm long; at least some leaves with smooth margins; plants small ..... ***Schistidium dupretii*** (s-f)

– Exothecial cells usually isodiametric, often quadrate, but sometimes with patches of elongate cells, forming a ± regular to very regular pattern; perichaetial leaves narrow or wide, usually concealing major part of the urn; hair point various, but not conspicuously narrower than the green part of the leaf apex; margins usually distinctly to conspicuously denticulate-papillose 16

16 Urn 0.7–1.0 mm long and 0.5–0.65 mm wide; leaves narrowly lanceolate, margins and back of costa strongly papillose down to below mid-leaf, with size of papillae increasing towards apex; exothecial cells arranged in neat vertical rows; peristome teeth 320–400 µm long; perichaetial leaves 0.5–0.8 mm wide; plants small ..... ***Schistidium lancifolium*** (s-f)

– Urn 0.9–1.35 mm long and 0.5–0.85 mm wide; leaves broader, with costa and margins less distinctly papillose; exothecial cells less neatly arranged; peristome teeth 400–700 µm long; perichaetial leaves 0.8–1.5 mm wide; plants medium-sized ..... ***Schistidium apocarpum*** (s-f)

17(13) K+ yellow 18

– K+ red 19

18 Peristome usually lacking; hair point usually long, 0.15–0.85 mm, finely denticulate; perichaetial leaves plicate; lid mamillate; plants small to medium sized ..... ***Schistidium flaccidum*** (rr)

– Peristome well developed; hair point short, 0–0.45 mm, coarsely spinulose; lid rostrate, but beak sometimes short; plants small ..... ***Schistidium confertum*** (rr)

19 Leaf margins or back of costa denticulate with papillae or projecting cells; peristome teeth 350–400 μm long, in freshly deoperculate capsules stellate-straight, scarcely twisted, orange; urn usually with 0–4 (6) stomata at base, but sometimes more, pores often rudimentary or lacking; central strand distinct, > 6 cells ..... ***Schistidium crassipilum*** (cc)

– Leaf margins and dorsal side of costa smooth (few papillae may occur at leaf apex immediately below the hair point, in *S. helveticum* also further down) 20

20 Stomata absent (absent to few in forms of *S. crassipilum* with smooth margins and costa, see 19); plants small, in compact cushions 21

– Stomata present, (3) 6–10 per urn; plants medium-sized to large with conspicuous hair points 23

21 Plants usually black, glossy; hair point absent or short (< 0.2 mm) on all leaves, coarse and coarsely spinulose with short and broad, patent to squarrose spinulae, terete, not decurrent; exothecial cells forming an irregular pattern ..... ***Schistidium helveticum*** (*Schistidium singarense*) (s-f)

– Plants brownish; hair point absent or short in lower leaves, conspicuous in perichaetial leaves, 0.15–1.0 mm long, coarse and terete, but flattened towards insertion, not or shortly decurrent, but embracing parts of upper lamina; exothecial cells up to 50–80 μm long, forming a regular pattern. ***Schistidium brunnescens*** 22

22 Leaves ovate-lanceolate to ovate triangular, often with shoulder, 1.85–2.6 mm long, usually with longitudinal bistratose ridge-like striae on one or both sides of costa; costa 58–90 μm wide in central part of leaf ..... ***Schistidium brunnescens*** subsp. ***griseum*** (r)

– Leaves oblong, ovate or short ovate-triangular, 1.1–2.0 mm long, shoulders and ridge-like striae absent; costa 38–60 µm wide in central part of leaf..... ***Schistidium brunnescens*** subsp. ***brunnescens*** (s-f)

23(20) Hair point erect, terete, narrow throughout, not decurrent, hyaline, but often brownish at insertion; central strand absent; urn usually ovate in shape; upper lamina cells isodiametric, not sinuose, not distinctly incrassate; lamina with irregular bistratose patches; plants in mats or decumbent tufts on ± shaded calcareous rocks..... ***Schistidium elegantulum*** subsp. ***elegantulum*** (s-f)

– Hair point stiff and straight, usually flattened at base, decurrent; central strand always distinct (> 20 cells); urn usually cylindrical in shape; upper and especially lower lamina cells strongly sinuose, distinctly incrassate (similar to cells of *Racomitrium*); lamina rarely with bistratose patches; plants in hoary tufts on exposed or moderately shaded calcareous rocks..... ***Schistidium robustum*** (r)

24(3) Plants with sporophytes..... 25

– Plants without sporophytes..... 44

25 Seta short, not longer than capsule, capsule immersed to emergent..... 26

– Seta longer than capsule, capsule exserted above the cushion..... 31

26 Seta arcuate (moist)..... 27

– Seta straight (moist)..... 30

27 Lamina bistratose from apex to widest part of leaf, semicircular in section; costa only slightly prominent on dorsal side; peristome present..... ***Grimmia tergestina*** (s-f)

– Lamina unistratose or with bistratose patches, margins unistratose or bistratose; leaves ± concave; costa ± prominent on dorsal side; peristome present or absent..... 28

28 Peristome absent; leaves concave in basal part only, obtusely keeled towards apex; lamina unistratose with bistratose margin and bistratose patches..... ***Grimmia anodon*** (r)

– Peristome present; lamina completely unistratose (margins sometimes locally bistratose)..... 29

29 Leaves spathulate, widest above mid-leaf; hair point long to very long, broadly inserted; margin completely unistratose; seta as long as capsule..... ***Grimmia crinita*** (rr)

– Leaves not spathulate, widest at or below mid-leaf; hair point not particularly long, with narrow insertion; margin partly bistratose; seta shorter than capsule ..... ***Grimmia plagiopodia*** (rr)

30(26) Leaves plicate; costa recessed in deep ventral groove; some plicae pluristratose at base, resembling additional costae; calyptra wide, campanulate, plicate, nearly enclosing the urn; peristome extensively perforated ..... ***Coscinodon cribrosus*** (rr)

– Leaves not plicate, semicircular in section; other characters different ..... ***Grimmia tergestina*** (s-f)

31(25) Seta arcuate (moist) 32

– Seta straight (moist) 40

32 Lamina bistratose in upper part of leaf; costa recessed in a deep grove, prominent on dorsal side, in transverse section without hydroids but with an additional layer of wide cells on the dorsal side of the guide cells; lamina and costa usually with scattered hemispherical papillae; central strand absent in weak stems and branches ..... ***Grimmia elatior*** (rr)
Note: Compare also *G. trichophylla* with guide cells in 2 layers.

– Lamina usually unistratose in upper part of leaf, sometimes with bistratose margins or striae; costa not grooved; in transverse section with hydroids, without additional wide cells (except in *G. trichophylla*); lamina and costa epapillose; stems with central strand 33

33 Leaves ovate, widest at or shortly above mid-leaf, apex ± broad; lamina usually unistratose, margins unistratose or bistratose in 1 or more cell rows; gemmae unknown 34

– Leaves lanceolate, from ovate base tapering to acuminate apex; lamina unistratose or with bistratose patches, margins unistratose or bistratose; gemmae sometimes present 35

34 Basal paracostal cells usually elongate, 4–8 times as long as wide; capsule subspherical to ovoid, lid mamillate, flat; leaf margins unistratose or bistratose in 1 cell row at one side of leaf only, not thickened, recurved on both sides at mid-leaf; costa slightly attenuate towards leaf base, mamillose dorsally at insertion ..... ***Grimmia orbicularis*** (s-f)

– Basal paracostal cells mostly shortly rectangular to quadrate, 2–4 times as long as wide; capsule ellipsoid to shortly cylindrical, lid usually rostrate; leaf margins pluristratose, thickened, recurved on both sides, on one side from base, on the other side from above base to above widest part of leaf; costa not attenuate towards leaf base..... ***Grimmia pulvinata*** (cc)

35 Leaves strongly asymmetric, one side rounded in outline, opposite side straight; margin of straight side recurved; costa S-shaped, towards apex not median, but approaching one of the margins; in cross section at mid-leaf with two narrowly elliptical guide cells arranged obliquely with respect to leaf plane; rope-like young shoots present in the interior of the cushion; gemmae unknown; narrow central strand of thin-walled cells contrasting sharply with the incrassate orange-tinged stereid-like cortical cells..... ***Grimmia funalis*** (rr)

– Leaves symmetric to slightly asymmetric, costa not S-shaped, median at leaf apex; young shoots of different shape or absent; short-stalked gemmae sometimes present at leaf base..... 36

36(35;64) Costa above mid-leaf rectangular in section, with edges angulate to winged; hair point conspicuously denticulate; lamina sometimes partly bistratose; gemmae sometimes present..... ***Grimmia muehlenbeckii*** (s-f)
Note: *G. hartmanii* also can have an angulate costa, but lacks a central strand.

– Costa in section rounded, not angulate or winged; hair point denticulate or smooth; gemmae present or absent..... 37

37(36;52) Lamina cells at leaf apex longer than wide, slightly sinuose; costa very wide at leaf base, sometimes > 80 µm, with 6 (8) guide cells at insertion; leaf margin revolute on one side, recurved on opposite side; hair point denticulate; gemmae unknown..... ***Grimmia decipiens*** (r)

– Lamina cells at leaf apex rounded; costa usually less wide; hair point nearly smooth; gemmae sometimes present..... 38

38 Costa in transverse section at leaf insertion and leaf base with two layers of enlarged cells, i.e. 1–2 (3) cells in addition to ventral guide cells, in size and position intermediate between guide cells and other costal cells; plants of siliceous substrates..... ***Grimmia trichophylla*** (r)

– Guide cells at leaf base in one layer; substrate various..... 39

39 Guide cells 4 at leaf insertion; leaves erecto-patent to spreading when moist; plants usually on calcareous substrates ..... ***Grimmia dissimulata*** (s-f)

– Guide cells 6 at leaf insertion; leaves erecto-patent to squarrose when moist; plants of siliceous substrates, often near water ..... ***Grimmia lisae*** (r)

40(31) Leaves semicircular in transverse section ± from base to apex 41

– Leaves ± keeled, not semicircular in transverse section (*G. longirostris* has leaves keeled in basal and semicircular in apical part) 42

41 Leaves ovate, usually with rounded apex; detached leaves lie flat on a slide; margin unistratose in bistratose upper part of leaf; most basal cells transversely elongate, incrassate, few elongate paracostal cells ..... ***Grimmia laevigata*** (s-f)

– Leaves from ovate base lanceolate, tapering from distinct shoulder to narrow apex; detached leaves on a slide usually fold along the costa and appear in lateral view; margin bistratose; most basal cells elongate, some nodulose, towards margin shorter ..... ***Grimmia ovalis*** (s-f)

42 Costa in transverse section recessed in a deep groove in upper part of leaf; leaves with distinct shoulder; basal cells short rectangular to quadrate with incrassate transverse walls; hair point denticulate ..... ***Grimmia montana*** (rr)

– Costa not recessed in groove; leaves without shoulder; basal cells elongate-rectangular with thin transverse walls; hair point smooth, sometimes short (< 0.4 mm) 43

43 Stem without central strand; plants usually with numerous short branches; basal lamina cells with strongly thickened longitudinal walls, porose, cells from leaf base to mid-leaf elongate and nodulose; ventral side of costa in cross section canaliculate (with a ± rounded profile); costa bistratose at mid leaf with 2 (-4) guide cells free at ventral surface; hair point lacking or short (< 0.4 mm), marginal supra-alar cells in conspicuous row consisting of 10–15 hyaline or yellowish-hyaline, thin-walled, non-sinuose cells; margins recurved to revolute on both sides ..... ***Racomitrium microcarpon*** (*Bucklandiella microcarpa*)(n.s.)

– Stem with central strand; plants sparsely branched; basal lamina cells not conspicuously incrassate or porose, towards margin usually short but neither widened nor hyaline; costa at mid-leaf usually 3–5-stratose composed of 3 different types of cells (guide cells, substereids and larger dorsal cells); margin recurved on one side ..... ***Grimmia longirostris*** (r)

44(24) Leaf apex without any hyaline cell; leaves strongly asymmetric, costa towards apex not median, but approaching one of the margins; rope-like young shoots present in the interior of the cushion (muticous leaves can occur in *G. anodon*, too) (male plants of) ..... ***Grimmia funalis*** (rr) (see also 35)

– Leaf apex with hair point or at least with some hyaline cells 45

45 Central strand absent; hair point lacking or short (< 0.4 mm), or with cell lumina clearly visible, denticulate; globular multicellular gemmae sometimes present at leaf tips 46

– Central strand present (lacking in weak stems and branches of *G. elatior*); cells of hair point with very narrow, hardly visible lumen; globular multicellular gemmae at leaf tips lacking 47

46 Plants sparsely branched; basal lamina cells not conspicuously incrassate or porose, towards margin usually short but neither widened nor hyaline; costa at mid-leaf usually 3–5-stratose; cells of leaf apex with cell lumen clearly visible; hair point denticulate; globular multicellular gemmae often present at leaf tips (or some leaf tips deformed due to gemma production) ..... ***Grimmia hartmanii*** (s-f)

– Plants usually with numerous short branches; basal lamina cells with strongly thickened longitudinal and thin transverse walls, porose, cells from leaf base to mid-leaf elongate and nodulose; ventral side of costa in cross section canaliculate (with a ± rounded profile); 2–4 guide cells free at ventral surface; hair point lacking or short (< 0.4 mm), marginal supra-alar cells in conspicuous row consisting of 10–15 hyaline or yellowish-hyaline, thin-walled, non-sinuose cells; costa at mid-leaf mostly bistratose ..... ***Racomitrium microcarpon*** (*Bucklandiella microcarpa*) (n.s.)

47 Lamina usually unistratose in upper part of leaf, margin unistratose or pluristratose in one or several rows 48

– Lamina bistratose in upper part of leaf or lamina unistratose with some bistratose cell rows, margin pluristratose in several rows 53

48 Lamina unistratose, margin unistratose (or at one side of leaf a single marginal row bistratose)....49
– Lamina usually unistratose, margin pluristratose in one or several rows....51
49 Leaves spathulate, widest above mid-leaf; margin completely unistratose, plane....***Grimmia crinita*** (rr)
– Leaves not spathulate, widest at or below mid-leaf; margin unistratose or partly bistratose, plane or recurved....50
50 Leaves spoon-like, concave; margin unistratose to partly bistratose, plane; basal cells short....***Grimmia plagiopodia*** (rr)
– Leaves not spoon-like, not concave, with an obtuse keel, leaf halves forming a right or obtuse angle in transverse section; margins unistratose or on one side of leaf a single unthickened bistratose row of cells, recurved on both sides around mid-leaf; costa slightly attenuate towards leaf base, mamillose dorsally at insertion; basal paracostal cells usually elongate, 4–8 times as long as wide....***Grimmia orbicularis*** (s-f)
51 Leaves strongly asymmetric, one side rounded in outline, opposite side straight; margin of straight side recurved; costa S-shaped, towards apex not median, but approaching one of the margins; in cross section at mid-leaf with two narrowly elliptical guide cells arranged obliquely with respect to leaf plane; rope-like young shoots present in the interior of the cushion; gemmae unknown; narrow central strand of thin-walled cells contrasting sharply with the incrassate orange-tinged stereid-like cortical cells....***Grimmia funalis*** (rr)
– Leaves ± symmetric, costa not S-shaped, median towards apex; young shoots of different shape or absent; short-stalked gemmae sometimes at leaf base....52
52 Leaves ovate, widest at or shortly above mid-leaf; apex ± broad; leaf margins pluristratose, thickened, recurved on both sides, on one side from base, on the other side from above base to above widest part of leaf; leaf halves forming approximately a right angle in transverse section; basal cells mostly shortly rectangular to quadrate, 2–4 times as long as wide; gemmae unknown....***Grimmia pulvinata*** (cc)
– Leaves lanceolate, from ovate base tapering to acuminate apex; gemmae sometimes present....37
53(47) Lamina continuously bistratose at least in upper part of leaf (in *G. laevigata* margin in part unistratose)....54

– Lamina unistratose even in upper part of leaf, with some cell rows bistratose; margin bistratose in several rows....62

54 Leaves semicircular in transverse section....55

– Leaves not semicircular in transverse section....58

55 Costa biconvex, prominent on ventral and dorsal sides, with a centrally placed group of hydroids, guide cells indistinct; plants of exposed calcareous rocks....***Schistidium teretinerve*** (*Grimmia teretinervis*) (n.s.)

– Costa not biconvex, guide cells distinct; substrate calcareous or siliceous....56

56 Leaves from ovate base lanceolate, tapering from distinct shoulder to narrow apex; detached leaves on a slide usually fold along the costa and appear in lateral view; margin bistratose; most basal cells elongate, some nodulose, towards margin shorter....***Grimmia ovalis*** (s-f)

– Leaves ovate, usually rounded or obtuse at apex; detached leaves lie flat on a slide; margin bistratose or unistratose; basal cells short or long....57

57 Margin towards leaf base unistratose in a widening zone; guide cells in a shallow groove with incrassate ventral walls in mid-leaf; most basal cells transversely elongate, incrassate, few paracostal cells elongate; hair point strongly denticulate....***Grimmia laevigata*** (s-f)

Note: *G. laevigata* is usually confined to siliceous rocks (Erzberger 2009). Its tufts disintegrate easily.

– Margin bistratose throughout bistratose part of lamina; costa not grooved, guide cells hardly discernible, ventral walls not incrassate; basal paracostal elongate cells usually extending far towards margin, where cells are shorter; hair point smooth or faintly denticulate....***Grimmia tergestina*** (s-f)

58(54) Costa in transverse section of upper part of leaf appearing recessed in a ± deep groove; leaves with or without shoulder; basal cells with thin or ± incrassate transverse walls....59

– Costa not grooved ventrally; leaves without shoulder; basal cells elongate with thin transverse walls....61

59 Costa without hydroids, ventral side of pluristratose costa with 1 to several layers of wide cells of guide-cell-like appearance; lamina and costa usually with scattered hemispherical papillae, rarely smooth; a wide band of strongly elongate paracostal cells with thin transverse walls present at leaf base; leaves without distinct shoulder ..... ***Grimmia elatior*** (rr)

– Costa with hydroids; costa and lamina without hemispherical papillae; basal cells with ± incrassate transverse walls, paracostal basal cells shorter, elongate in few rows; leaves with ± distinct shoulder 60

60 Leaves strongly plicate, some plicae pluristratose at base, resembling additional costae; shoulder poorly developed; hair point nearly smooth ..... ***Coscinodon cribrosus*** (rr)

– Leaves faintly plicate, without additional costae; shoulder distinct; hair point denticulate ..... ***Grimmia montana*** (rr)

61(58) Costa above mid-leaf rectangular in section, edges angulate to winged; in cross section at insertion with 4 (6) guide cells; leaf margin thickened, recurved on one side and revolute on the other; hair point denticulate; capsule ribbed when dry; short-stalked gemmae sometimes at leaf base ..... ***Grimmia muehlenbeckii*** (s-f)

– Costa rounded at dorsal side, but occasionally unevenly so to somewhat angulate in lower part of leaf; in cross section at insertion with 6, rarely only 4 guide cells; leaf margin not thickened, usually recurved on one side only; hair point smooth; capsule smooth when dry ..... ***Grimmia longirostris*** (r)

62(53) Costa biconvex, prominent on ventral and dorsal sides, with a centrally placed group of hydroids, guide cells indistinct; plants of exposed calcareous rocks ..... ***Schistidium teretinerve*** (*Grimmia teretinervis*) (n.s.)

– Costa not biconvex, guide cells distinct; substrate calcareous or siliceous 63

63 Leaves strongly asymmetric, one side rounded in outline, opposite side straight; margin of straight side recurved; costa S-shaped, towards apex not median, but approaching one of the margins; in cross section at mid-leaf with two narrowly elliptical guide cells arranged obliquely with respect to leaf plane; rope-like young shoots present in the interior of the cushion; gemmae unknown; narrow central strand of thin-walled cells contrasting sharply with the incrassate orange-tinged stereid-like cortical cells ..... ***Grimmia funalis*** (rr)

– Leaves symmetric to slightly asymmetric, costa median at leaf apex; young shoots of different shape or absent; short-stalked gemmae sometimes present at leaf base 64

64 Leaves ovate, widest at mid-leaf; basal cells shortly rectangular, marginal cells incrassate; margins plane throughout; gemmae unknown ..... ***Grimmia anodon*** (r)

– Leaves lanceolate, from ovate base tapering to acuminate apex; margin recurved to revolute at least on one side; gemmae sometimes present 36

Key to species of *Hedwigia*

References: Hedenäs (1994), Erzberger (1996), Ignatova *et al.* (2016), Graulich (2025)

1 Mid-leaf cells mostly with 1, rarely with 2 peltate papillae per cell on dorsal side; hyaline hair point usually reflexed when dry ..... ***Hedwigia stellata*** (rr)

– Mid-leaf cells predominantly with several, ± branched papillae per cell on dorsal side; leaves straight or falcate 2

2 Hyaline hair point of sterile shoots conspicuously white, strongly contrasting with the leaf lamina, occupying 1/4–1/2 of leaf length; median lamina cells often with 2 papillae placed near proximal and distal cell ends on dorsal side, the papillae of adjacent cells seemingly merging together, forming a regular pattern; hair points straight or curved to reflexed; spores 19.5–28 (30) µm ..... ***Hedwigia emodica*** (*Hedwigia ciliata* var. *leucophaea*) (s-f)

– Hyaline hair point of sterile shoots not conspicuously white, not strongly in contrast with lamina, occupying up to 1/3 of leaf length; median lamina cells usually with more than 2 papillae per cell on the dorsal side, not forming a regular pattern; hair points usually falcate; spores (23) 25–35 μm..... ***Hedwigia ciliata*** (*Hedwigia ciliata* var*. ciliata*) (s-f)

Note: Another species, *H. filiformis* has been reported from Western Europe and may perhaps also occur in Hungary. It resembles *H. ciliata*, but is distinguished by very short hair point, < 10% of leaf length, straight or weakly sinuose mid-leaf cells and smaller spores 20-22.5 μm.

Key to species of Bartramiaceae

Note on the examination of *Philonotis*: Since the species of this genus show a high degree of variability, it is advisable to examine well-grown plants and avoid juvenile stages. This also applies to the examination of leaves, which should be taken from the tomentose part of the stem, i.e. growth of the previous year, since the first leaves of a season tend to be untypical.

References: Buryová (unpublished), Nyholm (1960), Bergamini (2001), Frey *et al.* (2006)

1 Leaves lanceolate, not sheathing at base. ***Philonotis***.....5

– Leaves narrowly lanceolate to linear lanceolate, sheathing at base.....2

2 Lamina cells with striate cuticle; leaves curled or crispate when dry; seta about 1 cm long with erect, globose capsule..... ***Plagiopus oederianus*** (r)

– Lamina cells mamillose. ***Bartramia***.....3

3 Leaves with whitish sheathing base, abruptly contracted into lanceolate limb; cells mostly elongate, rarely quadrate to shortly rectangular..... ***Bartramia ithyphylla*** (r)

– Leaf base weakly sheathing, not conspicuously whitish; cells shorter, at most shortly rectangular.....4

4 Capsule overtopping leaves on long straight seta; tufts to 5 cm tall..... ***Bartramia pomiformis*** (s-f)

– Capsule immersed among leaves on short seta, appearing lateral; plants to > 10 cm tall..... ***Bartramia halleriana*** (rr)

5(1) All lamina cells with mamilla at distal end; leaves 1.2–2 mm long, 2.5–4 times as long as wide, margins plane, not recurved..... ***Philonotis marchica*** (rr)

– Lamina cells only in upper half of leaf with mamillae at distal end, lower cells smooth, or at least some mamillae at proximal end (especially in lower part of leaf).....6

6 Lamina cells only in upper half of leaf with mamillae at distal end (some cells without mamilla), lower cells smooth; leaves short, 0.6–0.9 (1) mm long ..... ***Philonotis capillaris*** (*Philonotis arnellii*) (r)

– Lamina cells with mamillae at proximal end, or some with mamillae in mid-cell, or cells with mamillae at distal end only in uppermost part of leaf or margin 7

7 Cells uniformly rectangular throughout, of ± equal width; margin mostly plane with single teeth; leaves not plicate ..... ***Philonotis caespitosa*** (r)

– Upper lamina cells ± linear, distinctly narrower than basal rectangular cells; margin recurved, partly toothed with geminate teeth; leaves plicate or not 8

8 Basal paracostal cells > 60 µm long (at least some cells), conspicuously translucent, leaves distinctly homomallous, gradually tapering, hardly plicate below; costa very robust, 60–180 µm wide near base ..... ***Philonotis calcarea*** (rr)

– Basal paracostal cells up to 50 µm long, not conspicuously translucent; leaves rarely weakly homomallous, ± abruptly tapering from broad base to narrow acumen, distinctly plicate below; costa usually only to 90 µm wide near base ..... ***Philonotis fontana*** (r)

Key to species of Bryaceae

References: Demaret (1993), Nyholm (1993), Ahrens in Nebel and Philippi (2001), Guerra *et al.* (2010), Erzberger and Schröder (2013), Bijlsma *et al.* (2020), Holyoak (2021), Kučera (2024)

1 Plants with subterranean rhizome-like stems and erect secondary stems with large terminal rosette and scale-like lower leaves, comal leaves in general > 5 mm long. ***Rhodobryum*** 2

– Plants without a conspicuous terminal rosette and without subterranean rhizome-like stems, leaves < 5 mm long. ***Bryum*** s.l. (incl. ***Imbribryum***, ***Ptychostomum***) 3

2 Leaf apex narrowly pointed; costa ceasing below apex; leaf rosette consisting of (11) 16–21 (27) leaves; costa with 1–2 (3) layers of dorsal stereids covered by 2–3 layers of wider superficial dorsal cells; margins weakly recurved; plants to 5 cm tall, dark green, with leaves 9–10 mm long and patent whether wet or dry; usually on shady acid humus ..... ***Rhodobryum roseum*** (r)

– Leaf apex broadly pointed; costa excurrent; leaf rosette consisting of (18) 21–35 (52) leaves; costa with (3) 4–7 layers of dorsal stereids, superficial dorsal cells unistratose to irregularly bistratose; margins strongly recurved to revolute; plants to 3 cm high with leaves 5–6 mm long and incurved when dry; usually on base-rich soil over limestone ..... ***Rhodobryum ontariense*** (s-f)

3 Plants whitish-green or silvery; shoots julaceous, leaves closely imbricate when moist and when dry, concave, broadly ovate to ovate 4

– Plants not conspicuously whitish-green or silvery; shoots not or rarely julaceous 6

4 Capsule gibbous on curved seta, with oblique mouth and long neck; leaves concave, imbricate; lamina cells 14–25 μm wide; plants in dense tufts with densely julaceous shoots, whitish or pale green above, usually vinaceous below; in crevices of basic rocks, often near waterfalls ..... ***Ptychostomum zieri*** (*Plagiobryum zieri*) (r)

– Capsules symmetrical or slightly asymmetrical; shoots julaceous, but not vinaceous below; lamina cells 8–16 μm wide 5

5 Costa excurrent as short, stout apiculus, 60–100 μm wide at leaf base; upper leaf cells green (in young leaves); plants short and bud-like, julaceous; capsules elongate-ovate, light-brown when ripe; seta 2–4 cm long; spores 16–20 μm; bulbils in leaf axils lacking ..... ***Ptychostomum funkii*** (*Bryum funckii*) (rr)

– Costa mostly ending distinctly below leaf apex, rarely percurrent or excurrent, less wide; upper leaf cells hyaline, without chlorophyll; plants slender, thin, often silvery white; capsules small, ovoid or obovoid to ellipsoidal, dark red when ripe, getting blackish later; seta shorter, to 2 cm long; spores 8–14 μm; plants often with bulbils in leaf axils ..... ***Bryum argenteum*** (cc)

6 Bulbils present in leaf axils, either foliate or with rudimentary leaf primordia. (*Bryum dichotomum* group)....7
– Bulbils in leaf axils lacking....10
7 Bulbils < 200 µm long, several per leaf axil, leaf primordia either rudimentary or only in uppermost part (< 1/3) of bulbil....8
– Bulbils > 200 µm long, solitary or several per leaf axil, leaf primordia in upper third, half or two thirds of bulbil....9
8 Bulbils brillliant yellow, usually *ca* 5 per leaf axil; leaf primordia rudimentary....***Bryum gemmilucens*** (rr)
– Bulbils not brilliant yellow, often 20–30 per leaf axil; leaf primordia peg-like, incurved or erect....***Bryum gemmiferum*** (r)
9 Bulbils solitary (rarely 2) in leaf axils; leaf primordia acuminate, erect, not incurved, occurring in upper half or two thirds of bulbil; bulbils up to 400 µm long (rarely more)....***Bryum bicolor*** (s-f)
– Bulbils several per leaf axil; leaf primordia rounded to obtuse, incurved, occurring in upper third of bulbil....***Bryum barnesii*** (r)
10(6) Filiform gemmae present in leaf axils....11
Filiform gemmae lacking....13
11 Leaves mostly abruptly narrowed to filiform acumen; leaves spirally twisted when dry; margin plane or recurved in lower part of leaf only....***Ptychostomum moravicum*** (*Bryum moravicum*) (cc)
– Leaves gradually narrowed to short acumen, flexuose, but not spirally twisted when dry; margin broadly or narrowly recurved from base to near apex....12
12 Leaf base red, contrasting green part of leaf (discolorous); margin with distinct border of 3–5 (10) rows of narrow, incrassate cells, border distinctly decurrent along stem; usually ± robust plants with conspicuous tomentum of red rhizoids, to > 4 cm tall (up to 10 cm)....***Ptychostomum pseudotriquetrum*** (incl. var. ***bimum***) (*Bryum pseudotriquetrum*) (s-f)
– Leaf base not contrasting rest of leaf, concolorous (either green or if red then whole leaf red); marginal border distinct, but narrower, to 3 rows, not decurrent; less robust plants, not tomentose....***Ptychostomum pallens*** (fo. *rutilans*) (*Bryum pallens*) (r)

13(10) Leaves spathulate or ovate, widest at or above middle, suddenly contracted into long, filiform point; cells at leaf base reddish, discolorous; lamina cells ± 20 µm wide 14

– Leaves widest below middle, more gradually narrowed to short or long point; cells at leaf base concolorous or discolorous 17

14 Leaves not spirally twisted when dry, closely imbricate and evenly arranged along ± julaceous stem; border often indistinct, 1–2 (3) cells wide; capsules very rare 15

– Leaves spirally twisted when dry; margin with distinct border 2–5 cells wide; capsules not infrequent, to 5 mm long 16

15 Leaves not decurrent, margins not recurved, except in lower part; stems julaceous; rhizoids coarsely papillose, papillae tall and to 5 µm wide; lamina cells 15–20 µm wide ..... ***Ptychostomum elegans*** (*Bryum elegans*) (s-f)

– Leaves slightly decurrent, margins often recurved to apex; plants not julaceous; rhizoids less coarsely, but densely papillose; lamina cells 16–23 (30) µm wide ..... ***Bryum stirtonii*** (r)

16 Plants dioicous; capsules brown when ripe, cernuous; rhizoidal tubers red-brown ..... ***Ptychostomum capillare*** (*Bryum capillare*) (c)

– Plants synoicous; capsules dark red when ripe, cernuous to pendulous; rhizoidal tubers bright red ..... ***Ptychostomum torquescens*** (*Bryum torquescens*) (r)

17(13) Robust plants, often with metallic sheen and reddish colour, stem evenly foliated, leaves stiff, densely imbricate when dry; costa ending below leaf apex or percurrent to shortly excurrent; marginal border indistinct 18

– Characters different 19

18 Plants glossy, with metallic sheen, mostly red to golden-green; mid-leaf cells of older leaves elongate, narrow, 8–12 µm wide, incrassate; costa ending in or just below leaf apex, rarely shortly excurrent; rhizoidal tubers often present, 100–200 µm in diameter ..... ***Imbribryum alpinum*** (*Bryum alpinum*) (s-f)

– Plants not glossy, not red; mid-leaf cells 10–18 (28) µm wide, not incrassate; costa stout, excurrent into short point; rhizoidal tubers absent, but fragile shoots sometimes developed in leaf axils ..... ***Imbribryum mildeanum*** (*Bryum mildeanum*) (rr)

19 Plants with rhizoidal tubers 20

Note: several other species occasionally or regularly also produce rhizoidal tubers, e.g. *Imbribryum alpinum, Ptychostomum imbricatulum, Ptychostomum capillare, Ptychostomum elegans, Ptychostomum moravicum, Ptychostomum torquescens, Bryum bicolor, Bryum barnesii, Bryum gemmiferum*. These are not keyed out here!

– Plants lacking rhizoidal tubers (but compare *Ptychostomum imbricatulum* sometimes with rhizoidal tubers) 27

20 Fully developed rhizoidal tubers small, < 100 (115) µm 21

– Fully developed rhizoidal tubers > 120 µm 22

21 Rhizoids pale violet, finely papillose, tubers yellowish to orange or reddish-brown, 70–80 µm, cells not to slightly protuberant ..... ***Bryum violaceum*** (s-f)

– Rhizoids pale yellowish brown, tubers bright crimson to reddish-brown, to 100 µm long, irregularly spherical, cells distinctly protuberant ..... ***Bryum klinggraeffii*** (s-f)

22 Rhizoids and tubers yellow to orange-yellow; costa becoming dark purple with age ..... ***Imbribryum tenuisetum*** (*Bryum tenuisetum*) (r)

– Tubers red; rhizoids not yellow 23

23 Rhizoids usually deep violet (old rhizoids dark red and coarsely papillose, young rhizoids pale reddish and only weakly papillose); tubers red to reddish-brown or orange, at the end of long rhizoids, never axillary, to 200 µm, cells not to slightly protuberant ..... ***Bryum ruderale*** (s-f)

– Rhizoids paler, not violet 24

24 Leaves with distinct border of 2–3 (4) rows of elongate, narrow cells; tubers glossy, bright crimson red, on short rhizoids at the stem base and frequently also in leaf axils above the soil, opaque in transmitted light, (130) 180–260 µm in diameter, tuber cells 30–35 (45) µm in diameter, strongly protuberant; plants of slightly acidic to highly basic habitats. ***Ptychostomum rubens*** agg. 25

– Leaves not or scarcely bordered; lamina cells 10–16 µm wide; tuber cells not protuberant; tubers never axillary 26

25 Sterile and young shoots with evenly arranged leaves; older stems mostly intact; leaves not or weakly differing in shape along the stem, oblong-lanceolate, erecto-patent when moist, apex denticulate, gradually narrowed and recurved into excurrent costa ..... ***Ptychostomum touwii*** (*Bryum touwii*) (r)
Note: A semicryptic segregate of a broader conceived *P. rubens*.

– Sterile and young shoots with upper leaves erect, often bud-like appressed, lower leaves more distant, spreading; older stems often broken off below the bud-like shoot tip; leaves oblong to elliptical, apex clearly delimited, excurrent costa bent outwards as a short, almost smooth point or hair..... ***Ptychostomum rubens*** (*Bryum rubens*) (s-f)

26 Plants growing in dense, nearly cushion-like yellowish to brownish-green or green tufts, with numerous basal rhizoids forming a ± dense felt; costa stout, in upper leaves excurrent in long, denticulate point; basal lamina cells beside the costa quadrate or shortly rectangular; mid-leaf cells 10–12 µm wide, incrassate; rhizoidal tubers spherical, 120–180 (220) µm in diameter, pale brownish to bright red, tuber cells usually < 45 µm long, not protuberant; plants of dry-warm calcareous habitats..... ***Bryum radiculosum*** (s-f)

– Plants growing in lax patches, mostly reddish-green, without conspicuous rhizoid felt; costa in upper leaves only shortly excurrent; basal lamina cells beside the costa rectangular; mid-leaf cells 10–14 (16) µm wide, slightly incrassate or thin-walled; rhizoidal tubers ± spherical, (180) 190–260 (330) µm, red, tuber cells usually not protuberant, (18) 24–55 (65) µm long; plants growing on base-rich non-calcareous soil..... ***Imbribryum subapiculatum*** (*Bryum subapiculatum, B. microerythrocarpum?*) (s-f)

27(19) Plants growing in tufts usually > 4 cm tall, leaves often strongly decurrent, plants often with dense tomentum of reddish rhizoids..... 28

– Plants smaller, leaves usually not or scarcely decurrent..... 30

28 Leaf base concolorous, not contrasting with upper lamina; border often bistratose; lamina cells 16–24 µm wide; rhizoid tomentum scarce or lacking; leaves conspicuously longly and broadly decurrent; soft plants to 10 cm tall, often pinkish to flesh-coloured..... ***Ptychostomum weigelii*** (*Bryum weigelii*) (n.s.)

– Leaf base discolorous, reddish, contrasting with upper green lamina; border unistratose, conspicuous; laminal cells 12–14 µm wide; rhizoid tomentum often conspicuous..... 29

29 Plants dioicous; sporophytes rare; spores usually 12–18 µm..... ***Ptychostomum pseudotriquetrum*** var. ***pseudotriquetrum*** (*Bryum pseudotriquetrum* var. *pseudotriquetrum*) (s-f)

– Plants synoicous, nearly always with sporophytes; spores usually 15–25 µm ..... ***Ptychostomum pseudotriquetrum*** var. ***bimum*** (*Bryum pseudotriquetrum* var*. bimum, Bryum bimum*) (rr)

30(27) Leaf base not contrasting upper lamina in colour, concolorous, plants often reddish to pinkish; marginal border often partially bistratose, sometimes inconspicuous; capsule narrow-mouthed, lid with ± acute mamilla 31

– Leaf base red, in contrast with upper green lamina, discolorous (examine old leaves!); plants green or variegated red; border unistratose, conspicuous or indistinct to lacking; lid sharply or obtusely pointed 34

31 Endostome cilia ± long, nodose or with short appendages; spores (15) 18–24 (26) µm; plants dioicous; often with wine-red to pinkish colour 32

– Endostome cilia short to rudimentary, rarely longer and nodose; spores > 28 µm; plants autoicous; seta usually long; leaf border yellowish; plants green or sometimes pale reddish 33

32 Capsule elongate pyriform, with curved neck, not conspicuously contracted below mouth when dry and empty; marginal border conspicuous, to 3 cells wide, often bistratose (in well developed plants) ..... ***Ptychostomum pallens*** (*Bryum pallens*) (r)

– Capsule short, symmetric, obconic when dry and empty, with conspicuous contraction below mouth; marginal border inconspicuous, often only 1–2 cells wide ..... ***Ptychostomum turbinatum*** (*Bryum turbinatum*) (rr)

33 Exostome teeth usually with oblique cross-walls connecting lamellae, exostome partially united to endostome; spores usually > 40 µm; endostome segments with narrow, slit-like perforations; border less conspicuous, only locally bistratose; plants sometimes pale reddish ..... ***Ptychostomum warneum*** (*Bryum warneum*) (n.s.)

– Exostome teeth without cross-walls between lamellae, endostome free; spores smaller, 28 (35) µm; endostome segments with oval perforations; leaf margin with yellowish, conspicuous regularly bistratose border; seta to 5 cm long; plants green ..... ***Ptychostomum cernuum*** (*Bryum uliginosum*) (n.s.)

34(30) Leaf margin without border or border indistinct 35

– Leaf margin with distinct border 37

35 Capsule with narrow mouth, elongate pyriform, mostly slightly asymmetric, gibbous, red-brown to blackish when ripe; cilia of variable length, nodose, not appendiculate; plants synoicous; spores 18–25 µm .....
Ptychostomum intermedium (*Bryum intermedium*) (rr)

– Capsule with wide mouth, cilia appendiculate, spores 10–12 µm or plants without capsules, dioicous 36

36 Plants small, 0.5–1 cm tall, whitish-green, julaceous; leaves broadly ovate, strongly concave, imbricate, crowded at bud-like apex; costa excurrent as short, but stout apiculus (of *ca* 10% of total leaf length or less), 60–100 µm wide at leaf base; lamina cells thin-walled, lax, 20–35 × 15 µm; marginal border lacking (or consisting of a single row of incrassate, hardly narrowed cells); capsule pyriform to obconic, strongly contracted below mouth when dry and empty .....
Ptychostomum funkii (*Bryum funckii*) (rr)

– Plants not bud-like, taller, 0.5–2 cm; leaves ovate to ovate-lanceolate, not strongly concave, gradually narrowed to long point formed by excurrent costa (of *ca* 20–30% of total leaf length), entire or weakly denticulate; lamina cells longer, 40–70 µm long; leaves enlarged and crowded towards shoot apex; leaf margin recurved to revolute from base to near apex; margin with ± indistinct border formed by 2–3 (4) rows of elongate, narrow cells; plants dioicous, but often with sporophytes; capsule wide-mouthed, pendulous; cilia long appendiculate .....
Ptychostomum imbricatulum (*Bryum caespiticium*) (c)

37(34) Plants without sporophytes .....
plants cannot be identified without ripe capsules

– Plants with ripe capsules 38

38 Cilia short to rudimentary; spores large, usually > 20 µm (18–50 µm); plants usually synoicous; capsule narrow-mouthed .....
39

– Cilia long, nodose or appendiculate; spores small, usually < 20 µm (10–24 µm); plants dioicous, synoicous or autoicous; capsule mouth wide or narrow 40

39 Exostome teeth with oblique cross-walls between lamellae; endostome attached to exostome; lid with sharp point; costa longly excurrent.....***Ptychostomum compactum*** (*Bryum algovicum*) (r)
Note: Compare also *P. warneum.*

– Exostome teeth usually without cross-walls; endostome free; capsule obovoid to pyriform; lid flat, mamilla indistinct; leaves ovate-lanceolate, upper leaves longly acuminate; costa excurrent into long, smooth or slightly denticulate cuspidate point; exostome teeth at tip with thickened cell wall remnants.....***Ptychostomum inclinatum*** (*Bryum archangelicum*, *B. imbricatum*) (rr)

40 Spores 15–25 µm; capsule mouth wide or narrow.....41

– Spores (at least majority) not exceding 16 µm; capsule large-mouthed.....42

41 Capsules ± gibbous, elongate pyriform, mostly somewhat curved and asymmetric, narrow-mouthed, cernuous to pendulous; leaf margin with indistinct border or 2–3 rows of narrow, elongate cells; plants synoicous.....***Ptychostomum intermedium*** (*Bryum intermedium*) (rr)

– Capsules cylindrical to clavate pyriform or elongate pyriform, not curved, symmetric, large-mouthed, sometimes inclined; leaf margin with distinct border of 2–6 rows of elongate, narrow incrassate cells; plants autoicous or with synoicous terminal gametoecium.....***Ptychostomum pallescens*** (*Bryum pallescens* agg., incl*. B. lonchocaulon*) (r)

42 Plants synoicous; red leaf base distinct, leaf margin with distinct border of narrow, elongate, incrassate cells.....***Ptychostomum creberrimum*** (*Bryum creberrimum*) (r)

– Plants dioicous; leaf base often concolorous to indistinctly red; leaf margin with few rows of narrow, elongate cells forming indistinct border.....***Ptychostomum imbricatulum*** (*Bryum caespiticium*) (c)

Key to species of *Pohlia*

References: Smith (2004), Erzberger (2005), Köckinger *et al*. (2005), Guerra *et al.* (2010), Ellis *et al*. (2021c)

1 Plants rarely with sporophytes; usually with numerous gemmae (bulbils) in leaf axils in upper part of stem, rarely bulbils solitary (in *P. andalusica*); lamina cells 8–10 times as long as wide; costa reaching leaf apex; leaf margin weakly denticulate at apex. (*Pohlia annotina* agg.) 2

– Plants without axillary bulbils 6

2 All bulbils ± globose, hardly longer than wide 3

– Bulbils ellipsoid, obconic or elongate and vermicular 4

3 Primordia of all bulbils broadly triangular-laminate, obtuse, reaching about 1/3 of total bulbil length, conspicuously concave, forming a dome over the apex that often traps an air bubble; bulbils 230–400 µm × 100–230 µm, (green) yellow-orange (red), according to age; plants glossy when dry ..... ***Pohlia bulbifera*** (rr)

– Leaf primordia poorly formed, peg-like, incurved, consisting of only 1 (2) cell(s), never laminate; bulbils mostly (70) 80–130 (175) µm × 60–110 (150) µm, usually stalked, yellow-translucent, occasionally brown; plants dull when dry ..... ***Pohlia camptotrachela*** (n.s.)

4 Leaf primordia distinctly laminate in form; bulbils (including primordia) usually narrowed towards the apex and the base in outline, not larger than 600 µm, yellowish-green when young, red-brown when mature; leaf primordia 3–5 (8), laminate, erect, comprising *ca* 1/2 of total bulbil length, inserted at the same level at flattened bulbil apex; plants glossy, leaves straight, appressed to erect when dry ..... ***Pohlia andalusica*** (rr)

– Leaf primordia peg-like, rarely becoming laminate on very large ovate bulbils; bulbils green, yellow, orange, red according to age; plants dull or glossy 5

5 Plants glossy when dry; bulbils mostly 150–300 (450) µm long and to 60 µm wide, rather uniform in shape, ellipsoid-linear to linear-vermicular; leaf primordia 1–2, reaching 1/4 of total bulbil length ..... ***Pohlia proligera*** (rr)

Note: The bulbils of this plant differ from those of *P. annotina*, which may be similar, by the following characters: body of the bulbil 1–2 cells wide, with 1–2 primordia consisting of 1–2 cells (*P. annotina*: bulbil body opaque, more than 2 cells wide, with 2–3 (4) leaf primordia mostly consisting of more than 2 cells. See photographs in Guerra *et al.* (2010), p. 192.

– Plants dull when dry; bulbils extremely variable in size and shape, obovoid, obconic, occasionally bulbiform, rarely vermicular, different forms often present on a single stem, mostly more than 80 µm wide at the broadest point and 150–300 (550) µm long, opaque, with (2) 3–4 (5) peg-like, erect primordia (occasionally becoming laminate with age); leaves patent when dry; leaf cells uniformly wide from costa to margin ..... ***Pohlia annotina*** (r)

6(1) Capsules longly cylindric, with neck as long as or longer than urn, horizontal; leaves narrowly lanceolate, margins recurved, denticulate; costa excurrent ..... ***Pohlia elongata*** (n.s.)

– Capsules shortly cylindric to ovoid, with shorter neck, drooping, pendulous 7

7 Lamina cells of upper leaves > 14–16 µm wide; vegetative leaves short, only 2–4 times as long as wide; stems and leaf base often reddish 8

– Lamina cells of upper leaves < 14–16 µm wide; leaves mostly > 4 times as long as wide; leaf base reddish or not 9

8 Plants whitish green, with waxy water-repellent surface; leaves predominantly ovate (observe older stems), ± distinctly decurrent; usually 1–3 cm high plants; rarely with sporophytes ..... ***Pohlia wahlenbergii*** (s-f)

– Plants brownish or pale green, not waxy, easily wetted; leaves lanceolate to ovate-lanceolate, hardly decurrent; plants only to 5 mm tall; occasionally with sporophytes ..... ***Pohlia melanodon*** (c)

9 Plants with rhizoidal gemmae, usually sterile, rarely > 1 cm tall 10

– Plants without rhizoidal gemmae, usually > 1 cm tall 11

10 Gemmae brownish, spherical to pyriform, with smooth surface, not knobbly, 75–150 × 70–90 µm; plants very small, only to 5 mm high; lower leaves lanceolate with costa ending below leaf apex, upper leaves narrowly lanceolate with costa excurrent; lamina cells very narrow and elongate, 70–120 × 9–12 (15) µm ..... ***Pohlia lescuriana*** (r)

Note: rhizoidal gemmae must be well soaked when examining dried specimens, because when insufficiently hydrated they may have protuberant cells. Care must also be taken not to confuse this species with *Dicranella rufescens*. In *P. lescuriana*, the marginal cells are slightly narrower than median leaf cells, whereas in *D. rufescens* they are sometimes even wider.

– Gemmae yellowish, rounded, with protuberant cells giving a knobbly appearance, 50–70 × 40–50 µm; leaf apices more strongly denticulate and lamina cells narrower and longer than in preceding species, 70–180 × 6–10 µm, wider in lower leaves ..... ***Pohlia lutescens*** (s-f)

11 Lamina cells very long and narrow, about 10 times as long as wide, 6–10 µm wide and up to 150 µm long; plants conspicuously glaucous green with metallic sheen; leaf base, stem and costa reddish; capsules cernuous, ellipsoid, neck half as long as urn, pale brown ..... ***Pohlia cruda*** (s-f)

– Lamina cells shorter and wider, only 5–7 times as long as wide, 10–12 µm wide and up to 70 µm long; capsule yellowish brown, elongate pyriform to elliptical; leaves erect, lanceolate, denticulate at apex 12

12 Plants paroicous, spores 20–25 µm in diameter; habitat various, also in wetlands 13

Plants dioicous, spores 10–12 µm in diameter, nearly smooth; growing exclusively in bogs ..... *Pohlia sphagnicola*
Note: doubtfully recorded.

13 Plants dark green ..... ***Pohlia nutans*** subsp***. nutans*** (s-f)

– Plants with variegated red, dense shoots, leaves red or at least with red costa ..... ***Pohlia nutans*** subsp***. schimperi*** (*Pohlia schimperi*) (r)

Key to species of Mniaceae (excl. *Pohlia*)

References: Koponen in Nyholm (1993), Sauer in Nebel and Philippi (2001), Berg *et al*. (2025)

1 Leaves unbordered, bluntly toothed down to mid-leaf; teeth predominantly simple ..... ***Mnium stellare*** (s-f)

– Leaves with a border of narrow elongate cells, often multistratose; teeth simple or double (geminate) or lacking 2

2 Leaf margins entire, leaves roundish oval; stems densely tomentose in lower part ..... ***Rhizomnium punctatum*** (s-f)

– Leaf margins toothed 3

3 Teeth of leaf margins usually in pairs (geminate); sterile shoots erect, leaves spirally arranged. *Mnium* pp. 4
– Teeth of leaf margins simple; sterile shoots procumbent or arcuate, with complanate leaves. ***Plagiomnium*** 8
4 Lamina cells 13–17 µm wide ..... ***Mnium thomsonii*** (rr)
– Lamina cells wider 5
5 Sterile shoots leafy for approximately 3/4 of the length; upper leaves lanceolate or narrowly elliptic, at least 2.5 times longer than wide; sporophytes always solitary 6
– Sterile shoots leafy in the upper half, the leaves almost forming a comal tuft; upper leaves broadly lanceolate or obovate, at most 2.5 times longer than wide; sporophytes 1–5 per perichaetium; plants synoicous ..... ***Mnium spinulosum*** (n.s.)
6 Cell walls of lamina cells uniformly thin, cell lumen angular; lid mamillate ..... ***Mnium hornum*** (r)
– Cell walls of lamina cells with small trigones, cell lumen therefore rounded; lid shortly rostrate 7
7 Double teeth of the leaves in the upper third of the shoot mostly blunt, appressed; dorsal surface of costa smooth or with few blunt teeth; plants synoicous ..... ***Mnium marginatum*** (s-f)
– Double teeth of the leaves in the upper third of the shoot acute, patent; dorsal surface of costa often with several sharp teeth; plants dioicous ..... ***Mnium lycopodioides*** (r)
8(3) Leaves narrowly lingulate (except in immature plants), conspicuously decurrent; transversely undulate when wet and dry; leaf cells 10–16 µm wide ..... ***Plagiomnium undulatum*** (c)
– Leaves orbicular to oval or ovate, decurrent or not, not transversely undulate; leaf cells larger 9
9 Leaves serrate down to mid-leaf ..... ***Plagiomnium cuspidatum*** (cc)
– Leaves serrate down to base 10
10 Leaf base decurrent along stem 11
– Leaf base not decurrent 13
11 Synoicous, often with sporophytes; lamina cells isodiametric, with thickenings ..... ***Plagiomnium medium*** (n.s.)
– Dioicous; lamina cells longer than wide, without thickenings 12
12 Leaves narrowly and often only shortly decurrent; sterile shoots prostrate; lamina cells 1.5–2 times as long as wide; costa

weak, often ending below leaf apex; at least some teeth nearly perpendicular to margin, formed by 1–3 (4) cells..... ***Plagiomnium affine*** (c)

– Leaves longly and broadly decurrent; sterile shoots arcuate; lamina cells twice as long as wide; costa strong apically, percurrent to excurrent; marginal teeth directed forward and formed by 1–2 cells..... ***Plagiomnium elatum*** (s-f)

13 Synoicous; lid longly rostrate; lamina cells not porose, isodiametric to shortly elongate, 35–50 × 20–32 µm, with trigones (collenchymatous thickenings)..... ***Plagiomnium rostratum*** (s-f)

– Dioicous; lid conical; lamina cells porose, elongate, 40–77 × 22–37 µm, without trigones..... ***Plagiomnium ellipticum*** (r)

Key to species of Orthotrichaceae

References: Erzberger and Papp (2000), Schäfer-Verwimp in Nebel and Philippi (2001), Siebel and During (2006), Guerra *et al.* (2014), Caparrós *et al.* (2016), Blockeel (2017), Vigalondo *et al*. (2020), Berg *et al*. (2025)

Codonoblepharon (2), *Lewinskya* (15–17), *Nyholmiella* (13), *Orthotrichum* (9–10; 18–25), *Pulvigera* (12), *Ulota* (4–8), *Zygodon* (2)

1 Plants with or without sporophytes, often with spindle-shaped gemmae having exclusively transverse walls, in leaf axils; if plants fertile then calyptra cucullate; lamina cells papillose or smooth..... 2

– Plants usually with sporophytes, or if sterile then gemmae occurring on leaf lamina or at leaf apex; calyptra large and conspicuous, mitriform or campanulate, often hairy, leaf cells papillose..... 3

2 Upper and median lamina cells smooth; autoicous, capsules frequent, with double peristome; gemmae very sparse, with pale walls; costa strong, 70–85 (100) µm wide in lower third of leaf, ending below apex or percurrent, sometimes slightly excurrent; leaves erect-spreading; rare blackish-green plants to 2 cm high, on trees (mainly *Fagus, Abies*) particularly in knotholes and seepage areas on the trunk, in Hungary around water-filled knotholes nearly exclusively on *Quercus cerris*, occasionally together with *Anacamptodon splachnoides*..... ***Codonoblepharon forsteri*** (*Zygodon forsteri*) (r)

– Upper and median lamina cells papillose; dioicous, capsules rare, gymnostomous (without peristome); gemmae generally abundant, ovoid to ellipsoid, consisting of 3–6 cells with greenish to brownish walls, without longitudinal walls; costa weak, 30–40 (50) µm wide in lower third of leaf, ending below apex, rarely percurrent or slightly excurrent; leaves erect-appressed, ± flexuose, usually curved and homomallous when dry; green plants, brownish below, on the bark of living trees, also saxicolous ..... ***Zygodon rupestris*** (r)

3 Marginal cells at leaf base hyaline, median basal cells incrassate and usually linear; leaves usually crispate when dry (except *Ulota coarctata* and *U. hutchinsiae*); seta usually longer than capsule, and capsule therefore exserted (far) above leaves; calyptra conspicuosly hairy. ***Ulota*** 4

– Marginal cells at leaf base not forming hyaline border, median basal cells rectangular, not incrassate; leaves not crispate when dry (but somewhat curled in some species not yet recorded in Hungary); seta usually not much longer than capsule, capsule therefore often immersed, emergent or shortly exserted above leaves (more conspicuously exserted in *Orthotrichum anomalum* and *Lewinskya speciosa*); calyptra hairy or not. ***Orthotrichum*** s.l. (incl. *Lewinskya*, *Pulvigera*, *Nyholmiella*) 9

4 Leaves straight and appressed when dry, in appearance much like *Orthotrichum* 5

– Leaves curled or crisped when dry 6

5 Capsule pale, elongate pyriform with contracted mouth and long neck, smooth and lacking striae when empty; on bark of deciduous trees ..... ***Ulota coarctata*** (rr)

– Capsule ellipsoid to narrowly cylindrical, not contracted at mouth, sulcate when empty; on siliceous rocks ..... ***Ulota hutchinsiae*** (rr)

6 Capsules spindle-shaped (fusiform) when empty, not contracted below mouth; sum of capsule length + seta length *ca* 5–8 mm; endostomial segments 8, linear, fragile, mostly uniseriate, ornamentation obliquely striate at base; leaves scarcely crisped when dry (each leaf is more strongly bent at its base than towards the tip, i.e. the radius of curvature increases from base to apex) ..... ***Ulota bruchii*** (s-f)

– Capsules ± contracted below mouth (urceolate) when dry and empty; sum of capsule length + seta length *ca* 3–5 mm;

endostomial segments fragile or persistent, not striate at base; leaves strongly crisped or not when dry. *Ulota crispa* s.l. (s-f).....7

7 Capsules when dry and empty conspicuously constricted below mouth, ribs very close to each other in upper half of urn (intercostal spaces can hardly be seen); exothecial bands 4–6 cells wide, reaching to mouth or nearly so; exostomial teeth pairs not easily splitting, usually bordered with a hyaline halo particularly apparent in lower half of tooth; endostomial segments 8, strong, persistent, shining, broad at base; leaf base wide, strongly concave, usually abruptly narrowing towards the leaf lamina; basal marginal leaf cells forming a broad band (7–15 cell rows) along the leaf base; leaves usually strongly crisped (with radius of curvature ± constant from leaf base to apex, compare however *U. bruchii*); operculum without differentiated basal ring.....***Ulota crispa*** s.str. (r)

– Capsules when dry and empty only slightly or not constricted below mouth, ribs separated by ± broad furrows in upper half of urn; exothecial bands 2–4 (5) cells wide, visibly separated from the mouth by a ring of small thin-walled cells in 2–6 rows; pairs of exostome teeth partially splitting in empty capsules, teeth not bordered by a hyaline halo; operculum with or without orange basal ring.....8

8 Endostome segments incurved when dry, uniseriate with incrassate and prominent transverse wall remnants, persistent, hardly fragile; all the cells of the exothecial bands hyaline with pale yellow incrassate lateral walls; leaves markedly crisped when dry, abruptly narrowing from a concave base; operculum without differentiated basal ring.....***Ulota intermedia*** (r)

– Endostome segments variably bent when dry, uniseriate or irregularly biseriate with thin transverse wall remnants, fragile, easily lost; cells of exothecial bands evenly pale yellow, at least in the two central rows; leaves slightly or moderately crisped when dry, gradually narrowing from a plane to slightly concave base; operculum usually with an orange to reddish basal ring.....***Ulota crispula*** (s-f)

9(3) Leaves ending in hyaline point; capsule pale brown, smooth to weakly striate, almost immersed in leaves; peristome teeth separating at maturity.....***Orthotrichum diaphanum*** (cc)

– Leaves without hyaline tip; peristome teeth separating or not.....10

10 Upper lamina cells large, 16–24 µm in diameter; leaves ovate-lingulate to elliptical with rounded apex (sometimes apiculate); plants 0.5–1 cm high, sometimes with leaf-borne gemmae; usually growing on wood or stones in the flood zone of rivers..... ***Orthotrichum sprucei*** (rr)

– Upper lamina cells smaller, 10–18 µm in diameter; leaves ovate to lanceolate with acute to obtuse apex, sometimes apiculate..... 11

11 Plants dioicous, usually without capsules; margins plane to incurved; leaves sometimes covered with conspicuous brown gemmae; plants usually corticolous..... 12

– Plants autoicous, almost always with capsules; gemmae, if present, green and inconspicuous; leaf margins recurved; plants corticolous or saxicolous..... 14

12 Leaves lanceolate, densely covered with brown filamentous gemmae; leaf margins plane; large plants, 3–4 cm tall or more..... ***Pulvigera lyellii*** (*Orthotrichum lyellii*) (c)

– Leaves ovate-lingulate, with rounded apex, with few to many small greenish gemmae; margins plane to incurved; small plants. ***Nyholmiella***..... 13

13 Leaf margin plane; upper lamina cells with 1 papilla per cell (rarely 2); gemmae predominantly on ventral side of leaf lamina; capsule with double peristome..... ***Nyholmiella obtusifolia*** (*Orthotrichum obtusifolium*) (c)

– Leaf margin incurved from base to somewhat cucullate apex; upper lamina cells with (1) 2–3 papillae per cell; gemmae on both sides of leaf lamina; capsule without peristome..... ***Nyholmiella gymnostoma*** (*Orthotrichum gymnostomum*) (n.s.)

14(11) Capsules with superficial stomata (phaneropore). ***Lewinskya***..... 15

– Capsules with immersed stomata (cryptopore). ***Orthotrichum***..... 22

15 Outer peristome teeth rudimentary, only a few cells high, hardly visible above capsule mouth; endostome segments 8, wide, with ± entire margins, erect when moist, incurved when dry; capsule immersed, capsule wall nearly smooth, capsule mouth contracted when dry..... ***Lewinskya acuminata*** (rr)

– Outer peristome teeth well developed; endostome segments narrow, or if wide, then 16 in number; capsule mouth not contracted when dry.....16

16 Outer peristome teeth erect or spreading when dry, coarsely papillose, ± translucent, in 8 pairs soon separating, sometimes with preperistome; capsules with 8 ± conspicuous striae, immersed to emergent, ovoid-ellipsoid; calyptra strongly hairy, the hairs rising above apex of calyptra; lamina occasionally bistratose above and towards margins; leaf cells with simple papillae; 1.5–5 cm tall robust plants, commonly on (siliceous) rock but sometimes also on deciduous trees.....***Lewinskya rupestris*** (*Orthotrichum rupestre*) (r)

Note: *Ulota hutchinsiae* might key out here, because it has superficial stomata, grows on siliceous rocks and has erect to spreading peristome teeth, sometimes with a preperistome, and a very hairy calyptra, and unlike other *Ulota* species, has the leaves not crisped, but straight and appressed when dry. However, its capsules are clearly exserted, strongly contracted and cylindrical when dry and empty, and careful examination of the coloured leaf base will reveal the characters typical of *Ulota* (hyaline marginal and incrassate median basal cells).

– Outer peristome teeth recurved when dry; capsules smooth or striate; plants corticolous or saxicolous.....17

17 Capsules pale, elongate-cylindrical, strongly sulcate when dry, hemi-emergent to shortly exserted; calyptra naked or with few short hairs; peristome teeth united in 8 pairs (or partly separating when old), regularly recurved when dry, touching surface of capsule throughout their length; inner peristome segments coarsely papillose (rarely nearly smooth); leaves mostly with a broad, short apex; mostly on trees, but also on rock. *Lewinskya affinis* s.l. (incl. *L. fastigiata*).....18

– Capsules yellowish, thin-walled, smooth or almost so when dry, immersed in the leaves or clearly exserted above the leaves; outer peristome teeth united in pairs or not, recurved but arcuate when dry, only the tips touching surface of capsule ('tea cup handle'); leaves mostly with a narrow, acute apex.....19

18 Exothecial bands broad, 4 rows of cells near capsule mouth (often 6–8 below); exostome teeth cancellate (lattice-like) and frequently fenestrate (pierced by broad openings resembling windows) at apex; spores verrucose and usually with scattered coarse lines; capsule usually hemi-emergent, urceolate, deeply furrowed when dry and empty; apex of perichaetial leaves acute to acuminate, frequently asymmetric; leaves shorter and more broadly lanceolate than in the next species..... ***Lewinskya fastigiata*** (*Orthotrichum affine* var. *fastigiatum*)(r)
Note: known at present from few sites only, but probably more widespread)

– Exothecial bands narrow, 2–3 rows of cells near capsule mouth (sometimes 4-6 below); exostome teeth sometimes weakyl fenestrate at apex; spores with thin and irregular papillae; capsule usually shortly emergent, cylindrical to ovoid-cylindrical, moderately furrowed when dry and empty; apex of perichaetial leaves shortly apiculate; leaves lanceolate..... ***Lewinskya affinis*** (*Orthotrichum affine*) (cc)

19 Capsule ovoid, completely or nearly without thickended longitudinal bands and completely smooth or nearly so when dry, immersed in the leaves; predominantly on bark; robust to medium-sized species..... 20

– Capsule cylindrical with long neck, weakly sulcate in upper half or total length, emergent to clearly exserted, gradually narrowed to the seta, seta 0.75–3 mm long; peristome teeth united in 8 pairs (or partly separating when old); inner peristome segments 8, papillose, with slightly irregular margins; calyptra usually densely hairy; plants forming tufts to 3 cm tall; on deciduous trees, rarely on rock..... 21

20 Endostome lacking, outer peristome teeth yellowish, at first united in pairs, soon separating; urn smooth or with hardly marked exothecial bands in the upper part..... ***Lewinskya shawii*** (*Orthotrichum shawii*) (rr)

– Endostome segments well developed, papillose, broad, 2 cells wide, with irregular margins, outer peristome teeth yellowish, narrow, not united in pairs; urn completely smooth, without exothecial bands..... ***Lewinskya striata*** (*Orthotrichum striatum*) (c)

21 Seta (1) 1.5–2.5 (3) mm long, as long as or longer than the urn, capsule clearly exserted; capsule wall smooth or with short striae in upper half only; ripe calyptra conical or fusiform, with golden or colourless hairs..... ***Lewinskya speciosa*** (*Orthotrichum speciosum*) (cc)

Note: When capsules are not strongly exserted, confusion with *L. affinis* might occur, especially when old capsules of *L. speciosa* sometimes are sulcate to near base. However, in a cushion of *L. speciosa* nearly always some smooth capsules will be present. Additional useful characters to separate *L. speciosa* from *L. affinis*: (i) strongly hairy calyptra (calyptra with only few or no hairs in *L. affinis*); (ii) peristome teeth arcuate, only the tips touching the capsule surface (regularly recurved in *L. affinis*); (iii) stomata confined to lower half of capsule (*L. affinis*: stomata not too frequent, scattered all over the capsule, some occasionally close to capsule mouth).

– Seta 0.75–1 (1.3) mm long, as long as or less long than the urn, capsule half emergent; capsule wall with distinct striae in total length; ripe calyptra oblong-conical, with greenish-yellowish hairs..... *Lewinskya breviseta* (*Orthotrichum speciosum* var. *brevisetum*) (not recorded in Hungary)

22(14) Outer peristome teeth erect or spreading when dry, often with preperistome (prostome); plants mostly on rocks..... 23

– Outer peristome teeth recurved when dry, touching surface of empty capsule; prostome lacking; plants mostly on trees..... 25

23 Vaginula with numerous golden-yellow hairs; calyptra campanulate, straw-coloured, with (moderately) numerous yellow, papillose hairs; capsule wide-ovoid to shortly urn-shaped; inner peristome segments 8 or 16, well developed; capsule wall with 8 pronounced striae, intermediate striae weak or lacking; plants densely tomentose, in tall lax cushions; on non-calcareous rocks..... ***Orthotrichum urnigerum*** (r)

– Vaginula naked or with a few hyaline hairs (very rarely with numerous hairs); inner peristome lacking; capsule with 16 ± equally strong striae (but intermediate striae often somewhat shorter); on base-rich rock..... 24

24 Capsules exserted above leaves, elongate-cylindrical, only very slightly constricted below mouth when dry; calyptra long conical to campanulate, with few to numerous papillose hairs; seta 2–4 mm long, as long as or longer than capsule, reddish brown; outer peristome teeth striate horizontally below, vertically above..... ***Orthotrichum anomalum*** (cc)

– Capsules immersed or only shortly exserted, wide ovoid or urn-shaped when empty, slightly constricted below mouth, ± abruptly contracted into seta; seta shorter than the capsule, pale; outer peristome teeth striate, papillose-striate or papillose-reticulate; inner peristome segments usually lacking ..... ***Orthotrichum cupulatum*** (s-f)

Note: Several varieties have been described (see Berg *et al*. 2025) apart from the typical variety which is the common taxon in Hungary. Perhaps var. *riparium* with epilose calyptra and papillae on lamina cells weak to absent, could be expected in Hungary.

25(22) Exothecial bands of capsule wall formed by 2 rows of well-differentiated yellowish cells (locally 3–4 cells wide); vaginula with many long hairs; spores 15–23 µm..... ***Orthotrichum patens*** (cc)

Note: Confusion with *O. stramineum*, the only other (Hungarian) corticole species with long vaginula hairs, can be avoided by taking into account the following characters: (i) spore size in just ripe capsules (*O. patens*: 16–20 (24) µm, *O. stramineum*: mostly 12 µm); (ii) capsule shape (*O. patens*: wide ovoid, abruptly (often forming a 90° angle) contracted into seta, dry empty capsules not longitudinally contracted, *O. stramineum*: capsule more cylindrical, gradually narrowed to seta, dry empty capsule always strongly contracted); (iii) width and length of capsule striae (*O. patens*: only 2–3 cells wide, *O. stramineum*: 4–6 cells wide and mostly longer); (iv) endostome sculpture (*O. patens*: papillose, *O. stramineum*: smooth); (v) apical openings in exostome teeth (*O. patens*: mostly lacking, *O. stramineum*: present); (vi) papillosity of upper lamina cells (*O. patens*: cells with 1–4 (6) simple or forked papillae, *O. stramineum*: less papillose, with small, mostly unbranched papillae); (vii) time of spore ripening (most easily observed, when both species occur together) – is 1 month ahead in *O. patens*.

A hairy vaginula is also observed in *O. urnigerum*, a saxicole species with an erect exostome.

– Exothecial bands of capsule wall formed by 4 or more rows of well-differentiated cells; vaginula hairy or not; spores usually smaller (but 18–24 µm in *O. rogeri*)..... 26

26 Vaginula with numerous long hairs (best seen near young capsules); capsule elongate-cylindrical, longitudinally contracted when dry; gradually narrowed into seta; empty capsule wall tough; capsule striae (3) 4–6 cells wide; inner peristome with 8 or 16 segments (the intermediate segments often consisting of few cells only); outer peristome teeth with apical window-like openings, extremely rarely splitting into 16 single teeth; spores mostly 12 µm (10–15 µm); calyptra

campanulate, with some smooth hairs, rarely naked, the tip conspicuously blackish far down..... ***Orthotrichum stramineum*** (s-f)

– Vaginula naked or with 1–3 hairs..... 27

27 Plants with dimorphic leaves, leaves (of female shoots) from broad ovate base elongate-lanceolate-lingulate, often rounded at apex, margins recurved for the greater part of their length, leaves of male branches smaller, with the base not or slightly widened, and margins plane or nearly so; inner peristome at least with some segments completely erect when dry, smooth to finely papillose (slightly ornamented by longitudinal striae at base)..... ***Orthotrichum rogeri*** (rr)

– Plants with monomorphic leaves, leaves of all shoots similar, independent of sex; endostome segments incurved when dry, smooth or papillose, without longitudinal striae..... 28

28 Upper leaves from ovate base lanceolate, widest at lower third, apex acute or obtuse, rarely rounded; capsule gradually narrowed to the seta, half emergent to almost exserted; neck and seta pale brown, contrasting with urn, with 8 striae 6–8 cells wide; stomata (mostly) 'pseudo-phaneropore', i.e. hardly covered by broadly rounded edges of surrounding cells; inner peristome with 8 or more often 16 segments (8 longer and 8 shorter, the latter sometimes reduced to 1–2 cells); calyptra short, to 1.4 mm long; gemmae unknown; exostome teeth yellowish, ornamented in upper part with papillae and lines..... ***Orthotrichum pallens*** (c)

Note: *Orthotrichum moravicum* is closely related to *O. pallens*, but differs in 16 inner peristome segments of ± equal length (not 8 longer and 8 shorter as in *O. pallens*) and nearly as long as the exostome teeth; the endostome processes have conspicuous lateral appendages (Plášek *et al.* 2009). *O. moravicum* was described from the Czech Republic and might be expected in Hungary.

– Upper leaves frequently ovate-lanceolate (widest shortly below middle) to oblong-lanceolate, acuminate or obtusely rounded (sometimes apiculate with 1–2 hyaline end cells); capsule immersed to half emergent, suddenly or gradually narrowed to seta; stomata covered by surrounding cells to a variable extent, mostly in a single capsule some stomata hardly covered, some covered half or more by irregularly protruding mamillae of surrounding cells; inner peristome mostly with 8 segments; exostome orange, ornamentation various..... 29

29 Capsule abruptly narrowed to the seta; exostome teeth in persistent pairs, ornamented with tall papillae (rarely some lines); endostome segments 8, with enlarged base, usually shorter than exostome teeth; gemmae very common..... ***Orthotrichum schimperi*** (s-f)

– Capsule gradually narrowed to the seta; exostome teeth pairs splitting at tips, ornamented in upper part with low papillae and some fine lines; endostome segments 8 or rarely 16, long and narrow, not noticeably widened at base, as long as exostome teeth, gemmae rare..... ***Orthotrichum pumilum*** (c)

Key to species of *Aulacomnium*
Reference: Berg *et al.* (2025)

– Stems tomentose; gemmae rare; cells at leaf base pluristratose, brownish; plants to 10 cm tall..... ***Aulacomnium palustre*** (r)
– Stems not tomentose, nearly always with gemmae in stalked globose clusters at shoot apices; cells at leaf base unistratose, green; plants 1–3 cm high..... ***Aulacomnium androgynum*** (r)

Key to species of *Fontinalis*

– At least lower stem leaves keeled; stem and branch leaves arranged in 3 rows..... ***Fontinalis antipyretica*** (r)
– All leaves plane, without border..... ***Fontinalis hypnoides*** (rr)

Key to species of *Plagiothecium*
References: Erzberger and Baráth (2017), Erzberger *et al.* (2020), Wolski and Nowicka-Krawczyk (2020), Wolski *et al*. (2022a, b), Berg *et al.* (2025)

1 Leaves whitish green, 2–5 mm long, imbricate, strongly transversely undulate; decurrent alar cells with straight outer walls; on forest soil..... ***Plagiothecium undulatum*** (rr)
– Plants without this combination of characters..... 2
2 Median lamina cells narrow, < 10 µm wide; small plants, usually only 2–3 cm long..... 3
– Median lamina cells > 10 µm wide; medium-sized to large plants..... 5

3 Leaves 0.9–1 mm long and *ca* 0.35 mm wide, symmetric, gradually acuminate to a long point, often with uniseriate gemmae and rhizoids at the tip; lamina cells 5 (8) µm wide..... ***Plagiothecium latebricola*** (rr)

– Leaves longer and wider (mostly > 0.5 mm wide), asymmetric, apex less longly drawn out, usually without gemmae at leaf tips (but gemmae frequent in leaf axils); lamina cells wider..... 4

4 Leaf apices plane; leaves asymmetric usually with one curved and one straight side, to 1.2 mm long, alar cells decurrent in 1–2 rows, not clearly delimited, not auriculate, with straight outer walls, rectangular; capsule erect to slightly inclined, 1–1.3 mm long..... ***Plagiothecium laetum*** (s-f)

– Leaf apices curved downward towards substrate when moist; leaves asymmetric with two curved sides, > 1.2 mm long, alar cells forming a distinct group, decurrent in 2–4 (5) rows, mostly somewhat auriculate, often with weakly bulging outer walls, isodiametric or rectangular; capsule horizontal to inclined, often gibbous, 1.5–2 mm long..... ***Plagiothecium curvifolium*** (s-f)

5 Decurrent alar cells inflated, oval to rounded, with bulging walls, sometimes only a few cells rounded and most cells rectangular or quadrate; lamina cells not wider than 16 µm..... 6

– Alar cells not inflated, the decurrent cells rectangular, not rounded; lamina cells wider than 16 µm or not..... 8

6 Alar cells mostly rectangular or quadrate, forming a long triangular group decurrent in 2–4 rows along stem and often remaining on the detached leaf, at least some of the outer cells with rounded outlines; apical part of lamina usually with a group of thin-walled short cells (rhizoid initials) often eroded; some leaves only weakly asymmetric; large plants to 10 cm long..... ***Plagiothecium platyphyllum*** (rr) (*Plagiothecium sylvaticum*)

– Most alar cells strongly inflated, rounded, forming an oval group usually less long, often wider, decurrent in 3–4 (6) rows; leaves without rhizoid initials at apex; all leaves distinctly asymmetric; medium-sized plants. ***Plagiothecium denticulatum***..... 7

7 Lamina cells in ± distinct transverse rows, therefore leaves sometimes transversely undulate when moist; margins at apex often completely without denticulations; leaves 2.5–4 mm long, strongly complanate, strongly asymmetric, at least some with one straight and one curved side; decurrent alar cells in 4–6 (8) rows; plants of wet habitats.....
.....***Plagiothecium denticulatum*** var***. undulatum*** (*Plagiothecium ruthei*) (r)

– Lamina cells not in transverse rows, leaves not transversely undulate when moist; margins at apex often denticulate; leaves 1.5–2.5 (3) mm long, less strongly complanate, asymmetric, mostly with both sides curved; decurrent alar cells in 3–5 rows; plants of humid, but not particularly wet habitats.....
.....***Plagiothecium denticulatum*** var. ***denticulatum*** (*Plagiothecium denticulatum*) (s-f)

8 Leaves ± symmetric, concave; plants julaceous, decumbent (examine older plants; young plants of other species can look similar); mid-leaf cells 65–120 (150) × (8) 10–12 (15) µm.....
.....***Plagiothecium cavifolium*** (s-f)

– Leaves symmetric to ± asymmetric, plane; mid-leaf cells wider or longer.....9

9 Majority of mid-leaf cells > 150 × 10–20 µm (7–10 times as long as wide), not in transverse rows; apical end cell linear, elongate; leaf apex occasionally with rhizoid initials.....
.....***Plagiothecium succulentum*** (s-f)

– Mid-leaf cells (65) 75–140 (155) × 15–22 (25) µm (4–6 times as long as wide) in ± transverse rows; apical end cell rhomboidal; leaf apex usually with (few) rhizoid initials.....
.....***Plagiothecium nemorale*** (s-f)

Note: Wolski and Nowicka-Krawczyk (2020) recently described a new species closely related to *P. nemorale*, *Plagiothecium angusticellum*, which they also identified in a collection by L. Vajda from Börzsöny Mts. *P. angusticellum* is missing in the latest Hungarian and European checklists (Erzberger and Papp 2020, Hodgetts *et al*. 2020). It might be worthwile to re-examine the Hungarian species of *Plagiothecium* in the light of the papers by Wolski *et al*. (2022a, b).

Key to species of *Orthothecium*
References: Ellis *et al*. (2021b), Németh and Schmotzer (2022)

– Plants medium-sized to robust, often reddish, leaves 2–4 mm long, strongly plicate longitudinally..... ***Orthothecium rufescens*** (rr)
– Plants delicate, mostly yellowish green, rarely reddish, leaves mostly 1.7 mm (to 2 mm) long, without longitudinal plicae..... ***Orthothecium intricatum*** (r)

Key to species of *Fabronia*
References: Ignatova *et al.* (2017), Berg *et al.* (2025)

– Leaf margins with unicellular teeth..... ***Fabronia ciliaris*** (rr)
Note: *Fabronia major* is recorded from Austria and could perhaps be expected in Hungary. It is distinguished from *F. ciliaris* by longer lamina cells, see Ignatova *et al.* (2017).
– Leaf margins with pluricellular teeth, appearing ciliate..... ***Fabronia pusilla*** (r)

Key to species of *Palustriella*

– Stems regularly complanately pinnately branched, tomentose, paraphyllia abundant; stem leaves cordate-triangular; alar cells numerous, forming a triangular group ascending the margin..... ***Palustriella commutata*** (r)
– Stems irregularly or subpinnately branched, not tomentose, paraphyllia few; stem leaves ovate to lanceolate; alar cells few, forming a group that does not ascend up the margin..... ***Palustriella falcata*** (rr)

Key to species of *Campyliadelphus*

– Stem leaves straight, sometimes curved, narrowly triangular lanceolate, about four times as long as wide, from ovate base gradually narrowed to long linear, ± channelled acumen; costa strong, reaching higher than 2/3 leaf length; leaf margin ± distinctly denticulate; wetland species..... ***Campyliadelphus elodes*** (*Campylium elodes*) (r)

– Stem leaves straight to falcate, lanceolate, about twice as long as wide, from broad base suddenly narrowed to channeled acumen; costa thin, extending to mid-leaf; leaf margin entire; slender, soft, yellowish green plants of dry calcareous habitats..... ***Campyliadelphus chrysophyllus*** (*Campylium chrysophyllum*) (s-f)

Key to species of *Campylium*

– Leaves gradually narrowed, 1.7–2.8 mm long, erect, irregularly branched plants..... ***Campylium stellatum*** (r)
– Leaves often abruptly narrowed into a long acumen, 1–2.3 mm long; creeping, often pinnately branched plants..... ***Campylium protensum*** (*Campylium stellatum* var. *protensum*) (r)

Key to species of *Drepanocladus*

1 Costa reaching 2/3 of leaf length or more; leaves mostly falcate; acumen flat; alar cells various..... 2
– Costa weak, mostly extending not far above mid leaf; leaves straight or falcate; acumen channeled; alar cells incrassate, porose, often reaching costa, distinctly decurrent; leaves 2–3 mm long, gradually and longly pointed from broadly lanceolate base; stem leaf insertion slightly curved..... ***Drepanocladus polygamus*** (*Campylium polygamum*) (r)
2 Alar cells in large groups extending across all or most of leaf base, cell walls thin; leaves nearly straight to moderately falcate, rarely strongly falcate; plants to > 10 cm long, green to brownish green..... ***Drepanocladus aduncus*** (s-f)
– Alar cells in relatively small groups reaching 40–60% distance from leaf margin to costa, the cell walls often incrassate; leaves often strongly falcate..... 3
3 Leaves lanceolate to linear-lanceolate, longly and finely acuminate; costa reaching into apex..... 4
– Leaves broadly ovate-lanceolate, shortly acuminate, gradually narrowed from base to apex, concave; costa ending in leaf apex; plants robust, turgid, to 30 cm long, brownish yellow..... ***Drepanocladus lycopodioides*** (rr)

4 Ratio of median leaf cell length (in µm) to leaf length (in mm) 18.0–24.5; alar cells often incrassate; leaves longly and finely pointed; often very robust plants, to 20 cm long; costa strong, (50) 70–100 µm wide at base, reaching to leaf apex..... ***Drepanocladus sendtneri*** (rr)

Notes: (i) To compute the aforementioned ratio, examine 8–10 leaves from a homogeneous part of stem under the microscope, measure length of the longest and the shortest leaf and cell length of the longest and the shortest leaf cell, then compute mean values and use these for computing the ratios (Hedenäs and Bisang 2002).

(ii) Problems with the separation of *D. sordidus* and *D. sendtneri*, also due to wide phenotypic plasticity, lead some authors to lump both under *D. sendtneri* (Berg *et al*. 2025).

– Ratio of median leaf cell length (in µm) to leaf length (in mm) 23–36.5; alar cells thin-walled; costa relatively weak, 30–75 µm wide at base, ending far below leaf apex..... ***Drepanocladus sordidus*** (n.s.)

Key to species of *Amblystegium* group
(incl. *Amblystegium, Hygroamblystegium, Platydictya, Pseudoamblystegium, Pseudocampylium, Serpoleskea*)

1 Leaves without costa or costa short and double, not reaching mid-leaf..... 2

– Leaves with single costa extending to or above mid-leaf..... 4

2 Perichaetial leaves with distinct distant teeth..... ***Platydictya jungermannioides*** (rr)

– Perichaetial leaves entire..... 3

3 Capsule curved; perichaetial leaves without costa; on shaded calcareous rocks..... ***Serpoleskea confervoides*** (*Amblystegium confervoides*) (s-f)

– Capsule straight or slightly curved; perichaetial leaves with costa reaching mid-leaf; on tree bark and rotting wood..... ***Pseudoamblystegium subtile*** (*Amblystegium subtile*) (s-f)

Note: Mats of delicate pleurocarpous mosses on tree bark with erect capsules may be mixtures of other species, e.g. *A. serpens* without capsules and *Leskea polycarpa* with erect capsules!

4 Costa reaching leaf apex, often bent in upper third..... 5

– Costa reaching mid-leaf, straight..... 8

5 Costa very strong, mostly > 40 µm wide at leaf base, hardly narrower towards the tip, mostly reaching to leaf apex, often slightly bent in upper third; plants growing in or near water.....6
– Costa less strong, distinctly narrowed towards the tip, bent above or not; plants not aquatic but growing in moist or wet habitats.....7
6 Leaves narrowly rounded at apex; branch leaves widest at (1/4) 1/3–1/2 leaf length; stem little and irregularly branched; plants growing in lime-poor flowing water.....***Hygroamblystegium fluviatile*** (*Amblystegium fluviatile*) (r)
– Leaves distinctly acuminate at apex; branch leaves widest at 1/8–1/4 leaf length; stem often densely and pinnately branched; plants growing in base-rich or lime-rich flowing water.....***Hygroamblystegium tenax*** (*Amblystegium tenax*) (s-f)
7 Leaf cells at mid leaf rhombic or hexagonal, 2–4 times as long as wide; leaves distinctly widened in lower third and contracted at leaf base, often narrowed ± abruptly towards leaf tip; costa always with a distinct bend.....***Hygroamblystegium varium*** (*Amblystegium varium*) (s-f)
– Leaf cells at mid leaf often elongate; leaves not conspicuously contracted at their base, gradually narrowed towards the tip; costa not to at most slightly bent.....***Amblystegium serpens*** (cc)
8 Slender (to medium-sized) plants, leaves to 1 mm long; variable with regard to length of costa and length of lamina cells (from 2–3 to 4–6 times as long as wide).....***Amblystegium serpens*** (including the more robust var. *juratzkanum* with leaves denticulate at base) (cc)
– Medium-sized to robust plants, leaves > 1 mm long.....9
9 Leaves decurrent along stem.....***Pseudocampylium radicale*** (*Campylium radicale, Amblystegium radicale, A. saxatile*) (r)
– Leaves not decurrent along stem, distantly arranged along stem; leaf margin entire; leaves distinctly contracted at leaf base..***Hygroamblystegium humile*** (*Amblystegium humile*) (s-f)

Key to species of *Calliergon* s.l. (incl. *Straminergon*)

1 Plants almost unbranched; costa reaching 3/4 or slightly more of leaf length; stem leaves oblong, ± imbricate; alar cells in decurrent group ascending up margin; often with rhizoids at leaf apex..... ***Straminergon stramineum*** (*Calliergon stramineum*) (rr)

– Plants irregularly to regularly pinnate; costa extending nearly to leaf apex; stem leaves often patent; alar cells in large triangular group not ascending up margins..... 2

2 Alar cells often reaching costa, in a plane or slightly concave group, gradually differentiated from upper cells; leaves 2–3 times as long as wide; plants irregularly branched, erect, pale to dark green; autoicous..... ***Calliergon cordifolium*** (r)

– Alar cells very sharply differentiated, rarely reaching costa, in a strongly concave group; leaves shorter and broader; *ca* 1.5 times as long as wide; plants pinnately branched with turgid main stems and short, thinner branches, green, yellowish or brownish; dioicous..... ***Calliergon giganteum*** (rr)

Note: Depauperate plants may approach *C. cordifolium*.

Key to species of *Scorpidium*

– Plants turgid; stem leaves ovate to ovate-orbicular, strongly concave, apex acute or shortly acuminate; costa rarely reaching mid-leaf, often short and double or lacking..... ***Scorpidium scorpioides*** (rr)

– Plants not turgid; stem leaves ovate-lanceolate, falcate, moderately concave, longly acuminate; costa reaching to 1/2–2/3 leaf length..... ***Scorpidium cossonii*** (*Drepanocladus cossonii*) (rr)

Key to species of *Pseudoleskeella*

– Usually clusters of deciduous branchlets in axils of upper leaves; stem leaves from ± cordate base abruptly narrowed into acumen; costa reaching acumen; paracostal basal cells rectangular, more than twice as long as wide, other basal cells isodiametric..... ***Pseudoleskeella nervosa*** (c)

– Deciduous branchlets lacking; stem leaves ovate-lanceolate, evenly narrowed to acute apex; costa reaching to mid-leaf or 2/3 of leaf length; all basal cells isodiametric (paracostal basal cells at most twice as long as wide); shoots terete when dry..... ***Pseudoleskeella catenulata*** (s-f)

Key to varieties of *Abietinella abietina*
References: Düll-Hermanns (1981), Smith (2004)

– Stem leaves 1–1.4 mm long; branch leaves broadly ovate, shortly pointed, mostly < 1.2 mm long, length:width ratio < 2.1:1, mostly *ca* 1.8:1; mid-leaf cells of branch leaves 1–1.5 (2) times as long as wide; leaves appressed in the dry state..... var. ***abietina*** (c)
– Stem leaves 1.5–2 mm long; branch leaves from ovate base lanceolate, longly acuminate, mostly > 1.2 mm long, length:width ratio > 2.1:1, mostly *ca* 2.5:1; mid-leaf cells of branch leaves 1.5–3 times as long as wide; leaves patent when dry..... var. *hystricosa*
Note: The occurrence of var. *hystricosa* in Hungary is controversial (Erzberger and Papp 2020).

Key to species of *Thuidium*

1 Apical cells of branch leaves with 1 papilla..... ***Thuidium tamariscinum*** (s-f)
– Terminal cells of branch leaves with several apical papillae (often therefore appearing truncate or forked)..... 2
2 Costa of stem leaves reaching into leaf apex; apical leaf cells elongate; apex of stem leaves recurved; cells of paraphyllia with papillae apical (at the distal end of cells), appearing over cell wall; stem tip of well-developed plants curved, hook-like..... ***Thuidium recognitum*** (s-f)
– Costa of stem leaves ending below leaf apex; apical leaf cells short; tips of stem leaves erect; cells of paraphyllia with a centrally placed papilla; stem tip ± straight, not hooked..... 3
3 Stem leaves with a long, fine acumen, the apex consisting of 3–4 uniseriate elongate cells (easily broken off!), perichaetial leaves without cilia..... ***Thuidium assimile*** (*Thuidium philibertii*) (s-f)

– Stem leaves more shortly pointed, apex not uniseriate; perichaetial leaves ciliate..... ***Thuidium delicatulum*** (s-f)

Key to species of *Eurhynchium*

References: Cortini Pedrotti (2005), Hugonnot and Chavoutier (2024)
Note: Examine the best developed leaves from the middle of stems!

– Leaves 1.2–2 times as long as wide; leaf apex narrow, narrower than 200 µm at 200 µm below apex, margins forming an angle of 15–45°..... ***Eurhynchium striatum*** (s-f)
– Leaves 1.2–1.3 times as long as wide; leaf apex broadly pointed, wider than 200 µm at 200 µm below apex, margins forming an angle of 45–85°..... ***Eurhynchium angustirete*** (s-f)

Key to species of *Rhynchostegium*

1 Mid-leaf cells lax, 10–16 µm wide, 3–5 times as long as wide; leaves subrotund..... ***Rhynchostegium rotundifolium*** (s-f)
– Mid-leaf cells 4–10 µm wide, 6–17 times as long as wide..... 2
2 Leaves widely elliptical, concave, apex obtuse and apiculate; entire or denticulate only at apex; costa reaching mid-leaf; yellowish green to brownish, often silvery, glossy julaceous plants with dense leaves..... ***Rhynchostegium murale*** (s-f)
– Leaves ovate to elliptical, apex acute or acuminate; margin denticulate from base to apex..... 3
3 Leaf apex acute; dark green plants with long straight branches and broadly ovate leaves denticulate all around; stem and branch leaves similar; basal cells weakly differentiated; aquatic or subaquatic plants in and by streams..... ***Rhynchostegium riparioides*** (*Platyhypnidium riparioides*) (s-f)
– Leaf apex acuminate..... 4
4 Stem leaves from broadly ovate base ± abruptly contracted to long acumen, acumen often twisted; alar cells ascending up margins; plants pale green, irregularly pinnate..... ***Rhynchostegium megapolitanum*** (s-f)
– Leaf apex not longly acuminate, flat; alar cells not or slightly ascending up margins..... ***Rhynchostegium confertum*** (s-f)
Note: *R. confertum* bears a superficial resemblance to *Leptodictyum riparium*; however, that species is slightly larger and has entire leaves.

Key to species of *Cirriphyllum*

1 Costa reaching leaf apex or percurrent; apex often twisted through 180°..... ***Cirriphyllum flotovianum*** (*C. reichenbachianum, Sciuro-hypnum flotowianum, Eurhynchium flotowianum*) (s-f)

Notes: (i) The taxonomic placement of this species in Sciuro-hypnum was based on a misidentified specimen of *S. populeum* (Kučera and Müller 2025). (ii) *C. flotovianum* resembles *Sciuro-hypnum populeum* in habit, but can be distinguished from that species by the characters given in the Key to species of *Brachythecium* s.l. 3 & 5 (p. 215–216).

– Costa reaching upper third of leaf..... 2

2 Stem leaves more gradually narrowed to lanceolate acumen; costa ending in dorsal spine; crushed fresh plants with cucumber smell..... ***Cirriphyllum crassinervium*** (*Eurhynchium crassinervium*) (s-f)

– Stem leaves abruptly narrowed to filiform acumen; costa not ending in dorsal spine; crushed fresh plants without cucumber smell..... ***Cirriphyllum piliferum*** (s-f)

Key to species of *Oxyrrhynchium*

References: Limpricht (1904), Nyholm (1979), Touw and Rubers (1989), Hedenäs (1992, 2024), Nebel and Philippi (2001), Smith (2004), Cortini Pedrotti (2005), Atherton *et al.* (2010), Guerra and Orgaz in Guerra *et al*. (2018), Berg *et al.* (2025)

1 Primary stems rhizomatous, subterranean, with scale-like leaves; lamina cells 4–6 µm wide; leaf apex often twisted by 180°, alar cells in general reaching costa..... ***Oxyrrhynchium schleicheri*** (*Eurhynchium schleicheri*) (s-f)

– Stems not rhizomatous, not subterranean; lamina cells 5–9 µm wide; leaf apex flat; alar cells reaching costa or not..... 2

2 Stem leaves ovate to triangular lanceolate, gradually narrowed to apex, 1.5–2 mm long; branches with complanate, almost distichous leaves, very glossy; synoicous or autoicous, often with capsules; stem leaves longly, but often narrowly decurrent or not, recurved at base; costa reaching into leaf acumen, occasionally ending in dorsal spine; leaf cells (40) 60–90 (100) µm long; alar cells reaching costa or not..... ***Oxyrrhynchium speciosum*** (*Eurhynchium speciosum*) (r)

Note: *Rhynchostegium riparioides* is somewhat similar in habit, but distinguished by a smooth seta, if present.

– Stem leaves ovate to rounded ovate, heart-shaped or not, rather suddenly narrowed to apex, 1–1.4 mm long; plants decumbent, irregularly pinnate, to 10 cm long; leaves complanate or not; dioicous, rarely with capsules; stem leaves variously decurrent (shortly or longly, narrowly or broadly); costa reaching 1/2 to 3/4 (4/5) leaf length, usually ending in conspicuous dorsal spine; leaf cells (30) 40–60 (96) µm long; alar cells not reaching costa. ***Oxyrrhynchium hians*** s.l. (*Eurhynchium hians*) (cc).....3

3 Stem leaves concave, rarely slightly so, cordate or broadly ovate, ± strongly narrowed at insertion, above narrowed to a set-off and sometimes twisted acumen that constitutes 10–15 (30)% of leaf length, decurrent or long-decurrent, often broadly so; branch leaves evenly arranged around branch, 0.6–0.8 mm wide and 1.4–2 times as long as wide.....***Oxyrrhynchium hians*** s.str. (s-f)

Note: Frequency preliminary, perhaps more frequent. Forms of *O. hians* formerly named *Eurhynchium hians* var. *rigidum* (Boulay) Düll belong to this taxon.

– Stem leaves plane or at most slightly concave, mostly varying around ovate, rarely cordate, strongly narrowed at insertion or not, mostly gradually narrowed to acuminate apex, narrowly or very narrowly decurrent; branch leaves often complanate or sub-complanate, occasionally evenly arranged around branch, 0.2–0.5 (0.7) mm wide and 1.6–3 times as long as wide.....4

4 Branch leaf mid-leaf lamina cells relatively long and narrow, (32) 42.5–76 (101) × (3) 4–6 (7) µm, (6) 8–15 (20) times as long as wide; costa ending 40–70% way up leaf; almost exclusively on base-rich or calcareous rocks.....***Oxyrrhynchium distichum*** (rr)

Note: Probably more frequent.

– Branch leaf mid-leaf lamina cells relatively short and wide, (25) 32.5–63.5 (80.5) × (4) 5–8.5 (11.5) µm, (4) 5–11 (16) times as long as wide; costa ending 60–85% way up leaf, on various substrates.....***Oxyrrhynchium swartzii***

Note: Probably the most frequent taxon of the genus, but frequency insufficiently known.

Key to species of *Rhynchostegiella*

References: Nyholm (1965), Nebel and Philippi (2001), Berg *et al*. (2025)
Note: Small delicate plants of a *Rhynchostegiella*-like habit growing on bark or artificial stone away from water might be *Brachythecium tenuicaule* (*Rhynchostegiella tenuicaulis*, *Cirriphyllum germanicum*), see the note under *Brachythecium tommasinii*.

1 Leaves narrow lanceolate or more often linear-lanceolate, 6–10 times as long as wide, longly acuminate; margins entire (or very finely denticulate near apex only); cells of extreme leaf apex linear, elongate (except in lower leaves); costa reaching into leaf apex; lamina cells 10–20 times as long as wide; frequently with sporophytes, seta smooth; plants forming glossy, silky yellowish green mats.....***Rhynchostegiella tenella*** (s-f)

– Leaves more broadly lanceolate, 3–5 times as long as wide, bluntly pointed or acute, denticulate along margins; cells of extreme leaf apex short, 4:1; costa of variable length; seta rough 2

2 Mats dull dark green, costa reaching into leaf apex; leaf cells 5–7:1.....***Rhynchostegiella teneriffae*** (s-f)
Note: Some authors (e.g. Berg *et al.* 2025) distinguish the closely related species *Rh. jacquinii* and *Rh. teesdalei*, here placed under *Rh. teneriffae*

– Mats glossy, light green; costa reaching shortly above mid-leaf; leaf apex narrowly lanceolate; leaf cells 8–10:1; on sunny or sheltered, warm sandstone and limestone rocks.....
.....***Rhynchostegiella curviseta*** (rr)
Note: The seta is smooth in ***R. curviseta*** var. ***laeviseta*** (W.E. Nicholson and Dixon) Podp. (rr)

Key to species of *Homalothecium*

1 Costa reaching into leaf apex; seta smooth; stems prostrate or ascending, not attached to substrate with rhizoids; branches straight, not incurved when dry; leaf margin slightly denticulate all around; in appearance similar to *H. lutescens*.....
.....***Homalothecium philippeanum*** (s-f)

– Costa ending below leaf apex, extending to 9/10 leaf length, sometimes terminating in dorsal spine; seta papillose; leaf margin denticulate at leaf base or at apex.....2

2 Plants irregularly branched, rarely ± pinnate, to 15 cm long; stems usually loosely attached to substrate; branches straight; basal leaf cells porose, leaf margin irregularly finely denticulate or entire; capsules usually curved, endostome well developed; plants yellowish green..... ***Homalothecium lutescens*** (c)
Note: This species resembles somewhat *Brachythecium glareosum*, but is distinguished by porose basal lamina cells.

– Plants pinnately branched, stems creeping, attached to the substrate by rhizoids; branches incurved when dry; basal cells not porose, margins denticulate at base with some teeth recurved, entire above; capsules erect; endostome reduced, without cilia..... ***Homalothecium sericeum*** (c)

Key to species of *Brachythecium* s.l.
(incl. *Brachytheciastrum*, *Sciuro-hypnum, Cirriphyllum* pp.)
References: Berg *et al.* (2025), Kučera and Müller (2025), Szűcs and Homm (2027)

1 Leaves with sharply set-off, long and narrow acumen (hair point); stem leaves ovate or narrowly ovate; transition between leaf lamina and acumen short, but not abrupt; lamina cells 6–12 µm wide..... ***Brachythecium tommasinii*** (*Cirriphyllum tommasinii*) (s-f)
Note: *Brachythecium tenuicaule*, syn. *Cirriphyllum germanicum, Rhynchostegiella tenuicaulis*, was included in *B. tommasinii* according to Erzberger and Papp (2020) and therefore has perhaps been neglected. However, a recent collection from Hungary was identified as ***B. tenuicaule*** (rr) (Szűcs and Homm 2027). It differs from *B. tommasinii* by a smooth seta (papillose in *B. tommasinii*), smaller and more gradually pointed leaves, hardly concave and hardly plicate, and from some other species of the genus by a rostrate capsule lid and, as *B. tommasinii,* a dioicous sexual condition. It is impossible to distinguish *B. tenicaule* from *B. tommasinii* on the basis of gametophytic characters, since intermediate forms are frequent.

– Leaves more gradually narrowed upwards, or with broad apex 2

2 Costa long, ending at least 80% up the leaf..... 3

– Costa shorter, ending 50-70% up the leaf..... 6

3 Alar groups reaching costa; costa mostly percurrent; autoicous, sporophytes frequent; operculum conical; seta ± rough above, smooth below..... ***Sciuro-hypnum populeum*** (*Brachythecium populeum*) (s-f)

– Alar groups not reaching costa, small, marginal, costa not percurrent; seta rough..... 4

4 Leaves strongly plicate, stem leaves triangular or narrowly triangular-ovate, ± gradually narrowed towards apex; medium-sized plants; dioicous, sporophytes rare; operculum conical ..... ***Brachythecium geheebii*** (rr)

– Leaves plane, abruptly narrowed into apical portion; medium-sized or small plants; operculum conical or rostrate 5

5 Medium-sized plants; stem leaves not decurrent, abruptly narrowed into short acumen on average 3 cells wide, often twisted 180°; costa very stout in the lower part of the leaf, distinctly narrowing above, ending shortly below leaf tip or reaching into it; stems prostrate, branches irregular, ascending; operculum rostrate ..... ***Cirriphyllum flotovianum*** (*C. reichenbachianum, Sciuro-hypnum flotowianum, Eurhynchium flotowianum*) (s-f)

Notes: The taxonomic placement of this species in *Sciuro-hypnum* was based on a misidentified specimen of *S. populeum* (Kučera and Müller 2025).

– Small plants; stem leaves distinctly decurrent, abruptly narrowed towards narrow apical portion that is at least 250 µm long, not twisted; costa less stout; dry branches strongly curved; operculum conical ..... ***Sciuro-hypnum reflexum*** (*Brachythecium reflexum*) (rr)

6(2) Alar groups reaching costa; plants of moist or periodically wet environments ..... ***Sciuro-hypnum plumosum*** (*Brachythecium plumosum*) (r)

– Alar groups not reaching costa 7

7 Alar cells dilated, thin-walled and hyaline, forming a large, distinct, decurrent group; plants of moist or periodically wet environments ..... ***Brachythecium rivulare*** (s-f)

– Alar cells not inflated, alar group hardly decurrent; plants of usually dry habitats (except *B. mildeanum*) 8

8 Alar groups extending up along margin in a band or an ovate group 9

– Alar groups different 10

9 Dioicous, sporophytes rare; leaves erect and imbricate, therefore branches usually julaceous; margin of branch leaves entire or very finely denticulate; branch leaf costa smooth, rarely ending in an indistinct spine on abaxial side; seta smooth ..... ***Brachythecium albicans*** (c)

– Autoicous, sporophytes frequent; leaves erect to patent; margin of branch leaves distinctly to coarsely denticulate; branch leaf costa frequently ending in a distinct spine on abaxial side; seta at least partly rough ..... ***Brachythecium campestre*** (r)

10 Leaves ± distinctly plicate; plants large to medium-sized; alar groups small, marginal, mainly consisting of quadrate or rectangular cells; plants dioicous or autoicous 11

– Combination of character states different; plants autoicous 14

11 Median lamina cells 35–65 µm long; plants dioicous; margin of branch leaves denticulate to finely so; seta smooth or rough; costa ending in distinct or indistinct spine on abaxial side; leaves very strongly plicate, reminding of a *Homalothecium* 12

– Median lamina cells 40–150 µm long; plants autoicous or dioicous; margin of branch leaves almost entire to coarsely denticulate; seta smooth; costa ending in spine on abaxial side or not 13

12 Costa reaching 75–85 % up the leaf, very stout at leaf insertion; margin of branch leaves denticulate; seta rough (but sporophytes rare); median lamina cells 35–60 µm long; plants growing on base-rich, but not calcareous rocks ..... ***Brachythecium geheebii*** (rr)

– Costa reaching 50–75 % up the leaf; margin of branch leaves denticulate to finely so; seta smooth; median lamina cells 50–65 µm long; plants growing in dry calcareous habitats, on small stones at the ground, never on rock ..... ***Brachythecium laetum*** (rr)

13 Dioicous; costa smooth or rarely ending in a small spine on abaxial side; margin of branch leaves finely denticulate to almost entire; median lamina cells 40–130 µm long; stem leaves elongate-triangular, near apex with a long and narrow, often twisted piliferous portion; plants growing in dry calcareous habitats ..... ***Brachythecium glareosum*** (s-f)

– Autoicous; costa often ending in a distinct spine on abaxial side; margin of branch leaves distinctly to coarsely denticulate; median lamina cells 54–150 µm long; stem leaves triangular-ovate, near apex narrow but not piliferous; plants growing in base-poor to base-rich habitats ..... ***Brachythecium salebrosum*** (cc)

14(10) Stem leaves 0.35–0.6 (0.9) mm wide; plants small (to medium-sized); alar groups small, marginal, mainly consisting of quadrate to rectangular cells, distinctly delimited; branch leaf spine of costa and prorate cell ends of costa strong, rarely absent 15

– Stem leaves wider; plants large; alar groups indistinctly delimited 16

15 Seta smooth; some lamina cells distinctly prorate ..... ***Brachytheciastrum olympicum*** (r)

– Seta rough; lamina cells of stem leaves hardly prorate, of branch leaves prorate ..... ***Brachytheciastrum velutinum*** (*Brachythecium velutinum*) (cc)

16 Seta smooth; costal spine absent or rarely present and very weak 17

– Seta rough or partly rough 18

17 Leaf margin entire or finely denticulate; alar cells regularly rectangular; median lamina cells of stem leaves 8–13 µm wide; rarely with sporophytes; plants of moist habitats ..... ***Brachythecium mildeanum*** (s-f)

– Leaf margin denticulate; alar cells quadrate to short rectangular; median lamina cells 7–9 µm wide; capsules often inclined; often with sporophytes; plants growing in soft, mostly dense, but usually small turfs, with erect shoots, in open deciduous forests in calcareous areas ..... ***Brachythecium capillaceum*** (r)

18 Branches often complanate; costal spine relatively strong; seta rough above, smooth below; leaf margin strongly denticulate; plants growing in different types of forest, on forest litter, humus-rich soil and soil-covered stones and rocks, sometimes even on rotting wood; also in spruce plantations ..... ***Sciuro-hypnum curtum*** (*Brachythecium curtum, B. oedipodium* auct.) (r)

– Branches not complanate; costal spine absent or occasionally present and very weak; seta completely and conspicuously rough; leaf margin denticulate; common plants of nutrient-rich habitats with very wide ecological amplitude ..... ***Brachythecium rutabulum*** (cc)

Key to species and varieties of *Hypnum* s.l. (incl. *Buckia, Jochenia*)

1 Alar cells increasing in size towards leaf base, 12–20 µm wide; medium sized plants 2

– Alar cells homogeneous, of equal size, hardly > 10 µm in diameter; small plants 6

2 Plants pale to whitish green; complanately ± regularly pinnately branched; leaves weakly to strongly curved, margins mostly denticulate in upper half, in particular the branch leaves; alar cells yellowish, forming excavate auricles, somewhat decurrent; growing mostly on acidic soil ..... ***Hypnum jutlandicum*** (r)

– Plants (light) green, golden yellow or brown; branching laxly pinnate to irregular, not complanate; other characters variable 3

3 Plants light green, never brownish; capsule lid mostly with mamilla, not rostrate, but sporophytes rare; leaves always distinctly falcate, even when growing on vertical surfaces, distinctly denticulate towards apex; plants smaller than typical *H. cupressiforme* ..... ***Hypnum andoi*** (rr)
Notes: (i) Probably more widespread, only recently discovered. (ii) The mamillate capsule lid is perhaps an unreliable character (J. Kučera, pers. comm.)

– Plants green, yellow green or brown; capsule mostly with distinct beak, sporophytes mostly frequent; leaves straight to weakly falcate, even when growing on vertical surfaces, denticulate only at apex, rarely down to mid-leaf; plants irregularly pinnate, variable; growing mostly on bark and rock ..... ***Hypnum cupressiforme*** 4

4 Plants complanate, branches usually less wide than principal stem 5

– Plants not complanate, in general julaceous, branches as wide as the principal stem, mostly robust plants with ovate-lanceolate to linear-lanceolate, ± concave leaves ..... ***Hypnum cupressiforme*** var. ***lacunosum*** (s-f)

5 Plants usually forming mats, leaves mostly strongly falcate, usually turned towards the substrate; alar group slightly to strongly excavate ..... ***Hypnum cupressiforme*** var. ***cupressiforme*** (cc)

– Plants usually forming wefts, leaves ± straight or slightly falcate, usually oriented away from the substrate, shoots often slightly julaceous; alar group conspicuous, strongly excavate, alar cells incrassate, often brownish..... ***Hypnum cupressiforme*** var. ***subjulaceum*** (n.s.)

6 Leaves ovate, rather abruptly narrowed to the acumen, concave; dioicous; plants julaceous, often erect, in yellowish green to brownish green mats; on calcareous rocks..... ***Buckia vaucheri*** (*Hypnum vaucheri*) (s-f)

– Leaves ovate-lanceolate, gradually and longly acuminate; autoicous, often with capsules; leaves weakly falcate, denticulate all around, in particular branch leaves; alar groups fairly distinct; capsule erect or curved, lid rostrate; plants pale green, 2–4 cm long; on tree bases and tree trunks..... ***Jochenia pallescens*** (*Hypnum pallescens* var. *reptile*) (s-f)

Notes: (i) The rejection of Jocheniaceae in the checklist (Erzberger and Papp 2020) was based on an erroneous concept of *J. pallescens* believed to include the alpine *J. protuberans*. See Berg *et al*. (2025). (ii) *J. protuberans* might perhaps also be expected in more montane parts of Hungary. It differs from *J. pallescens* by patent, straight to weakly curved branch leaves.

Key to species of *Taxiphyllum*

– Costa short, double, ceasing before mid-leaf, rarely not developed; leaves ± complanate, slightly concave; plants to 1 cm long, pinnately branched, attached to the substrate by rhizoids; with a cucumber smell..... ***Taxiphyllum wissgrillii*** (s-f)

– Leaves without costa; leaves not complanate, strongly concave; plants more robust, glossy, julaceous, to 2 cm long; hardly attached to the substrate by rhizoids; not smelling like cucumber..... ***Taxiphyllum densifolium*** (s-f)

Key to species of *Calliergonella*

– Leaves straight, ovate or elongate-ovate, above suddenly narrowed to a rounded, occasionally apiculate apex; stem and branch tips pointed due to closely imbricate leaves..... ***Calliergonella cuspidata*** (c)

– Leaves ± falcate-secund, longly and gradually tapering from an ovate or elongate-ovate base to a narrow or occasionally obtuse apex; stem and branch tips not pointed.....***Calliergonella lindbergii*** (*Hypnum lindbergii*) (s-f)

Key to species of *Rhytidiadelphus*
Reference: Ellis *et al*. (2021a)

– Stem leaves falcato-secund, not squarrose; alar cells lacking; shoot tips hooked.....***Rhytidiadelphus loreus*** (rr)
– Stem leaves squarrose; alar cells differentiated, hyaline or orange-brown coloured; shoot tips not hooked.....***Rhytidiadelphus squarrosus*** (s-f)

Key to species of *Neckera* s.l. (incl. *Alleniella, Exsertotheca*)
References: Nyholm (1960), Cortini Pedrotti (2005)

1 Leaves transversely undulate.....3
– Leaves plane, not transversely undulate.....2
2 Leaf apex rounded, rarely obtuse; leaves 0.3–0.6 mm long; mid leaf cells 8–25 µm long.....***Alleniella besseri*** (*Homalia besseri*, *Neckera besseri*) (s-f)
– Leaf apex obtuse to very shortly acuminate, apiculate; leaves 1.5–2 mm long; mid leaf cells 20–60 µm long.....***Alleniella complanata*** (*Neckera complanata*) (s-f)
3 Leaf margin narrowly recurved from base to apex, at least on one side, broadly incurved in basal part on other side; plants small, mostly to 2–3 cm (5 cm) long; often with filiform small-leaved flagelliform caducous branches; dioicous, sporophytes rare, exserted.....***Neckera pumila*** (n.s.)
– Leaf margin broadly incurved on one side at leaf base, otherwise flat, not narrowly recurved; plants medium-sized to robust, 3–20 cm long; flagelliform branches rare; autoicous or dioicous, sporophytes immersed or exserted.....4
4 Leaves gradually tapering from mid-leaf to sharp tip; plants medium-sized, 3–5 (10) cm long, leaves to 2.5 mm long; nearly exclusively epiphytic; autoicous, capsules immersed, but rare in Hungary.....***Neckera pennata*** (s-f)

– Leaves ± parallel-sided for most of their length, abruptly tapering to short, obtuse tip; plants robust, 5–20 (30) cm long, leaves 2.5–4 mm long; mostly saxicole, more rarely epiphytic; dioicous, sporophytes rare, capsule exserted.....
.....***Exsertotheca crispa*** (*Neckera crispa*) (s-f)

Key to species of *Thamnobryum*
References: Mastracci (2003), Ellis *et al*. (2022)

– Branch leaves distinctly concave and glossy, with a short and coarsely dentate apex; shoots unbranched or irregularly branched; submarginal cells not elongate.....
.....***Thamnobryum neckeroides*** (r)
– Branch leaves plane, with an elongate and dentate apex; shoots dendroid; submarginal cells elongate, sharply delimited from the other lamina cells towards the costa.....
.....***Thamnobryum alopecurum*** (s-f)

Key to species of *Isothecium*

– Margins denticulate to below mid-leaf; branch leaves longly and finely pointed; branching ± dendroid.....
.....***Isothecium myosuroides*** (r)
– Margins entire or denticulate only towards apex; branch leaves shortly pointed, ovate-oblong to broadly lanceolate, apex obtuse, acute or shortly apiculate; leaves concave, appressed.....
.....***Isothecium alopecuroides*** (c)

Key to species of *Anomodon* s.l. (incl. *Pseudanomodon, Claopodium*)

1 Leaves narrowed to an attenuate apex; leaf cells unipapillose or pluripapillose.....2
– Leaf apex broad or narrow, obtuse or bluntly pointed; leaf cells pluripapillose.....3
2 Leaf terminating in a long, hyaline, uniseriate point; lamina cells pluripapillose.....
.....***Claopodium rostratum*** (*Anomodon rostratus*) (s-f)
– Leaf not terminating in uniseriate hyaline point; lamina cells unipapillose.....***Anomodon longifolius*** (s-f)

3 Leaf apex triangular-acuminate, denticulate; plants often with attenuate (progressively smaller leaved) branches.....***Pseudanomodon attenuatus*** (*Anomodon attenuatus*) (c)

– Leaf apex rounded or apiculate, entire.....4

4 Leaf base decurrent, irregularly tearing when removed; papillae only on the outer side of the leaf base; leaves gradually narrowed to tapering apex, homomallous, robust plants, to 10 cm long.....***Anomodon viticulosus*** (c)

– Leaf base auriculate; auricles rounded, all of their margin with high, partly branched papillae; leaves abruptly contracted from broadly oval base to an almost linear, lingulate, paralell-sided apex, not homomallous; slender plants, to 5 cm long.....***Anomodon rugelii*** (rr)

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GLOSSARY – ENGLISH

Most of the definitions of this glossary are compiled from the following treatments: Magill (1990), Malcolm and Malcolm (2000), Frey *et al.* (2006), Damsholt (2002), Paton (1999), Smith (1978, 2004), Watson (1981). See also the next chapter 'Glossary – Hungarian (Alaktani kifejezések)' for Hungarian definitions.

English term	Hungarian term	Definition
abaxial	**abaxiális**	side away from stem or axis; back, dorsal, or lower surface of leaf or costa (opposed to adaxial)
acidophilous	**mészkerülő**	acid-loving, preferring an acid habitat, growing on substrata that are acid in reaction; see calcifuge
acrocarpous	**akrokarp**	(applied to mosses) refers to the production of archegonia and later sporophytes at the apices of the main stems; the main stems are usually erect, tufted and sparingly branched; e.g. *Polytrichum*
acumen (pl. acumina)	**kihegyesedő levélcsúcs**	a slender, tapering point; e.g. *Amblystegium serpens*
acuminate	**kihegyezett**	slenderly tapered with an angle of less than 45°; e.g. leaf tip of *Homalothecium sericeum*
acute	**hegyes**	sharp pointed, with terminal angle less than 90° but greater than 45°; e.g. leaf tip of *Eurhynchium angustirete*
adaxial	**adaxiális**	side towards stem or axis; ventral or upper surface of a leaf or costa (opposed to abaxial)
adventive thalli	**járulékos telepek**	lateral thalli, e.g. in *Metzgeria*, which break away and form a means of asexual reproduction
air-chamber	**légkamra**	specialized internal air-containing cavity connected to a pore common in most complex thalloid liverworts, e.g. Marchantiales
air-pore	**légzőpórus**	opening to air-chambers in the upper surface of some marchantialean liverworts; e.g. *Conocephalum conicum*; see pore

alar cells	**sarki sejtcsoport**	referring to cells at basal margins (angles) of a leaf; these cells are often differentiated in size, shape or color from other leaf cells, e.g. *Dicranum*; see auricle
alveola (pl. alveolae)	**alveola**	a depression, e.g. on the surface of a spore; see also areola
androecium	**hímtáj**	antheridia and surrounding leaves (perigonium), the male inflorescence; see gynoecium, gametoecium
angulate	**szögletes**	angled, having angles or corners; e.g. gemmae of *Diplophyllum* species
annulus (pl. annuli)	**gyűrű**	in stegocarpous mosses a zone of variously differentiated cells between the capsule urn and operculum, facilitating opening of the capsule; see valve
antheridium (pl. antheridia)	**antheridium**	male gametangium; a multicellular globose to broadly cylindric, stalked structure containing spermatozoids
antical	**antikális**	the dorsal surface of a horizontal stem; the leaf margin oriented towards the shoot apex of a longitudinal or obliquely inserted leaf (opposed to postical)
aperture	**nyílás**	an opening or hole; e.g. on the dorsal surface of the thallus in species of *Pellia* s.l., enabling spermatozoids to exit
apical	**apikális**	at apex, summit or point of a structure
apical lamina (pl. laminae)	**apikális levéllemez**	in *Fissidens* the part of the leaf above or distal to the vaginant laminae
apiculus (pl. apiculi)	**szálkahegy** (1)	a short, abrupt point (1) of a capsule; e.g. *Physcomitrium patens*; or (2) of a leaf apex, often without involvement of a costa; e.g. *Rhynchostegium murale* (see mucro)
apophysis (pl. apophyses)	**apofízis**	a strongly differentiated, sterile neck at the base of a capsule, between seta and urn; e.g. *Polytrichum* (see neck)

appendiculate	**függelékes**	with short, thin, transverse projections; e.g. *Ptychostomum imbricatulum* endostomial cilia (see nodulose)
archegonium (pl. archegonia)	**archegónium**	female gametangium or sex organ; a multicellular, flask-shaped structure consisting of a stalk, venter, neck and containing an ovum
arcuate	**ívelt**	curved; e.g. seta of *Microbryum curvicollum*
areola (pl. areolae)	**areola**	small angular or polygonal surface area differing in colour or structure from the surrounding area, forming a pattern or network; e.g. air-chambers on a thallus; see also alveola
areolation	**sejthálózat**	the cellular network of a leaf or thallus; see lamina cell
ascending	**felemelkedő**	pointing obliquely upward, away from the substrate; e.g. shoots of *Lophozia ascendens*
attenuate	**elkeskenyedő**	slenderly tapering; e.g. shoot tips of *Pseudanomodon attenuatus*
auricle	**fülecske**	a small, ear-like lobe; often present at the basal margins of leaf in mosses; e.g. *Climacium* (see alar cells)
autoicous	**autooikus**	with archegonia and antheridia in separate clusters on the same plant (see synoicous, paroicous, dioicous, monoicous, sexual condition) [the suffix "-oecious" strictly applies only to sporophytic or diploid sexuality, and thus is inapplicable to bryophytes; however, it is nonetheless frequently employed (autoecious) as an alternative spelling and pronounciation to "-oicous"]
axil	**hónalj**	the upper angle formed by the axis and any organ that arises from it; e.g. leaf and stem, stem and branch
axillary hair	**hónalji szőr**	hair in the leaf axils; e.g. in species of *Didymodon*
axis (pl. axes)	**tengely**	the main stem; a conceptual line around which structures (leaves, branches, etc.) develop

basal	**alapi**	at the base, bottom or proximal end (opposed to terminal or distal); see also lateral
basal cell(s)	**levélalapi sejt**(ek)	cells at the base; (1) in leaves, frequently differentiated cells of the lower 1/4–1/3 of a leaf (see lamina cells); (2) cell at point of attachment of an axillary hair
basal membrane	**alapi membrán**	a short tube or cylinder often supporting segments and cilia of the endostome; e.g. *Bryum*; or teeth of the haplolepidous peristome; e.g. *Tortula*
biconvex	**bikonvex**	convex on both sides, e.g. the costa of *Schistidium teretinerve*
bifurcate, furcate	**villás**	Y-shaped or forked; stems or thalli divided into two ± equal parts; characteristic of some liverworts, e.g. *Metzgeria*; also used to describe the shape of papillae, e.g. *Syntrichia subpapillosissima*
bilobed	**kétkaréjú**	divided into two lobes or segments; e.g. underleaves of *Lophocolea* species
bistratose	**kétrétegű**	composed of two cellular layers; e.g. leaf blades of *Diphyscium foliosum* that are two cells thick
border	**szegély**	cells along a leaf margin that differ from other leaf cells in their shape, size, colour, or wall thickening, sometimes forming a pluristratose structure; e.g. in *Fissidens bryoides*; see limbidium
bract	**buroklevél**	a modified leaf associated with a gametangium or gemma-cup (see perichaetial leaf, perigonial leaf)
brood body	**szaporítótest**	any structures that function as asexual propagules such as gemmae, bulbils, tubers or reduced branches or leaves
bulbil	**rügytest**	vegetative propagule; a small, deciduous, bulb-like axillary propagulum; e.g. *Bryum bicolor*

caducous	**lehulló**	easily or soon falling away; e.g. bulbils of species of *Bryum* and *Pohlia*, leaves or shoot tips of species of *Campylopus*, leaves of *Dicranodontium denudatum*; see deciduous, fugacious
calcicole, calcicolous	**meszes helyen élő**	growing nearly exclusively in calcareous habitats, as on dolomite and limestone, calcareous sand and sandstone; see calciphilic
calcifuge	**mészkerülő**	avoiding calcareous habitats, see acidophilous
calciphilic	**mészkedvelő**	favouring calcareous habitats, as on dolomite and limestone; see calcicole
calyptra (pl. calyptrae)	**süveg**	a membraneous covering of haploid tissue over the developing sporophyte, derived from the archegonial venter; in mosses the venter generally ruptures near the base, is carried upwards by elongation of the seta, and frequently expands to form a protective covering over the capsule
campanulate	**harang alakú**	bell-shaped; e.g. calyptrae of many Orthotrichaceae; see also mitrate, cucullate
canaliculate	**árkolt**	channelled (lengthwise); U-shaped in cross section; e.g. leaves of *Grimmia tergestina*, thalli of *Riccia canaliculata*; see keeled
capitulum (pl. capitula)	**fejecske**	head; shoot tip ending in a dense cluster of young branches; e.g. *Sphagnum*
capsule	**tok**	the sporangium; terminal spore-producing part of the sporophyte; in most mosses it is differentiated into an apical operculum, central urn (spore-bearing region) and a sterile basal neck or apophysis; in most liverworts and hornworts it is a uniform structure containing spores and elaters and usually opens by splitting into 4 (or 2) valves

central strand	**központi sejtköteg**	a small group of elongate cells forming a central axis of some stems and thalli, usually colored and thin-walled in transverse section; e.g. *Grimmia pulvinata*
cernuous	**bókoló**	nodding or drooping, orientation of a capsule with its longitudinal axis intermediate between horizontal and pendulous; e.g. *Pohlia nutans*
channelled	**csatornás**	hollowed out like a gutter and semicircular in cross section (see keeled)
chlorenchyma	**klorenchima**	assimilating tissue composed of cells containing chloroplasts
chlorocyst	**klorocita**	green, chloroplasts containing cell; generally used in contradistinction to hyalocysts; e.g. leaves of *Sphagnum, Leucobryum*
ciliate	**pillás**	fringed with hair-like appendages; e.g. perichaetial leaves of *Hedwigia ciliata*; see laciniate
cilia (pl.)	**ciliák** (többes szám)	a delicate hair- or tooth-like structure fringing a leaf, thallus or other structure, or alternating with the processes of the inner peristome (endostome); e.g. in the perichaetial leaves of *Hedwigia ciliata*
clavate	**bunkó alakú**	thickened towards the apex; club-shaped; e.g. perianths of *Gymnocolea inflata*
collenchymatous	**kollenchimatikus**	cell network with cell walls more heavily thickened at the (leaf or exothecial cell) angles; e.g. *Aulacomnium palustre*; see trigones
columella	**kolumella**	the central column of sterile tissue in the sporogenous region of a capsule in most mosses and hornworts
comal tuft	**levélrozetta**	a tuft of crowded, enlarged leaves at tip of stem or branch; e.g. species of *Rhodobryum*
complanate	**lapított**	flattened or compressed, such as leaves flattened into more or less one plane; e.g. perianth of *Radula complanata*

compressed	**összenyomott**	flattened; e.g. perianth of *Radula complanata*
concave	**homorú**	having an outline or surface curved like the interior of a circle or sphere
concolorous	**hasonló színű**	said of two or more parts of structures that have the same colour; e.g. median and basal lamina cells of *Ptychostomum pallens*; opposite: discolorous
conduplicate	**hosszában összehajtott**	strongly folded longitudinally along the middle; e.g. the leaves of *Fontinalis antipyretica* or the sheathing part of the leaves of *Fissidens;* in liverworts like *Scapania* short for bilobed-conduplicate, one lobe folded over the other
conical	**kúp alakú**	cone-shaped; e.g. operculum of *Brachythecium rutabulum*
connivent	**ívesen összehajló**	directed or pointing together, though not fused, as the tips of leaf lobes inclined and converging towards one another; e.g. *Fuscocephaloziopsis lunulifolia*
convex	**domború**	having an outline or surface curved like the exterior of a circle or sphere
cordate	**szívalakú**	heart-shaped, said of leaves attached at the broad end; e.g. *Calliergon cordifolium*
cortex (adj. cortical)	**kéreg**	the outer layer of cells of the stem, surrounding the medulla; e.g. the translucent stem cortex of *Cephalozia* species
corticolous	**kéreglakó**	growing on bark; e.g. most of Orthotrichaceae species; see also saxicolous, terricolous
costa (pl. costae)	**levélér**	nerve of a moss leaf, always more than one cell thick, formed by cells differing from lamina cells; see also midrib (used for liverworts, e.g. *Metzgeria*)
costate	**eres**	having a nerve (costa), e.g. leaves of most mosses; opposite: ecostate
crenulate	**csipkézett**	with minute rounded teeth; e.g. leaf margin of *Fissidens taxifolius*

crispate, crisped	**fodros**	wavy; often used more loosely to mean variously curled, twisted and contorted; e.g. dry leaves of *Ulota crispa* s.l.
cryptopore	**rejtett pórusú**	having immersed stomata, with the guard cells sunken below level of the exothecial cells and often ± covered by them; e.g. species of *Orthotrichum* (opposed to phaneropore); see also immersed
cucullate	**csuklyás**	hooded or hood-shaped; a calyptra split along one side only; e.g. *Entosthodon fascicularis*; see also mitrate, campanulate; also used to describe leaves strongly concave and erect or inflexed at the tips, like a monk's cowl; e.g. *Trichostomum crispulum*
cuneate (cuneiform)	**ék alakú**	wedge-shaped; e.g. exothecial cells of *Entosthodon hungaricus* in cross section
cuspidate	**hirtelen kihegyezett**	ending abruptly in a stout, rigid point
cuticle	**kutikula**	an extracellular wax-like layer on the epidermis of most liverworts, leaves or stems, setae and capsules of mosses and capsules of hornworts
cygneous	**hattyúnyak-szerűen ívelt**	curved like a swan's neck; e.g. seta in many species of *Campylopus, Grimmia pulvinata*
cylindrical, terete	**henger alakú, hengeres**	elongate and circular in transverse section; e.g. capsules of species of *Encalypta* or *Syntrichia*
deciduous	**lehulló**	falling off, see caducous, fugacious
decumbent	**elfekvő** (1)	with stem prostrate, but with ascending tips; e.g. *Lophozia ascendens, Oxyrrhynchium hians*
decurrent	**lefutó**	with basal leaf margins extending down the stem past the leaf insertion as ridges or narrow wings; e.g. *Plagiomnium undulatum*

dehiscent	**felnyíló**	referring to the capsule opening regularly by means of an annulus and operculum (many mosses) or valves (hornworts, liverworts, *Andreaea*) (opposed to indehiscent)
dendroid	**fa alakú**	having a growth habit like a tree, e.g. *Climacium dendroides*
dentate	**fogazott**	strongly toothed, teeth usually composed of one or more cells, e.g. leaf margin of *Plagiomnium affine*
denticulate	**finoman fogazott**	finely toothed (see dentate; subjectively distinct); e.g. leaf margin of *Pterigynandrum filiforme*
deoperculate	**fedő nélküli**	referring to capsule after the operculum has fallen
dextrorse	**jobbra csavarodott**	forming a right-handed helix (like in a normal screw); e.g. twist of seta of *Racomitrium canescens* (opposed to sinistrorse)
dimorphic	**kétalakú**	occurring in two forms; e.g. stem and branch leaves of *Kindbergia praelonga*
dioicous	**kétlaki**	with archegonia and antherida on separate plants, see also autoicous, synoicous, paroicous, monoicous, sexual condition ('dioecious' – see note after autoicous)
diplolepidous	**kettős perisztómiumú**	peristome type usually consisting of a double ring of teeth, the exostome and the endostome; e.g. *Hypnum cupressiforme*; see haplolepidous
discoid	**tányérszerű**	flattened into a plate or disk; e.g. gemmae of *Marchantia polymorpha*
discolorous	**eltérő színű**	said of two or more parts or structures that differ in colour; e.g. the reddish basal cells of *Ptychostomum pseudotriquetrum*, which differ from median lamina cells; opposite: concolorous
distal	**disztális**	away from the base or point of attachment; towards the apex of a leaf or stem; the outer, convex face of a spore (opposed to proximal)
distichous	**kétsoros**	leaves alternating in two opposite rows; e.g. *Fissidens, Distichium*

divergent	**szétálló** (1)	spreading from a point of attachment; e.g. lobes of underleaves of *Lophocolea*
dorsal	**dorzális**	of leaves: the abaxial, back or lower surface; of peristome teeth: the outer face; (of horizontal stems or thalli) the upper surface, away from the substrate (opposed to ventral); see also antical (liverworts with conduplicate leaves)
dorsal lamina (pl. laminae)	**dorzális levéllemez**	part of the leaf blade opposite the sheathing base, extending from the base to the apex; e.g. *Fissidens*
echinate	**tüskés** (2)	with stiff bristles; e.g. spore surface of *Physcomitrium patens, Microbryum davallianum* s.str.
ecostate	**ér nélküli**	without a costa; e.g. leaves of *Hedwigia* species; opposite: costate
edentate	**fogak nélküli**	without teeth; i.e. entire leaf margins; e.g. *Tortula lindbergii*
elater (pl. elateres, elaters)	**elatera**	a differentiated elongate cell, dead at maturity and normally with one to three helicoidal wall thickenings, found interspersed among the spore mass in most liverwort capsules; function: to break up the spore mass and subsequently help disperse the spores
ellipsoidal	**ellipszoidális**	a solid that has an elliptical outline; e.g. gemmae of *Scapania*
elliptical	**elliptikus**	oblong with convex sides and acute or obtuse ends; e.g. leaves of *Jungermannia pumila*
elongate	**hosszúkás** (1)	stretched out; e.g. linear; see oblong
emarginate	**kicsípett**	broadly notched at the apex (compare with retuse, less deeply notched); e.g. leaves of *Marsupella funckii* or apical leaves of *Lophocolea heterophylla*

emergent	**kiemelkedő**	partially exposed, referring to capsules or perianths only partly projecting beyond the tips of perichaetial leaves; e.g. capsule of *Tortula protobryoides* (see exserted, immersed)
endostome	**endosztómium**	the inner circle of a diplolepidous peristome, formed from contiguous periclinal wall-pairs of the primary and inner peristomial layers; typically a weak membraneous structure consisting of a basal membrane bearing segments (processes) and cilia; the endostome is homologous with the haplolepidous peristome
entire (1)	**épszélű**	without teeth; ± smooth on the margin; refers to leaves (e.g. *Drepanocladus aduncus*) or other structures; e.g. perianth mouth (*Scapania scandica*)
entire (2)	**tagolatlan**	not divided into lobes, refers to leaves (e.g. *Jungermannia*), underleaves (e.g. *Nardia*), peristome teeth (e.g. *Encalypta ciliata*) or other structures
epapillose	**papilla nélküli**	without papillae; e.g. lamina of most species of *Schistidium* or *Grimmia*; opposite: papillose
ephemeral	**efemer**	short-lived; refers to an organism which completes its life cycle in a single season
epidermis (adj. epidermal)	**epidermisz**	the outer cell layer of a stem, capsule or thallus
epilose	**szőrtelen**	lacking hairs or a hair point, opposite: piliferous, hairy
epiphragm (pl. epiphragmata)	**epifragma**	in Polytrichaceae: a circular membrane formed by the expanded tip of the columella and attached to the ends of the peristome teeth; it partially closes the mouth of the capsule after the lid has dropped away; similar structure in *Weissia brachycarpa, W. condensa, W. rostellata*
epiphyte	**epifiton**	a plant growing on another plant; e.g. species of *Lewinskya*

erect	**felálló**	(1) with leaves directed toward stem apex; e.g. leaves of *Brachythecium albicans*; (2) with capsules straight, not curved; e.g. *Leskea polycarpa*
erecto-patent	**fel- és elálló**	spreading at an angle of 45° or less; e.g. leaves of *Pohlia* or *Bryum* s.l. species (see spreading, patent)
erose	**szabálytalanul fogazott**	ragged or irregularly notched as if gnawed by an animal; e.g. apical leaf margin of *Didymodon sinuosus*
excurrent	**kilépő**	extending beyond the apical margin; e.g. an awn formed by a protruding costa as in *Fissidens taxifolius*
exostome	**exosztómium**	the outer circle of a diplolepidous peristome; missing or rudimentary in haplolepidous peristomes
exothecial cells	**exotheciális sejtek**	cells of the outermost layer of the capsule wall, forming the capsule epidermis
exserted	**kiálló**	projecting and exposed; e.g. capsules or perianths held clear of the tips of perichaetial leaves; e.g. capsule of *Ceratodon purpureus* (see emergent, immersed)
falcate	**sarló alakú**	curved like the blade of a sickle; e.g. leaf of *Drepanocladus aduncus*
falcate-secund	**sarlósan görbült**	strongly curved and turned to one side; e.g. leaves of *Paraleucobryum longifolium*
fascicle	**köteg**	a group, cluster or bundle of branches; e.g. branches in *Sphagnum*
fertile	**termő**	stems, branches or thalli producing sex organs (antheridia, archegonia), opposite: sterile
fibril	**rost**	fine, fiber-like wall thickenings, spiral or annular, in hyalocysts of *Sphagnum*
fibrillose	**rostos**	with fine, fiber-like wall thickenings (fibrils), applied to *Sphagnum* hyalocysts
filament	**filamentum**	a single row of cells attached end-to-end, long and sometimes branched; e.g. gemmae of *Ptychostomum moravicum*

filiform	**fonalszerű**	slender and elongate, filamentous, thread-like; e.g. gemmae of *Ptychostomum moravicum*
flagelliform branch	**ostorszerű ág**	refers to a long, thin shoot with small (reduced) leaves, functioning as a means of asexual propagation; e.g. in *Pseudo-taxiphyllum elegans*
flexuose	**kanyargós**	slightly and irregularly bent, twisted, or wavy; e.g. leaves of *Leptobryum pyriforme*
foliose (1)	**leveles**	leafy, with leaves; e.g. leafy liverworts; opposite: thallose
foliose (2)	**levélszerű**	leaf-like, e.g. pseudoparaphyllia of *Brachythecium rutabulum*
fugacious	**eltűnő**	vanishing (e.g. oilbodies of *Lophozia* and many other liverworts) or readily falling away (see caducous, deciduous)
furrowed	**barázdált**	grooved; describes (1) strongly plicate capsule walls with deep longitudinal furrows and ridges; e.g. in *Ulota crispa*; see also plicate, sulcate; (2) plicate leaves; e.g. in *Grimmia montana*; (2) the end cells of the assimilating lamellae in *Polytrichum commune* as seen in cross section
fusiform	**orsó alakú**	spindle-shaped, narrow (more than 3 times as long as wide) and tapered at both ends; e.g. ripe capsule of *Ulota bruchii*
gametangium (pl. gametangia)	**ivarszerv**	vessel bearing gametes; e.g. archegonium, antheridium
gametoecium (pl. gametoecia)	**gametöcium**	gametangia and surrounding leaves (see androecium, gynoecium)
gametophyte	**gametofiton**	the haploid, sexual generation producing gametes; in bryophytes, the dominant generation represented by thallose or leafy fully developed plants; see also sporophyte
geminate	**kettős**	arranged in pairs; e.g. the marginal teeth in *Mnium*

gemma (pl. gemmae)	**sarjtest**	uni- or multicellular, filamentous, globose, ellipsoidal, cylindrical, stellate or discoid brood body, relatively undifferentiated, serving in vegetative reproduction
gemma cup	**rügykosárka**	cup-shaped, gemmae-containing structure of thalline (e.g. *Marchantia*) or foliar (e.g. *Tetraphis*) origin, presumably structured to aid in distribution of gemmae by water splash (splash-cup)
gemmiferous, gemmiparous	**rügyképző**	bearing gemmae; e.g. leaves of *Radula complanata*
gibbous	**dudoros**	swollen or bulging on one side; e.g. capsule of *Leptobryum pyriforme*
glabrous	**sima**	smooth, not papillose, rough or hairy; e.g. calyptra of *Encalypta vulgaris*
globose	**gömb alakú**	spherical; e.g. gemmae of *Grimmia hartmanii*
guard cells	**zárósejtek**	(1) the specialized inflatable epithecial cells surrounding a moss or hornwort stoma, usually paired and kidney-shaped (in some species of the moss family Funariaceae only a single cell with a central slit-like opening); (2) the cells surrounding air-pores in the epidermis of thallose liverworts
guide cells	**euriciták**	large, highly vacuolated, thin-walled and longitudinally arranged cells found in a median layer across the costa of many mosses; e.g. guide cells sandwiched between two layers of stereid cells in the costal cross section of *Philonotis fontana*
gynoecium (pl. gynoecia)	**termőtáj**	a structure consisting of female reproductive organs (archegonia) and the surrounding leaves (perichaetium); see androecium, gametoecium
habitat	**termőhely**	local environment characteristic of a species

hair point	**szőrszerű levélcsúcs**	hyaline, smooth or denticulate structure usually formed by an excurrent costa; e.g. *Tortula muralis*
haplolepidous	**egyszerű perisztómiumú**	peristome type consisting of a single ring of teeth; e.g. *Dicranum*; see diplolepidous
heterogeneous	**heterogén**	made up of contrasting or unrelated parts; e.g. costa cross section of *Didymodon* species; opposite: homogeneous
heteromorphous	**eltérő alakú**	having different shapes; e.g. stem and branch leaves of *Thuidium* species; opposite: homomorphous
homogeneous	**homogén**	uniform or composed of similar parts; e.g. costa cross sections in *Schistidium* and *Orthotrichum* s.l. species; opp. heterogeneous
homomallous	**egy oldalra hajló**	pointing the same way; e.g. leaves of *Dicranella heteromalla, Homomallium incurvatum*; see secund
homomorphous	**homomorf**	having the same shape; e.g. stem and branch leaves in many pleurocarpous mosses
hyaline	**üvegszerű**	colorless or transparent; e.g. hair point of *Grimmia pulvinata*
hyalocyst	**hialocita**	large, colourless water-storage cell as in leaves of *Sphagnum* and *Leucobryum*
hyalodermis	**hialodermisz**	stem epidermis of differentiated external cells, usually enlarged, hyaline cells with very few or no chloroplasts; e.g. in species of *Sphagnum* or *Calliergonella*
hydroid	**hidroid**	tracheid-like conductive cell in the central strand of some bryophytes, especially mosses (e.g. *Polytrichum*), sometimes also in the costa (e.g. *Syntrichia montana*)
imbricate	**zsindelyszerű**	closely appressed and overlapping; e.g. with the leaf margins overlapping like shingles on a roof; e.g. shoots of *Bryum argenteum*

immersed	**besüllyedt**	submerged or below the surface; referring to (1) a capsule or perianth exceeded by the blades or awns of the perichaetial leaves or bracts; e.g. *Schistidium apocarpum*; see emergent, exserted; (2) sunken stomata; see cryptopore; e.g. *Orthotrichum anomalum*
inclined	**hajlott**	bent down; applied to capsules that are between the erect and horizontal positions; e.g. *Ceratodon purpureus*; see also pendent
incrassate	**megvastagodott falú**	with thickened cell walls; e.g. subepidermal cells of *Riccia sorocarpa*
incubous	**felsőállású**	lying upon; an oblique leaf insertion in which the postical (proximal) leaf margins are oriented toward the ventral stem surface; when viewed from above the antical leaf margins will overlap the postical (proximal) leaf margins of the leaves directly above; found in some leafy liverworts; e.g. *Lejeunea* (see succubous)
incurved	**behajló**	curved upward (adaxially) and inward, subjectively stronger than inflexed and weaker than involute; applied mostly to leaf tips and margins; opposite: recurved
indehiscent	**kleisztokarp**	describes a capsule that does not dehisce by means of a lid or valves; the spores are released by the rupture or decay of the capsule wall; e.g. *Tortula acaulon* var. *acaulon*
inflated	**felfújt**	swollen or bladderlike; puffed up; e.g. the lobules of certain species of *Frullania* or *Lejeunea*, or alar cells of *Calliergonella cuspidata*
inflexed	**begörbült**	bent upward (adaxially) and weakly inward; applied to leaf margins or leaves on a stem; e.g. *Polytrichum juniperinum*; (see incurved, involute, inrolled; opposed to reflexed)

involucre	**burok**	a protective sheath of tissue of thalline origin, surrounding a single antheridium, archegonium or sporophyte in certain thallose liverworts and hornworts; e.g. *Sphaerocarpos*
involute	**begöngyölt**	rolled upward (adaxially) and tightly inward, applied to leaf margins; e.g. *Weissia controversa* (syn. inrolled; see incurved; opposed to revolute)
irregular	**szabálytalan**	asymmetric; not fitting any detectable pattern
isodiametric	**izodiametrikus**	about as broad as long; applied to cells about the same diameter in all directions; including square, rounded, or hexagonal; e.g. exothecial cells of *Physcomitrium*
julaceous	**barkaszerű**	smoothly cylindric; like a catkin, referring to stems or branches with strongly imbricate leaves; e.g. *Bryum argenteum*
K+	**K+**	colour reaction with a 2% solution of potassium hydroxide (KOH), giving either reddish or yellowish colours, e.g. in leaves of Pottiaceae or *Schistidium*
keel	**él**	a ridge formed along a sharp fold of a leaf (*Fontinalis*), or perianth (Lejeuneaceae), in liverworts in particular the line of the fold between the dorsal and the ventral lobe of a (conduplicate) leaf
keeled	**élelt**	sharply folded along the middle, like the keel of a boat; V-shaped in cross section; see channelled, canaliculate; e.g. leaves of *Grimmia pulvinata, Fontinalis antipyretica*
laciniate	**fonalasan rojtos**	fringed with appendages coarser than cilia and more than one cell wide; e.g. leaf of *Ptilidium pulcherrimum*; see ciliate
lacunose	**üreges**	with depressions or perforations on a surface; e.g. on the dorsal surface of a *Riccia cavernosa* thallus

lamellae (pl.)	**lamellák**	parallel photosynthetic ridges or plates along a leaf blade, or costa; e.g. *Polytrichum, Pterygoneurum*
lamina (pl. laminae)	**levéllemez**	the flattened, generally uni-stratose and green part of the leaf blade excluding the costa and border (see apical, dorsal and sheathing (vaginant) laminae)
lamina cell	**levélsejt**	cell of a lamina (see areolation; basal cells)
laminate	**levéllemezszerű**	like a lamina, said of leaf primordia with a flat blade; e.g. in bulbils of *Bryum bicolor*
lanceolate	**lándzsa alakú**	lance-shaped, narrow and tapered from near the base; narrowly ovate-acuminate; e.g. leaf of *Leptodictyum riparium*
lateral	**laterális**	at the side; e.g. lateral leaves as opposed to underleaves in leafy liverworts (see basal and terminal)
lax	**laza**	loose; referring to large thin-walled cells (e.g. in species of Funariaceae), as well as to rather distant spacing of branches or leaves on a stem; e.g. *Oxyrrhynchium hians*
lenticular	**lencse alakú**	doubly convex, lens-shaped; e.g. gemmae of *Tetraphis pellucida*
lid	**tokfedő**	operculum, covering the mouth of most moss capsules; usually separated from the mouth by an annulus to open the capsule at dehiscence (see stegocarpous)
limb	**felső levéllemez**	the upper part of a leaf which may differ from the base; e.g. in *Syntrichia ruralis*
limbidium (pl. limbidia)	**szegély**	see border, differentiated leaf margin, e.g. in *Fissidens bryoides*
linear	**vonalszerű**	very narrow, elongate with nearly parallel sides; e.g. lamina cells of *Hypnum cupressiforme*
lingulate	**nyelv alakú**	tongue-shaped; wide oblong with a rounded apex; e.g. leaves of *Plagiomnium undulatum*
lobe (1)	**lebeny**	any segment of a divided (lobed) leaf or other organ

lobe (2)	**felső karéj**	the larger segment of an unequally divided leaf in leafy liverworts (see lobule)
lobule	**alsó karéj**	the smaller segment of an unequally divided leaf in leafy liverworts, which is often modified to form a water sac; e.g. *Frullania*
lumen (pl. lumina)	**sejtüreg**	the cell cavity
lunate	**félhold alakú**	crescent shaped; e.g. gemma cup of *Lunularia cruciata*
mamilla (pl. mamillae)	**mamilla**	strongly bulging surface of a cell; (1) various hollow papilla-like protuberances without associated local wall thickening; i.e., with the cell lumen extending into the protuberances (as seen in cross sections); e.g. leaf cells of *Bartramia pomiformis*; (2) a central protuberance of the operculum; e.g. *Grimmia orbicularis*; see mamillate
mamillate	**csecsbimbós**	convex to hemispherical with a blunt central projection; e.g. operculum of *Grimmia orbicularis*
mamillose	**mamillás**	with mamillae; e.g. leaf cells of *Bartramia pomiformis*
marginal	**szélső**	at the margin, especially as applied to a leaf
mat	**szőnyeg**	a densely interwoven, horizontal growth form; e.g. *Brachythecium, Hypnum*
median leaf cells	**levélközépi sejtek**	mid-leaf cells; median leaf cells are from the upper middle of a leaf, at 2/3 of leaf length, midway between costa and margin
medulla	**bélszövet**	the interior, non-cortical part of the stem
midrib	**középér**	chief median part of a thallus formed by ± differentiated cells; e.g. *Metzgeria* (see costa)
mitrate (mitriform)	**sapka alakú**	referring to calyptrae; (1) conic and undivided (similar to a bishop's mitre); e.g. in species of *Orthotrichum*; or (2) equally lobed at base; e.g. *Physcomitrium pyriforme* (opposed to cucullate; see campanulate)

monoicous	**egylaki**	bisexual; with antheridia and archegonia on the same plant; including autoicous, synoicous, paroicous; see also sexual condition; 'monoecious', see note after autoicous (opposed to dioicous)
mucro (pl. mucrones)	**szálkahegy** (2)	a short, abrupt point, usually formed by excurrent costa; e.g. *Trichostomum brachydontium* (see apiculus)
muticous	**szálkátlan**	without a point or awn; e.g. leaf tips of *Pogonatum*
mycorrhiza	**mikorrhiza**	fungal hyphae in symbiosis with plants, e.g. some liverworts
neck	**nyak**	(1) in mosses: the sterile basal portion of a capsule between the base of the urn and the top of the seta (syn. apophysis); e.g. species of *Polytrichum* (2) the cylindrical upper portion of an archegonium
nodulose	**csomós**	(1) cilia (e.g. *Bryum*): with nodular thickenings; see appendiculate (2) wall thickenings (e.g. *Racomitrium*): minutely knobbed, inner outline wavy; see sinuose
oblique	**ferde**	slanted; e.g. an oblique leaf insertion is one that is between transverse and longitudinal; cross walls in most moss rhizoids
oblong	**hosszúkás** (2)	rectangular with rounded corners or ends; see elongate
obovate	**fordított tojás alakú** (1)	egg-shaped with apex broader than base; referring to a two-dimensional structure; e.g. leaves of *Tortula caucasica*
obovoid	**fordított tojás alakú** (2)	an inversely ovoid solid; e.g. capsule of *Entosthodon pulchellus*
obtuse (1)	**tompa**	an angle of more than 90°; e.g. in the bluntly keeled leaf of *Grimmia orbicularis*
obtuse (2)	**tompa csúcsú**	broadly pointed, blunt or rounded; leaf apex of *Nyholmiella; Gymnocolea inflata* lobe apex

ocellus (pl. ocelli)	**ocellum**	in leafy liverworts: leaf cell differing from surrounding cells in having one large oil body and lacking chloroplasts; e.g. upper lobe of *Frullania tamarisci*
oil-body	**olajtest**	a membrane-bound, terpene-containing organell unique to the cells of liverworts
oil-cell	**olajsejt**	in thalloid liverworts: cell differing from surrounding cells and characterized by a very large oil body; e.g. *Marchantia*
operculum (pl. opercula)	**tokfedő**	see lid
orbicular	**kör alakú**	nearly circular; e.g. leaf of *Solenostoma gracillimum*
oval	**ovális**	widely elliptical; e.g. leaf of *Plagiomnium rostratum*
ovate	**tojásdad**	outline of an egg with base broader than apex; e.g. stem leaf of *Calliergonella cuspidata*
ovoid	**ovoidális**	an egg-shaped solid; e.g. capsule of *Tortula lindbergii*, gemmae of *Scapania* species
palmate	**tenyeres**	with finger-like lobes radiating from centre; e.g. thallus of *Riccardia palmata*
papilla (pl. papillae)	**papilla**	cell ornamentation, a solid microscopic protuberance of cell wall; see papillose, wart, and slime papilla)
papillose	**papillás**	bearing papillae; e.g. seta of *Brachythecium rutabulum*, upper leaf cells of *Syntrichia ruralis*
paracostal	**parakosztális**	referring to cells beside the costa, which may have different shape; e.g. in species of *Grimmia*
paraphyllium (pl. paraphyllia)	**parafillium**	small green outgrowths of various shapes, i.e. filiform, lanceolate, scale- or leaf-like or sometimes branched; produced randomly on the stems or branches of many pleurocarpous mosses; e.g. *Thuidium* (see pseudoparaphyllium)

parenchyma	**parenchima**	a tissue of relatively undifferentiated, usually thin-walled and isodiametric cells; e.g. seen in stem cross sections of *Didymodon*
paroicous	**paroikus**	with antheridia and archegonia in a single gametoecium but not mixed, the antheridia in the axils of bracts just below the bracts surrounding the archegonia; e.g. *Pohlia nutans*, many liverworts; see also autoicuos, synoicous, dioicous, monoicous (paroecious; see note after autoicous)
patent	**elálló**	of leaves spreading from the stem at an angle of 45° or more; e.g. *Eurhynchium angustirete*; see spreading, erecto-patent
pedicellate	**nyeles**	borne on a stalk or pedicel, such as most bryophyte gametangia; also papillae of some species of *Syntrichia*
peltate	**pajzs alakú**	shieldlike structure fixed on a central stalk; e.g. papillae of *Hedwigia stellata* lamina cells
pendent (pendant), **pendulous**	**lecsüngő**	hanging downward (see inclined); e.g. pendent branch (*Sphagnum*, opposite: spreading branch), or capsules drooping and inclined beyond horizontal; e.g. *Ptychostomum compactum*
percurrent	**végig futó**	extending to the apex; e.g. costa of *Sciuro-hypnum populeum*
perennial	**évelő**	a plant in which the vegetative parts live year after year; e.g. pleurocarpous mosses
perforate	**likacsos**	pierced through; e.g. hyalocysts of *Sphagnum*
perianth	**perianthium**	tubular sheath derived from modified fused leaves enclosing the archegonia and developing sporophyte in most leafy liverworts; e.g. *Frullania dilatata*
perichaetial leaf	**perichaetiális levél**	modified leaf or underleaf (bract) associated with the gynoecium; collectively forming the perichaetium

perichaetium (pl. perichaetia)	**perichaetium**	the ensheathing cluster of modified leaves enclosing the archegonia, forming part of the gynoecium (see perichaetial leaf)
perigonial leaf	**perigoniális levél**	modified leaf or underleaf (bract) associated with the androecium; collectively forming the perigonium
perigonium (pl. perigonia)	**perigonium**	the cluster of modified leaves enclosing the antheridia, forming part of the androecium
perigynium	**perigynium**	in some liverworts in Jungermanniales a tubular extension of the stem tissue surrounding the gynoecium, elevating the female bracts and perianth (if present)
peristome	**perisztómium**	a circular structure, generally divided into 4, 8, 16, 32, or 64 teeth, arranged in a single or double (rarely multiple) row around the mouth of a capsule; (see endostome, exostome, prostome; inner, outer, single and double peristome)
phaneropore	**felszíni pórusú**	a capsule with superficial stomata; with guard cells at the same level as other exothecial cells and not sunken in; e.g. species of *Lewinskya* (opposed to cryptopore)
piliferous	**szőrhegyű**	having a hair point; e.g. *Polytrichum piliferum*
pinnate	**tollasan elágazó**	with numerous, spreading branches on opposite sides of the axis and thus resembling a feather; e.g. *Ctenidium molluscum*
pitted	**áttört**	having small depressions or holes (sometimes called pores) in the cell wall; they are conspicuous as depressions in thickened walls between adjacent cells; e.g. *Dicranum*; see porose
plane	**síkfelületű**	flat, not curved or wavy, not involute, referring to leaf margins (e.g. *Dicranella rufescens, D. staphylina*) or blade (e.g. lateral leaves of *Pedinophyllum interruptum*)

pleurocarpous	**pleurokarp**	refers to the production of archegonia on short side branches in mosses; as a result the sporophytes appear lateral; most pleurocarpous mosses are prostrate, highly branched and often mat-forming; e.g. *Brachythecium rutabulum*
plica (pl. plicae)	**hosszredő**	longitudinal furrow or pleat; e.g. on a leaf surface running parallel to the costa; see plicate
plicate	**hosszredős**	with longitudinal furrows or pleats (plicae); e.g. leaves of *Homalothecium*, calyptrae of *Zygodon* or *Coscinodon*, perianths of some liverworts, e.g. species of *Diplophyllum*; see furrowed, sulcate
pluristratose	**többsejtrétegű**	in several layers; e.g. leaf border of *Cinclidotus fontinaloides*
pore	**pórus**	a small aperture, (1) the opening in the wall of some cells; e.g. in leaf hyalocysts and hyalodermis of *Sphagnum;* (2) the central opening in a stoma (see pseudopores, air-pores, pitted)
porose	**porózus**	having pores; refers to thick-walled lamina cells of mosses with strong local thinning; e.g. basal leaf cells of *Dicranum scoparium*; see pitted
postical	**posztikális**	the ventral surface of a horizontal stem; that leaf margin oriented towards the base of a longitudinal or obliquely inserted leaf; e.g. the larger of the two lobes in a *Scapania* leaf (see proximal; opposed to antical)
primordium (pl. primordia)	**primordium**	the embryonic stage of a leaf or other organ, made up of undifferentiated (unspecialized) cells; e.g. in bulbils of *Bryum* and *Pohlia*
procumbent	**elfekvő** (2)	spreading, prostrate, lying on the substrate; e.g. sterile shoots of *Plagiomnium* species

propagule (propagulum)	**propagulum**	reduced bud, branch or leaf serving in vegetative reproduction (see brood-body)
prorate	**prorát**	having papillae or mamillae borne at the tips of cells, or formed by projecting cell ends; e.g. *Philonotis,* cells of *Ctenidium molluscum*
prosenchymatous	**prozenchimatikus**	refers to long, tapering, parallel cells overlapping at their tips
prostome	**prosztómium**	a rudimentary structure outside, and usually adhering to, the exostome teeth, also called preperistome; e.g. *Orthotrichum anomalum*; see also peristome
prostrate	**heverő**	lying flat on the ground, creeping; e.g. *Pedinophyllum interruptum*
protonema (pl. protonemata)	**protonema**	a filamentous, globose or thalloid structure resulting from spore germination and representing the first stage of bryophyte development; in liverworts a globose, short thalloid or filamentous structure generally giving rise to a single individual; in mosses the protonema is typically filamentous although *Sphagnum*, *Andreaea* and *Tetraphis* have ± thallose protonemata
proximal	**proximális**	near the base or point of attachment; the surface of a spore inside the spore tetrad (opposed to distal)
pseudopapillose	**álpapillózus**	having projecting cell walls seen in transverse section of leaf lamina, similar to papillae, but at the cell wall between adjacent cells, not at the cell lumen (also called joint thickenings); e.g. *Dicranum viride*, *Grimmia hartmanii*
pseudoparaphyllium (pl. pseudoparaphyllia)	**álparafillium**	Small, unistratose, filiform or foliose structure resembling a paraphyllium, but restricted to the areas of the stem around branch primordia; often found in pleurocarpous mosses; e.g. *Hypnum*

pseudoperianth	**álperianthium**	a hyaline unistratose sheath outside the calyptra for protection of a single archegonium and the sporophyte (not derived from leaves, thus not being a true perianth); e.g. *Asterella saccata*
pseudopodium (pl. pseudopodia)	**pszeudopodium**	(1) an elongation of the gametophyte axis below the sporophyte in *Sphagnum* and *Andreaea*, serving the function of a seta; (2) a similar extension of a stem tip bearing clusters of gemmae; e.g. *Aulacomnium palustre, Tetraphis pellucida*
pseudopore	**álpórus**	pore-like structure covered by a thin membrane that may be revealed by staining; e.g. in *Sphagnum* leaves, consisting of a fibril ring without an interior perforation
pyriform	**körte alakú**	pear-shaped; e.g. capsule of *Physcomitrium pyriforme*
quadrate	**négyszögletes**	square or nearly so; e.g. leaf cells of *Ceratodon purpureus*
receptacle	**receptaculum**	a disc or wart-like structure bearing antheridia or archegonia and found directly on the thallus (e.g. *Conocephalum*), inside the thallus (e.g. *Pellia*), or elevated on a stalk (e.g. *Marchantia*)
recurved	**visszahajló**	curved downward (abaxially) and outward; in leaves: referring to margins (e.g. *Barbula unguiculata*), apices, or marginal teeth (e.g. *Conardia compacta*); in peristome teeth: curved outward and ± downward (e.g. *Lewinskya affinis*); opposed to incurved
reflexed	**hátratört**	abruptly bent down (abaxially), generally referring to leaf tips or leaves on a stem; e.g. leaves of *Dicranella schreberiana*, leaf tips of *Pseudoscleropodium purum* (opposed to inflexed)
reniform	**vese alakú**	kidney-shaped; e.g. spores of *Physcomitrium arenicola*

reticulate	**hálószerű**	forming a network; e.g. thallus surface of *Conocephalum conicum*
retuse	**kicsípett**	notched at the apex (especially when referring to leaf shape); less deep than emarginate
revolute	**hátragöngyölt**	closely rolled downward (abaxially) and backward, referring to a leaf margin; e.g. *Pseudocrossidium hornschuchianum* (opposed to involute)
rhizoid	**rhizoid**	hair-like structure that functions in absorption and anchorage; in liverworts and hornworts one-celled and usually hyaline; in mosses usually brown to reddish, simple or branched, multicellular filaments, generally with oblique end-walls (see tomentum)
rhizoid furrow	**rhizoid barázda**	in some thallose liverworts a deep groove or channel running along the stalk of a receptacle and containing rhizoids; e.g. species of *Mannia*
rhizoid initial	**nematogón**	rhizoid-generating cell; such cells are usually smaller than neighbouring cells; e.g. at the leaf tips of *Plagiothecium platyphyllum*
rhizomatous	**rhizomatikus**	having a slender underground stem, horizontal and creeping; e.g. species of *Rhodobryum*
rhomboidal	**romboidális**	oblong-hexagonal; e.g. cells of *Bryum* s.l. species
rostrate, rostellate	**csőrös**	beaked, narrowed into a slender tip or point; e.g. operculum of *Grimmia pulvinata*
rudimentary	**csökevényes**	incompletely developed, vestigial, reduced; e.g. peristome teeth of *Tortula caucasica*
rugose	**gyűrt**	with transverse or irregular wrinkles or undulations; e.g. leaves of *Dicranum spurium, Rhytidium rugosum*
saccate	**zsákszerű**	sac-like; abruptly and deeply concave, like forming a sac; e.g. ventral leaf margin of *Nowellia curvifolia*; base of male bracts in *Radula complanata*

saxicolous	**sziklalakó**	growing on rocks; e.g. *Orthotrichum anomalum*; see also corticolous, terricolous
sclerodermis	**szklerodermisz**	an internal tissue of thick-walled cells forming a cylinder inside the hyalodermis; e.g. stem of *Sphagnum*
secund	**egyoldalra hajló**	turned to one side; e.g. leaves on a stem of *Dicranella heteromalla*; see homomallous
semilunate	**félhold alakú**	see lunate
septate	**válaszfalas**	divided by cell walls; having partitions; e.g. hyalocysts of *Sphagnum* leaves
serrate	**fűrészfogú**	saw-toothed; with regularly arranged marginal teeth formed by one or more cells; e.g. leaf margin of *Polytrichum formosum*
sessile	**ülő**	without a stalk or seta; e.g. gemmae of *Syntrichia papillosa*
seta (pl. setae)	**toknyél**	elongated portion of the sporophyte between the capsule and foot in liverworts and mosses (see pseudopodium)
sexual condition	**nemi eloszlás**	denotes the distribution of sexual organs within / among plants; see autoicous, dioicous, synoicous
sheathing	**hüvélyező**	applied to the base of leaves surrounding and clasping the stem, base of seta or capsule; the sheathing base of leaves is frequently composed of hyalocysts or otherwise differing cells (see limb)
sheathing (vaginant) **laminae**	**hüvelyező levéllemezek**	in *Fissidens*, the clasping laminae below the apical lamina
shoot	**hajtás**	a stem plus leaves and other appendages
shoulder	**váll**	an area of abrupt narrowing; e.g. the area on a leaf where the leaf base is abruptly narrowed to the upper lamina or blade; e.g. leaf of *Grimmia ovalis*
sigmoid	**S-alakú**	S-shaped; e.g. peristome teeth of *Funaria hygrometrica*

sinistrorse	**balra csavarodott**	forming a left-handed helix (opposed to a normal screw); e.g. twist of seta in *Racomitrium affine* (opposed to dextrorse)
sinuose	**ráncosan öblös**	wavy, as (1) in leaf margin (e.g. *Chionoloma tenuirostre*), or as (2) in uneven wall thickening of *Racomitrium* (see nodulose)
sinus	**szinusz**	the notch or indentation between two segments, as in a bilobed leaf
slime-papilla (pl. papillae)	**nyálka papilla**	clavate mucilage-secreting cell, common on young leaves and often terminating very short, uniseriate filaments (slime hair); e.g. at thallus tip of *Apopellia endiviifolia*
spathulate	**lapát alakú**	tapering proximally from a broad, rounded apex; e.g. leaf of *Homalia trichomanoides*
spine	**tüske**	(1) acute protruding cell ends on dorsal side of costa in species of *Tortella*, distinguished from papillae; (2) short sharp protuberances as seen in profile on the margin of spores of some liverworts; e.g. *Fossombronia pusilla, Sphaerocarpos michelii*; (3) protruding tooth on the dorsal side at the tip of the costa; e.g. *Brachytheciastrum velutinum*, species of *Oxyrrhynchium*
spinulose, spinose	**tüskés** (1)	(a) minutely spiny (subjectively distinct); e.g. hair points in leaves of *Schistidium confertum, S. helveticum*; (b) with sharp, pointed teeth; e.g. upper leaf margin of *Dicranum polysetum*; hair point of *Syntrichia* species
spiral fibrils	**spirális rostok**	wall thickenings arranged spirally in the hyalocysts and hyalodermis of *Sphagnum* species and giving the cells their mechanical strength
spore	**spóra**	a reproductive unit produced in a capsule as a result of meiosis; usually minute, mostly spherical and generally unicellular bodies that give rise on germination to a protonema

sporophyte	**sporofiton**	the spore-bearing diploid generation; initiated by the fertilization of an egg; remaining attached to the gametophyte and partially dependent on it; typically consisting of foot, seta and capsule
spreading	**szétálló** (2)	forming an angle of 45° or more (but less than 90°); e.g. the adaxial angle between a leaf and stem (see erecto-patent, squarrose, patent)
spreading branch	**elálló ág**	in *Sphagnum*: branch that at least at the point of insertion turns away from the stem (opposite: pendent branch)
squarrose	**berzedt**	spreading at right angles
stegocarpous	**sztegokarp**	referring to capsules with a dehiscent operculum (opposed to indehiscent)
stellate	**csillag alakú**	star-shaped; e.g. shoot tip of *Campylium stellatum*
stem	**szár**	the main gametophyte axis of mosses and leafy liverworts
stereid	**sztereid**	slender, elongate, thick-walled, fiber-like cell found in groups (stereid bands) in the costa or stems of some mosses
sterile	**meddő**	referring to a gametophyte without gametangia or sporophytes (opposed to fertile)
stipitate	**kocsányos**	having a stipe or special stalk-like base; e.g. the antheridia of liverworts
stoma (pl. stomata)	**sztóma**	minute opening in the capsule wall of hornworts, and usually in the capsule neck of mosses; surrounded or bordered by two guard cells
-stratose	**-rétegű**	referring to the number of layers as seen in cross sections; i.e., uni-, bi-, multistratose
stria (pl. striae)	**csík** (1)	fine ridges or lines; e.g. capsule wall of *Orthotrichum pallens*
striate	**rovátkolt**	marked with fine ridges or lines (striae); e.g. capsules of *Orthotrichum* species
striolate	**finoman barázdás**	finely ridged; e.g. leaf cell walls of *Hymenoloma crispulum*

strumose	**golyvás**	applied to some moss capsules with a goiter-like swelling (or struma) at one side of the base; e.g. *Ceratodon purpureus, Cynodontium strumiferum*
substereid	**szubsztereid**	almost with the characteristics of a stereid, but with walls not as strongly thickened
substrate	**aljzat**	the substance on which a bryophyte grows; e.g. soil, bark, rock
subula (pl. subulae)	**szubula**	a long, slender point; e.g. leaves of *Pleuridium* species
subulate	**ár alakú**	slenderly long-acuminate; e.g. leaf tips of *Pleuridium* species
succubous	**alsóállású**	lying under; an oblique leaf insertion in which the antical (distal) leaf margins are oriented toward the ventral stem surface; when viewed from above the antical leaf margins will lie under or be overlapped by the postical (proximal) leaf margins of the leaves directly above; found in various leafy liverworts; e.g. *Jungermannia* (see incubous)
sulcate	**barázdás**	strongly plicate, with deep longitudinal furrows or grooves; e.g. capsules of *Ulota*; see also furrowed
supra-alar cells	**sarki sejtcsoport feletti sejtek**	the cells immediately above the alar cells; e.g. *Racomitrium*
synoicous	**szinoikus**	with antheridia and archegonia mixed in the same gametoecium ('synoecious': see note after autoicous); e.g. *Ptychostomum torquescens*; see also autoicous, paroicous, dioicous, monoicous, sexual condition
terminal	**terminális**	at the apex, tip or distal end (opposed to basal); see also lateral
terrestrial, terricolous	**talajlakó**	growing on soil; see also saxicolous, corticolous
thallus (pl. thalli)	**telep**	a ± flattened gametophyte, not differentiated into a stem and leaves
tomentose	**nemezes**	woolly, densely covered with rhizoids; beset with tomentum; e.g. stem of *Dicranum polysetum*

tomentum (pl. tomenta)	**nemez**	a felt-like covering of abundant rhizoids, on some stems or rarely leaves; e.g. stems of *Dicranum*
trifarious, tristichous	**háromsoros**	arranged in three rows or ranks; e.g. leaves of *Seligeria trifaria*
trigones	**háromszögű falvastagodások**	generally triangular wall thickenings, found at the point where three (or more) cells meet; especially common in leaf cells of liverworts (see collenchymatous)
truncate	**levágott csúcsú**	abruptly cut off at the apex; e.g. perianth of *Radula complanata*
tuber	**rhizoid gumó**	gemmae borne on rhizoids (rhizoidal gemmae), found in many acrocarpous mosses; e.g. *Bryum*
tuberculate	**bibircses**	covered with small wart-like elevations; e.g. perianth of *Frullania dilatata*; irregularly roughened; e.g. cuticle of *Scapania nemorea*; see verrucose, verruculose
tuberous	**gumós**	like a tuber (rhizoidal gemma), e.g. swollen parts of underground persistent protonema of *Ephemerum* species
tubular	**csöves**	cylindrical and apparently hollow; e.g. involucre surrounding the female gametangium of *Apopellia endiviifolia*
tuft	**párna**	growth form with stems erect but radiating at the edges; small cushions; caespitose habit; e.g. *Orthotrichum*
tumid, turgid	**duzzadt**	inflated, plump or swollen; e.g. shoots of *Drepanocladus lycopodioides*
turf	**gyep**	growth form with stems erect, parallel and ± close together; often covering extensive areas; e.g. *Bryum argenteum*
underleaf	**allevél**	ventral, variously modified leaf in most leafy liverworts; e.g. *Lophocolea*
undulate	**hullámos**	leaf with ± transversely wavy surface; e.g. *Exsertotheca crispa*
unipapillose	**egypapillás**	with a single papilla per cell; e.g. lamina cells of *Leskea polycarpa*

uniseriate	**egysoros**	in one series; applied to a hair-like structure comprised of a single row of cells; e.g. tip of *Thuidium assimile* stem leaf, filiform leaf segments of *Blepharostoma trichophyllum*
unistratose	**egysejtrétegű**	one-layered; comprised of a single cell layer; e.g. most bryophyte leaves
urceolate	**korsó alakú**	urn-shaped, applied to capsules constricted below a wide mouth and abruptly narrowed to the seta; e.g. *Ulota crispa* s.l.
urn	**urna**	spore bearing portion of a capsule (opposed to neck)
vaginula (pl. vaginulae)	**vaginula**	a ring or sheath enveloping the base of the seta, derived from the base of the archegonium and surrounding stem tissue and remaining after the separation of the calyptra
valve	**kopács**	one of the parts or partially detached flap of tissue into which the capsule of most liverworts and hornworts separates upon dehiscence; rare in mosses (e.g. *Andreaea*)
ventral	**ventrális**	(of leaves) the adaxial, top, or upper surface; (of peristome teeth) the inner face; (of stems or thalli) the lower surface, next to the substrate; (opposed to dorsal); see also postical (liverworts with conduplicate leaves)
ventral scale	**hasi pikkely**	a unistratose, leaf-like structure of epidermal origin, often hyaline or reddish; ventral scales most commonly occur in two or four rows along the ventral surface in complex thalloid liverworts; e.g. Marchantiales
vermicular, vermiform	**hernyószerű**	worm-shaped; long, narrow and somewhat wavy, commonly with rounded ends; usually applied to cells (e.g. *Drepanocladus aduncus*) or bulbils (e.g. *Pohlia proligera*)
verrucose, verruculose	**bibircses**	see tuberculate

vitta (pl. vittae)	**csík** (2)	a band or ribbon; in liverworts the longitudinal stripe of longer, often thicker-walled cells in a leaf lamina resembling a nerve but only one cell layer thick; e.g. *Diplophyllum albicans*
wart	**szemölcs**	a small elevation or protuberance; e.g. on the seta of *Brachythecium rutabulum* (see papilla)
water sac	**víztartó kancsó**	an inflated or inrolled lobule or leaf part, usually filled with water; e.g. postical lobe of *Frullania dilatata*
wedge-shaped	**ék alakú**	see cuneate
weft	**szövedék**	a loosely interwoven, often procumbent growth form: e.g. *Thuidium*
wing	**szárny**	a thin, flat membranous expansion or appendage such as the margin of a spore, the keel of a perianth or folded leaf, the unistratose marginal part of a thallus
xeromorphic	**xeromorf**	adapted for dryness
zig-zag	**cikcakk**	e.g. the median line on an exostome tooth of *Ptychostomum capillare*

GLOSSARY – HUNGARIAN (Alaktani kifejezések)

The Hungarian part was compiled from Boros (1953), Orbán and Vajda (1983), complemented from Váczy (1980) and edited in accordance with Darók (2011), in particular concerning Hungarian spelling of technical terms derived from Latin or Greek, which remains controversial in many cases. The Hungarian definitions result from team work of all authors with important input from the reviewers.

magyar kifejezés	angol kifejezés	magyarázat
abaxiális	**abaxial**	a szártól vagy tengelytől távolabb eső oldal; a levél vagy a levélér hátsó, háti vagy alsó felülete; vö. adaxiális; dorzális
adaxiális	**adaxial**	a szár vagy tengely felé eső oldal; a levél vagy a levélér hasi vagy felső felülete; vö. abaxiális; ventrális
akrokarp	**acrocarpous**	csúcsontermő; azok a lombosmohák, melyek a sporofitont a hajtásuk csúcsán fejlesztik; a főszárak általában felállók, sűrűn egymás mellett állók, kevéssé elágazók; pl. *Polytrichum*
alapi	**basal**	az alaphoz közel fekvő, az alsó vagy proximális végen lévő; vö. terminális, disztális
alapi membrán	**basal membrane**	rövid cső vagy henger, amely gyakran az endosztómium szegmentumait és ciliáit (pl. *Bryum*), vagy az egyszerű perisztómium fogait (pl. *Tortula*) tartja
aljzat	**substrate**	az az anyag (fakéreg, korhadó fa, szikla, talaj stb.), melyre a moha rátelepül
allevél	**underleaf**	a leveles májmohák hasi oldalán lévő, az oldalsó levelektől ± eltérő alakú levél; pl. *Lophocolea*
álpapillózus	**pseudopapillose**	a felszínen a harántfalak folytatásában kialakuló pontszerű sejtfalvastagodásokat viselő; leginkább a levél keresztmetszeti képén látható; pl. *Dicranum viride, Grimmia hartmanii*

álparafillium	**pseudoparaphyllium**	kicsi, egyrétegű, fonalszerű vagy lemezszerű képlet, amely hasonlít a parafilliumra, de csak a szár ágkezdemény körüli területeire korlátozódik; gyakran megtalálható a pleurokarp moháknál; pl. *Hypnum*
álperianthium	**pseudoperianth**	egyes májmoháknál a toksüveg külső részén található áttetsző, egyrétegű hüvely, amely egy archegóniumot és a sporofitont védi (nem levelekből származik, így nem igazi perianthium); pl. *Asterella saccata*
álpórus	**pseudopore**	vékony membránnal lezárt pórus, amely festéssel tehető láthatóvá; pl. *Sphagnum* levelekben
alsó karéj	**lobule**	a leveles májmohák egyenlőtlenül osztott levelének kisebb lebenye; az oldalsó levél hasi oldal felé behajló része, amely gyakran változatos alakú víztartókká módosul; pl. *Frullania*
alsóállású	**succubous**	ferde levélállás, ahol a levél antikális (disztális) szélei a szár hasi oldala felé irányulnak; felülnézetben a közvetlenül felettük lévő levelek posztikális (proximális) levélszélei az antikális levélszélek fölött vannak vagy azokat fedik; különböző leveles májmoháknál található; pl. *Jungermannia*; vö. felsőállású
alveola	**alveola**	mélyedés, pl. a spóra felületén
antheridium	**antheridium**	hím gametangium (ivarszerv); többsejtű, gömbölyű vagy széles hengeres, kocsányos képlet, amely spermatozoidokat tartalmaz
antikális	**antical**	felső, dorzális; a vízszintes szár felső felülete; egy hosszanti vagy ferdén beillesztett levélnek a hajtás csúcsa felé eső széle; vö. posztikális, alsó ill. ventrális
apikális	**apical**	csúcsi, csúcson lévő
apikális levéllemez	**apical lamina**	a *Fissidens* fajoknál a levél ventrális oldalán a hüvelyező rész feletti levéllemez

apofízis	**apophysis**	a toknyél és az urna között, a spóratok tövében található látványosan elkülönülő nyaki rész; pl. *Polytrichum*; vö. nyak
ár alakú	**subulate**	igen keskeny, alapjától a csúcs felé egyenletesen vékonyodó, hegyes csúcsú; pl. *Pleuridium* fajok levélcsúcsa
archegónium	**archegonium**	női gametangium (ivarszerv); többsejtű, palack alakú képlet, amely szárból, hasból, nyakból áll és egy petesejtet tartalmaz
areola	**areola**	kicsi, sokszögű felület, amely színében vagy szerkezetében eltér a környezetétől, mintát vagy hálózatot alkotva; pl. légkamrák a telepen; ld. alveola
árkolt	**canaliculate**	(hosszában) csatornás, keresztmetszetében U alakú; pl. *Riccia canaliculata* telep, *Grimmia tergestina* levél; vö. élelt
áttört	**pitted**	kis mélyedésekkel vagy lyukakkal (pórusokkal) rendelkező; pl. a *Dicranum scoparium* szomszédos levélsejtjei közötti megvastagodott sejtfalak
autooikus	**autoicous**	olyan növény, amelyen az archegóniumok és antheridiumok különálló csoportokban, de ugyanazon az egyeden helyezkednek el; vö. szinoikus, paroikus, kétlaki, egylaki; az edényes növényeknél használt „autöcikus" megfelelője; [az „-öcikus" utótag szigorúan csak a sporofitikus vagy diploid szexualitásra vonatkozik, ezért nem alkalmazható a mohákra]
balra csavarodott	**sinistrorse**	felfelé csavarodás az óramutató járásával megegyező spirálban (mint egy nem szabványos balmenetes csavarnál); pl. *Racomitrium affine* toknyele

barázdált, barázdás	**furrowed, sulcate**	(1) spóratok esetén: durván rovátkolt, mély hosszanti barázdákkal vagy hornyokkal erősen redőzött; pl. az *Ulota crispa* kapszulái; (2) levél esetén: a felszínén húzódó hosszanti mélyedések és kiemelkedések mintázata; pl. *Grimmia montana*; (3) *Polytrichum commune* lamella csúcsi sejtjeinek disztális felszíne keresztmetszetben
barkaszerű	**julaceous**	olyan szárak vagy ágak, amelyek hengeres megjelenésűek, mert levelei zsindelyszerűen állnak; pl. *Bryum argenteum*
begöngyölt	**involute**	felfelé (adaxiálisan) és szorosan befelé tekert levélszélekre vonatkozik; pl. *Weissia controversa*; vö. behajló; hátragöngyölt
begörbült	**inflexed**	felfelé (adaxiálisan) és enyhén befelé hajlik; a levélszélekre vagy a szár leveleire vonatkozik; pl. *Polytrichum juniperinum*; vö. behajló, begöngyölt, hátratört
behajló	**incurved**	felfelé (adaxiálisan) és befelé hajlik, szubjektíven erősebb, mint a begörbült, és gyengébb, mint a begöngyölt; többnyire levélcsúcsokra és -szélekre vonatkozik; vö. visszahajló
bélszövet	**medulla**	a szár belső, nem kéregszerű része
berzedt	**squarrose**	hátratört, derékszögben elálló
besüllyedt	**immersed**	(1) olyan tok vagy perianthium, amelyen a perichaetiális levelek ill. fellevelek túlnyúlnak; pl. *Schistidium apocarpum*; vö. kiemelkedő, kiálló (2) felszín alatti sztóma; ld. rejtett pórusú; pl. *Orthotrichum anomalum*
bibircses	**tuberculate, verrucose, verruculose**	szemölcsszerű kiemelkedésekkel borított; pl. *Frullania dilatata* perianthiuma; szabálytalanul érdes; pl. *Scapania nemorea* kutikulája

bikonvex	**biconvex**	mindkét oldalán domború, pl. a *Schistidium teretinerve* levélere
bókoló	**cernuous**	a spóratok orientációjára vonatkozik; a tok hosszanti tengelye a vízszintes és a függőleges között helyezkedik el; pl. *Pohlia nutans*; vö. hajlott
bunkó alakú	**clavate**	a csúcs felé megvastagodott; pl. *Gymnocolea inflata* perianthiuma
burok	**involucre**	telep eredetű védőhártya, amely egyes telepes májmoháknál és becősmoháknál egyetlen antheridiumot, archegóniumot vagy sporofitont vesz körül; pl. *Sphaerocarpos*
buroklevél	**bract**	ivarszervet vagy rügykosárkát körülvevő levél; vö. perichaetiális levél, perigoniális levél
cikcakk	**zig-zag**	pl. *Ptychostomum capillare* exosztómium fog középvonala
ciliák (többes szám)	**cilia** (plural)	a levelet vagy a telepet szegélyező, továbbá a belső perisztómium nyúlványai között elhelyezkedő finom szőr-, vagy pillaszerű képletek; pl. *Hedwigia ciliata* perichaetiális levele
csatornás	**channelled**	ereszcsatornához hasonló, keresztmetszetében félkör alakú; vö. élelt
csecsbimbós	**mamillate**	domború vagy félgömb alakú, tompa középső kiemelkedéssel; pl. a *Grimmia orbicularis* tokfedője
csík (1)	**stria**	finom gerinc vagy vonal; pl. *Orthotrichum pallens* tokján
csík (2)	**vitta**	szalag vagy sáv; májmohákban a levéllemezen található, levélérhez hasonló hosszanti csík; hosszabb, gyakran vastagabb falú sejtekből áll, de csak egy sejtréteg vastag; pl. *Diplophyllum albicans*
csillag alakú	**stellate**	pl. *Campylium stellatum* hajtáscsúcs
csipkézett	**crenulate**	finoman csipkés, apró, lekerekített fogakkal; pl. *Fissidens taxifolius* levél széle

csökevényes	**rudimentary**	nem teljesen kifejlődött, visszafejlődött, elsatnyult (redukált); pl. *Tortula caucasica* perisztómium fogai
csomós	**nodulose**	(1) ciliák esetében: csomós megvastagodásokkal, apró dudorokkal ellátott (pl. *Bryum*); ld. függelékes; (2) falvastagodás esetében: a sejt belső oldalán hullámos, öblös, ráncos vonalú, egyenlőtlen vastagságú sejtfallal rendelkező (pl. *Racomitrium*); ld. ráncosan öblös
csőrös	**rostrate, rostellate**	a tokfedő hosszan kihúzott, csőrszerű részben végződik, vékony hegyre vagy csúcsra keskenyedő; pl. *Grimmia pulvinata* tokfedője
csöves	**tubular**	cső alakú, hengeres és látszólag üreges; pl. *Apopellia endiviifolia* női ivarszervét körülvevő burok
csuklyás	**cucullate**	főkötőalakú, kapucniszerű; pl. *Entostodon fasciculare* csak az egyik oldalán hasított kaliptrája, *Trichostomum crispulum* szerzetesi csuklyához hasonló, felálló vagy begörbült levélcsúcsa
disztális	**distal**	a tőtől vagy a rögzítési ponttól távoli, a levél vagy szár csúcsa felé eső; a spóra külső, domború oldala; vö. proximális
domború	**convex**	kör vagy gömb külső felületéhez hasonló ívelt kontúrral vagy felülettel rendelkezik; vö. homorú
dorzális	**dorsal**	hátoldali; levelek esetében: az abaxiális, hátsó, alsó felület; perisztómium fogak esetében: a külső felület; vízszintes szárak vagy telepek esetében: a felső felület, az aljzattól távoli; vö. ventrális
dorzális levéllemez	**dorsal lamina**	*Fissidens* fajoknál a levéllemeznek a hüvelyező alapjával szemben lévő, az alaptól a csúcsig érő része

dudoros	**gibbous**	púpos, egyik oldalon duzzadt, kidomborodó; pl. *Leptobryum pyriforme* tok
duzzadt	**tumid, turgid**	felfúvódott, dagadt, telt; pl. *Drepanocladus lycopodioides* hajtása
efemer	**ephemeral**	rövid életű, életciklusát egyetlen évszak alatt teljesíti
egy oldalra hajló	**homomallous, secund**	pl. *Homomallium incurvatum*, *Dicranella heteromalla* levelei
egylaki	**monoicous**	a hím és női ivarszervek ugyanazon növénykén fejlődnek ki; beleértve az autooikus, szinoikus és paroikus nemi eloszlást (monöcikus, ld. az autooikus utáni megjegyzést); vö. kétlaki
egypapillás	**unipapillose**	sejtenként egyetlen papillával; pl. *Leskea polycarpa* levélsejtje
egysejtrétegű	**unistratose**	egyetlen sejtrétegből álló; pl. a legtöbb lombosmoha levele
egysoros	**uniseriate**	fonálszerű képletre vonatkozik, amely egyetlen sejtsorból áll; pl. *Thuidium assimile* szárlevelének csúcsa, *Blepharostoma trichophyllum* levélrojtja
egyszerű perisztómiumú	**haplolepidous**	perisztómium típus, amely egyetlen foggyűrűből áll; pl. *Dicranum*; vö. kettős perisztómiumú
ék alakú	**cuneate** (cuneiform), **wedge-shaped**	pl. *Entosthodon hungaricus* exotheciális sejtjeinek keresztmetszete
él	**keel**	behajtásvonal mentén kialakult gerinc a perianthiumon (pl. Lejeuneaceae) vagy a levélen (pl. *Fontinalis*), illetve a májmohák esetében behajtásél a háti és a hasi levéllebeny között
elálló	**patent**	a levelek a szártól 45°-os vagy annál nagyobb szögben elállók; vö. fel- és elálló, szétálló; pl. *Eurhynchium angustirete*
elálló ág	**spreading branch**	*Sphagnum* fajoknál olyan ág, amely legalább a tövénél eláll a szártól; vö. lógó ág

elatera	**elater**	differenciált, hosszúkás sejt, éretten elhalt, általában egy-három helikális falvastagodással; a legtöbb májmoha kapszulában a spóratömeg között elszórva található; funkciója: a spóratömeg felbontása és ezáltal a spórák szétterjesztése
élelt	**keeled**	hosszában élesen összehajtott, hajó gerincéhez hasonló, keresztmetszetében V alakú; pl. *Grimmia pulvinata, Fontinalis antipyretica* levele
elfekvő (1)	**decumbent**	fekvő, felfelé ívelő csúcsú szár; pl. *Lophozia ascendens, Oxyrrhynchium hians*
elfekvő (2)	**procumbent**	heverő, aljzaton fekvő; pl. *Plagiomnium* fajok meddő hajtásai
elkeskenyedő	**attenuate**	elvékonyodó; pl. *Pseudanomodon attenuatus* hajtáscsúcsai
ellipszoidális	**ellipsoidal**	elliptikus körvonalú három-dimenziós képletekre vonatkozó; pl. *Scapania* sarjtestjei
elliptikus	**elliptical**	hosszúkás, domború oldalakkal, hegyes vagy tompa végekkel; pl. *Jungermannia pumila* levele
eltérő alakú	**heteromorphous**	különböző alakú; pl. *Thuidium* fajok szár- és águlevele; vö. homomorf
eltérő színű	**discolorous**	olyan képletre vonatkozik, amelynek részei különböző színűek; pl. *Ptychostomum pseudo-triquetrum* vöröses levélalapi sejtjei, amelyek színben eltérnek a középső sejtektől; vö. hasonló színű
eltűnő	**fugacious**	hamar széteső és eltűnő; pl. *Lophozia* és sok más májmoha olajtestjei

endosztómium	**endostome**	belső perisztómium; a kettős perisztómium belső köre, amely az elsődleges és belső perisztomiális rétegek szomszédos, a tok felületével párhuzamos falpárjaiból alakul ki; szegmentumokkal (nyúlványokkal) és ciliákkal rendelkező alapi membrán, amely egy jellemzően gyenge membránszerkezet; az endosztómium homológ az egyszerű perisztómiumú mohák perisztómiumával
epidermisz	**epidermis**	a szár, a tok vagy a májmohák telepének legkülső sejtrétege
epifiton	**epiphyte**	egy másik növényen élő növény; pl. *Lewinskya* fajok
epifragma	**epiphragm**	a Polytrichaceae fajok tokján a kolumella kiterjedt csúcsa által kialakított kör alakú membrán, amely a perisztómium fogainak végéhez kapcsolódik; részben bezárja a tok száját, miután a tokfedő lehullott; hasonló szerkezet fordul elő a *Weissia brachycarpa, W. condensa, W. rostellata* fajoknál is
épszélű	**entire** (1)	sima élű; nem fogazott mohalevél (pl. *Drepanocladus aduncus*) vagy egyéb képlet szélére vonatkozik (pl. *Scapania scandica* perianthium szája)
ér nélküli	**ecostate**	pl. *Hedwigia* fajok levele; vö. eres
eres	**costate**	érrel rendelkező; pl. legtöbb lombosmoha levele; vö. ér nélküli
euriciták	**guide cells**	nagy sejtüregű, vékonyfalú és hosszirányban elhelyezkedő sejtek, amelyek sok lombosmoha erének középső rétegében találhatók; pl. *Philonotis fontana* levélérének keresztmetszetében a két sztereid sejtréteg között található nagyüregű sejtek
évelő	**perennial**	többéves; vegetatív részei áttelelnek; pl. pleurokarp mohák

exosztómium	**exostome**	külső perisztómium; a kettős perisztómium külső köre; hiányzik, vagy csak kezdetleges az egyszerű perisztómiumú moháknál
exotheciális sejtek	**exothecial cells**	a spóratartó tok külső felületének sejtjei, a tok falának legkülső rétege, epidermisze
fa alakú	**dendroid**	fához hasonló növekedési formájú; pl. *Climacium dendroides*
fedő nélküli	**deoperculate**	a tokfedő leesése utáni kapszulára vonatkozik
fejecske	**capitulum**	üstökszerűen elrendeződő ágakból álló hajtáscsúcs; pl. *Sphagnum*
fel- és elálló	**erecto-patent**	45°-os vagy annál kisebb szögben álló; pl. *Pohlia* és *Bryum* s.l. fajok levelei (vö. szétálló, elálló)
felálló	**erect**	(1) levelek, amelyek a szár csúcsa felé irányulnak; pl. *Brachythecium albicans*; (2) egyenes, nem ívelt kapszulák, pl. *Leskea polycarpa*
felemelkedő	**ascending**	az aljzattól távolodó irányban felfelé mutató; pl. *Lophozia ascendens* hajtása
felfújt	**inflated**	duzzadt vagy hólyagszerű, felfúvódott; pl. bizonyos *Frullania*- vagy *Lejeunea*-fajok levelének alsó karéja, vagy a *Calliergonella cuspidata* levél sarki sejtjei
félhold alakú	**lunate, semilunate**	pl. *Lunularia cruciata* rügykosárka
felnyíló	**dehiscent**	olyan tokra vonatkozik, amely szabályosan nyílik egy gyűrű és tokfedő segítségével (pl. legtöbb lombosmoha), vagy kopáccsal (pl. becősmohák, májmohák, *Andreaea*); vö. kleisztokarp
felső karéj	**lobe** (2)	a leveles májmohák egyenlőtlenül osztott levelének nagyobb szegmense; ld. alsó karéj
felső levéllemez	**limb**	a levél felső része, amely színében, szerkezetében különbözhet az alsó résztől; pl. *Syntrichia ruralis*

felsőállású	**incubous**	ferde levélállás, ahol a levél posztikális (proximális) szélei a szár hasi oldala felé irányulnak; felülnézetben az antikális levélszélek a közvetlenül felettük lévő levelek posztikális (proximális) levélszélei fölött vannak vagy azokat fedik; különböző leveles májmoháknál található; pl. *Lejeunea*; vö. alsóállású
felszíni pórusú	**phaneropore**	olyan tok, amelynek felszínén a gázcserenyílás zárósejtjei nem besüllyedtek, hanem egy szintben vannak a többi exotheciális sejttel*;* pl. *Lewinskya* fajok; vö. rejtett-pórusú
ferde	**oblique**	pl. legtöbb lombosmoha rhizoid sejtjeinek keresztfala
filamentum	**filament**	szál, egymáshoz kapcsolódó sejtek egyetlen sora, hosszú és néha elágazó képlet; pl. *Ptychostomum moravicum* sarjtestjei
finoman barázdás	**striolate**	pl. *Hymenoloma crispulum* levelének sejtfala
finoman fogazott	**denticulate**	apró fogakat viselő (ld. fogazott; szubjektíven megkülönböztethető); pl. *Pterigynandrum filiforme* levélszéle
fodros	**crispate, crisped**	különböző módon göndör, csavart és torzított forma; *Ulota crispa* s.l. száraz levelei
fogak nélküli	**edentate**	pl. *Tortula lindbergii* ép levélszéle
fogazott	**dentate**	egy- vagy többsejtű éles fogakkal rendelkező; pl. *Plagiomnium affine* levélszéle
fonalasan rojtos	**laciniate**	szőrszálaknál vastagabb, több sejt szélességű nyúlványokkal szegélyezett; pl. *Ptilidium pulcherrimum* levele; vö. pillás
fonalszerű	**filiform**	szálszerű, karcsú és hosszúkás; pl. *Ptychostomum moravicum* sarjtestjei
fordított tojás alakú (1)	**obovate**	fordított tojás alakú kétdimenziós képletre vonatkozó; felső felében szélesebb, mint az alsó felében; pl. *Tortula caucasica* levele

fordított tojás alakú (2)	**obovoid**	fordított tojás alakú három-dimenziós képletre vonatkozó; pl. *Entosthodon pulchellus* tok
függelékes	**appendiculate**	rövid, vékony, derékszögben elálló függelékekkel rendelkező, pl. *Ptychostomum imbricatulum* endosztómium ciliái; vö. csomós
fülecske	**auricle**	kis, fülcimpaszerű lebeny, egyes lombosmohák levélalapjának szélén; pl. *Climacium*; ld. sarki sejtcsoport
fűrészfogú	**serrate**	szabályosan rendezett, egy- vagy többsejtű szélső fogakkal; pl. *Polytrichum formosum* levélszéle
gametöcium	**gametoecium**	ivarszerv(ek) és a körülötte lévő levelek (ld. hímtáj, termőtáj)
gametofiton	**gametophyte**	ivaros haploid nemzedék, a mohák fejlett telepes vagy leveles hajtása; moháknál a domináns életfázis; vö. sporofiton
golyvás	**strumose**	olyan tok, amely a toknyéllel való ízesülése fölött az alsó részén egyoldalú duzzanattal kiöblösödő; pl. *Ceratodon purpureus, Cynodontium strumiferum*
gömb alakú	**globose**	pl. *Grimmia hartmanii* sarjtestjei
gumós	**tuberous**	gumó alakú; pl. az *Ephemerum* fajok föld alatti tartós protonemájának duzzadt részei
gyep	**turf**	növekedési forma, amely egyenes, egymással párhuzamos és közeli vagy nem közeli szárakból áll; gyakran kiterjedt területeket borít; pl. *Bryum argenteum*
gyűrt	**rugose**	szabálytalanul ráncos; pl. a *Dicranum spurium, Rhytidium rugosum* levelei
gyűrű	**annulus**	a tokfedővel felnyíló spóratoknál a tok nyílásának felső alaktanilag különböző sejtekből álló sejtsor(ok), amely(ek) a tok felnyílását segíti(k)
hajlott	**inclined**	ferdén álló kapszulákra vonatkozik, amelyek helyzete az egyenesen felálló és a vízszintes között van; pl. *Ceratodon purpureus*
hajtás	**shoot**	leveles szár

hálószerű	**reticulate**	pl. *Conocephalum conicum* telepfelülete
harang alakú	**campanulate**	pl. sok Orthotrichaceae fajok toksüvege
háromsoros	**trifarious, tristichous**	három sorba rendeződő; pl. *Seligeria trifaria* levelei
háromszögű falvastagodások	**trigones**	három (vagy több) sejt találkozási pontján található, általában háromszög alakú falvastagodások; különösen gyakoriak a májmohák levélsejtjeinél; ld. kollenchimatikus
hasi pikkely	**ventral scale**	az epidermiszből eredő egyrétegű, levélszerű képződmény, amely, gyakran átlátszó vagy vöröses; a hasi pikkelyek leggyakrabban két vagy négy sorban fordulnak elő a hasi felületen; pl. Marchantiales
hasonló színű	**concolorous**	két vagy több, azonos színű szerkezeti részre vonatkozik; pl. *Ptychostomum pallens* középső levélsejtjei és levélalapi sejtjei; vö. eltérő színű
hátragöngyölt	**revolute**	lefelé (abaxiálisan) és szorosan hátrafelé tekert levélszélekre vonatkozik; pl. *Pseudocrossidium hornschuchianum*; vö. begöngyölt
hátratört	**reflexed**	hirtelen, térdesen hátrahajlott (abaxiálisan); levélre, vagy levélcsúcsra vonatkozik; pl. *Dicranella schreberiana* levele, *Pseudoscleropodium purum* levélcsúcsa; vö. begörbült
hattyúnyakszerűen ívelt	**cygneous**	pl. sok *Campylopus* faj, *Grimmia pulvinata* toknyele
hegyes	**acute**	a csúcsszöge 90°-nál kisebb, de 45°-nál nagyobb; pl. *Eurhynchium angustirete* levélcsúcsa
henger alakú, hengeres	**cylindrical, terete**	hosszúkás és keresztmetszetében kör alakú; pl. *Encalypta* és *Syntrichia* fajok tokja
hernyószerű	**vermicular, vermiform**	féreg alakú; hosszú, keskeny és kissé hullámos, általában lekerekített végekkel; sejtekre (pl. *Drepanocladus aduncus*) vagy rügytestekre (pl. *Pohlia proligera*) vonatkozik

heterogén	**heterogeneous**	egymástól különböző részekből álló; pl. *Didymodon* fajok ér keresztmetszete; vö. homogén
heverő	**prostrate**	az aljzaton fekvő, kúszó; pl. *Pedinophyllum interruptum*
hialocita	**hyalocyst**	nagy, üreges, víztároló sejt; pl. *Sphagnum* és *Leucobryum* fajok leveleiben
hialodermisz	**hyalodermis**	differenciált külső sejtekből álló réteg; pl. megnagyobbodott, vagy üvegszerű sejtekből álló szár epidermisz, amely nem, vagy csak kevés kloroplasztiszt tartalmaz; pl. *Sphagnum*, *Calliergonella* fajoknál
hidroid	**hydroid**	tracheidaszerű, víz vezetésére alkalmas sejt egyes lombosmohák központi sejtkötegében (pl. *Polytrichum*), néha a levélérben is (pl. *Syntrichia montana*)
hímtáj	**androecium**	hímivarszervek (antheridiumok) és a környező levelek (perigonium) együttese
hirtelen kihegyezett	**cuspidate**	hirtelen erős, merev csúcsban végződő
homogén	**homogeneous**	egységes vagy hasonló részekből álló; pl. *Schistidium* fajok vagy *Orthotrichum* s.l. fajok ér keresztmetszete (vö. heterogén)
homomorf	**homomorphous**	ugyanolyan alakú; pl. sok pleurokarp moha szár- és águlevele; vö. eltérő alakú
homorú	**concave**	kör vagy gömb belsejéhez hasonló ívelt kontúrral vagy felülettel; vö. domború
hónalj	**axil**	a tengely és az abból kiinduló bármely képlet által alkotott felső szög; pl. levél és szár, szár és ág
hónalji szőr	**axillary hair**	szőr a levélhónaljakban; pl. *Didymodon* fajoknál
hosszában összehajtott	**conduplicate**	hosszirányban élesen behajtott; pl. *Fontinalis antipyretica* levelei, *Fissidens* leveleinek hüvelyező része; májmoháknál, (pl. *Scapania*) a levél egymásra hajló két lebenye

hosszredő	**plica**	hosszanti redő vagy barázda, amely pl. a levél felületén az érrel párhuzamosan fut; vö. hosszredős
hosszredős	**plicate**	hosszanti barázdákkal vagy redőkkel rendelkező; pl. *Homalothecium* fajok levele, *Zygodon* vagy *Coscinodon* toksüvege, néhány májmoha perianthiuma, pl. *Diplophyllum* fajok; vö. barázdás, barázdált
hosszúkás (1)	**elongate**	megnyúlt; pl. lineáris
hosszúkás (2)	**oblong**	téglalap alakú, lekerekített sarkokkal vagy végekkel
hullámos	**undulate**	olyan levél felülete, amelyen az érre merőleges vagy hegyes szögben álló hullámok találhatók; pl. *Exsertotheca crispa*
hüvelyező	**sheathing**	több lombosmoha faj levelének a szárat, a toknyél vagy spóratok tövét körülvevő, erősen kiszélesedő, gyakran a levél többi részétől eltérő sejtekből (pl. hialociták) álló alsó részére vonatkozik (vö. levéllemez)
hüvelyező levéllemezek	**sheathing** (vaginant) **laminae**	a *Fissidens* fajoknál az apikális levéllemez alatt található hüvelyező levéllemezek
ivarszerv	**gametangium**	ivarsejttartó, ivarsejteket hordozó képlet; pl. archegónium, antheridium
ívelt	**arcuate**	görbe, görbült; pl. *Microbryum curvicollum* toknyele
ívesen összehajló	**connivent**	egymás felé mutató, de nem összeforrt; pl. *Fuscocephaloziopsis lunulifolia* levélkaréjainak csúcsai
izodiametrikus	**isodiametric**	egyenlő méretű; körülbelül ugyanolyan széles, mint hosszú; minden irányban körülbelül azonos átmérőjű sejtekre vonatkozik, beleértve a négyzetes, lekerekített vagy hatszögletű sejteket; pl. *Physcomitrium* fajok exotheciális sejtjei
járulékos telepek	**adventive thalli**	telepek oldaláról leváló, vegetatív szaporodást szolgáló telepszerű képletek; pl. *Metzgeria* fajoknál

jobbra csavarodott	**dextrorse**	felfelé csavarodás az óramutató járásával ellenkező spirálban (mint egy szabványos jobbmenetes csavarnál); pl. *Racomitrium canescens* toknyele
K+	**K+**	2%-os kálium-hidroxid (KOH) oldatra adott vöröses vagy sárgás színreakció; pl. Pottiaceae család vagy *Schistidium* fajok levelei
kanyargós	**flexuose**	enyhén és szabálytalanul ide-oda hajló; pl. *Leptobryum pyriforme* levele
kéreg	**cortex**	a szár külső sejtrétege, amely a medullát (szárbelet) veszi körül; pl. *Cephalozia* fajok szárának áttetsző kérge
kéreglakó	**corticolous**	kérgen élő; pl. Orthotrichaceae fajok többsége; vö. sziklalakó, talajlakó
kétalakú	**dimorphic**	azonos funkciójú képlet két eltérő formájú megjelenése egy egyeden belül; pl. *Kindbergia praelonga* szár- és águlevele
kétkaréjú	**bilobed**	két lebenyre vagy szegmensre osztott; pl. *Lophocolea* fajok allevelei
kétlaki	**dioicous**	olyan növény, amelyen az archegóniumok és antheridiumok külön egyeden helyezkednek el; (diöcikus: ld. az autooikus utáni megjegyzést)
kétrétegű	**bistratose**	két sejtrétegből álló; pl. *Diphyscium foliosum* két sejt vastagságú levéllemeze
kétsoros	**distichous**	két egymással szemben álló sorba rendeződő levelek; pl. *Fissidens, Distichium* fajok
kettős	**geminate**	párokba rendeződő; pl. egyes *Mnium* fajok levelei szélén található dupla fogak
kettős perisztómiumú	**diplolepidous**	perisztómium típus, amely kettős foggyűrűből áll, az exosztómiumból és az endosztómiumból; pl. *Hypnum cupressiforme*; vö. egyszerű perisztómiumú

kiálló	**exserted**	kapszulák vagy perianthiumok, amelyeket nem érnek el a perichaetiális levelek csúcsai; pl. *Ceratodon purpureus* tokja; vö. kiemelkedő
kicsípett (1) (2)	**emarginate, retuse**	mélyebben (emarginate) vagy kevésbé mélyen (retuse) a levélcsúcson szélesen bevágott; pl. *Marsupella funckii* vagy *Lophocolea heterophylla* csúcsi levelei
kiemelkedő	**emergent**	kapszulák vagy perianthiumok, amelyek csak részben nyúlnak túl a perichaetiális levelek csúcsain; pl. *Tortula protobryoides* tokja; vö. kiálló, besüllyedt
kihegyesedő levélcsúcs	**acumen**	karcsú, kihegyezett levélvég; pl. *Amblystegium serpens*
kihegyezett	**acuminate**	45°-nál kisebb végszögű csúcsra vonatkozik; pl. *Homalothecium sericeum* levélcsúcsa
kilépő	**excurrent**	a csúcson túlnyúló; pl. *Fissidens taxifolius* kiálló levélere
kleisztokarp	**indehiscent**	nem felnyíló, nem felhasadó; olyan kapszulára vonatkozik, amely nem nyílik fel szabályosan (tokfedővel vagy hasítékkal); a spórák a tok falának szakadásával vagy bomlásával szabadulnak ki; pl. *Tortula acaulon* var. *acaulon* tokja
klorenchima	**chlorenchyma**	kloroplasztiszokat tartalmazó asszimiláló sejtcsoport
klorocita	**chlorocyst**	zöld (klorofill tartalmú) sejt; pl. *Sphagnum, Leucobryum* fajok zöld levélsejtjei; vö. hialocita
kocsányos	**stipitate**	speciális nyélszerű alapzattal rendelkező; pl. májmohák antheridiumai
kollenchimatikus	**collenchymatous**	a mohalevél vagy tokfal sejthálózata abban az esetben, ha a sejtek sarkai erősebben megvastagodottak; pl. *Aulacomnium palustre* (ld. háromszögű falvastagodások)
kolumella	**columella**	központi meddő sejtoszlop a legtöbb lombosmoha és becősmoha spóratokjának spóraképző régiójában

kopács	**valve**	a legtöbb májmoha és becősmoha érett kapszulájának egymástól elváló részei; lombosmoháknál ritka (pl. *Andreaea*)
kör alakú	**orbicular**	pl. *Solenostoma gracillimum* levele
korsó alakú	**urceolate**	olyan urna alakú kapszulára vonatkozik, amely a széles száj alatt beszűkül és az alapjánál hirtelen elkeskenyedik; pl. *Ulota crispa* s.l.
körte alakú	**pyriform**	pl. *Physcomitrium pyriforme* tokja
köteg	**fascicle**	nyaláb, egymáshoz simuló ágak csoportja; pl. *Sphagnum* fajok oldalágai
középér	**midrib**	(májmoháknál) a telep közepén húzódó, elkülönülő sejtállomány (vö. levélér); pl. *Metzgeria* fajok
központi sejtköteg	**central strand**	számos faj szárának és telepének központi tengelyét képező hosszúkás sejtek, amelyek keresztmetszetben általában vékony falúak és gyakran eltérő színűek; pl. *Grimmia pulvinata*
kúp alakú	**conical**	pl. *Brachythecium rutabulum* tokfedője
kutikula	**cuticle**	az epidermisz felszínen lévő viaszos réteg; a legtöbb májmoha és lombosmoha levelein vagy szárain, toknyelein, tokjain, valamint becősmohák kapszuláin fordul elő
lamellák	**lamellae**	lemezkék; egyes lombosmohák levélerének felületén lévő, azzal párhuzamosan futó, klorofil tartalmú sejtekből álló (asszimiláló) lemezek; pl. *Polytrichum* fajok
lándzsa alakú	**lanceolate**	keskeny és tőből elvékonyodó, ovális-hegyes; pl. *Leptodictyum riparium* levele
lapát alakú	**spathulate**	csúcsa felé majdnem kerekre szélesedő levéllemez; pl. *Homalia trichomanoides* levele
lapított	**complanate**	lapos vagy összenyomott; pl. *Radula comlanata* perianthiuma
laterális	**lateral**	oldalsó; pl. az oldalsó levelek és az allevelek megkülönböztetésére (vö. alapi és terminális)

laza	**lax**	nagy, vékonyfalú sejtekre (pl. Funariaceae fajok), vagy a levelek és az elágazó hajtások ritkás elrendeződésére vonatkozik (pl. *Oxyrrhynchium hians*)
lebeny	**lobe** (1)	egy osztott vagy karéjos levél része
lecsüngő	**pendent** (pendant), **pendulous**	lógó (vö. hajlott); pl. *Sphagnum* fajok lelógó ága, (vö. elálló ág), vagy a vízszintesnél jobban lehajló kapszulák; pl. *Ptychostomum compactum*
lefutó	**decurrent**	szárrafutó; a levél a száron vékony vagy szélesebb szalag formájában, hosszabb-rövidebb nyúlványban folytatódik; pl. *Plagiomnium undulatum*
légkamra	**air-chamber**	fejlett telepes májmohák (pl. Marchantiales) telepében található, gázcserenyílásokhoz kapcsolódó nagyobb üreg
légzőpórus	**air-pore**	néhány telepes májmoha felső felületén lévő, légkamrákhoz kapcsolódó nyílás; pl. *Conocephalum conicum*
lehulló	**caducous, deciduous**	könnyen vagy hamar leváló; pl. *Pohlia* és *Bryum* fajok rügytestjei, *Campylopus* fajok levelei vagy hajtáscsúcsai, *Dicranodontium denudatum* levelei
lencse alakú	**lenticular**	mindkét oldalán domború; pl. *Tetraphis pellucida* sarjtestjei
levágott csúcsú	**truncate**	csonkavégű; pl. *Radula complanata* perianthiuma
levélalapi sejt(ek)	**basal cell**(s)	(1) a levél legalsó részének (1/4–1/3) sejtjei, melyek a többi levélsejttől eltérő alakúak lehetnek; (2) sejt a hónaljszőr rögzítési pontján
levélér	**costa**	(lombosmoháknál) általában a levéllemez közepén lévő, a lemez sejtjeitől eltérő alakú sejtekből álló többsejtréteges megvastagodott rész; vö. középér
leveles	**foliose** (1)	pl. leveles májmohák (vö. telepes májmohák)

levélközépi sejtek	**median leaf cells**	a levél felső kétharmadánál a levélér és a levélszél között félúton lévő sejtek
levéllemez	**lamina**	a levél lapos, általában egyrétegű és zöld része, a levélér és a szél kivételével (ld. apikális, dorzális és hüvelyező levéllemez)
levéllemezszerű	**laminate**	lapos levélkezdeményre vonatkozó; pl. *Bryum bicolor* sarjtestjén
levélrozetta	**comal tuft**	levélrózsa a szár vagy ág végén; olyan lombosmoha levelek, amelyek a szár csúcsán nagyok és tömötten állnak; pl. *Rhodobryum* fajok
levélsejt	**lamina cell**	levéllemez sejtje (ld. sejthálózat)
levélszerű	**foliose** (2)	pl. *Brachythecium rutabulum* álparafilliumai
likacsos	**perforate**	átlyuggatott; pl. *Sphagnum* fajok hialocitái
mamilla	**mamilla**	kidudorodás, dudor; (1) a sejt erősen kidudorodó felülete, amely nem helyi falvastagodás, hanem a sejtüreg kidomborodásának eredménye (keresztmetszetben vizsgálható); pl. *Bartramia pomiformis* levélsejtjei; (2) a tokfedő kidudorodása; pl. *Grimmia orbicularis*
mamillás	**mamillose**	pl. *Bartramia pomiformis* levélsejtjei
meddő	**sterile**	olyan gametofiton egyed, amelyen nem fejlődtek ki ivarszervek; vö. termő
megvastagodott falú	**incrassate**	pl. *Riccia sorocarpa* epidermisz alatti sejtjei
meszes helyen élő	**calcicole, calcicolous**	kizárólag meszes élőhelyeken, pl. dolomiton, mészkövön, meszes homokon és homokkövön előforduló
mészkedvelő	**calciphilic**	többnyire meszes élőhelyeken (pl. dolomiton, mészkövön) élő
mészkerülő	**acidophilous, calcifuge**	meszes élőhelyeket kerülő, savas élőhelyeket preferáló, savanyú aljzaton növő
mikorrhiza	**mycorrhiza**	gombák és növények (pl. májmohák) szimbiózisa

négyszögletes	**quadrate**	négyzet, vagy ahhoz hasonló alakú; pl. *Ceratodon purpureus* levélsejtjei
nematogón	**rhizoid initial**	rhizoidokat fejlesztő sejt, amely általában kisebb, mint a szomszédos sejtek; pl. *Plagiothecium platyphyllum* csúcsi levélsejtjei
nemez	**tomentum**	száron vagy ritkán leveleken található, filcszerű, sűrű rhizoid szövedék; pl. *Dicranum* fajok szárán
nemezes	**tomentose**	gyapjas, rhizoidokkal sűrűn borított; pl. *Dicranum polysetum* szára
nemi eloszlás	**sexual condition**	az ivarszervek eloszlását jelöli a növény egyedeken/növény egyedek között; ld. autooikus, dioikus, szinoikus
nyak	**neck**	(1) lombosmoháknál: a spóratok meddő alapi része, amely az urna alapja és a toknyél teteje között található (szinonimája: apofízis); pl. *Polytrichum* fajok (2) az archegónium hengeres felső része
nyálka papilla	**slime-papilla**	bunkó alakú, nyálkát kiválasztó sejt, amely rövid, egysejtsoros szőrszerű képletek (nyálkaszőr) végén fordul elő; pl. *Apopellia endiviifolia* telep végén
nyeles	**pedicellate**	pl. a legtöbb moha gametangiuma; egyes *Syntrichia* fajok papillái
nyelv alakú	**lingulate**	hosszú, párhuzamos oldalú, lekerekített csúcsú; pl. *Plagiomnium undulatum* levelei
nyílás	**aperture**	felszíni pórus pl. a *Pellia* fajok telepén, amelyen a spermatozoidok kijutnak
ocellum	**ocellus**	leveles májmoháknál: szomszédos sejtektől eltérő levélsejt, amelyben a kloroplasztiszok helyett egy nagy olajtest van; pl. *Frullania tamarisci* felső levéllebenye
olajsejt	**oil-cell**	telepes májmoháknál: szomszédos sejtektől eltérő levélsejt, amely egy nagyon nagy olajtestet tartalmaz; pl. *Marchantia* fajok

olajtest	**oil-body**	membránnal körülvett, terpént tartalmazó organellum, amely csak májmohák sejtjeiben fordul elő
orsó alakú	**fusiform, spindle-shaped**	több mint háromszor olyan hosszú, mint széles és mindkét végén elvékonyodó; pl. *Ulota bruchii* érett tokja
összenyomott	**compressed**	lapított; pl. *Radula complanata* perianthiuma
ostorszerű ág	**flagelliform branch**	hosszú, vékony hajtás, kis (redukált) levelekkel, amely a vegetatív szaporodást szolgálja; pl. *Pseudotaxiphyllum elegans*
ovális	**oval**	széles elliptikus; pl. *Plagiomnium rostratum* levele
ovoidális	**ovoid**	tojás alakú test; pl. *Tortula lindbergii* spóratokja, *Scapania* fajok sarjtestjei
pajzs alakú	**peltate**	központi nyélen ülő kerekded képletre vonatkozik; pl. *Hedwigia stellata* levélsejtjeinek papillája
papilla	**papilla**	dudor, szemölcs; a sejtfal kidudorodó vastagodása; vö. papillás, nyálka papilla
papilla nélküli	**epapillose**	pl. *Grimmia*, *Schistidium* fajok többségének levéllemeze; vö. papillás
papillás	**papillose**	papillákat viselő; pl. *Brachythecium rutabulum* toknyele, *Syntrichia ruralis* felső levélsejtjei
parafillium	**paraphyllium**	különböző alakú (fonalszerű, lándzsás, pikkely- vagy levélszerű, néha elágazó) zöld kinövés; amely sok pleurokarp moha szárán vagy ágain bárhol megjelenhet; pl. *Thuidium* fajok (vö. álparafillium)
parakosztális	**paracostal**	a levélér melletti sejtekre vonatkozik, amelyek a levéllemez többi sejtjétől eltérő alakúak lehetnek; pl. *Grimmia* fajok
parenchima	**parenchyma**	viszonylag differenciálatlan, általában vékonyfalú és izodiametrikus sejtekből álló sejtcsoport; pl. *Didymodon* fajok szárkeresztmetszetében; vö. prozenchimatikus

párna	**tuft**	kompakt növekedési forma, többnyire sugárirányban álló hajtások együttese, pl. *Orthotrichum* fajok
paroikus	**paroicous**	olyan gametöciumra vonatkozik, amelyben az antheridiumok és archegóniumok térben elkülönülnek, az antheridiumok a levélhónaljakban, közvetlenül az archegóniumokat körülvevő levelek alatt találhatók; pl. sok májmoha, *Pohlia nutans* (paröcikus; ld. az autooikus utáni megjegyzést)
perianthium	**perianth**	a leveles májmohák archegóniumát és sporogoniumát kezdetben körülölelő, a legfelső levélörv összenövéséből keletkezett burokszerű képződmény; pl. *Frullania dilatata*
perichaetiális levél	**perichaetial leaf**	a termőtájhoz kapcsolódó módosult levél; ilyen levelek együttese alkotja a perichaetiumot
perichaetium	**perichaetium**	az archegóniumokat körülvevő eltérő alakú vagy nagyságú levelek együttese, a termőtáj része (vö. perichaetiális levél)
perigoniális levél	**perigonial leaf**	a hímtájhoz kapcsolódó módosult levél; ilyen levelek együttese alkotja a perigoniumot
perigonium	**perigonium**	a hím ivarszerveket körülvevő fellevelek együttese, a hímtáj része
perigynium	**perigynium**	néhány májmohánál (Jungermanniidae) a termőtájat körülvevő csőszerű képlet, amely felemeli a felleveleket és a perianthiumot
perisztómium	**peristome**	a tok szája körül egy vagy két (ritkán több) sorban elrendezett, általában 4, 8, 16, 32 vagy 64 fogra osztott kör alakú képlet (ld. endosztómium, exosztómium, prosztómium; belső-, külső-, egyszerű- és kettős perisztómium)
pillás	**ciliate**	szőrszerű nyúlványokkal szegélyezett; pl. *Hedwigia ciliata* perichaetiális levelei (vö. fonalasan rojtos)

pleurokarp	**pleurocarpous**	oldalttermő; olyan lombosmohákra vonatkozik, amelyek szára elágazó és a spóratokot rövid oldalágakon fejlesztik; a legtöbb pleurokarp moha földön fekvő, erősen elágazó és gyakran szőnyegszerű növekedésű; pl. *Brachythecium rutabulum*
porózus	**porose**	likacsos, pórusokkal rendelkező; áttört, gödörkés sejtfal; a lombosmohák levelének vastag sejtfala, ha az helyenként erősen elvékonyodik; pl. *Dicranum scoparium* levélalapi sejtjei
pórus	**pore**	(1) egyes sejtek falában található apró nyílás; pl. *Sphagnum* fajok levelének, ill. szár- és ág hialodermiszének hialocitáiban; (2) a sztóma központi nyílása (vö. álpórus, légzőpórus, áttört)
posztikális	**postical**	alsó, ventrális; a vízszintes szár hasi felülete; egy hosszanti vagy ferdén beillesztett levélnek a hajtás töve felé eső széle; pl. *Scapania* fajok levelének nagyobb lebenye (ld. proximális; vö. antikális)
primordium	**primordium**	kezdemény; a levél vagy más képlet embrionális stádiuma, amely differenciálatlan (nem specializált) sejtekből áll; pl. *Bryum* és *Pohlia* fajok rügytestjei
propagulum	**propagule** (propagulum)	szaporítótest, redukált rügy, ág vagy levél, amely a vegetatív szaporodásban vesz részt; ld. sarjtest
prorát	**prorate**	a sejtek csúcsain elhelyezkedő vagy a sejtek végeinek kiugrásával kialakuló papillákat vagy mamillákat viselő; pl. *Philonotis* fajok, *Ctenidium molluscum* levélfelszíne
prosztómium	**prostome**	az exosztómium fogakon kívül található külső, általában azokhoz tapadó kezdetleges képlet, preperisztómiumnak is nevezik; pl. *Orthotrichum anomalum*

protonema	**protonema**	előtelep; a spórából fejlődő fonalas, gömbölyű vagy telepszerű képződmény, a mohafejlődés első stádiuma; a májmoháknál egy gömbölyű, rövid telepszerű vagy fonalas képlet, amelyből általában egyetlen mohaegyed fejlődik ki; a lombosmoháknál a protonema általában fonalas, bár a *Sphagnum, Andreaea* és *Tetraphis* protonemája ± telepszerű
proximális	**proximal**	a tőhöz vagy a rögzítési ponthoz közelebb eső; a levél vagy szár töve felé eső; a spóráknak a spóratetrád belseje felé eső felülete (vö. disztális)
prozenchimatikus	**prosenchymatous**	olyan sejthálózatra vonatkozik, ahol a sejtek hosszanti irányban megnyúltak, hossztengelyük sokkal hosszabb, mint a szélességük
pszeudopodium	**pseudopodium**	álláb*;* (1) a *Sphagnumok* és az *Andreaeak* toknyele; a leveles (haploid) nemzedékhez tartozó képlet, amely a (diploid) tokot hordozza; (2) a szárcsúcs levéltelen nyúlványa, amelyen sarjtestek csoportjai fejlődnek; pl. *Aulacomnium palustre, Tetraphis pellucida*
ráncosan öblös	**sinuose**	hullámos; (1) a levél szélére (pl. *Chionoloma tenuirostre*); vagy (2) a levélsejtek falainak egyenlőtlen megvastagodásaira vonatkozik (pl. *Racomitrium* fajok) (ld. csomós)
receptaculum	**receptacle**	több telepes májmohánál megjelenő, antheridiumokat vagy archegóniumokat hordozó, korong vagy szemölcsszerű képlet, amely közvetlenül a telep felületén (pl. *Conocephalum*), a telep belsejében (pl. *Pellia*) vagy abból kiemelkedve, egy ernyőszerű nyeles képződmény végén található (pl. *Marchantia*)

rejtett pórusú	**cryptopore**	olyan tok, amelynek felszínén a gázcserenyílás zárósejtjei besüllyedtek; pl. *Orthotrichum* fajok (vö. felszíni pórusú)
-rétegű	**-stratose**	a keresztmetszetben látható sejtrétegek számára vonatkozik; azaz egy-, két-, több(sejt)rétegű
rhizoid	**rhizoid**	gyökérszerű képződmény, amely általában felszívási és rögzítési funkciót lát el; májmoháknál és becősmoháknál egysejtű és többnyire átlátszó; lombosmoháknál általában barna vagy vöröses, egyszerű vagy elágazó, többsejtű szál, rendszerint ferde végfalakkal (ld. nemez)
rhizoid barázda	**rhizoid furrow**	néhány telepes májmoha receptaculumának nyelében található mély barázda, amely rhizoidokat tartalmaz; pl. *Mannia* fajok
rhizoid gumó	**tuber**	rhizoidokon előforduló vegetativ szaporítótest, amely számos akrokarp mohánál megtalálható; pl. *Bryum*
rhizomatikus	**rhizomatous**	vízszintesen kúszó, vékony föld alatti szárral rendelkező; pl. *Rhodobryum* fajok
romboidális	**rhomboidal**	hosszúkás-hatszögletű sejtekre vonatkozik; pl. *Bryum* s.l. fajok
rost	**fibril**	*Sphagnum* fajok hialocitáin található finom, szálszerű falvastagodás, amely gyűrű, vagy spirális alakú lehet; ld. spirális rostok
rostos	**fibrillose**	finom, szálszerű falvastagodásokkal (rostok) rendelkező; *Sphagnum* fajok hialocitáira vonatkozik
rovátkolt	**striate**	finom hosszanti gerincekkel vagy vonalakkal, csíkokkal rendelkező; pl. *Orthotrichum* fajok spóratokjai
rügyképző	**gemmiferous, gemmiparous**	sarjmorzsákat hordozó; pl. *Radula complanata* levelei

rügykosárka	**gemma cup**	csésze alakú, gemmákat tartalmazó képlet, amely telep- (pl. *Marchantia*), vagy levéleredetű (pl. *Tetraphis*); feltehetően a gemmák vízcseppek általi terjedését segíti
rügytest	**bulbil**	vegetatív szaporítótest; kicsi, könnyen kihulló, hagymához hasonló levélhónalji szaporító képlet; pl. *Bryum bicolor*
S-alakú	**sigmoid**	pl. *Funaria hygrometrica* perisztómium fogai
sapka alakú	**mitrate** (mitriform)	kaliptrákra vonatkozik; (1) kúpos és osztatlan, süveghez hasonló; pl. *Orthotrichum* fajok; vagy (2) az alján egyenlően karéjos; pl. *Physcomitrium pyriforme* (vö. csuklyás; ld. harang alakú)
sarjtest	**gemma**	egy- vagy többsejtű, fonalas, gömbölyű, ellipszoid, hengeres, csillag vagy korong alakú, viszonylag differenciálatlan vegetatív szaporítótest
sarki sejtcsoport	**alar cells**	a levél tövének külső szélénél elhelyezkedő, a levél többi részétől eltérő méretű, alakú vagy színű sejtekből álló sejtcsoport; pl. *Dicranum*; ld. fülecske
sarki sejtcsoport feletti sejtek	**supra-alar cells**	közvetlenül a sarki sejtek felett található sejtek; pl. *Racomitrium*
sarló alakú	**falcate**	sarló pengéjéhez hasonlóan ívelt; pl. *Drepanocladus aduncus* levele
sarlósan görbült	**falcate-secund**	erősen ívelt és egy oldalra hajló; pl. *Paraleucobryum longifolium* hajtásai és levelei
sejthálózat	**areolation**	levél vagy telep sejtjeinek elrendeződése
sejtüreg	**lumen**	a sejtek sejtfalon belüli belső tere
síkfelületű	**plane**	lapos, nem ívelt vagy hullámos, nem begöngyölt; a levélszélekre (pl. *Dicranella rufescens, D. staphylina*), vagy levéllemezre vonatkozik (pl. *Pedinophyllum interruptum* laterális levele)
sima	**glabrous**	csupasz: nem papillás vagy érdes, szőrtelen; pl. *Encalypta vulgaris* kaliptrája

spirális rostok	**spiral fibrils**	spirális falvastagodások a *Sphagnum* fajok hialocitáiban ill. hialodermiszében, amelyek mechanikai szilárdságot adnak a sejteknek
spóra	**spore**	a meiózis eredményeként a tokban képződő reproduktív egység; általában apró, többnyire gömb alakú és egysejtű képlet, amelyből csírázáskor protonema fejlődik
sporofiton	**sporophyte**	a spóraképző diploid nemzedék; a gametofitonon fejlődik ki; jellemzően toknyél és spóratok alkotja
süveg	**calyptra**	a fejlődő sporofitont borító, haploid szövetből álló hártya, amely az archegónium hasi részéből származik; a lombosmoháknál a toknyél megnyúlásával – gyakran kitágulva – továbbra is a tokon maradva védőburkot képez
szabálytalan	**irregular**	nem feleltethető meg semmilyen szabályos formának
szabálytalanul fogazott	**erose**	szaggatott vagy szabálytalanul hiányos, rágásnyomszerű; pl. *Didymodon sinuosus* levélszegély
szálkahegy (1)	**apiculus**	(1) a tok (pl. *Physcomitrium patens*) vagy (2) a levélvég (pl. *Rhynchostegium murale*) rövid, hirtelen, gyakran ér nélküli kicsúcsosodása; (vö. szálkahegy (2))
szálkahegy (2)	**mucro**	rövid, hirtelen kicsúcsosodás, amelyet gyakran a kifutó levélér képez (pl. *Trichostomum brachydontium*) (vö. szálkahegy (1))
szálkátlan	**muticous**	nem szálkahegyben végződő; pl. *Pogonatum* fajok levélcsúcsa
szaporítótest	**brood body**	bármely olyan képlet, amely a vegetatív szaporodást szolgálja, például sarjmorzsák, rügytestek, rhizoid gumók, redukált ágak vagy levelek; vö. sarjtest

szár	**stem**	a lombosmohák és a leveles májmohák gametofitonjának fő-tengelye
szárny	**wing**	vékony, lapos, hártyás képlet, mint például a spóra széle, a perianthium éle, a vastag telepű májmohák oldalsó, erősen elvé-konyodó része (telepszárny)
szegély	**border, limbidium**	a levelek szélén látható sejtek, amelyek alakjukban, méretükben, színükben vagy falvastagságukban eltérnek a többi levélsejttől, néha többsejtrétegű részt alkotnak; pl. *Fissidens bryoides*
szélső	**marginal**	széli, szegélyi; különösen a levelek esetében
szemölcs	**wart**	bibircsók, kis kiemelkedés vagy dudor; pl. *Brachythecium rutabulum* toknyelén (vö. papilla)
szétálló (1)	**divergent**	a rögzítési ponttól kétirányban elálló; pl. *Lophocolea* allevelének lebenyei
szétálló (2)	**spreading**	45°-os vagy annál nagyobb (de 90°-nál kisebb) szöget bezáró; pl. a levél és a szár közötti adaxiális szög (ld. fel- és elálló, berzedt, elálló)
sziklalakó	**saxicolous**	sziklákon növő; pl. *Orthotrichum anomalum*
szinoikus	**synoicous**	olyan fajokra vonatkozik, amelyeknél az antheridiumok és az archegóniumok egymás mellett találhatók ugyanabban a game-tóciumban (szinöcikus; ld. az autooikus utáni megjegyzést); pl. *Ptychostomum torquescens*
szinusz	**sinus**	két szegmens közötti bevágás vagy bemélyedés; pl. kétkaréjú levél
szívalakú	**cordate**	széles alappal rendelkező, fülecskés levelekre vonatkozik; pl. *Calliergon cordifolium*
szklerodermisz	**sclerodermis**	vastagfalú sejtekből álló henger alakú sejtcsoport, amely a száron belül a hialodermisz alatt talál-ható; pl. *Sphagnum*
szögletes	**angulate**	sarkokkal rendelkező; pl. *Diplophyllum* fajok sarjtestjei

szőnyeg	**mat**	sűrűn összefonódó, vízszintes növekedési forma; pl. *Brachythecium, Hypnum* fajok
szőrhegyű	**piliferous**	szőrszerű levélcsúccsal rendelkező; pl. *Polytrichum piliferum*
szőrszerű levélcsúcs	**hair point**	a levél csúcsán általában kifutó levélér folytatásaként megjelenő, átlátszó sima vagy fogazott képlet; pl. *Tortula muralis*
szőrtelen	**epilose**	szőr vagy szőrszerű levélcsúcs nélküli; vö. szőrhegyű
szövedék	**weft**	lazán összefonódó, gyakran elfekvő hajtásokból álló növekedési forma; pl. *Thuidium* fajok
sztegokarp	**stegocarpous**	a felnyíló tokfedővel rendelkező kapszulákra vonatkozik; vö. kleisztokarp
sztereid	**stereid**	vékony, hosszúkás, vastag falú, rostszerű sejt, amely csoportokban (sztereid sávokban) található egyes lombosmohák levélerében vagy szárában
sztóma	**stoma**	gázcserenyílás; apró nyílás a becősmohák kapszulájának falában, és általában a lombosmohák kapszuláján; két félhold alakú zárósejt veszi körül
szubsztereid	**substereid**	a sztereidhez hasonló, de annál kevésbé vastagodott falú sejt
szubula	**subula**	hosszú, karcsú levélcsúcs; pl. *Pleuridium* fajok
tagolatlan	**entire** (2)	lebenyekre nem osztott levél (pl. *Jungermannia*), allevél (pl. *Nardia*), perisztómium fog (pl. *Encalypta ciliata*), vagy egyéb képlet
talajlakó	**terrestrial, terricolous**	talajon növekvő; vö. sziklalakó, kéreglakó
tányérszerű	**discoid**	lemez vagy korong alakú; pl. *Marchantia polymorpha* sarjtestjei
telep	**thallus**	± lapított gametofiton, amely nem differenciálódik szárra és levelekre

tengely	**axis**	a főszár; egy képzeletbeli vonal, amely körül a különböző képletek (levelek, ágak stb.) elhelyezkednek
tenyeres	**palmate**	egy középpontból kiinduló, ujjszerű lebenyekkel rendelkező; pl. *Riccardia palmata* telepe
terminális	**terminal**	végálló; a csúcson, valamilyen képlet hegyén, vagy a disztális végén elhelyezkedő (vö. alapi)
termő	**fertile**	ivarszerveket (antheridiumokat, archegóniumokat) hordozó hajtások vagy telepek; vö. meddő
termőhely	**habitat**	élőhely, a faj jellemző előfordulási helye
termőtáj	**gynoecium**	női ivarszerveket (archegóniumokat) magába foglaló képlet és a környező levelek (perichaetium) együttese
többsejtrétegű	**pluristratose**	több sejtrétegből álló; pl. *Cinclidotus fontinaloides* levélszegélye
tojásdad	**ovate**	tojás körvonalú, amelynek alapja szélesebb, mint a csúcsa; pl. *Calliergonella cuspidata* szárlevele
tok	**capsule**	a sporangium; a sporofiton spóraképző terminális része; a legtöbb lombosmohában apikális tokfedőre, központi urnára (spóraképző régió) és meddő alapi nyakra (apofízisre) tagolódik; a legtöbb májmohában és becősmohában homogén szerkezetű, spórákat és elaterákat tartalmaz, és általában 4 (vagy 2) hasítékkal nyílik
tokfedő	**lid, operculum**	a legtöbb lombosmoha tokjának éréskor leváló felső része; általában gyűrű választja el a szájtól, amely a tok felnyílását segíti (ld. sztegokarp)
toknyél	**seta**	májmohák ill. lombosmohák kapszulájának nyele; (vö. pszeudopodium)
tollasan elágazó	**pinnate**	számos, a tengely két oldalán elterülő ágat viselő, madártollra emlékeztető; pl. *Ctenidium molluscum*

tompa	**obtuse** (1)	több mint 90°-os szöget bezáró; pl. *Grimmia orbicularis* tompa szögben élelt levele
tompa csúcsú	**obtuse** (2)	lekerekített csúcsú; pl. *Nyholmiella* levélcsúcsa; *Gymnocolea inflata* lebeny csúcsa
tüske	**spine**	(1) hegyes, kiálló sejtvégek (nem papillák) a levélér dorzális oldalán pl. egyes *Tortella* fajokban; (2) egyes májmohák spóráin található hegyes kiálló képletek; pl. *Fossombronia pusilla, Sphaerocarpos michelii*; (3) a dorzális oldalon kiálló fog az ér végén; pl. *Brachytheciastrum velutinum, Oxyrrhynchium* fajok
tüskés (1)	**spinulose, spinose**	kisebb (’spinulose’) vagy nagyobb (’spinose’), éles, hegyes fogakkal rendelkező; pl. ’spinulose’ *Schistidium confertum, Sch. helveticum* levelének szőrszerű levélcsúcsa, ’spinose’ *Dicranum polysetum* levél felső részének széle, *Syntrichia* fajok szőrszerű levélcsúcsa
tüskés (2)	**echinate**	a sün tüskéihez hasonló, merev sörtékkel rendelkező; pl. *Physcomitrium patens, Microbryum davallianum* s.str. spóra felülete
ülő	**sessile**	nyél nélküli; pl. *Syntrichia papillosa* sarjtestjei
üreges	**lacunose**	felületi mélyedésekkel vagy perforációkkal rendelkező; *Riccia cavernosa* telep háti felülete
urna	**urn**	a tok spóratermő része (a meddő nyakkal ellentétben)
üvegszerű	**hyaline**	színtelen vagy átlátszó; pl. *Grimmia pulvinata* szőrszerű levélcsúcsa
vaginula	**vaginula**	a toknyél alapját körülvevő gyűrű vagy hüvely, amely az archegónium alapjából és az azt körülvevő szár sejtjeiből származik, és a süveg leválása után is megmarad
válaszfalas	**septate**	sejtfalakkal elválasztott; válaszfalakkal rendelkező; pl. *Sphagnum* fajok hialocitái

váll	**shoulder**	hirtelen szűkülő terület; pl. a levél azon része, ahol a levélalap hirtelen szűkül a felső levéllemez felé; pl. *Grimmia ovalis* levele
végigfutó	**percurrent**	a csúcsig nyúló; pl. *Sciuro-hypnum populeum* levélere
ventrális	**ventral**	hasoldali; levelek esetében: az adaxiális, felső felület; perisztómium fogak esetében: a belső felület; vízszintes szárak vagy telepek esetében: az alsó felület, az aljzathoz közeli; vö. dorzális; ld. még: posztikális (májmohák hosszában összehajtott levelekkel)
vese alakú	**reniform**	pl. *Physcomitrium arenicola* spórája
villás	**bifurcate, furcate**	olyan elágazási mód, amelyben a tengely csúcsa két, lényegében nagyjából egyforma ágra válik szét; ennek következtében a tengely nem növekszik tovább, hanem két egyforma ágra oszlik (a telepes májmohák egy részének jellegzetes elágazása; pl. *Metzgeria* fajok); papillák alakjára is használatos; pl. *Syntrichia subpapillosissima*
visszahajló	**recurved**	levelek esetében: lefelé (abaxiálisan) és kifelé hajló; a szélre (pl. *Barbula unguiculata*), csúcsra vagy széli fogakra (pl. *Conardia compacta*) vonatkozik; perisztómium fogak esetében: kifelé és ± lefelé hajló (pl. *Lewinskya affinis*); vö. behajló
víztartó kancsó	**water sac**	felfújt vagy behajlított, általában vízzel telt lebeny vagy levélrész; pl. *Frullania dilatata* alsó lebenye
vonalszerű	**linear**	nagyon keskeny, hosszúkás, szinte párhuzamos oldalú; pl. *Hypnum cupressiforme* levélsejtjei
xeromorf	**xeromorphic**	szárazsághoz adaptált

zárósejtek	**guard cells**	(1) a moha vagy becősmoha gázcserenyílását körülvevő, speciális exotheciális sejtek, melyek általában párosak és vese alakúak (a Funariaceae család egyes fajainál csak egyetlen sejt alkotja, közepén résszerű nyílással); (2) a telepes májmohák epidermiszében a légzőpórusokat körülvevő sejtek (ld. gázcserenyílás)
zsákszerű	**saccate**	pl. *Nowellia curvifolia* hasi levélszéle; *Radula complanata* hím buroklevelének alja
zsindelyszerű	**imbricate**	fedelékes, zsindelyes, egymást részben takaró; szorosan egymáshoz simuló és átfedő; pl. a levélszélek átfedik egymást, mint a tető cserepei; pl. *Bryum argenteum* hajtásai

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German bryologist Peter Erzberger developed an interest in the Hungarian bryophyte flora in the 1990s. He participated in the German bryophyte recording programme together with German colleagues, coordinated by Ludwig Meinunger and Wiebke Schröder. In cooperation with the Hungarian Natural History Museum in Budapest, he also took part in numerous field trips to countries of the Balkan Peninsula, including Romania, Serbia, Montenegro, North Macedonia, Greece, and Albania.

In 2012, he initiated a project with Hungarian colleagues aimed at producing a grid-cell-based distribution atlas of the Hungarian bryophyte flora. This project is still ongoing. Alongside his fieldwork, he also undertook extensive revisions of specimens housed in the bryophyte collections of the Hungarian Natural History Museum and the University of Eger, focusing mainly on groups that had been poorly understood by bryologists in the 20th century, such as the Grimmiaceae and Bryaceae. These studies were often carried out in cooperation with experts from Germany, Switzerland, and Poland.

Some of the results of these studies provided the basis for checklists employing up-to-date taxonomic concepts. His aim of sharing these concepts with Hungarian colleagues also led to the publication of identification keys. The present volume is the second, enlarged edition, made necessary by the addition of numerous new species to the Hungarian bryophyte flora.