Journal of Bryology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/yjbr20

New national and regional bryophyte records, 65

L. T. Ellis, C. Ah-Peng, G. Aslan, V. A. Bakalin, A. Bergamini, D. A. Callaghan, P. Campisi, F. M. Raimondo, S. S. Choi, J. Csiky, É. Csikyné Radnai, B. Cykowska-Marzencka, I. V. Czernyadjeva, Yu M. Kalinina, O. M. Afonina, G. Domina, P. Drapela, V. E. Fedosov, E. Fuertes, R. Gabriel, M. Kubová, I. Soares Albergaria, G. Gospodinov, R. Natcheva, A. Graulich, T. Hedderson, E. Hernández-Rodríguez, V. Hugonnot, C. W. Hyun, M. Kırmacı, U. Çatak, S. Kubešová, J. Kučera, C. La Farge, J. Larraín, P. Martin, B. Mufeed, C. N. Manju, K. P. Rajesh, Cs. Németh, J. Nagy, N. Norhazrina, N. Syazwana, S. V. O'Leary, S. J. Park, A. P. Peña-Retes, A. Rimac, A. Alegro, V. Šegota, N. Koletić, N. Vuković, S. Rosadziński, J. A. Rosselló, M. S. Sabovljević, A. D. Sabovljević, A. Schäfer-Verwimp, C. Sérgio, A. V. Shkurko, D. Shyriaieva, V. M. Virchenko, M. Smoczyk, D. Spitale, P. Srivastava, I. Omar, A. K. Asthana, M. Staniaszek-Kik, A. Cienkowska, M.-M. Ștefănuţ, S. Ștefănuţ, G. Tamas, C.-C. Bîrsan, G.-R. Nicoară, M. C. Ion, T. Pócs, G. Kunev, E. I. Troeva, J. van Rooy, P. Wietrzyk-Pełka, M. H. Węgrzyn, G. J. Wolski, D. Bożyk & A. Cienkowska

To cite this article: L. T. Ellis, C. Ah-Peng, G. Aslan, V. A. Bakalin, A. Bergamini, D. A. Callaghan, P. Campisi, F. M. Raimondo, S. S. Choi, J. Csiky, É. Csikyné Radnai, B. Cykowska-Marzencka, I. V. Czernyadjeva, Yu M. Kalinina, O. M. Afonina, G. Domina, P. Drapela, V. E. Fedosov, E. Fuertes, R. Gabriel, M. Kubová, I. Soares Albergaria, G. Gospodinov, R. Natcheva, A. Graulich, T. Hedderson, E. Hernández-Rodríguez, V. Hugonnot, C. W. Hyun, M. Kırmacı, U. Çatak, S. Kubešová, J. Kučera, C. La Farge, J. Larraín, P. Martin, B. Mufeed, C. N. Manju, K. P. Rajesh, Cs. Németh, J. Nagy, N. Norhazrina, N. Syazwana, S. V. O'Leary, S. J. Park, A. P. Peña-Retes, A. Rimac, A. Alegro, V. Šegota, N. Koletić, N. Vuković, S. Rosadziński, J. A. Rosselló, M. S. Sabovljević, A. D. Sabovljević, A. Schäfer-Verwimp, C. Sérgio, A. V. Shkurko, D. Shyriaieva, V. M. Virchenko, M. Smoczyk, D. Spitale, P. Srivastava, I. Omar, A. K. Asthana, M. Staniaszek-Kik, A. Cienkowska, M.-M. #tefănuț, S. #tefănuț, G. Tamas, C.-C. Bîrsan, G.-R. Nicoară, M. C. Ion, T. Pócs, G. Kunev, E. I. Troeva, J. van Rooy, P. Wietrzyk-Pełka, M. H. Węgrzyn, G. J. Wolski, D. Bożyk & A. Cienkowska (2021) New national and regional bryophyte records, 65, Journal of Bryology, 43:1, 67-91, DOI: 10.1080/03736687.2021.1878804

To link to this article: https://doi.org/10.1080/03736687.2021.1878804

Published online: 25 Mar 2021.

JOURNAL OF BRYOLOGY
2021, VOL. 43, NO. 1, 67–91
https://doi.org/10.1080/03736687.2021.1878804

Taylor & Francis
Taylor & Francis Group

BRYOLOGICAL NOTE

New national and regional bryophyte records, 65

L. T. Ellis[a], C. Ah-Peng[b], G. Aslan[c], V. A. Bakalin[d], A. Bergamini[e], D. A. Callaghan[f], P. Campisi[g], F. M. Raimondo[g], S. S. Choi[h], J. Csiky[i], É. Csikyné Radnai[j], B. Cykowska-Marzencka[k], I. V. Czernyadjeva[l], Yu M. Kalinina[l], O. M. Afonina[l], G. Domina[m], P. Drapela[n], V. E. Fedosov[o,p], E. Fuertes[q], R. Gabriel[r,s], M. Kubová[r,t], I. Soares Albergaria[s,u], G. Gospodinov[v], R. Natcheva[v], A. Graulich[w], T. Hedderson[x], E. Hernández-Rodríguez[y], V. Hugonnot[z], C. W. Hyun[aa], M. Kırmacı[ab], U. Çatak[ab], S. Kubešová[ac], J. Kučera[ad], C. La Farge[ae], J. Larraín[af], P. Martin[ag], B. Mufeed[ah], C. N. Manju[ah], K. P. Rajesh[ah], Cs. Németh[ai], J. Nagy[ai], N. Norhazrina[aj], N. Syazwana[aj], S. V. O'Leary[ak], S. J. Park[al], A. P. Peña-Retes[am], A. Rimac[an], A. Alegro[an], V. Šegota[an], N. Koletić[an], N. Vuković[an], S. Rosadziński[ao], J. A. Rosselló[ap], M. S. Sabovljević[aq], A. D. Sabovljević[aq], A. Schäfer-Verwimp[ar], C. Sérgio[as], A. V. Shkurko[at], D. Shyriaieva[au], V. M. Virchenko[au], M. Smoczyk[av], D. Spitale[aw], P. Srivastava[ax], I. Omar[ax], A. K. Asthana[ax], M. Staniaszek-Kik[ay], A. Cienkowska[ay], M.-M. Ştefănuţ[az], S. Ştefănuţ[ba], G. Tamas[ba], C.-C. Bîrsan[ba], G.-R. Nicoară[ba], M. C. Ion[ba], T. Pócs[bb], G. Kunev[bc], E. I. Troeva[bd], J. van Rooy[be,bf], P. Wietrzyk-Pełka[bg], M. H. Węgrzyn[bg], G. J. Wolski[ay], D. Bożyk[ay] and A. Cienkowska[ay]

[a]Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD, UK; [b]UMR PVBMT, Pôle de Protection des Plantes, Pôle Forêt, Université de La Réunion, Saint-Pierre, Île de La Réunion; [c]Buharkent Meslek Yüksek Okulu, Bitkisel ve Hayvansal Üretim Programı, Aydın Adnan Menderes Üniversitesi, Buharkent Aydın, Turkey; [d]Botanical Garden-Institute, Russian Academy of Science, Vladivostok, Russia; [e]WSL Swiss Federal Research Institute Biodiversity & Conservation Biology, Birmensdorf, Switzerland; [f]Bryophyte Surveys Ltd, Bristol, UK; [g]Department of Biological, Chemical and Pharmaceutical Sciences and Technologies, University of Palermo, Palermo, Italy; [h]Team of Ecological Survey Research, National Institute of Ecology, Seocheon, Korea; [i]Department of Ecology, Institute of Biology, University of Pécs, Pécs, Hungary; [j]Nagy Lajos Secondary Grammar School of the Cistercian Order, Pécs, Hungary; [k]Institute of Botany, Polish Academy of Sciences, Kraków, Poland; [l]Komarov Botanical Institute of the Russian Academy of Sciences, St. Petersburg, Russia; [m]Department of Agricultural, Food and Forest Sciences, University of Palermo, Palermo, Italy; [n]Valle de San Pedro, Quillota, Chile; [o]Faculty of Chemistry, Lomonosov Moscow State University, Moscow, Russia; [p]Botanical Garden-Institute, Vladivostok, Russia; [q]Departamento de Biodiversidad, Ecología y Evolución, Facultad de Biología, Universidad Complutense de Madrid, Madrid, España; [r]cE3c/GBA, Centre for Ecology, Evolution and Environmental Changes/Azorean Biodiversity Group and University of the Azores, Angra do Heroísmo, Portugal; [s]GREENGA – Green Garden Azores, PO Azores 2020, ACORES-01-0145-FEDER-000070; [t]CEITEC, Central European Institute of Technology, Faculty of Science, Masaryk University, Brno, Czech Republic; [u]CHAM – Centro de Humanidades – Núcleo dos Açores and University of the Azores, Ponta Delgada, Portugal; [v]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria; [w]Donceel, Belgium; [x]Bolus Herbarium, University of Cape Town, Rondebosch, South Africa; [y]Institut de recherche sur les forêts, Université du Québec en Abitibi-Témiscamingue, Rouyn-Noranda, Québec, Canada; [z]Le Bourg 43380, Blassac, France; [aa]Plant Resources Division, National Institute of Biological Resources, Incheon, Korea; [ab]Aydın Adnan Menderes Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü, Kepez-Aydın TR-09010, Turkey; [ac]Moravian Museum, Department of Botany, Brno, Czech Republic; [ad]University of South Bohemia, České Budějovice, Czech Republic; [ae]Cryptogamic Herbarium (ALTA), Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada; [af]Instituto de Biología, Pontificia Universidad Católica de Valparaíso, Campus Curauma, Valparaíso, Chile; [ag]Tetbury, Gloucestershire, UK; [ah]PG & Research Department of Botany, The Zamorin's Guruvayurappan College, Kozhikode-14, Kozhikode, Kerala, India; [ai]Department of Botany, Faculty of Horticultural Sciences, Szent István University, Budapest, Hungary; [aj]Department of Biological Sciences and Biotechnology, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia; [ak]Wallingford, Oxon, UK; [al]Department of Biology, Jeonbuk National University, Jeonju, Korea; [am]Departamento de Botánica, Instituto de Biología, Universidad Nacional Autónoma de México, Ciudad de México, México; [an]Division of Botany, Department of Biology, University of Zagreb, Zagreb, Croatia; [ao]Poznań, Poland; [ap]Jardín Botánico, Universitat de València, Valencia, Spain; [aq]Institute of Botany and Botanical Garden. Faculty of Biology, University of Belgrade, Belgrade, Serbia; [ar]Herdwangen-Schönach, Germany; [as]cE3c/LISU, Centre for Ecology, Evolution and Environmental Changes / Museu Nacional de História Natural e da Ciência, Lisbon, Portugal; [at]Tsitsin Main Botanical Garden, Russian Academy of Sciences, Moscow, Russia; [au]Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine; [av]Rzepin, Poland; [aw]MuSe Museo delle Scienze, Corso del Lavoro e della Scienza, Trento, Italy; [ax]Bryology Laboratory, CSIR- National Botanical Research Institute, Lucknow, India; [ay]Department of Geobotany and Plant Ecology, University of Łódź, Łódź, Poland; [az]Faculty of Biology, University of Bucharest, Bucharest, Romania; [ba]Institute of Biology Bucharest of Romanian Academy, Bucharest, Romania; [bb]Botany Department, Eszterházy Károly University, Eger, Hungary; [bc]Faculty of Biology, Department of Botany, Sofia University "St. Kliment Ohridski", Sofia, Bulgaria; [bd]Institute for Biological Problems of Cryolithozone SB RAS, Yakutsk, Russia; [be]National Herbarium (PRE), South African National Biodiversity Institute, Pretoria, South Africa; [bf]School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa; [bg]Prof. Z. Czeppe Department of Polar Research and Documentation, Institute of Botany, Jagiellonian University, Kraków, Poland

ARTICLE HISTORY First Published Online 15 March 2021

1. ***Aneura maxima*** (Schiffn.) Steph.

Contributors. G. Gospodinov and R. Natcheva

Bulgaria. Sofia Province, Ihtiman Sredna Gora Mts, NW of Gabra village, near Chukurovo coal mine, 23.603208°E, 42.548586°N, 827 m a.s.l., in a seepage spring area on wet mineral soil and at the base of sedges on a complex bedrock of conglomerates, sandstones, siltstones, shales, clays and coal, male and

CONTACT L. T. Ellis l.ellis@nhm.ac.uk

female plants with sporophytes, 21 March 2019, *coll*. G. Gospodinov, *leg*. G. Gospodinov, R. Natcheva (SOM 9810-B).

Aneura maxima is here reported new to Bulgaria (*cf*. Ganeva and Natcheva 2003). It was represented by several patches of large, glossy green, irregularly branched thalli with lobate and strongly undulate margins, bearing unistratose wings 1–15 cells wide. Distribution in Europe includes Belgium (Andriessen et al. 1995), France (Sotiaux and Sotiaux 1996), Finland (Frahm 1997), Denmark (Thingsgaard 2002), Luxembourg (Werner 2003), the Czech Republic (Kučera 2004), Poland (Buczkowska and Bączkiewicz 2006), Slovakia (Loskotová 2006), Portugal and Spain (Sérgio and Garcia 2009), Norway (Frahm 2011), Romania (Ştefănuţ 2012), and The Netherlands (van der Pluijm 2016). Thus, our report extends the distribution of the species further to the south-east of Europe.

In Bulgaria the genus *Aneura* Dumort. is represented so far only by *A. pinguis* (L.) Dumort. The individuals from just one location in Bulgaria fit the morphological description given for *A. maxima* by e.g. Damsholt (2002). Our finding supports the suggestions of other bryologists that most likely *A. maxima* has a wider range of occurrence in Europe but probably represented by scattered small populations. The species is likely overlooked due to the close morphological similarity with the strongly variable *A. pinguis*.

2. ***Aneura pinguis*** (L.) Dumort.
Contributor. J. A. Rosselló
Spain. Balearic Islands: Mallorca, Escorca, Mortitx, Torrent de s'Hort des Molí, 31SDE9214, on sunny and wet calcareous rocks in a temporary spring, 320 m a.s.l., 14 May 2009, *leg*. J. Pericàs *1237* and J. A. Rosselló (VAL).

This is the first record of the Aneuraceae family in the Balearic archipelago. Recently, it has been suggested that *Aneura pinguis* is a complex of formally unnamed cryptic species (ten, A to J) as revealed by nuclear and plastid DNA markers (Bączkiewicz et al. 2017). However, lack of discriminant morphological features between DNA types prevented a finer taxonomic approach, as previously suggested (Wachowiak et al. 2007).

3. ***Barbilophozia hatcheri*** (A.Evans) Loeske
Contributors. Cs. Németh and J. Nagy
Hungary. Pest County, Buda Mts [8579.2] (Central European Mapping Scheme), south of the village of Budakeszi, Mária-szurdok (in former maps as either Meteor-szurdok or Kavics-árok), on shaded sandstone-conglomerate rock, ca. 252 m a.s.l., 47°29′39.3″N, 18°55′43.1″E, 10 June 2016, *leg*. Cs. Németh, J. Nagy and G. Mészáros, *det*. Cs. Németh, *conf*. W. Schröder (Herb. Németh 7998). Associated bryophytes: *Lophozia bicrenata* (Hoffm.) Dumort., *Marsupella funckii* (F.Weber & D.Mohr) Dumort., *Scapania mucronata* H.Buch, *Dicranella heteromalla* (Hedw.) Schimp., *Dicranum scoparium* Hedw., *Hypnum cupressiforme* Hedw., *Polytrichum piliferum* Hedw.

Barbilophozia hatcheri is characterised by 3–4 lobed leaves, the upper leaves having reddish gemmae at the tip of lobes. Exact identification, however, needs microscopical examination of the cilia at the base of the leaves. In Hungary two other species of *Barbilophozia* Loeske occur, namely *B. barbata* (Schreb.) Loeske and *B. floerkei* (F.Weber & D.Mohr) Loeske (Papp, Erzberger, Ódor, et al. 2010). The former differs from *B. hatcheri* in lacking cilia on the basal part of leaves, whilst the latter can be differentiated by the absence of gemmae and the shape of cells of the cilia, which are subquadrate in the latter species, while they are elongated in *B. hatcheri*.

This calcifuge species usually grows on subneutral to acidic substrates. Its Hungarian habitat was on a shady northern steep slope on sandstone-conglomerate rocks and on soil amongst them.

In Europe, *B. hatcheri* is widely distributed and occurs in most European countries including all of the countries surrounding Hungary: Austria, Croatia, Romania, Serbia, Slovakia, Slovenia, and The Ukraine (Hodgetts 2015). *Barbilophozia hatcheri* is missing in the latest checklist (Papp, Erzberger, Ódor, et al. 2010) and thus it is new to the bryoflora of Hungary.

4. ***Bartramia aprica*** Müll.Hal.
Contributor. T. A. Hedderson
Pakistan. Northwest Frontier Province, Kohistan District, ca. 4.5 km southeast of Dasu on the N35 from Islamabad, 800 m a.s.l., 34.2433°N, 73.1850°E, in rock crevices in part shade near waterfall, 17 July 1998, *leg*. T. A. Hedderson *12137* (BOL).

Bartramia aprica is widespread and relatively common around the Mediterranean basin, extending north to the British Isles and eastward to Turkey and Azerbaijan, and it also occurs in areas of western North America with a Mediterranean climate (Damayanti et al. 2012). It has also been reported from Afghanistan (Kürschner and Frey 2019). Material of this species was long treated as *B. stricta* Brid., a species that otherwise occurs in western South America, but morphological and molecular data show clearly that the Northern Hemisphere populations are distinct from those in South America and require recognition at species level. The earliest available name for this taxon is *B. aprica* (Müller 2014).

5. ***Brachytheciastrum olympicum*** (Jur.) Vanderp., Ignatov, Huttunen & Goffinet
Contributors. P. Martin and S. V. O'Leary
Andorra. Coll d'Ordino, 1885 m a.s.l., 42°33′14.40″N, 1°33′54.0″E, 16 May 2019. On soil under coniferous trees, *leg. & det*. P. Martin & S. V. O'Leary *s.n., conf*. D. Orgaz.

Brachytheciastrum Ignatov & Huttunen was separated from *Brachythecium* Schimp. in 2002 (Ignatov and Huttunen 2002). In 2013, a taxonomic revision was presented for *Brachytheciastrum* and seven species were recognised in the Mediterranean region (Orgaz et al. 2013). *Brachytheciastrum olympicum* was noted to be distributed in Asia and Europe, found on rocks and calcareous soils. Within Europe, it has been confirmed from Cyprus, Greece, Portugal and Turkey with unconfirmed records from Bosnia-Herzegovina, Italy, Lebanon, Macedonia, Romania and Slovenia. *Brachytheciastrum olympicum* is also recorded from Spain (Guerra et al. 2018). Orgaz et al. (2013) discussed how *B. olympicum* was considered distinct by some authors, while others thought it identical with *Brachytheciastrum salicinum* (Schimp.) J.D.Orgaz, M.J.Cano & J.Guerra, comb. nov. They argued that *B. olympicum* is distinct from *B. salicinum* on the basis of characters in leaf shape, the presence of prorate cells on the dorsal leaf surface and the shape of the alar cell group.

6. ***Brachythecium campestre*** (Müll.Hal.) Schimp.
Contributors. S. V. O'Leary and P. Martin
Andorra. Bony de Les Neres, Ordino. 42°32′31"N, 1°33′25"E ca. 2000 m a.s.l., on woodland floor by path, 16 May 2019, *leg.* and *det.* S. V. O'Leary & P. Martin *s.n., conf.* L. Hedenäs.

When lacking sporophytes, plants of this species are difficult to separate from *Brachythecium salebrosum* (Hoffm. ex F.Weber & D.Mohr) Schimp. In the Iberian Peninsula generally (Guerra et al. 2018), and in the material collected on Bony de Les Neres, specimens encountered have been in this condition. Identification then relies on features of the gametophyte. *Brachythecium campestre* has both leaf margins, which are strongly toothed, recurved from near the middle to near the apex and alar cells which ascend up the leaf margin, features usually lacking in *B. salebrosum*. Caution is required, however, as, in some cases, largely because of the variability of *B. salebrosum,* differentiation can be practically impossible (Guerra et al. 2018).

7. ***Brachythecium cirriphylloides*** K.D.McFarland
Contributors. E. Hernández-Rodríguez and A. P. Peña-Retes
Mexico. Oaxaca: (1) Pine-oak forest, Paraje de la Cruz, Santa Catarina Lachatao, 17°15′16.2′′N, 96°28′2.4′′W, 2578 m a.s.l., July 21, 2016, *leg*. E. Hernández-Rodríguez *580* (MEXU); (2) Pine-oak forest, Junto al manantial, San Juan Evangelista Analco, 17°23′55.4′′N, 96°30′41.8′′W, 2646 m a.s.l., 23 July 2016, *leg*. E. Hernández-Rodríguez *637* (EBUM).

McFarland (1992) distinguished *B. cirriphylloides* from other Brachytheciaceae species by its large size, dioicous condition, and broadly cordate leaves with abruptly long apices; alar and basal cells are small, and the setae are papillose. There are specimens of this species either unnamed or referred to *B. ruderale* (Brid.) W.R.Buck [*B. alboflavens* Cardot; *B. stereopoma* (Spruce ex Mitt.) A.Jaeger], *B. occidentale* (Hampe) A.Jaeger [*B. flexiventrosum* (Müll.Hal.) A.Jaeger] or *B. rutabulum* (Hedw.) Schimp.

Brachythecium cirriphylloides grows on moist shaded soil, tree trunks, and rocks in an altitudinal range between 1524 and 3000 m a.s.l. Its distribution in Mexico includes Michoacán and Veracruz; in the Americas, the species is also known from Guatemala, Colombia, and Venezuela (McFarland 1992; Sharp et al. 1994).

Oaxaca is the state in Mexico with the second highest moss richness (Delgadillo 2014). However, there are under explored areas that can provide new records, for example, those well-preserved forests cited by Hernández-Rodríguez and Aguirre Hidalgo (2020). The addition of *B. cirriphylloides* to the Oaxaca moss flora brings its known number to 473 species. In addition, this record represents a new species for southern Mexico.

8. ***Bryoerythrophyllum rubrum*** (Jur. ex Geh.) P.C.Chen
Contributor. I. V. Czernyadjeva
Russia. Arctic Siberia, Yakutia, New Siberian Islands Archipelago, Stolbovoy Island, 74°10′36"N, 135°27′42.1"E, vicinity of polar station, dry terrace, grass sedge-moss tundra, on soil, 3 August 2019, *leg.* I. V. Czernyadjeva, *# 9´-19* (LE).

This species is found mostly in the mountainous regions of central and southern Europe: Austria, Germany, Slovakia, Switzerland, Romania, Slovenia, France, Italy, and the Caucasus (Podpěra 1954; Fedosov and Ignatova 2008; Ros et al. 2013; Hodgetts 2015). There are indications of this species in Sweden (Sollman and Frahm 2007) and China (Li et al. 2001). In Russia, isolated finds are known from the Caucasus (Karachaevo-Cherkessia, Kabardino-Balkaria, Stavropol Territory), in the Taimyr Peninsula (Taimyrsky State Nature Reserve, surroundings of Ledyanaya Bay of Taimyrskoe Lake), Severnaya Zemlya Archipelago (Oktyabrskoj Revolutsii Island), Vrangel Island, Sakhalin Island (Afonina 2002, 2004; Fedosov and Ignatova 2008; Bakalin et al. 2012; Doroshina 2012; Sofronova et al. 2017). In addition, *B. rubrum* is known from the bipolar stations in subantarctic Îles Kerguelen and the Antarctic (Sollman 2016; Ellis, Aleffi, Alegro, et al. 2016).

Bryoerythrophyllum rubrum is characterised by linear-lanceolate, gradually tapering, narrowly acuminate leaves, comparatively strongly recurved margins from above base to near the apex. It differs from the closely related *B. recurvirostrum* being larger in size, leaf margins almost entire and dioicous sexual condition.

9. ***Calymperes woodii*** L.T.Ellis
Contributors. N. Norhazrina and N. Syazwana
Peninsular Malaysia. Johor, Muar, Ayer Hitam Forest Reserve, 2°2′7.8′′N, 102°48′1.8′′E, on tree trunk, 34 m

a.s.l., 16 April 2019, *leg*. N. Norhazrina, R. Abidah, N. Syazwana & M. Aisyah *3799* (UKMB).

Calymperes woodii was first identified as endemic to areas of lowland rainforest in Negeri Sembilan, Peninsular Malaysia. It was first reported by Ellis (1997), collected in 1996 from Pasoh Forest Reserve, eastern Negeri Sembilan. Ellis discovered that this material was identical to what became the type specimen for the species, which had been collected by G. H. S. Wood in 1954 from Sungai Menyala Forest Reserve, western Negeri Sembilan (*Wood 1372*, BM, BM000518093). Here it is newly recorded from the state of Johore.

This species has dimorphic leaves, as some possess a gemmiferous proboscis, similar to those in *Calymperes graeffeanum* Müll.Hal. and *C. hispidum* Renauld & Cardot. Unlike plants of these species, those in *C. woodii* possess axillary paraphyses. The type specimen of *C. woodii* was originally erroneously identified as *Calymperes subserratum* M.Fleisch. However, the leaves of *C. subserratum* are monomorphic and narrowly strap-shaped, while those in *C. woodii* are strongly dimorphic and mostly narrowly spathulate.

10. ***Calypogeia apiculata*** (Steph.) Steph.
Contributors. S. S. Choi, V. A. Bakalin and C. W. Hyun
Republic of Korea. Jeju-do, Jeju-si, Jocheon-eup, Gyorae-ri, Gyorae stream, on basalt in evergreen forest, 33°25′41.3″N, 126°38′29.5″E, 520 m a.s.l., 11 April 2012, *leg*. S. S. Choi *120364* (JNU), *det*. V. A. Bakalin

Calypogeia apiculata is a disjunctively distributed south Asian to south-east Asian liverwort, hitherto known in Sri Lanka, Indonesia (Java) and Malaysia (Söderström et al. 2010; Chuah-Petiot 2011; Long and Rubasinghe 2014). This is the first record of the species for the Korean Peninsula, based on the collection from Jeju Island which is characterised by a northern variant of subtropical climate and vegetation. We did not compare the genetic identity of the material from Korea with that from Java, and our identification is based only on morphology. However, we have studied the type specimen in G (Holotype. 'Java. Prof. Stahl' G00061103!) and that is morphologically identical with the Korean specimen.

11. ***Chenia leptophylla*** (Müll.Hal.) R.H.Zander
Contributor. J. Kučera
Czech Republic. South Bohemia, distr. Č. Budějovice, Římov, Dolní Stropnice: near Větrník farmhouse, 48.86713°N, 14.51970°E, 465 m a.s.l., on soil in stubble field, 19 September 2020, *leg*. J. Kučera *22420*, herb. CBFS.

Chenia leptophylla, originally described from South Africa, Eastern Cape Province, is probably an introduced moss in Europe, which was first recorded in southern England (under the name *Tortula vectensis* E.F.Warb. & Crundw., which is one of two other heterotypic synonyms from eastern Asia and Australia). Since then, records from European countries have increased, having been additionally reported from four mainland Mediterranean (Spain, Portugal, France, Italy), four island dependencies (Sicily, Sardinia, Azores, Canary Islands) and four Central European countries (Germany, Austria, Poland, Hungary; Hodgetts and Lockhart 2020). The record from the Czech Republic had been expected for a long time but was not found until this year's hornwort hunt in South Bohemia. The new member of the Czech bryoflora was recorded from a wheat stubble field, growing with *Phaeoceros carolinianus* (Michx.) Prosk., *Anthoceros agrestis* Paton and other usual arable field mosses.

12. ***Codonoblepharon microtheca*** (Dixon ex Malta) Matcham & O'Shea
Contributors. T. A. Hedderson, C. Ah-Peng
La Réunion. Commune La Tampon, Notre Dame de la Paix, *Acacia heterophylla* Willd. forest near viewpoint, 1725 m a.s.l., 21.26375°S, 55.60197°E, on top of basalt wall, 28 October 2018, *leg*. T. A. Hedderson *19271* (BOL).

This species occurs otherwise in mountainous regions of tropical East Africa (Kenya, Rwanda, Uganda, the Democratic Republic of Congo and Tanzania) with outlying populations in northern South Africa (Matcham and O'Shea 2005). *Codonoblepharon microtheca* joins a large group of species in the Réunion bryophyte flora that are disjunctive from tropical east Africa (Ah-Peng et al. 2010); many of these are likely to be discovered on the intervening islands, most of which remain very poorly documented. The lithophytic habitat is unusual for this species, which normally occurs as an epiphyte, although the high precipitation experienced by Réunion may account for this.

13. ***Cololejeunea rossettiana*** (C.Massal.) Schiffn.
Contributors. P. Campisi, G. Domina and F. M. Raimondo.
Tunisia. Jendouba, El Feidja National Park, track to a small forest house ENE of the Park Centre, 850–865 m a.s.l., in *Quercus* L. forest and maquis, 36°30′25″N, 8°19′7″E, 3 April 2014, *leg*. F. M. Raimondo, *det*. P. Campisi, *83* (PAL).

This specimen was collected during the 12th Iter Mediterraneum of OPTIMA in Tunisia from 24 March to 4 April 2014 (Domina et al. 2015). In total 43 sites were visited and 428 bryophyte specimens were collected (Campisi et al. 2015), some of which are of particular interest, as reported in Ellis, Afonina, Andriamiarisoa, et al. (2017) and Ellis, Afonina, Aleffi, et al. (2018).

This is a submediterranean-subatlantic species known through old records in North Africa from Morocco and Algeria (Ros et al. 2007). Although rather widely distributed in Europe it is often locally rare and therefore included in the Red Lists of several

European countries (Hodgetts 2015). The species is also known in South Asia (Paton 1999).

It is a basiphytic liverwort that generally grows on rocks, in gorges, streams and woods, cliffs and caves, occasionally as an epiphyte on bryophytes (Dierßen 2001). In particular, in the Tunisian locality *Cololejeuna rossettiana* was found on the leaves of *Thamnobryum alopecurum* (Hedw.) Gangulee. The finding of this species in Tunisia confirms its presence in North Africa after more than half a century.

14. ***Cryphaea heteromalla*** (Hedw.) D.Mohr

Contributors. M. Smoczyk, S. Rosadziński and M. Staniaszek-Kik

Poland. W Poland, Lubuskie Lakeland: (1) 1.5 km NW of the church in the village of Sułów, north water reservoir in the 'Mokradła Sułowskie' nature reserve, 52.3843°N, 14.7132°E, 64 m a.s.l., branch of *Salix cinerea* L. in willow carr (*Salicetum cinereae*), at a height of 1.3 m and with NW exposure, 25 February 2017, *leg*. M. Smoczyk, (KRAM B-229981); (2) 2.66 km E of the village of Trzebiechów, 52.1608°N, 14.9928°E, 65 m a.s.l., bough of *Salix fragilis* L. growing on the dike of a fish-pond, at a height of 1.6 m and with SE exposure, 19 October 2017, *leg*. S. Rosadziński, (POZG 17); (3) W Poland, Wielkopolskie Lakeland: in a forest near the road in the village of Jeziory, in Wielkopolski National Park, 52.2679°N, 16.81042°E, 96 m a.s.l., trunk of *Acer platanoides* L. in oak-hornbeam forest (*Galio sylvatici-Carpinetum*), 16 October 2020, *leg*. M. Staniaszek-Kik (KRAM 257650).

Cryphaea heteromalla is an epiphytic species with a suboceanic-Mediterranean distribution pattern, covering mainly Europe, but also North America and North Africa (Draper et al. 2006), present also in the Middle East (Turkey, Iran) and West Russia (Rao 2000). In Europe this species has recently expanded to the east as have some other epiphytic mosses (Grünberg et al. 2014; Stebel and Smoczyk 2017; Ellis, Aleffi, et al. 2019). *Cryphaea heteromalla* was hitherto unknown in Poland (Ochyra et al. 2003). It was found in 2017 during a bryological investigation of the 'Mokradła Sułowskie' Nature Reserve in the western part of Poland. This record by Michał Smoczyk was mentioned by Müller (2016).

At the first Polish locality, a single specimen was found on a branch of *Salix cinerea* in willow carr on the bank of a shallow eutrophic lake. At the second locality it was found a few months later, a short distance from the first. Both localities were close to the border with Germany. The third locality, found in 2020, is over 150 km to the east. Looking at the current distribution of *C. heteromalla* in Germany and Poland, the path of the species moving eastwards in lowlands from the Brandenburg region is clearly visible (Schaepe and Rohner 2013, 2014; Müller 2016). A similar pattern of spread was observed, for *Orthotrichum pulchellum* Brunt. (Stebel and Smoczyk 2017), as well as alien, invasive species, e.g. *Orthodontium lineare* Schwägr (Żarnowiec et al. 2020).

15. ***Cryptocolea imbricata*** R.M.Schust.

Contributors. P. Wietrzyk-Pełka, M. H. Węgrzyn and B. Cykowska-Marzencka

Norway. Svalbard archipelago, NW Spitsbergen, Kongsfjorden, Vestre Brøggerbreen glacier marginal zone: 78°55′9.12″N, 11°48′14.08″E, 57.5 m a.s.l., on initial soil on glacier moraine, 7 July 2017, *leg*. P. Wietrzyk-Pełka, M. Węgrzyn *s.n*. (KRAM).

Cryptocolea imbricata is the only species of the genus *Cryptocolea* R.M.Schust. (Paton 1999). It is a very rare species with a disjunctive distribution across Arctic and subarctic regions, previously known from North America (Lake Superior–Susie Island, Minnesota, and Apostle Island, Michigan) (Schuster 1953, 1969), Greenland (Schuster 1988), Alaska (Steere and Inoue 1978), and Siberia (Chukoskiy Peninsula) (Schljakov 1975). In mainland Europe, the species was recorded in Swedish Lapland (Schuster and Mårtensson 1978). In Svalbard, it was only reported form Vestfjordalen in Wijdefjorden in northern part of Spitsbergen Island (Frisvoll 1981).

The second observation of the species in Svalbard was made during fieldwork on primary succession of initial communities on the glacier moraine of the Kongsfjorden (Wietrzyk-Pełka et al. 2018, 2020). Despite the fact that *Cryptocolea imbricata* had already been reported from Svalbard by Frisvoll (1981) and included in the island's bryophyte checklist (Hodgetts 2015), in 2017 the species was observed for the first time in Svalbard on glacier moraine. Frisvoll and Elvebakk (1996) emphasised the interesting distribution of this species in terms of phytogeography that implies the need for more detailed study of its distribution.

16. ***Didymodon validus*** Limpr.

Contributors. P. Martin and S. V. O'Leary

Spain. Montserrat, 1000 m a.s.l., 41°35′43.5″N, 1°49′18.7″E, 11 May 2019. Found on conglomerate sedimentary rock on the side of a path. The dominant part of the conglomerate is limestone and the sequence is cemented together by calcite. Other species found in the area which indicate the basic nature of the rocks included *Tortella nitida* (Lindb.) Broth., *Gymnostomum viridulum* Brid., *Orthotrichum cupulatum* Brid., *Crossidium squammiferum* (Viv.) Jur., *Schistidium helveticum* (Schkuhr) Deguchi, *Grimmia orbicularis* Bruch ex Wilson and *Grimmia tergestina* Tomm. ex Bruch & Schimp. *leg. & det*. P. Martin & S. V. O'Leary *s.n*., *conf*. J. Kučera.

This record is the first for the Iberian Peninsula. Historically there has been controversy regarding the taxonomic status of *D. validus*, which has been considered by many as a variety of *Didymodon rigidulus*

Hedw. (Jimenez 2006). Jimenez argued there were enough distinguishing characters to maintain *D. validus* as a good species and noted a world distribution of Central Asia and Europe.

Didymodon validus is a difficult species to identify and we are grateful to Jan Kučera for carrying out ITS (Internal Transcribed Spacer) sequencing to confirm the identification. Plants of the same genotype are known from Austria, N. Italy, Slovenia, E. Switzerland and the Bavarian Alps with similar genotypes in southern Siberia. Morphologically very similar plants were collected in the Czech Republic, Slovakia and southern Poland but these have not been investigated by molecular methods. Added to this there are closely related lineages with varying morphologies from the whole Holarctic (pers. comm. J. Kučera).

17. ***Fabronia pusilla*** Raddi
Contributor. T. A. Hedderson
Pakistan. Northwest Frontier Province, Kohistan District, ca. 4.5 km southeast of Dasu on the N35 from Islamabad, 800 m a.s.l., 34.2433°N, 73.1850°E, in rock crevices near waterfall, 17 July 1998, *leg*. T. A. Hedderson *12138, 12141* (BOL).

This species is common in and around the Mediterranean basin, extending as far east as Iraq (Agnew and Vondráček 1975). It has been reported from adjacent Afghanistan (Kürschner and Frey 2019) whilst Ignatova et al. (2017) also indicate its presence in the nearby territories of Kyrgyzstan and Tajikistan, as well as from the Baikal area of Siberia; they also suggest that reports from China are likely erroneous. It also occurs disjunctively in western North America, where it extends south to Mexico.

18. ***Fossombronia japonica*** Schiffn.
Contributors. S. S. Choi, V. A. Bakalin and S. J. Park
Cambodia. Mondulkiri province, Ou Reang district, roadside, on shaded soil in *Pinus kesiya* Royle ex Gordon forest, 12°22′46.2″N, 107°07′36.6″E, 643 m a.s.l., 29 September 2018, *leg*. S.S. Choi *C18065* (JNU), *det.* S.S. Choi

Fossombronia japonica is a tropical to subtropical species widely distributed through East Asia and southeast Asia to Papuasia. It is known from Sakhalin Province and Primorsky Territory in Russia, the Republic of Korea, Japan, Taiwan, Papua New Guinea, and Indonesia (Java) (Krayesky et al. 2005; Söderström et al. 2010; Wang et al. 2011; Borovichev and Bakalin 2017; Katagiri and Furuki 2018).

Herein, the species is reported for the first time from Mondulkiri Province of Cambodia. This species is characterised by regularly reticulate spores, unispiral elaters, and segmented oil-bodies.

19. ***Fossombronia pusilla*** (L.) Nees
Contributors. B. Mufeed, C. N. Manju and K. P. Rajesh
India. Kerala, Idukki district, Anamudi Shola National Park, Iddalymotta (2350 m), 22 September 2018, lithophytic, on land cuttings along with *Pogonatum microstomum* (Schwägr.) Brid. and *Asterella leptophylla* (Mont.) Grolle, *leg*. Mufeed B. *9914* (ZGC).

Fossombronia pusilla was first described by Linnaeus (1753) in his 'Species Plantarum' as *Jungermannia pusilla* L. It is widespread in Asia, and has been recorded from Turkey in the Near East (Kürschner and Erdağ 2005); China, Taiwan, Japan, the Malay Archipelago and Australia (Scott 1985; Krayesky et al. 2005; Katagiri and Furuki 2012). This species is also found in many European countries, Macaronesia and the Azores, as well as in north and South Africa and disjunctively in South America (Chile) (Schuster 1992a; Paton 1999; Damsholt 2002; Söderström et al. 2002). Recently it has been reported from Russia (Borovichev and Bakalin 2017). In India *F. pusilla* was previously known only from the Nilgiri hills in Tamil Nadu, south India (Srivastava and Udar 1975; Daniels 2010; Alam 2014). The present collection from Anamudi shola National Park in the Western Ghats extends its distribution to Kerala.

20. ***Frullania glomerata*** (Lehm. & Lindenb.) Mont.
Contributors. E. Fuertes and J. Larraín
Argentina. (1) Prov. Misiones, Dpto. San Pedro, Parque Provincial La Araucaria, pr. San Pedro, en bosques mixtos de forófitos laurifolios de hoja perenne, coníferas de *Araucaria angustifolia* (Bertol.) Kuntze (pino de paraná), y helechos arbóreos *Cyathea atrovirens* (Langsd. & Fisch.) Domin, 500–600 m a.s.l., 26°40'S, 54°04'W, 28 November 2007, *leg.* Fuertes & Prada *s.n.* (MACB 109656); (2) Prov. Tierra del Fuego: Dpto. Ushuaia, Parque Nacional de Tierra del Fuego, Estancia Moat, situada cerca del margen izquierdo del Canal Beagle, epífita en diferentes forófitos perennifolios, de *Notofagus betuloides* (Mirb.) Oerst., *N. pumilio* (Poepp. & Endl.) Krasser, *Drimys winteri* J.R.Forst. & G.Forst. y *Embothrium coccineum* J.R.Forst. & G.Forst., 20 m a.s.l., 54°48'S, 67°18'W, 19 March 2005, *leg.* Fuertes *s.n*. (MACB 109376, CONC).

Frullania glomerata is an epiphytic liverwort, seldom saxicolous, placed in section *Australes* Verd. of subgenus *Frullania* (Hentschel et al. 2009). It is characterised by being dioicous, with underleaves about 3 or more times wider than the stem, entire or with 1–2 blunt lateral teeth at each side, laminar lobules at the distal portion of stems becoming galeate below, styli basally foliose ended in an uniseriate row of 4–9 cells, and verrucose perianths. It has a Neotropical distribution, known from Brazil (Gradstein and Pinheiro da Costa 2003), Bolivia (Churchill et al. 2009), and central and northern Argentina, in Buenos Aires and Salta provinces (Reiner 1988). It has been reported also from Chile by Hässel de Menéndez and Rubies (2009), based on two literature records (Montagne 1838, 1850). Montagne did not report precise localities for the occurrence of the species in Chile, and no

specimens of this taxon from Chile have been found after a thorough search of Montagne's herbarium in PC.

The finding of this taxon in Tierra del Fuego corresponds to the first report for the species outside the Neotropics. This suggests the species has an extensive ecological range, and it is expected to occur in transitional areas along the Andes, both in Chile and Argentina. Despite extensive field work in the last 20 years by the authors of this note, no further populations of this taxon have been found north of Tierra del Fuego.

21. ***Frullania parvistipula*** Steph.

Contributors. S. Ştefănuţ, G. Tamas, C.-C. Bîrsan and M. C. Ion

Romania. (1) Braşov County: Cincşor, 45°50′4.98"N, 24°49′33.82"E, 464 m a.s.l., on beech bark, 4 November 2019, *leg*. S. Ştefănuţ, G. Tamas, C.-C. Bîrsan & M.C. Ion *s.n.*, *det*. S. Ştefănuţ (BUCA *B4967*); (2) Giurgiu County: Comana Forest, 44°09′23.5"N, 26°05′59.2"E, 93 m a.s.l., on Turkey oak bark, 23 January 2020, *leg*. S. Ştefănuţ, G. Tamas & C.-C. Bîrsan *s.n.*, *det*. S. Ştefănuţ (BUCA *B4988*).

The record from Cincşor is the first report of *Frullania parvistipula* in Transylvania. In this forest it grows on the bark of *Fagus sylvatica* L. along with *Frullania dilatata* (L.) Dumort. and *Radula complanata* (L.) Dumort. In Comana Forest *F. parvistipula* grows on bark of *Quercus cerris* L. along with *Porella platyphylla* (L.) Pfeiff. and *Anomodon viticulosus* (Hedw.) Hook. & Taylor.

The first records of *F. parvistipula* published for Romania were from specimens collected in 1997 (Ştefănuţ 2004, 2008; Ştefănuţ and Goia 2012) but the oldest specimens from Romania were collected in 1897 by K. Loitlesberger as *F. dilatata* var. *subtilissima* (Nees) Debat (Ştefănuţ 2020). With these records the conservation status of *F. parvistipula* in Romania is changed from Critically Endangered—CR B1ab(ii,iii,iv,v)+B2ab(ii,iii,iv,v); C1 + 2b to Endangered—EN B2ab(ii,iii,iv).

22. ***Grimmia meridionalis*** (Müll.Hal.) E.Maier

Contributors. S. V. O'Leary and P. Martin

Andorra. Anyós, La Massana, 42°31′57′′N, 1°31′44′′E, ca. 1400 m a.s.l., in area of acidic schist, on boulder by woodland path from Xalet La Pastorella to Church of Sant Cristòfol d'Anyós, 12 May 2019, *leg. & det.* S. V. O'Leary & P. Martin *s.n., conf.* R. D. Porley.

Previously known as *Grimmia trichophylla* var. *meridionalis* Mull.Hal., this taxon was elevated to specific status as *Grimmia meridionalis* (Müll.Hal.) E.Maier in 2002 (Maier 2002). Separation from related species can be problematic, as the distinctive characters are variable and some specimens can be difficult to place. Particular confusion arises in separating this species from the closely related *Grimmia dissimulata* E.Maier. In transverse section of the costa, the two eurocysts nearest the axis at the broadest part of the leaf in the current species appear elliptical, with the major axes of the ellipses forming a 'V'. In contrast, in *Grimmia dissimulata* these eurocysts are 'more or less rounded' (Maier 2002). This character can be troublesome, as can be seen even in Maier 2002, where diagrams of *G. dissimulata* show a tendency for the eurocysts to appear elliptical in some cases. There is also a concern that tilting the sectioning blade away from a plane perpendicular to the costal axis will distort the apparent eurocyst shape. (pers. comm. R. D. Porley). The material collected clearly showed elliptical guide cells in many sections as described for *G. meridionalis*. Elongate nodulose basal paracostal cells were observed in many leaves, which supports this identification.

23. ***Gymnomitrion alpinum*** (Gottsche) Schiffn.

Contributor. A. Graulich

France, Corsica. Haute-Corse, Asco, Les Grand Mulets, 42°23′30′′N, 8°56′32′′E, 1850 m a.s.l., on wet rocks shaded by *Alnus alnobetula* subsp. *suaveolens* (Req.) Lambinon & Kerguélen with *Andreaea frigida* Hueb-ener, *Gymnomitrion concinnatum* (Lightf.) Corda and *Racomitrium macounii* Kindb., 8 July 2019, *leg*. A. Graulich, *det*. A. Graulich and N. Hodgetts, herb. Graulich Corsica 16/19.

This dioicous member of the Gymnomitriaceae is characterised by leaves that sheath the stem, the dark reddish-brown colour, small mid-leaf cells (12–16 µm) and the lack of stem hyalodermis (Paton 1999). In Europe, *Gymnomitrion alpinum* is known only from mountainous regions and is recorded from Italy, Spain, Andorra, France, Germany (extinct), United Kingdom, Norway, Switzerland, Austria, the Czech Republic, Slovakia, Poland, Bulgaria and recently from Romania (Ellis, Bayliss, et al. 2014; Hodgetts and Lockhart 2020). *Gymnomitrion alpinum* is considered vulnerable or endangered in several of these countries (Hodgetts and Lockhart 2020). This first observation of *G. alpinum* adds a new alpine species to the bryophyte flora of Corsica, which are all very rare on the island (Geissler 1981; Ellis, Alikhadzhiev, et al. 2020).

24. ***Gymnostomum mosis*** (Lorentz) Jur. & Milde

Contributor. T. A. Hedderson

Pakistan. Northwest Frontier Province, Batgram District, Battal, 1450 m a.s.l., 34°35′N, 73°08′E, on mortar of walls along side of road, 17 July 1998, *leg.* T. A. Hedderson *12111b, 12114, 12122* (BOL).

Gymnostomum mosis is known mostly from the eastern Mediterranean region, ranging from Tunisia east to Iraq (Agnew and Vondráček 1975; Kürschner 2000; Taha 2019). Occurrences in Afghanistan (Kürschner and Frey 2019), along with those reported here, are somewhat disjunctive from this main range. However,

the species is likely also to occur in the intervening, generally poorly explored, regions.

25. ***Gymnostomum viridulum* Brid.**
Contributor. T. A. Hedderson
Pakistan. Northern Areas, Baltistan District, ca. 20 km west of Skardu on Gilgit-Skardu Road along Indus River, 2200 m a.s.l., 35.4595°N, 75.4532°E, forming cushions in rock crevices in steppe vegetation, 19 July 1998, *leg*. T. A. Hedderson *12165* (BOL).

This species has a disjunctive distribution between Mediterranean-climate areas of western North America and a broad distribution around the Mediterranean basin, extending northward to the UK (Guerra 2004; Zander et al. 2007). It is very likely that the apparent gap between the eastern Mediterranean area and the Pakistan—Afghanistan (Kürschner and Frey 2019) populations will be filled by additional collecting. Since *G. calcareum* Nees & Hornsch. is often treated in a broad sense to include, *inter alia*, *G. viridulum* (Sérgio 2006; Zander et al. 2007), it is possible that additional Asian populations have been treated under the former name.

26. ***Hennediella arenae*** (Besch.) R.H.Zander var. ***arenae***
Contributors. P. Drapela and J. Larraín
Chile. (1) Región Metropolitana, Provincia del Maipo, Comuna de Paine, Reserva Natural Altos de Cantillana, Roblería Las Launas, afloramientos rocosos, sobre granito, 2021 m a.s.l., 33°55′01.7"S, 70°58′35.1"W, 8 December 2018, *leg*. P. Drapela, *492* (CONC); (2) Región del Maule, Provincia de Linares, Comuna de Linares, Río Achibueno, estero La Gloria, sendero hacia Lagunas Cuellar, saliendo desde el puesto 'El Rucio', en grieta de roca, 1660 m a.s.l., 36°02′27.5"S, 71°04′39.0"W, 21 January 2018, *leg*. J. Larraín *42426* (CONC, MUB), en tierra en base de roca, 1023 m a.s.l., 36°05′05.9"S, 71°08′32.2"W, 22 January 2018, *leg*. J. Larraín 42546 (CONC); (3) Región de Los Lagos, Provincia de Chiloé, Comuna de Ancud, Estación Biológica Senda Darwin, en corte de tierra húmedo al interior del bosque, 30 m a.s.l., 41°52′S, 73°40′W, 18 January 2003, *leg*. J. Larraín *23203* (CONC); (4) Región de Aisén, Provincia de Coyhaique, Comuna de Coyhaique, Coyhaique Alto, Estancia Galilea, cabeceras de la cuenca del Río Aisén, sobre roca en el arroyo, 1121 m a.s.l., 45°24′27.4"S, 71°38′51.1"W, 19 February 2017, *leg*. J. Larraín *41155B* (CONC).

Hennediella Paris is a subcosmopolitan genus found on all continents, in a wide variety of ecosystems except for tropical lowlands. Species of this genus can occur from sea level to high elevation, reaching as much as 5000 m a.s.l. (Cano 2008). Of the 15 species of *Hennediella* recognised by Cano (2008), six occur in Chile. *Hennediella arenae* var. *arenae* is an Austral taxon distributed in southern South America, New Zealand and in some subantarctic islands, so far collected usually near streams in crevices of wet rocks or on soil, between sea level and 2000 m a.s.l. (Cano 2008). Samples of this taxon were recently collected from granite outcrops in Altos de Cantillana Natural Reserve in high elevation (2000 m a.s.l.) *Nothofagus macrocarpa* (A.DC.) F.M.Vázquez & R.A.Rodr. forests. This collection represents a new record for the Metropolitan Region of Chile, and an extension of its northern distribution limit. It was previously known in Chile from Concepción Province to Tierra del Fuego (Müller 2009; Larraín 2016). We are providing additional records from Linares, Chiloé, and Coyhaique Provinces, to fill part of the gaps in its known distribution in Chile (Müller 2009). Diagnostic characters for the identification of this species are the lingulate to obovate leaves, papillose upper basal cells, the coarsely papillose dorsal surface of the costa, the recurved border at least on one side, and the differentiated marginal cells in 1–3 rows.

27. ***Hygrohypnum eugyrium*** (Schimp.) Loeske
Contributor. D. Spitale
Italy. Tuscan-Emilian Apennine National Park, province of Parma, close to Bivacco Lago Scuro, 10°2′54.256″E, 44°22′40.381″N, 1547 m a.s.l., immersed in a rheocrene spring, 31 July 2011, *leg*. and *det*. Daniel Spitale, *conf*. Lars Hedenäs.

Hygrohypnum eugyrium has a suboceanic-boreal-montane distribution and in Europe is present in Scandinavia, Great Britain and Ireland, France, Spain, Switzerland, Italy, Austria, Germany, Belgium, Romania, Poland, Slovenia and Bosnia-Herzegovina (Hodgetts 2015). However, according to Ros et al. (2013) the species is not present in Italy, probably because it has been reported only once (specimen collected and identified by G. Brusa and reported in Cortini-Pedrotti 2006).

The present finding represents the first confirmed record for Italy. The species was found immersed in a spring together with *Bryum pseudotriquetrum* (Hedw.) P.Gaertn., C.Mey. & Scherb., *Jungermannia hyalina* Lyell, *Pellia epiphylla* (L.) Corda, *Racomitrium aciculare* (Hedw.) Brid. and *Scapania undulata* (L.) Dumort. The pH of the water was 6.4 and electrical conductivity was 27 mS cm^{-1}.

28. ***Hymenoloma mulahaceni*** (Höhn.) Ochyra
Contributor. V. E. Fedosov
Russia. Polar Ural Mountains eastern slope, Jamal-Nenets Autonomous District, vicinity of Laborovaya village, eastern periphery of Yanganape calcareous massif; 67.6945°N, 67.8568°E, ca. 140 m a.s.l., rock outcrops in creek canyon, locally abundant on igneous rock with *Ceratodon purpureus* (Hedw.) Brid., 2 August 2017, *leg*. V. Fedosov *s.n*. (MW).

Hymenoloma mulahaceni is a rare species with a disjunctive distribution, occurring in montane regions of

the Holarctic. It is known in Europe (Sierra Nevada, Alps, Iceland), Transcaucasia (Armenia), Middle Asian countries (Kazakhstan, Tajikistan, Kyrgyzstan), Altai Mountains, Chukotka and Kamchatka in Russia. (A record from Arctic Taimyr by Fedosov and Ignatova (2005) was based on an atypical specimen of *Hymenoloma crispulum* (Hedw.) Ochyra). It is also recorded from Alaska in North America (Afonina 2004; Ignatov et al. 2006; Werner et al. 2013). The present record is the first for the Ural Mountains, distant from the closest previously known locality of the species by more than 2000 km. Taxonomy of this insufficiently known species was considered in detail by Werner et al. (2013).

29. ***Indusiella thianschanica*** Broth. & Müll.Hal.
Contributors. Yu. M. Kalinina and O. M. Afonina.
Russia. South Siberia, Western Sayan Mts., Republic of Khakassia, Pozarym Reserve, middle course of Karatosh River, 51°40′37.96"N, 89°24′11.51"E, 1608 m a.s.l., rocky dry steppe slope, on fine soil in crack of rock, with sporophytes, 15 July 2019, *leg*. Yu. Kalinina, *061901* (LE).

Indusiella thianschanica is a rare species distributed predominantly in arid regions of Asia (Mongolia, China, Tibet, Tadzhikistan, Kyrgyzstan); it is also known from Africa (Chad), North America (Alaska), and South America (Bolivia, Argentina) (Ignatov et al. 2017). In Russia, the highest number of locations for *I. thianschanica* are seen in southern Yakutia; but it is also known from Altai, West Sayan, and south-west of Buryatia; remote finds are from southern Taimyr (Anabar Plateau) and the Caucasus (Dagestan) (Ignatova et al. 2017). The finding of *I. thianschanica* in Khakassia was likely, taking into account the range of the species.

30. ***Kiaeria glacialis*** (Berggr.) I.Hagen
Contributors. S. Ştefănuţ, G. Tamas, C.-C. Bîrsan, G.-R. Nicoară and M.-M. Ştefănuţ
Romania. Southern Carpathians: Retezat Mountains, on the edge of Galeş Lake, Hunedoara County, 45°23′3.33"N, 22°54′35.46"E, 1981 m a.s.l., on soil, 24 July 2020, *leg*. S. Ştefănuţ, G. Tamas, C.-C. Bîrsan & R. Nicoară *s.n.*, *det*. S. Ştefănuţ & M.-M. Ştefănuţ (BUCA *B4991*).

Kiaeria glacialis was collected from a glacial ring area, on the southern side of Galeş Lake. The plants grew along with other bryophytes such as *Cephalozia bicuspidata* (L.) Dumort., *Barbilophozia sudetica* (Nees ex Huebener) L.Söderstr., De Roo & Hedd., and *Pohlia nutans* (Hedw.) Lindb. subsp. *schimperi* (Müll.Hal.) Nyholm.

This is the first report of *Kiaeria glacialis* for Romania and the Carpathian Mountains (Ştefănuţ and Goia 2012). In Europe *K. glacialis* has been reported from the Faroe Islands, Finland, Iceland, Norway, Svalbard, Sweden, Great Britain, the Czech Republic, Russia (Hodgetts and Lockhart 2020) and now Romania. The conservation status of *K. glacialis* in Romania is Critically Endangered—CR B1ab(ii,iii) + 2ab(ii,iii).

31. ***Lepidolejeunea cuspidata*** (Gottsche) Heinrichs & Schäf.-Verw.
Contributors. T. Pócs and A. Schäfer-Verwimp
Venezuela. Estado Mérida, carretera Mérida—La Culata, debajo de la población de El Valle, 08°39.09′N, 71°07.08′W, 1980 m a.s.l., Bosque andino degradado, sobre corteza, 14 April 2005, *leg*. T. Pócs *05038/E* (EGR, herb. Schäfer-Verwimp).
Dominican Republic. Prov. Santiago, Cordillera Central, humid secondary vegetation near Mata Grande above San José de las Matas, on humid slope, 950 m a.s.l., 12 April 2007, *leg*. Schäfer-Verwimp & Verwimp *27175* (JE, FR, EGR) (Schäfer-Verwimp and Pócs 2009, as *L. involuta* (Gottsche) Grolle).

Lepidolejeunea cuspidata was previously known mainly under *L. punctata* (Herzog) R.M.Schust. or *L. dominicensis* R.M.Schust., both in synonymy of *Lepidolejeunea involuta* (Grolle 1984; Piippo 1986) until Heinrichs et al. (2015) demonstrated that *L. cuspidata* and *L. involuta* belong to independent lineages within *Lejeunea involuta* sensu Piippo (1986). *Lepidolejeunea cuspidata* is recognised by dispersed ocelli, mostly smaller than the surrounding cells while ocelli of *L. involuta* are generally as large as the surrounding cells. Schuster (1992b) showed ocelli of both *L. cuspidata* and *L. involuta* under *L. punctata* from Jamaica, Fig. 24:5 as 'phase with 13–16[18] ocelli per lobe' (= *L. involuta*), and Fig. 24:6 as 'phase with ca. 30–36 ocelli per lobe' (= *L. cuspidata*).

Lepidolejeunea cuspidata is a widespread neotropical species, originally described as *Lejeunea cuspidata* by Gottsche (Gottsche et al. 1845) from a Breutel collection made on St. Christopher, Lesser Antilles. Its range is still imperfectly known because of its inclusion in the synonymy of *Lepidolejeunea involuta*. Presently, it is recorded from Mexico, Costa Rica, Panama, Colombia, Ecuador, Brazil, and the West Indies (Dominica, Guadeloupe, Jamaica) (Herzog 1951, type of *Hygrolejeunea punctata*; Winkler 1970, as *Hygrolejeunea punctata* Herzog; Heinrichs et al. 2015; Schäfer-Verwimp and van Melick 2016). These are the first records for Venezuela and the Dominican Republic. It occurs from near sea level in south and southeast Brazil to 1980–2020 m in Venezuela and Ecuador (A. S-V. observations); however, most specimens (25 of 29 specimens in ASV) originate from between 650 and 1500(–1600) m a.s.l.

32. ***Leucoloma ambreanum*** Renauld & Cardot
Contributors. J. van Rooy and C. La Farge
Africa, Mozambique. South-west of Inhaminga, Mazamba River Gorge, 18°33′36"S, 34°52′23"E, 225 m a.s.l., at the base of a tufa waterfall, on a fallen tree in

forest, in shade, 9 June 2012, *leg*. M. Koekemoer *4223* (PRE).

Recent collecting activities in the Sofala and Zambezia Provinces of Mozambique yielded a significant number of new records (Ellis, Aranda, et al. 2013; Hedderson et al. 2015). Here we report another new record for Mozambique, the fifth collected by Marinda Koekemoer (PRE) during a collecting trip in June 2012. The others were *Cyathodium africanum* Mitt., *Fissidens ovatus* Brid., *Funaria longicollis* Dixon and *Pelekium gratum* (P.Beauv.) Touw, reported in the NNRBR 37 column (Ellis, Aranda, et al. 2013).

This species belongs to *Leucoloma* subsect. *Caespitulosa* (Besch.) Renauld, a group of four species centred in the Madagascar and Indian Ocean islands biodiversity hotspot (CEPF 2016), which is also recognised as a centre of bryophyte diversity and endemism (Von Konrat et al. 2008; Geffert et al. 2013). *Leucoloma caespitulans* (Müll.Hal.) A.Jaeger is restricted to the Comores and *L. subcespitulans* Besch. is only known from the island of Réunion. *Leucoloma amblyacron* Müll.Hal. ex Besch. was described from Mauritius and its synonym, *L. brevifolium* Dixon & P.de la Varde, from India, whereas *L. ambreanum* Renauld & Cardot occurs in Madagascar and here reported for the first time from continental Africa and Mozambique in south-east Africa (La Farge-England 1998; La Farge 2002; O'Shea 2006).

Leucoloma subsect. *Caespitulosa* is characterised by contorted leaves (when dry), hyaline leaf margin not distinctly undulate and restricted to the lower ½–⅔ of the leaf, leaf cell papillae low, multifid, abaxial and frequently in pairs at the distal and proximal ends of adjacent cells, and basal cells short (<3:1) (La Farge-England 1998).

33. ***Lophocolea muricata*** (Lehm.) Nees

Contributor. D. A. Callaghan

United Kingdom. Tyntesfield, north Somerset, 51° 26'15.0"N, 2°42'43.6"W, 55 m a.s.l., on trunk of *Dicksonia antarctica* Labill. in shaded walled garden of Victorian estate, associated with *Heteroscyphus fissistipus* (Hook.f. & Taylor) Schiffn., 23 August 2020, *leg*. D.A. Callaghan, *det*. D.A. Callaghan, *conf*. N.G. Hodgetts (BBSUK).

A pan-tropical to pan-south temperate species, with a disjunct occurrence in the Southern Appalachians (Engel 2010), joining a small group of antipodal bryophytes that have survived transit and persisted in Britain on the trunks of *Dicksonia* L'Hér. imported from Australasia for ornamental planting. This small liverwort is woolly in appearance due to its hispid leaves and is unlike any species native to Britain. It is autoecious, and both male and female branches are present in the small population at Tyntesfield, where it was seen only on a single *Dicksonia* trunk. In its native range of Australasia it is typical of rich, moist forests, most often occurring on woody substrates, but also sometimes epiphyllous, including on the leaf fronds of *Dicksonia* (Engel 2010).

34. ***Marsupella subemarginata*** Bakalin & Fedosov

Contributor. J. Kučera

Czech Republic. Krkonoše Mts, Velká Kotelní jáma cirque, upper part, 50.75271°N, 15.53203°E, 1400 m a.s.l., vertical face of N-facing damp gneiss rock, 2 September 2020, *leg*. J. Kučera *22290*, herb. CBFS.

Marsupella subemarginata was recently described (Bakalin et al. 2019) as a semi-cryptic species of the *Marsupella emarginata* complex. The distribution known so far is highly disjunct (Russia: Kamchatka, Japan: Honshu, Switzerland: Valais) but the authors anticipated a much wider distribution particularly in eastern and north- eastern Asia and temperate Atlantic Europe. Its recent discovery, confirmed using the molecular barcode (ITS region), suggests that the distribution of *M. subemarginata* might be even wider, as the Giant Mountains in the northern Czech Republic range are not an Atlantic region, although the climate is definitely precipitation-rich (estimates for the main ridge region are between 1200–1400 mm). It is thus more likely that the species is widely distributed in precipitation rich areas of the whole Holarctic circumboreal region.

35. ***Meesia minor*** Brid.

Contributors. V. E. Fedosov and A. V. Shkurko

Russia. (1) Murmansk Province, Khibiny Mountains, Gora Aikuayvenchor Nature Sanctuary, 67.59°N, 33.70° E, moist cliff ledge, 28 Jun. 2012, *leg*. Kozhin M. N. *s.n.* (MW); (2) Arkhangelsk Province, Pinezhsky District, Pinezhsky State Reserve, 64.5552°N, 43.2515°E, on wet rock, 27 Jul. 1988, *leg*. Ignatov M. S. *s.n.* (MHA); (3) Komi Republic, Polar Ural western slope, vicinity of Seida Train Station (ca. 67.05°N, 63.07°E), on a ridge slope with limestone outcrops, 8 Aug. 1964, *leg*. Filin V. R. (MW); (4) Jamal-Nenets Autonomous District, Polar Ural eastern slope, Yanganape limestone massif, 67.7088°N, 67.8174°E, ca. 245 m a.s.l., rich fen, near brook, 27 Jul. 2017, *leg*. V. E. Fedosov *s.n*. (MW); (5) Khanty-Mansi Autonomous District, Berezovsky District, subpolar Ural, Ner-Oyka Mountain range, 64.5484°N, 59.6215°E, ca. 680 m a.s.l., tundra on S-facing slope, 4 Aug. 2013, *leg*. Lapshina E. D. *s.n*. (MHA); (6) Western Caucasus, Krasnodar Territory, slope of Fisht Mountain to Belaya River, 44.0499°N, 40.0166°E, ca. 1850m a.s.l., moist cliffs near a glacier, 19 Aug. 1999, *leg*. Ignatov M. S. (MHA); (7) Adygeya Republic, Malaya Laba River basin, NE-facing slope of Bol`sjoy Tkhach Mountain, alpine heath, on soil, 7 Jul. 1995, *leg.* Akatova T. V. *s.n*. (MHA); (8) Karachay-Cherkess Republic, Teberda State Reserve, Khatipara Ridge, upper course of Malaya Khatipara River, N-facing slope, 43.4347°N, 41.6847°E, ca. 2850 m a.s.l., moist meadow, on soil, 2 Sept. 2005, *leg*. Ignatov M. S. *s.n.* (MW); (9) Altai Republic, Kosh-

Agachsky District, Kuraisky Ridge of Altai Mts, Tabozhok Mountain, 50.0833°N, 88.8499°E, ca. 2700 m a.s.l., alpine bog, 1 Aug. 1992, *leg*. Ignatov M. S. *s.n.* (MHA); (10) Altai Republic, Ulagansky District, Chulyshmanskoe Upland, Bogoyash River upper course, 50.3833°N, 89.4666°E, ca. 2350 m a.s.l., spring bog in *Kobresia*-dominated mountain tundra, 27 Jul. 1993, *leg*. Ignatov M. S. *s.n.* (MHA); (11) Krasnoyarsk Territory, Taimyr Peninsula, Byrranga Mountains, left side of Bolshaya Bootankaga River, 77.30°N, 98.0833°E, ca. 75 m a.s.l., 1 Aug. 1991, *leg*. Kuvaev V. B. & Voropanov V. *s.n*. (MW); (12) Krasnoyarsk Territory, vicinity of Medvezhya River mouth, 71.1465°N, 102.682°E, moist rocky tundra in place with late snow melting, on clay, 13 Jul. 2008, *leg*. Fedosov V. E. *s.n*. (MW); (13) Krasnoyarsk Territory, periphery of Anabar Plateau, Fomich River valley, 72.0704°N, 110.1150°E, low floodplain, sandy alluvium, 13 Jul. 2008, *leg*. Fedosov V. E. *s.n.* (MHA); (14) Yakutia, Evenо-Bytantaisky District, Orulgan Ridge, Tumara River upper course, Sakhchaan Creek, 68.2833°N, 128.7833°E, ca. 1300 m a.s.l., tundra, near rocky outcrop, 3 Aug. 2011, *leg*. Ignatov M. S. *s.n.* (MW); (15) Yakutia, Tomponsky District, Sette-Daban Ridge, valley of right tributary of Vostochnaya Khandynga River, 62.7802°N, 136.7991°E, ca. 485 m a.s.l., cliff outcrops near water, 19 Jul. 2016, *leg*. Ignatov M. S. & Ignatova E. A. *s.n.* (MHA); (16) Yakutia, Oymyakomsky District, Suntar-Khayata Ridge, Mus-Khaya Mountain, Knoryi Creek, 62.5499°N, 140.9499°E, ca. 1695 m a.s.l., on a cliff ledge, on soil, 13 Jul. 2011, *leg*. Ignatov M. S. & Ignatova E. A. *s.n.* (MHA); (17) Yakutia, Momsky District, Ulakhan-Chistay Ridge, right side of Tirektyakh River, Mramornaya Mountain, 64.9155°N, 146.4575°E, ca. 865 m a.s.l., *Eriophorum* L. and *Equisetum* L. dominated fen on slope, 17 Jul. 2018, *leg*. Ignatov M. S. & Ignatova E. A. *s.n.* (MHA); (18) Magadan Province, Ol`skoye Basalt Plateau in upper course of Ola River, 60.6567°N, 151.2855°E, ca. 1221 m a.s.l., moist dwarf-shrub—moss tundra, on soil, 7 Aug. 2011, *leg*. Malashkina E. V. *s.n*. (MHA); (19) Kamchatsky Territory, Kamchatka Peninsula, Kronotsky State Reserve, Geyzernaya River upper course near Smerty Walley, 54.4744°N, 160.1946°E, on moist cliff, 7 Sept. 2012, *leg*. Fedosov V. E. (MW); (20) Kamchatsky Territory, Aleutsky District, Bering Island, Svinye Mountains, on soil in a deep niche at cliff base, 27 Jul. 2010, *leg*. Fedosov V. E. *s.n*. (MW); (21) Sakhalin Island, Smirnykhovsky District, Vayda Mountain Nature Reserve, left side of Vitnicza Stream, 49.8833°N, 143.4666°E, ca. 750 m a.s.l., moss tundra on a moist slope, 21 Aug. 2006, *leg*. Ignatov M. S. & Teleganova V. V. *s.n*. (MHA).

Described in the early nineteenth century, *M. minor* was almost immediately regarded as a variety of *Meesia uliginosa* Hedw., and was rarely recognised until Hedenäs (2020a) found that it is well delimited genetically and quite distinguishable morphologically. Therefore, distribution of this species is still insufficiently known; according to the aforementioned paper, it occurs in montane areas of Europe and also likely in the Subantarctic. We revisited specimens assigned to *M. uliginosa* in MW and MHA and found that more than a half of them belong to *M. minor*. This species is widespread in the Russian Arctic and Subarctic, occurring on base rich rock outcrops and on eroded loamy soil in tundra, along watercourses, on soil-slides, in rich fens with shallow turf layer often associated with *Orthothecium* Schimp., *Flexitrichum* Ignatov & Fedosov, *Distichium* Bruch & Schimp., *Encalypta* Hedw., *Campylium* (Sull.) Mitt., etc., while *M. uliginosa* s.str. largely occurs in damp lowland rich fens with *Hamatocaulis* Hedenäs, *Scorpidium* (Schimp.) Limpr., *Cinclidium* Sw., *Meesia triquetra* (Jolycl.) Ångstr., etc. Southward, *Meesia minor* mostly occurs in the alpine belt, in areas with calcareous bedrocks. Apparently, *M. minor* has circumpolar distribution in Northern Hemisphere unlike one more species considered by Hedenäs (2020a), *M. minutissima* Hedenäs; no specimen of this species was found during our revision.

36. ***Metzgeria lindbergii*** Schiffn.

Contributors. B. Mufeed, C. N. Manju and K. P. Rajesh

India. Kerala, Idukki district, Anamudi Shola National Park, Mannavan Shola (2100–1945 m), epiphytic, on bark of large trees in shola forest, 07 February 2018, *leg*. B. Mufeed *9844* (ZGC); 26 September 2018, *leg*. B. Mufeed *13349a* (ZGC).

Metzgeria lindbergii is widely distributed in Bhutan, China, Indonesia, Japan, Malaysia, Nepal, The Philippines, Sri Lanka, Australia (So 2003; He and Jia 2019) and Columbia (Ellis, Afonina, Doroshina, et al. 2019). Two synonyms of *M. lindbergii* were recognised by So (2003) and He and Jia (2019): *Metzgeria himalayensis* Kashyap from the Western Himalayas and *M. assamica* Srivastava from Assam. *Metzgeria lindbergii* is also known in India from Himachal Pradesh (Singh and Singh 2010), Manipur (Singh et al. 2010), Odisha (Mishra et al. 2016), Sikkim (Singh et al. 2008) and Tamil Nadu (Foreau 1961; Srivastava and Udar 1975; Daniels 2010). Hitherto recorded only from Tamil Nadu in South India, the present collection from Anamudi shola National Park is a new record for Kerala.

36. ***Ochrobryum kurzianum*** Hampe

Contributors. N. Norhazrina and N. Syazwana

Peninsular Malaysia. Perak, Hulu Kinta, Gunung Korbu, track from Kijang camp to Seroja camp, 4°40′59.99"N, 101°17′60.00"E, on tree trunk, 955 m a.s.l., 4 July 2019, *leg*. N. Norhazrina, S. Norrahaslinda, N. Syazwana, & M. Aisyah *4227* (UKMB).

Ochrobryum kurzianum is widespread in tropical Asia, recorded from Sri Lanka and India to Thailand and Cambodia, just reaching the borders of Malaya (Eddy 1990); it also occurs in Nepal and Burma (Allen

1992). This species and *Ochrobryum gardneri* (Müll.Hal.) Lindb. were treated as a single species by Mitten (1859). However, Allen (1992) reported that leaves in the two species differ in their basal lamina, with that of *O. gardneri* being generally narrower, also its propagula are borne on the upper dorsal surface of the leaves rather than in the leaf axils, and its calyptrae tend to be laciniate rather than strongly ciliate at their base.

The diagnostic characters for *O. kurzianum* are lanceolate leaves, narrowly ovate at the base with broadly acute or obtuse apices, globose propagula that cluster in leaf axils and basal leaf laminae with 4–6 layers of long-rectangular cells (Allen 1992). Globose propagula clustered in the leaf axils also occur in *Ochrobryum sessile* B.H.Allen, but *O. sessile* has linear leaves, slenderly acute apices and uni- or bi-layered apical ventral leucocysts with a single cell width. Eddy (1990) also stated that barren plants of *O. kurzianum* might be mistaken for juvenile plants of *Schistomitrium*, but usually have a slightly wider hyaline lamina towards the leaf base.

38. ***Orthodontium lineare*** Schwägr.
Contributor. A. Bergamini
Switzerland. Canton of Schaffhausen, Schaffhausen, Striitholz close to Herblingen, on a rotten *Quercus* L. trunk in a European beech forest together with *Dicranum montanum* Hedw., *Tetraphis pellucida* Hedw. and *Lophocolea heterophylla* (Schrad.) Dumort., 47°44′04.44′′N, 8°40′13.05′′E, 510 m a.s.l., 3 March 2020, *leg.* A. Bergamini *20-34* (Private Herbarium).

This is the first certain record of *Orthodontium lineare* in Switzerland. Previous indications of an occurrence of this species in Switzerland, e.g. in DAISIE (Roy et al. 2019), were highly uncertain and of unknown origin. The species was therefore not listed in the Swiss checklist (Swissbryophytes 2004–2020).

Orthodontium lineare is considered a neophyte in Europe originating from the Southern Hemisphere (Meijer 1952). It was first found in 1910 in England, and 1939 in continental Europe close to Berlin (Meijer 1952; Żarnowiec et al. 2020). Nowadays, it is widely distributed in Europe where it is especially common in England and Wales, Belgium, The Netherlands, northern Germany and western Poland (Żarnowiec et al. 2020). In many southern European countries the species is still absent although suitable climatic conditions and habitats are present there (Mateo et al. 2015).

At the newly discovered site in Switzerland the species occurred on a single rotten tree trunk. The total area covered on the trunk was less than 1 dm^2. Sporophytes were abundant and it was estimated that between 80 and 100 sporophytes were present. Given that in one capsule of *O. lineare* around 45,000 spores can be produced (Hedenäs et al. 1989), the sporophytes on the tree trunk may produce a total number of approx. 4 million spores if all capsules ripen. Therefore, it seems possible that the species may colonise other sites in the immediate vicinity in the near future, as shown for example by Herben (1994).

39. ***Orthomnion javense*** (M.Fleisch.) T.J.Kop.
Contributors. P. Srivastava, I. Omar and A. K. Asthana
India. (North-eastern region) Meghalaya, Ribhoi, near Umiam Lake, ca. 976 m a.s.l., epiphytic, 28 June 2019, *leg*. Priyanshu Srivastava, *321642* (LWG).

Orthomnion javense has been recorded from China, Indonesia, Japan, Laos, Papua New Guinea, the Philippines and Vietnam (Yi and He 2014; Koponen et al. 2019). Omar et al. (2020) reported this species from southern India and Nepal. Now, the species has been found growing on stem bark at an elevation of 976 m a.s.l in the vicinity of Meghalaya (north-eastern India). With this report its distribution is extended from south India to north-east India. Plants were slender, lax, 3.5–5 cm long with fragile leaves, crisped when dry, elliptical, 4–5 × 1.9–2.3 mm, margin entire, apex acute to obtuse, a group of quadrate cells on both sides of the apiculus; leaf borders 2–3 cells wide and extending to near leaf apex; costa vanishing much below the apex and lacking a specialised stereid band, laminal cells hexagonal, 28–35 × 20–32 µm. Sporophyte not seen.

40. ***Orthotrichum cupulatum*** var. ***fuscum*** (Venturi) Boulay
Contributors. M. Kırmacı, G. Aslan and U. Çatak
Turkey: Province Van, Erciş, north of Alkasnak Village, 39°00′02.7′′N, 43°39′14.3′′E, 1920 m a.s.l., on soil covered basalt rock in valley, general vegetation *Juglans regia* L., *Rosa canina* L. and *Salix* L. sp., 04 November 2019, *leg.* M. Kırmacı & M. Armağan (MKIR 8267).

Orthotrichum cupulatum var. *fuscum* is distinguished by its very hairy calyptra, short and globose capsules, and papillose peristome teeth. The Turkish record has slightly revolute leaves and bifurcate papillae. It was associated with *Encalypta alpina* Sm., *Grimmia anodon* Bruch & Schimp., *G. laevigata* (Brid.) Brid., *G. ovalis* (Hedw.) Lindb., *Homalothecium sericeum* (Hedw.) Schimp., *Orthotrichum rupestre* Schleich. ex Schwägr., *Tortula inermis* (Brid.) Mont., *T. revolvens* (Schimp.) G. Roth, *Syntrichia ruralis* (Hedw.) F.Weber & D.Mohr and *S. subpapillosissima* (Bizot & R.B.Pierrot ex W.A.Kramer) M.T.Gallego & J.Guerra.

Orthotrichum is represented by 30 taxa in Turkey (Erdağ and Kürschner 2017; Kırmacı and Agcagil 2018). *Orthotrichum cupulatum* var. *fuscum* is very rare, known from Iraq (Agnew and Vondráček 1975; Aziz and Al-Ni'ma 2017), Israel and Cıs-Jordan (Herrnstadt et al. 1991) and Lebanon (Charouk 1982) in the

near and middle east (Kürschner and Erdağ 2020). It is also recorded from France, Italy, Austria, Germany, Slovakia, Switzerland, and Greece, and given Red List categories in Italy and Switzerland: DD; Slovakia: VU (Hodgetts 2015). The species was collected from only one locality in Turkey, and since its distribution is unknown, its Red List category is given as DD.

The bryoflora in eastern Turkey is very poorly known. Very few studies have been undertaken (Schiffner 1913; Henderson 1957, 1958; Henderson 1961; Henderson and Prentice 1969; Papp 2007). It is possible that many new taxa will be added to the flora after a detailed investigation of this region with an average altitude of 2000 m a.s.l.

41. ***Orthotrichum hispanicum*** F.Lara, Garilleti & Mazimpaka
Contributors. P. Martin and S. V. O'Leary
Andorra. Serra Dels Corrals, 2100 m a.s.l., 42°33′14.30′′N, 1°27′12.20′′E, 15 May 2019, epiphytic within *Pinus uncinata* Mill. ex Mirb. forest, though the host tree species was not noted. It is unlikely to have been growing on the acidic bark of *P. uncinata* but instead on understory species, which in these forests would typically be *Juniperus alpina* Gray, *Salix caprea* L. or *Sorbus* L. spp. (F. Lara pers. comm.), *leg. & det.* P. Martin & S. V. O'Leary *s.n., conf.* T.L. Blockeel.

This is the first record from Andorra. The very first record was from Spain and the holotype dates from 1996. It is a rare species and there are still only four records from Spain, mostly growing on *Buxus sempervirens* L. (Lara et al. 2000). Since then a more widespread distribution has been discovered, but in each country in which it has been found, there are only a small number of records: three records each from France and Georgia, two records each from Greece and Turkey with single records from The Netherlands, Libya and India (F. Lara pers. comm.). The species was first recorded in Switzerland in 2014; since then it has been found at different localities in the same region which is thought to indicate a self-generating population. The sites in Switzerland are humid in contrast to the drier conditions in the Mediterranean sites (Kiebacher et al. 2019).

42. ***Phaeoceros carolinianus*** (Michx.) Prosk.
Contributors. B. Mufeed and C. N. Manju
India. Kerala, Idukki district, Anamudi Shola National Park, Mannavan Shola, 1700 m a.s.l., terrestrial, usually growing on land cuttings, 24 September 2018, *leg.* B. Mufeed *9963* (ZGC).

Phaeoceros carolinianus is a widely distributed and common species worldwide (Hässel de Menéndez 1987; Schuster 1992a). Very common in India, it has been reported by most authors as *Phaeoceros laevis* subsp. *carolinianus* (Michx) Prosk. *Phaeoceros carolinianus* is closely related to *Phaeoceros laevis* (L.) Prosk. in its thallus morphology. However, sexual characters and spore patterns distinguish these two species. *Phaeoceros laevis* is a dioicous species and spores are usually densely covered with minute papillae, and pseudoelaters are branched, but *P. carolinianus* is a monoicous species and the spores are bright yellowish-green with a more roughly papillate sporoderm and the pseudoelaters are short and stumpy. *Phaeoceros carolinianus* is known from Tamil Nadu in south India (Asthana and Srivastava 1991; Daniels 2010). The present collection is a new record for Kerala.

43. ***Plagiobryum zieri*** (Hedw.) Lindb.
Contributor. V. E. Fedosov
Russia. Polar Ural Mountains eastern slope, Jamal-Nenets Autonomous District, vicinity of Laborovaya village, eastern periphery of Yanganape calcareous massif; 67.7039°N, 67.8591°E, ca. 170 m a.s.l., on moist surface of igneous rock with oozing water, 9 August 2017, *leg.* V. E. Fedosov *s.n.* (MW).

This species is newly recorded for the Ural Mountains. *Plagiobryum* (*Ptychostomum*) *zieri* is widespread in mountain areas of Europe (most countries) and North America, with isolated localities in South Africa and Central America. Distribution of this species in Asia is insufficiently known due to limited number of specimens and possible confusion with *P. japonicum* Nog. (Ignatov et al. 2018). Localities of this species are known from the Altai Mountains, Anabar Plateau, eastern Sayan, Kadar Range in Transbaikalia, Chukotka, Commander Islands and Dusse Alin Range in Bureja River upper course (Ivanov et al. 2017), while the specimens from Shikotan Island (North Kurils) and Primorsky Territory are considered dubious (Ignatov et al. 2018) since essential traits to differentiate *P. zieri* from *P. japonicum* are capsule shape and endostome length, thus plants without capsules from the areas where both species may occur, are hard to identify.

44. ***Plagiothecium berggrenianum*** Frisvoll
Contributors. I. V. Czernyadjeva and E. I. Troeva
Russia. Arctic Siberia, New Siberian Islands Archipelago, Stolbovoy Island: (1) vicinity of polar station, 74°10′8.4"N, 135°29′15.1"E, sea terrace, graminoids-lichen tundra, together with *Hylocomium splendens* (Hedw.) Schimp., *Tomentypnum involutum* (Limpr.) Hedenäs & Ignatov, 6 August 2019, *leg.* I. V. Czernyadjeva, *# 25-19* (LE); (2) northwest tip of the island, 74°09′35.4"N, 135°27′5.2"E, low sea terrace, hummocky *Salix polaris*-graminoid-moss tundra, together with *Oncophorus elongatus* (I.Hagen) Hedenäs, 7 August 2019, *leg.* E. I. Troeva, *# 54me19* (LE).

This Arctic-mountain species, in Europe was known from the Arctic Ocean islands (Svalbard, Franz Josef

Land, Novaya Zemlya) and Nenets Autonomous District (Ignatov and Ignatova 2020). In Asiatic Russia it is fairly common in permafrost areas (Yamal, Gydan and Taimyr peninsulas, Yamal-Nenets Autonomous District, Anabar Plateau, Yakutia, Magadan and Chukotka Provinces, Kamchatka Peninsula), extending as far south as ca. 61°N (Ust-Maya District of Yakutia) (Fedosov et al. 2011; Pisarenko et al. 2017; Ignatov and Ignatova 2020). In America it is known from Alaska, Canadian Arctic Archipelago and Greenland (Ireland 2014).

Plagiothecium berggrenianum grows on wet soil, usually as solitary stems in tufts with other mosses. It is a distinctive species made conspicuous by the combination of medium-sized plants; appressed, symmetric, ovate, strongly concave leaves; distinctly recurved leaf margins; and hook-shaped leaf apiculi.

45. ***Plagiothecium succulentum*** (Wilson) Lindb.

Contributors. G. J. Wolski, D. Bożyk and A. Cienkowska

Nepal. Eastern part of Nepal, between Topke Gola and Shewaden, on rock, 3150 m a.s.l., 28 June 1972, *leg*. Z. Iwatsuki *1879* (H, 5th Bot. Exped. to E. Himalaya by University of Tokyo), *det*. G. J. Wolski.

Plagiothecium succulentum was described as *Hypnum denticulatum* var. *succulentum* in 'Bryologia Britannica' (Wilson 1855). The subsequent decades brought reports of this taxon from Europe, Asia and North America (e.g. Gravet 1883; Brotherus 1909, 1923; Mönkemeyer 1927; Grout 1932; van der Wijk et al. 1964–1969; Ignatov et al. 2006; Li and Ireland 2008). In the 1960s, as a result of taxonomic revision (Ireland 1969), this species was removed from the North American flora, which resulted in a reduction of its coverage to Eurasia. Currently, *P. succulentum* is quite common in Europe, as this species is known from almost all countries of the continent (Sabovljević et al. 2008; Ros et al. 2013; Hodgetts 2015). It is also known from numerous countries in Asia: Korea, China, Iran, and Russia (Redfearn et al. 1996; Akhani and Kürschner 2004; Ignatov et al. 2006; Pak and Ch'oe 2007; Li and Ireland 2008; Kürschner and Frey 2011), while its presence in North America is currently being analysed and discussed (Wolski in preparation).

Until now, 10 taxa belonging to the genus *Plagiothecium* have been recorded from Nepal: *P. argentatum* (Mitt.) Q.Zuo, *P. cavifolium* (Brid.) Z.Iwats., *P. decoratum* J.T.Wynns, *P. denticulatum* (Hedw.) Schimp., *P. denticulatum* var. *obtusifolium* (Turner) Moore, *P. longisetum* Lindb., *P. neckeroideum* Schimp., *P. neckeroideum* fo. *exile* J.T.Wynns, *P. neckeroideum* var. *myurum* Molendo, *P. nemorale* (Mitt.) A.Jaeger (Karczmarz 1981; Kattel and Adhikari 1992; Wynns 2015; Wolski and Nowicka-Krawczyk 2020). *Plagiothecium succulentum* is listed for the first time from this country.

46. ***Pseudoamblystegium subtile*** (Hedw.) Vanderp. & Hedenäs

Contributors. R. Gabriel, M. Kubová, C. Sérgio and I. Soares Albergaria

Portugal, Azores. Terceira Island, Angra do Heroísmo, municipal garden 'Jardim Duque da Terceira', 38° 39′24.0′′N, 27°13′05.99′′W, 31 m a.s.l, on the base of a shrub, in acidic conditions, 7 April 2017, *leg*. Michaela Kubová *s.n*. (AZU).

A new understanding of the pleurocarpous moss species *Pseudoamblystegium subtile* was proposed by Vanderpoorten and Hedenäs (2009). The new genus is separated from the other Amblystegiaceae primarily due to its phylogenetic consistency and is characterised by the possession of leaves with a very short nerve, and erect capsules (Vanderpoorten and Hedenäs 2009).

The species generally occurs across eastern and south-eastern Europe, and is present in countries from central, northern and south-western Europe (Hodgetts 2015). This is its first record for the Azores, and Macaronesia, considerably expanding its known distribution. Although *P. subtile* is classified as of Least Concern in the European Red List of bryophytes (Hodgetts et al. 2019), in some countries (e.g. Germany, Poland, Finland) it has a different conservation status. Notwithstanding, other studies have found the species growing in polluted areas (e.g. Paal and Degtjarenko 2015). In the Azores, the species was found in the municipal garden of Angra do Heroísmo (Terceira Island), growing on a shrub, *Nandina domestica* Thunb., together with *Cololejeunea minutissima* (Sm.) Steph. and *Syntrichia laevipila* Brid. The plant was growing on the base of the shrub, 10–40 cm height, in acidic conditions (pH 3.8). The specimen was collected without sporophytes.

47. ***Pseudoleskeella rupestris*** (Berggr.) Hedenäs & L.Söderstr.

Contributors. M. S. Sabovljević and A. D. Sabovljević

Bosnia and Herzegovina. Jahorina Mt (Republic of Srpska), 43.721789°N, 18.517436°E, on limestone rock above timberline in the high-mountain grassland, 6 October 2018, *leg./det*. Marko S. Sabovljević and Aneta D. Sabovljević *s.n*. (BEOU).

In the Balkans this species was overlooked had not been recorded historically (Pavletić 1955). More recently, it has been reported in the Balkans from Montenegro (Dragićević et al. 2008), Albania (Papp, Erzberger, Marka, et al. 2010), Serbia (Papp et al. 2014), Croatia (Alegro et al. 2015), northern Macedonia (Papp et al. 2016) and Greece (Papp and Tzakiri 2017). With a circumpolar, boreal and montane distribution, it is also present in Turkey, France and Spain (Ros et al. 2013).

Pseudoleskeella rupestris was recorded in limestone rocks in the grassland outcrops above timberline, in

vegetation of Elyno-Seslerietea Br.-Bl. 1948 type with *Juniperus nana* Willd. The accompanying species were *Tortella tortuosa* (Hedw.) Limpr. and *Radula complanata* (L.) Dumort. Hodgetts (2015) stated this species is threatened in four central European countries, while it is near threatened (NT) in UK and Finland. In many European countries it is considered data defficient (DD). However, it is not threatened in Europe as a whole (Hodgetts et al. 2019), since Hallingbäck et al. (2019) assessed its overall European population as stable.

The bryophyte flora of Bosnia-Herzegovina is rich (Sabovljević 2004; Sabovljević et al. 2011) with a relatively long research history (Sabovljević et al. 2001). However, bryological investigation over the last few decades has been absent (Pantović et al. 2017). Occasional recent studies have generated data on new species records (Ellis et al. 2016; Pantović et al. 2016). According to Sabovljević et al. (2008), Ros et al. (2013) and Hodgetts (2015) *P. rupestris* was hitherto unrecorded for Bosnia-Herzegovina.

48. ***Ptychostomum minii*** (Podp. ex Guim.) D.Bell & Holyoak (*Bryum minii* Podp. ex Guim.)
Contributor. V. Hugonnot
France. Ardèche, Asperjoc, ruisseau d'Aiguebelle, 450 m a.s.l., 4°19′45′′E, 44°41′20′′N, 27 May 2009, *leg.* V. Hugonnot *s.n.* (Herb. V. Hugonnot).

Ptychostomum minii is reported from Sardinia (Italy) (Ros et al. 2013), Portugal (Sérgio et al. 1999, 2013), Spain (Cezón et al. 2010) and France (Skrzypczak 1998). It was previously considered a very rare species but many new records have been published in Portugal (Sérgio, Garcia, Stow 2013). This species is included in the Portuguese Red Data Book as Least Concern (LC) but with special attention (Sérgio, Garcia, Sim-Sim, et al. 2013). In Spain, it is evaluated as Vulnerable (VU) (Garilleti and Albertos 2012).

In France, only one population was known to date, in the bryologically famous Rocher de Roquebrune (department) where the author observed it in 2006. The species has been found 200 km north of the absolute northern limit of the species' previously known distribution, in Ardèche, north-east Cévennes, Massif Central.

Ptychostomum minii was growing in a small, temporary watercourse on granitic substrate, in wet rock crevices together with *Entosthodon pulchellus* (H.Philib.) Brugués, *Philonotis capillaris* Lindb., *Imbribryum alpinum* (Huds. ex With.) N.Pedersen. In France, it is not known if the species is rare or widely overlooked due to its inconspicuous habit. It is also possible that the species has been confused with small *I. alpinum*, which may have a similar overall appearance in the field. *Ptychostomum minii* is distinct in its rosulate foliage, making a dense terminal bud (when dry), by the slightly spirally twisted leaves (note that this character is subject to variation from clearly apparent contorted leaves to upright ones) and by the distinct margin of elongated cells.

49. ***Racomitrium lanuginosum*** (Hedw.) Brid.
Contributors. J. Csiky and É. Csikyné Radnai
Hungary. Cserhát Mountain, Bér, Nagy-hegy, 365 m. a.s.l., 47°51'56.91"N, 19°28'41.38"E, on open boulder scree slope, close to the forest edge, on andesite rocks, 18 July 2020, *leg*. János Csiky and Éva Csikyné Radnai, *det.* János Csiky (JPU).

Racomitrium lanuginosum has a broad distribution in the Northern Hemisphere (Hedenäs 2020b) and found to be common in most of the European countries (Hodgetts and Lockhart 2020). Erzberger et al. (2016) considered *R. lanuginosum* doubtfully recorded from Hungary, since recently doubts have arisen concerning the trustworthiness of the collector of the only specimen from Hungary (BP 6630, Cottus Castriferrei, Sorkikápolna in silvis without year *leg*. Márton, J.) and, additionally, the agricultural region (lowland landscape without rocks and cliffs) seems unsuitable to support this species in the vicinity of Sorkikápolna. For this reason this species is mentioned as Data Deficient (DD) on the recent Red List of Hungarian mosses (Papp, Erzberger, Ódor, et al. 2010) and on the updated checklist and country status of European bryophytes as well (Hodgetts and Lockhart 2020). Based on the new population found in the Cserhát Mt. in 2020, it can be stated that *R. lanuginosum* certainly occurs in Hungary. Associated moss species within 1 m^2 on the boulder scree of Nagy-hegy in Cserhát Mt were *Hypnum cupressiforme* Hedw., *Dicranum scoparium* Hedw. and *Andreaea rupestris* Hedw. It is surprising that *R. lanuginosum* with its striking appearance was not formerly found within this protected area. In this respect, the possibility may also arise that *R. lanuginosum* has become established here in the last two decades.

50. ***Radula acuta*** Mitt.
Contributors. B. Mufeed, C. N. Manju and K. P. Rajesh
India. Kerala, Idukki district, Anamudi Shola National Park, Mannavan Shola, 1705 m a.s.l., lithophytic, 14 July 2017, *leg*. B. Mufeed *7513b* (ZGC).

Radula acuta is known from the Pacific Islands, including Fiji, Samoa and Tahiti (So 2006), from China (Piippo 1990), Indonesia, The Philippines (Yamada 1979; Tan and Engel 1986), Japan (Yamada and Iwatsuki 2006), Malaysia (Chuah-Petiot 2011), New Caledonia (Thouvenot et al. 2011), Papua New Guinea (Yamada and Piippo 1989), Taiwan (Wang et al. 2011) and Thailand (Yamada 1979; Lai et al. 2008). In India it has been reported from Arunachal Pradesh and the Andaman and Nicobar Islands (Majumdar et al. 2012). The present collection is a new record for Peninsular India.

Plants small, leafy, up to 10 mm long and 2 mm wide, rarely branched, saxicolous; leaf apiculate or

subacute; leaf lobes loosely imbricate, widely spreading, slightly concave, dorsal base slightly covering the stem; lobules subquadrate, 1/3 of the leaf length, 0.35 mm long and 0.28 mm wide; laminal cells pentagonal or hexagonal with trigones, 24–34 µm; marginal cells quadrangular, 15–17 × 20–25 µm; apex acute, usually ends with a single cell, 26 × 21 µm.

51. ***Rhynchostegium megapolitanum*** (Blandow ex F.Weber & D.Mohr) Schimp.

Contributors. D. Shyriaieva, S. Kubešová and V. M. Virchenko

The Ukraine. Steppe zone, Mykolaiv region, Southern Bug river basin: (1) Pervomaisk distr., near Kuripchyne village, 47°59′54.2"N, 31°00′06.5"E, slopes of the gully, meso-xeric grasslands, 48°00′37.1"N, 30°59′10.7"E, steppe shrubs, 10 May 2018, *leg*. D. Shyriaieva & D. Vynokurov, *det*. V. M. Virchenko; (2) Domanivka distr., near Bohdanivka village, 47°47′44.2"N, 31°09′58.0"E, dry grasslands (steppe), on slopes, 13 May 2018, *leg*. D. Shyriaieva & D. Vynokurov, *det*. V. M. Virchenko; (3) Voznesensk distr., near Yuzhnoukrainsk town, 47°48′03.2"N, 31°10′34.7"E, grassland vegetation on rocky outcrops, 8 June 2018, *leg*. D. Shyriaieva, *det*. V. M. Virchenko; (4) Voznesensk distr., near Trykraty village, 47°42′39.2"N, 31°24′16.2"E, meso-xeric grasslands, 19 June 2019, *leg*. D. Shyriaieva & D. Vynokurov, *det*. V. M. Virchenko; (5) Mykolaiv distr., near Petrovo-Solonykha village, alluvial terrace of Southern Bug river, 47°05′16.8"N, 31°53′25.4"E, sandy dry grasslands and 47°04′39.0"N, 31°53′12.8"E, steppe on sandy loam soils, 11 July 2018, *leg*. D. Shyriaieva, *det*. S. Kubešová; (6) Mykolaiv distr., near Kovalivka village, alluvial terrace of Southern Bug river, 47°18′26.6"N, 31°43′05.5"E, sandy dry grassland, 20 July 2018, *leg*. D. Shyriaieva, *det*. S. Kubešová; (7) Vitovskyi distr., near Marivka village, alluvial terrace of Ingul river, 47°08′40.6"N, 32°13′31.4"E, sandy dry grassland, 16 July 2019, *leg*. D. Shyriaieva & D. Vynokurov, *det*. S. Kubešová. All specimens are deposited in KW-B.

Rhynchostegium megapolitanum is known from Eurasia, northern Africa, Macaronesia, and South America (Dierßen 2001). In Europe the species occurs especially in the Mediterranean, while northward it becomes rare (Hodgetts and Lockhart 2020). According to the 'Moss Flora of Ukraine' (Bachuryna and Melnychuk 2003) *R. megapolitanum* is listed only for two regions of the country—Transcarpathia and Crimea.

In 2018–2019 we found new localities of *Rhynchostegium megapolitanum* in the Mykolaiv region. The findings from the National Park Buzkyi Gard (localities 1–4) are located in the north part of the steppe zone, in different habitat conditions—meso-xeric grasslands on shaded slopes where large granite stones sometimes occur (1, 4); zonal steppe dominated by xeric grasses on deep fine soil (2); petrophytic steppe community on shallow soils with granitic gravel (3). The moss cover included *Brachythecium albicans* (Hedw.) Schimp., *Bryum caespiticium* Hedw., *Homalothecium lutescens* (Hedw.) H.Rob., *Hypnum cupressiforme* Hedw., *Syntrichia ruralis* (Hedw.) F.Weber & D.Mohr and *Weissia longifolia* Mitt.

We also found *R. megapolitanum* further south, on sandy alluvial terraces of the Southern Bug river basin (localities 5–7), where moss cover included *Bryum caespiticium*, *B. capillare* Hedw., *Ceratodon purpureus* (Hedw.) Brid., *Syntrichia ruralis* and rarely, *Brachythecium albicans* and *Hypnum cupressiforme*.

Thus, *R. megapolitanum* occurs in the Southern Bug river basin from the northern edge of the steppe zone to its southern part. We suggest the species is more widespread in the steppe zone of The Ukraine than previously thought and could be also found in the forest-steppe zone.

52. ***Riccia cavernosa*** Hoffm.

Contributors. G. Gospodinov, R. Natcheva and G. Kunev

Bulgaria. West Bulgaria, Kyustendil Province: (1) W shore of dam Drenov dol, 42.30359299°N, 22.68449135°E, 544 m a.s.l, on silt substrate, soil of Fluvisol type derived from leached Chromic Luvisols, developed over silicate bedrock, grows together with *Physcomiterlla patens* (Hedw.) Bruch & Schimp., *Riccia frostii* Austin, *Bryum klinggraefii* Schimp. and *B. argenteum* Hedw., 11 October 2020, *leg.* G. Gospodinov, R. Natcheva, G. Kunev *s.n*., *det.* G. Gospodinov & R. Natcheva (SOM 9812-B, 9814-B); (2) E of village Lozno, dam Lozenski, 42.28952606°N, 22.66218733°E, 564 m a.s.l., on mud over silicate alluvial- and talus-drift sediments, grows together with *Drepanocladus aduncus* (Hedw.) Warnst., *Bryum rubens* Mitt., and *Riccia frostii*, 11 October 2020, *leg*. & *det.* G. Gospodinov & R. Natcheva *s.n.* (SOM 9820-B); (3) shore of Bagrentsi dam, 42.265816°N, 22.77224°E, 493 m a.s.l., on mud of eroded soil of Fluvisol type derived from leached Chromic Luvisol over silicate bedrock of conglomerates, sandstones and shales, grows together with *Riccia crystallina* L. and *R. frostii*, 09 October 2020, *leg.* & *det.* G. Gospodinov, R. Natcheva *s.n.* (SOM 9833-B).

Riccia cavernosa is reported here as an addition to the Bulgarian bryophyte flora. Although it has a cosmopolitan distribution, Jovet-Ast (1965, 1966) describes the species as rare in the Mediterranean region and widely distributed further north in Central and Western Europe, Africa, America, and Asia. In the Balkans, it has been found in Montenegro, Croatia, and Romania (Hodgetts and Lockhart 2020). In Bulgaria, *R. cavernosa* was found fertile and fairly abundant at all three sites and especially at site (1). Perhaps it is more common in Bulgaria but overlooked due to the specific habitat—muddy bare periodically inundated shores of dams.

Riccia cavernosa was observed in two different plant communities. The first develops on silt deposits with dominant species some short living dwarf annual hygrophytes as *Gnaphalium uliginosum* L., *Cyperus micheliianus* (L.) Delile, *C. fuscus* L. and at site (1) with abundance of *Amaranthus blitum* L. subsp. *emarginatus* (Uline & W.L.Bray) Carretero, Muñoz Garm. & Pedrol. Such floristic composition is typical of the association *Cyperetum micheliani* Horvatić 1931 (Šumberová 2011) reported from Bulgaria by Tzonev (2015). At the shore sides the substrate is more sandy, poor and well drained. This is reflected by the change of vegetation into a community dominated by the halophytes *Crypsis alopecuroides* (Piller & Mitterp.) Schrad., *C. schoenoides* (L.) Lam. and with presence of some subhalophytic ruderals, such as *Mentha pulegium* L. and *Pulicaria vulgaris* Gaertn. Thus, the abundance of *Riccia* species at new established locations rapidly decreases with the shift from dwarf-cyperoid-hygrophytic to halophytic-ruderal community types.

53. ***Riccia frostii*** Austin

Contributors. G. Gospodinov, R. Natcheva and G. Kunev

Bulgaria. West Bulgaria, Kyustendil Province: (1) W shore of dam Drenov dol, 42.30359299°N, 22.68449135°E, 544 m a.s.l, on mud of soil of Fluvisol type derived from leached Chromic Luvisol over silicate bedrock, grows together with *Physcomiterlla patens* (Hedw.) Bruch & Schimp., *Riccia cavernosa* Hoffm., *Bryum klinggraefii* Schimp., and *B. argenteum* Hedw., 11 October 2020, *leg.* G. Gospodinov, R. Natcheva, G. Kunev *s.n.*, *det.* G. Gospodinov & R. Natcheva (SOM 9813-B); (2) E of village Lozno, dam Lozenski, 42.28952606°N, 22.66218733°E, 564 m a.s.l., on mud over silicate alluvial-drift and talus-drift sediments, grows together with *Drepanocladus aduncus* (Hedw.) Warnst., *Bryum rubens* Mitt., and *Riccia cavernosa*, 11 October 2020, *leg.* & *det.* G. Gospodinov, R. Natcheva *s.n.* (SOM 9820-B); (3) shore of Bagrentsi dam, 42.265816°N, 22.77224°E, 493 m, on mud of eroded soil of Fluvisol type derived from leached Chromic Luvisol over silicate bedrock of conglomerates, sandstones and shales, grow together with *Riccia crystallina* L. and *R. cavernosa*, 09 October 2020, *leg.* & *det.* G. Gospodinov, R. Natcheva *s.n.* (SOM 9834-B, 9835-B).

The species was represented by numerous male and female individuals. The comments on the distribution and ecology in Bulgaria of the foregoing species apply also to *R. frostii* since both species shared the same habitat and were found together at all sites. These taxa, along with *R. crystallina*, have diagnostic value for the class of freshwater shoreline vegetation *Isoëto-Nanojuncetea* Br.-Bl. et Tx. in Br.-Bl. et al. 1952 (Mucina et al. 2016), which is poorly studied in the country in terms of dynamics, distribution and species composition (especially the bryophytes).

Riccia frostii was previously a questionable species in the Bulgarian bryoflora. Jovet-Ast (1986) reported the species as present in Bulgaria, but the original source of this data is unknown to us. Based on this monograph the species was included for the Bulgarian flora by Söderström et al. (2002), Sabovljević and Natcheva (2006), and Hodgetts and Lockhart (2020). Söderström et al. (2002) consider its occurrence in Bulgaria as doubtful, while Hodgetts and Lockhart (2020) treated it under the category 'Taxon recorded in some literature but later rejected'. Therefore, this is the first confirmed finding of the species for the country. Its distribution on the Balkans also includes Serbia, Croatia, Romania, as well as Hungary, Italy, Spain, European Russia, Belarus and The Ukraine outside the peninsula (Hodgetts and Lockhart 2020).

54. ***Riccia rhenana*** Lorb. ex Müll.Frib.

Contributors. G. Gospodinov and R. Natcheva

Bulgaria. Dragichevo marsh, on wet mud along the shore, 42.631653°N, 23.156738°E, 963 m a.s.l, terrestrial forms on silicate sandstones, argillite and conglomerate bedrock, 1 September 2018, *leg.* & *det* G. Gospodinov *s.n.* (SOM 9837-B); intermediate terrestrial forms on silicate sandstones, argillite and conglomerate bedrock, 1 September 2018, *leg.* & *det* G. Gospodinov *s.n.*, (SOM 9838-B, 9839-B); aquatic forms floating among *Typha* L., *Lemna trisulca* L., *L. minor* L., *Potamogeton* L. *sp.*, on silicate bedrock, 1 September 2018, *leg.* & *det* G. Gospodinov *s.n.*, (SOM 9840-B).

Riccia rhenana is reported here as new to Bulgaria. It has been suggested to be an autodiploid of *R. fluitans* (Berrie 1964). The morphological determination between the two is unreliable, due to a large variety of forms in both species (Berrie 1964). In Bulgaria both *R. rhenana* ($n = 16$, Gospodinov and Natcheva, unpublished) and *R. fluitans* ($n = 8$; Gospodinov and Natcheva 2020) are present. The species was found as both aquatic and terrestrial forms, all sterile. A dense network of thalli in the water was found among *Potamogeton* sp., *Lemna trisulca* and *Typha* sp. The terrestrial form occurs on wet mud, approx. 5–20 cm from the water, and on fallen stems/leaves of *Typha* sp. In Europe it is confirmed from Finland, Sweden, France, Belgium, Hungary, the Czech Republic, Poland, The Netherlands, most of European Russia and The Ukraine (Hodgetts and Lockhart 2020). In the Balkans it is reported for Romania and Montenegro (Ellis, Afonina, et al. 2020; Hodgetts and Lockhart 2020).

55. ***Riccia rhenana*** Lorb. ex Müll.Frib.

Contributors. A. Rimac, A. Alegro, V. Šegota, N. Koletić and N. Vuković

Croatia. Moslavina Region, near settlement Plesmo, on muddy banks of the Veliki Strug River, 45°18'27.26"N, 16°50'15.21"E, 90 m a.s.l., 21 August 2019, *leg.*

A. Rimac, N. Vuković, N. Koletić, V. Šegota *s.n.*, *det.* A. Rimac, A. Alegro (ZA55985, ZA55986).

The species was collected in Pannonian region of Croatia, on muddy banks of the Veliki Strug River, a lowland river belonging to the Sava River catchment and Black Sea Basin. The river is eutrophic, very turbid and almost stagnant. Terrestrial thalli of *Riccia rhenana* were frequent in the stand of *Sparganium erectum* L., in the narrow zone along the bank. This vegetation belongs to the alliance *Phragmition communis* Koch 1926, i.e. riparian vegetation of mesotrophic and eutrophic standing freshwater bodies or gently moving streams of boreo-temperate Eurasia (Mucina et al. 2016). *Riccia rhenana* generally inhabits wet and muddy margins of ponds, lakes and rivers or it can be found floating below the water surface (Paton 1999). Aquatic forms of *R. rhenana* cannot be distinguished with certainty from very similar *R. fluitans* L. without cytological examination and chromosome counting. By contrast, terrestrial thalli of *R. rhenana* are more robust than those of *R. fluitans*, with wider areolae on dorsal surface, larger epidermal cells, as well as larger cells in the ventral scales. Furthermore, the two species differ in the angle between branches, (60)80–105° in *R. rhenana* and 60–90° in *R. fluitans* (Paton 1999). *Riccia rhenana* is a European Temperate element (Hill and Preston 1998), distributed throughout western Europe, present in several countries of northern and eastern Europe (Hodgetts 2015) and two Mediterranean countries (Ros et al. 2013). In southeast Europe, *Riccia rhenana* was reported from Romania (Ellis et al. 2011) and Montenegro (Ellis, Afonina, et al. 2020).

56. ***Syntrichia fragilis*** (Taylor) Ochyra
Contributor. T. A. Hedderson
Pakistan. Northwest Frontier Province, Kohistan District, ca. 4.5 km southeast of Dasu on the N35 from Islamabad, 800 m a.s.l., 34.2433°N, 73.1850°E, scattered on thin soil among rocks, 17 July 1998, *leg*. T. A. Hedderson *12140* (BOL).

This widespread species has a broad distribution in the Americas, Africa, Europe, the Pacific Islands, and southern Asia including Iraq and China (Gallego 2005; Mishler 2007).

57. ***Syntrichia laevipila*** Brid.
Contributor. T. A. Hedderson
Namibia. Otjozondjupa Region, Otjiwarongo Area, Waterberg National Park, Mission Trail between restaurant and German graveyard, 1480 m a.s.l., 20.51101°S, 17.24212°E, on bark of large *Acacia erioloba* E.May in thornveld, 30 November 2019, *leg*. T. A. Hedderson *19374* (BOL).

This widespread species, mostly of temperate and subtropical distribution, is known from all continents except Antarctica (Gallego 2005). It is recorded from most countries in southern Africa, and from all provinces of adjacent South Africa (O'Shea 2006; Van Rooy 2006).

58. ***Targionia lorbeeriana*** Mull.Frib.,
Contributors. B. Mufeed, C. N. Manju and K. P. Rajesh
India. Kerala, Idukki district, Munnar, 926 m a.s.l., 28 September 2017, terricolous, forming dense overlapping patches on land cuttings in well illuminated areas of semi evergreen forests, *leg*. B. Mufeed *7245* (ZGC).

This species has been reported from Turkey (Kürschner and Erdağ 2005), Africa (Wigginton 2009), Europe (Söderström et al. 2007), Macronesia (Söderström et al. 2002). In India this species was reported only from the Nilgiri Hills of Tamil Nadu (Udar and Gupta 1983; Alam and Srivastava 2012). The present collection extends its distribution to Kerala.

59. ***Vesicularia montagnei*** (Bel.) Broth.
Contributor. T. A. Hedderson
Pakistan. Northwest Frontier Province, Kohistan District, ca. 4.5 km southeast of Dasu on the N35 from Islamabad, 800 m a.s.l., 34.2433°N, 73.1850°E, on wet rock just below waterfall, 17 July 1988, *leg*. T. A. Hedderson *12142b, 12146* (BOL).

A widespread SE Asian species ranging from India and Sri Lanka to the Pacific area and recently recorded from Yemen (Kürschner and Ochyra 2014). However, this large genus of morphologically plastic species has not been revised, thus the real range of its species remains very unclear.

Acknowledgements

L. T. Ellis acknowledges the support of The Natural History Museum, London (BM). D. Shyriaieva thanks the administration of the National Nature Park Buzkyi Gard and Denys Vynokurov for their substantial help in collecting samples. The field work in the study was particulary supported by The Rufford Foundation (project ID 27637-1). The work of G. Gospodinov was supported by the Bulgarian Ministry of Education and Science under 249 the National Research Programme 'Young scientists and postdoctoral students' approved by 250 DCM no. 577/17.08.2018. Esther Fuertes and Juan Larraín thank Jörn Hentschel for confirming the identity of the Tierra del Fuego specimen of *Frullania glomerata*. E. Fuertes' research is funded by projects AECI, A-3818-2005, A-6307-2006 y A- 8930-2007 of the Science and Innovation Ministry of Spain. J. Larraín's research is funded by CONICYT postdoctoral grant 3160556. Staff at PC is acknowledged for providing working space and full access to collections to JL. We thank Argentine National Parks for providing collecting permits to E. Fuertes. Pedro Drapela and Juan Larraín thank the staff at Altos de Cantillana Natural Reserve for providing access and logistic support, especially to Fernanda and Ximena Romero, and María Jesús Cano for confirming the identity of some of our specimens.

B. Mufeed, C.N. Manju and K.P. Rajesh thank Dr Christine Cargill, Australian National Herbarium, Australia; Dr. Devendra Singh, Botanical Survey of India, Kolkata and Dr A.K.

Asthana CSIR-National Botanical Research Institute, Lucknow for confirming some of our collections. We acknowledge the help given by the officials of Kerala Forest Department for providing permission to collect bryophyte specimens from the forests of Anamudi Shola National Park. N. Norhazrina and N. Syazwana would like to thank Universiti Kebangsaan Malaysia for supporting this research project through Geran Universiti Penyelidikan (GUP-2018-016 and GGPM-2017-090), and thank L.T. Ellis (BM) for confirming the identity of their collection of *Calymperes*. The work of S. S. Choi, V. A. Bakalin and S. J. Park was supported by the grant 'National ecosystem Survey' from the National Institute of Ecology, while that of S. S. Choi, V. A. Bakalin and C. W. Hyun was supported by the grant 'Biological Diversity Survey of the Flora of Korean Bryophyta (NIBR201902104)' from the National Institute of Biological Resources of Ministry of Environment in Korea to C. W. Hyun. Laboratory work of S. S Choi was also supported by the grant 'National ecosystem Survey' from the National Institute of Ecology. The study by Yu. M. Kalinina and O. M. Afonina was funded by RFBR, project number 19-34-90033. The work of V. Fedosov was supported by RSF Grant 18-14-00121. T. A. Hedderson is grateful to the National Research Foundation of South Africa for their continued financial support, and to the Himalayan Wildlife Project for their logistical support in Pakistan. The contribution of E. Hernández-Rodríguez and A. P. Peña-Retes is part of the project 'Effect of forest management on two contrasting groups: mosses and medium and large mammals, Sierra Norte, Oaxaca, Mexico' supported by Consejo Nacional de Ciencia y Tecnología, Mexico (ID 595991) and The Sigma Xi Grant-in-Aid of Research (ID G201603152071095) through scholarships to E. Hernández-Rodríguez. The work of I. V. Czernyadjeva was supported by Russian Foundation for Basic Research (grants # 18-05-60093) and it was carried out within the framework of the institutional research project (no. AAAA-A19-119020690077-4) of the Komarov Botanical Institute of the Russian Academy of Sciences. V. Hugonnot thanks Cecilia Sérgio for checking his collections from France. The work of G. Gospodinov and R. Natcheva was supported by The Bulgarian National Science Fund, project 'Cryptic species in Bulgarian flora—molecular species delimitation in the *Aneura pinguis* complex'. Priyanshu Srivastava, Ichha Omar and A. K. Asthana are thankful to The Director, CSIR- National Botanical Research Institute, Lucknow for encouragement and providing the facilities. Thanks are also due to the Department of Biotechnology, New Delhi for providing financial assistance. S. Ştefănuț, G. Tamas, C.-C. Bîrsan, G.-R. Nicoară and M. C. Ion acknowledge the support by project no. RO1567-IBB03/2020 through Institute of Biology Bucharest of Romanian Academy. A. V. Shkurko was supported by governmental contract 118021490111-5 of Tsitsin Main Botanical Garden.

The contribution by Beata Cykowska-Marzencka has been financially supported by the statutory fund of the W. Szafer Institute of Botany of the Polish Academy of Sciences. The field research in 2017 leading to her results has received funding from the European Union's Horizon 2020 project INTERACT, under grant agreement No 730938. The laboratory analyses were financed by National Science Centre in Poland (research project No. 2017/27/N/ST10/00862). The work of Paulina Wietrzyk-Pełka was supported by Etiuda project of the National Science Centre in Poland (research project No. 2019/32/T/ST10/00182).

M. Kırmacı, G. Aslan and U. Çatak give many thanks to Aydın Adnan Menderes University's scientific research project department (BAP) for supporting their research (FEF 18018) and to Dr Metin Armağan (Adnan Menderes University) for helping during their field trip.

ORCID

V. A. Bakalin http://orcid.org/0000-0001-7897-4305
J. Larraín http://orcid.org/0000-0002-9423-6561
A. Rimac http://orcid.org/0000-0002-8720-9493

References

Afonina OM. 2002. Additions to the moss flora of Severnaya Zemlya Archipelago Novosti Sistematiki Nizšikh. Rastenii. 36:203–210. Russian.

Afonina OM. 2004. Moss flora of Chukotka. St-Petersburg: Botanicheskiy Institut im. Komarova, Rossiyskaya Akademiya Nauk. Russian.

Agnew S, Vondráček M. 1975. A moss flora of Iraq. Feddes Repertorium. 86:341–489.

Ah-Peng C, Bardat J, Stamenoff P, Hedderson TAJ, Strasberg D. 2010. Bryophytes of La Réunion Island: biodiversity, endemicity and conservation. Cryptogamie, Bryologie. 31:241–270.

Akhani H, Kürschner H. 2004. An annotated and updated checklist of the Iranian bryoflora. Cryptogamie, Bryologie. 25:315–347.

Alam A. 2014. Morphotaxonomy of *Fossombronia* Raddi (Metzgeriales) from Nilgiri hills (India). Frahmia. 7(1):1–12.

Alam A, Srivastava SC. 2012. Hepaticae of Nilgiri Hills, Western Ghats (India) Vol. I, terrestrial diversity. Germany: Lap Lambert Academic Publishing; p. 373.

Alegro A, Šegota V, Papp B. 2015. A contribution to the bryophyte flora of Croatia, IV. Žumberačka gora Mts. Studia Botanica Hungarica. 46:5–24.

Allen BH. 1992. A revision of *Ochrobryum* (Leucobryaceae). Contributions from the University of Michigan Herbarium. 18:113–130.

Andriessen L, Sotiaux A, Nagels C, Sotiaux O. 1995. *Aneura maxima* (Schiffn.) Steph. in Belgium, new for the European liverwort flora. Journal of Bryology. 18:803–806.

Asthana AK, Srivastava SC. 1991. Indian hornworts (a taxonomic study). Bryophytorum Bibliotheca. 41:1–160.

Aziz FH, Al-Ni'ma B. 2017. Species chick [sic] list of bryophyte, Pteridophyta, lichens and mashroom [sic] of Iraq and Kurdistan region. Zanco Journal of Pure and Applied Sciences. 29:53–73.

Bachuryna HF, Melnychuk VM. 2003. Flora mokhiv Ukrayiny [The Moss Flora of the Ukraine]. Fasc. 4. Kyiv: Akademperiodyka. Ukrainian.

Bączkiewicz A, Szczecińska M, Sawicki J, Stebel A, Buczkowska K. 2017. DNA barcoding, ecology and geography of the cryptic species of *Aneura pinguis* and their relationships with *Aneura maxima* and *Aneura mirabilis* (Metzgeriales, Marchantiophyta). PloS ONE. 12(12): e0188837.

Bakalin VA, Fedosov VE, Fedorova AV, Nguyen VS. 2019. Integrative taxonomic revision of *Marsupella* (Gymnomitriaceae, Hepaticae) reveals neglected diversity in Pacific Asia. Cryptogamie, Bryologie. 40:59–85.

Bakalin VA, Pisarenko OY, Cherdantseva VY, Krestov PV, Ignatov MS, Ignatova EA. 2012. Bryophytes of Sakhalin. Vladivostok: Izd-vo Morskogo gosuniversiteta. Russian.

Berrie G. 1964. Experimental studies on polyploidy in liverworts I. The *Riccia fluitans* complex. The Bryologist. 67:146–152.

Borovichev E, Bakalin V. 2017. Genus *Fossombronia* (Fossombroniaceae, Marchantiophyta) in the Russian Far East. Cryptogamie, Bryologie. 38(1):1–13.
Brotherus VF. 1909. Musci (Laubmoose). III. Unterklase Bryales: II. Gruppe: Pleurocarpi. In: Engler A, Prantl K, editors. Die natürllichen Pflanzenfamilien, Teil 1, Abt. 3, Hälfte 2. Leipzig: W. Engelmann; p. 701–1246.
Brotherus VF. 1923. Die Laubmoose Fennoskandias. Flora Fennica I. Helsingfors: Societas pro fauna at flora Fennica.
Buczkowska K, Bączkiewicz A. 2006. *Aneura maxima* – a liverwort new to Poland. Cryptogamie, Bryologie. 27:453–458.
Campisi P, Dia MG, Domina G, Raimondo FM. 2015. Bryophytes collected during the 12th "Iter Mediterraneum" (Tunisia, 24 March–4 April 2014). First contribution. Bocconea. 27:63–68.
Cano MJ. 2008. Taxonomic revision of *Hennediella* Paris (Pottiaceae, Bryophyta). Bryophytorum Bibliotheca. 64:1–142.
Cezón K, Muñoz J, Hespanhol H. 2010. The discovery of *Bryum minii* Podp. ex Machado-Guim. in Spain, with new synonyms and correct authorship. The Bryologist. 113:371–375.
Charouk S. 1982. Contribution à l'étude bryologique du Liban. Mousses et Hépatiques de la vallé de Nahr Ibrahim. Thèse Doct. 3̊ cycle, Marseille, Univ. Aix-Marseille III (Centre St. Jérôme). French.
Chuah-Petiot MS. 2011. A checklist of Hepaticae and Anthocerotae of Malaysia. Polish Botanical Journal. 56:1–44.
Churchill SP, Sanjines NN, Aldana C. 2009. Catálogo de las briófitas de Bolivia: diversidad, distribución y ecología. Santa Cruz de la Sierra: La Rosa Editorial. Spanish.
Cortini-Pedrotti C. 2006. Flora dei muschi d'Italia. Bryopsida II parte. Rome: Antonio Delfino Editore. Italian.
[CEPF] Critical Ecosystem Partnership Fund. 2016. The biodiversity hotspots [accessed 2017 October 20]. http://www.cepf.net/resources/hotspots/Pages/default.aspx
Damayanti L, Muñoz J, Wicke S, Symmank L, Shaw B, Frahm J-P, Quandt D. 2012. Common but new: *Bartramia rosamrosiae*, a "new" widespread species of apple mosses (Bartramiales, Bryophytina) from the Mediterranean and western North America. Phytotaxa. 73:37–59.
Damsholt K. 2002. Illustrated flora of Nordic liverworts and hornworts. Lund: Nordic Bryological Society.
Daniels AED. 2010. Checklist of the bryophytes of Tamil Nadu. Archive for Bryology. 65:1–118.
Delgadillo MC. 2014. Biodiversidad de Bryophyta (musgos) en México. Revista Mexicana Biodiversidad. 85:100–105.
Dierßen K. 2001. Distribution, ecological amplitude and phytosociological characterization of European bryophytes. Bryophytorum Bibliotheca. 56:1–289.
Domina G, Greuter W, Elyes Kchouk M, El Mokni R, Smaoui A, Vitek E, Bazan G, Escobar P, Raimondo FM. 2015. The 12th "Iter Mediterraneum" in Tunisia, 24 March–4 April 2014. Bocconea. 27:5–11.
Doroshina GY. 2012. New moss records from Stavropol Territory. 5. In: New bryophyte records. Arctoa. 21:286–287. Russian.
Dragićević S, Veljić M, Marin P. 2008. New records to the moss flora of Montenegro. Cryptogamie, Bryologie. 29:397–400.
Draper I, Lara F, Albertos B, Garilleti R, Mazimpaka V. 2006. Epiphytic bryoflora of the Atlas and Antiatlas Mountains, including a synthesis of the distribution of epiphytic bryophytes in Morocco. Journal of Bryology. 28:312–330.
Eddy A. 1990. A handbook of Malesian Mosses. 2. Leucobryaceae to Buxbaumiaceae. London: Natural History Museum Publications.
Ellis LT. 1997. A new species of *Calymperes* (Musci: Calymperaceae) from Peninsular Malaysia. Bulletin of the Natural History Museum. Botany. 27:7–9.
Ellis LT, Afonina OM, Aleffi M, Andriamiarisoa RL, Bačkor M, Goga M, Bednarek-Ochyra H, Callaghan DA, Campisi P, Dia MG, et al. 2018. New national and regional bryophyte records, 55. Journal of Bryology. 40:173–187.
Ellis LT, Afonina OM, Andriamiarisoa RL, Bednarek-Ochyra HH, Cykowska-Marzencka B, Stryjak-Bogacka M, Bell NE, Boiko M, Callaghan DA, Campisi P, et al. 2017. New national and regional bryophyte records, 53. Journal of Bryology. 39:368–387.
Ellis LT, Afonina OM, Atwood JJ, Bednarek-Ochyra H, Burghardt M, Dragićević S, Vuksanović S, Espinoza-Prieto B, Opisso J, Goga M, et al. 2020. New national and regional bryophyte records, 62. Journal of Bryology. 42:195–208.
Ellis LT, Afonina OM, Doroshina G, Agudelo C, Andriamiarisoa RL, Asthana AK, Gupta D, Rawat KK, Sahu V, Aymerich P, et al. 2019. New national and regional bryophyte records, 58. Journal of Bryology. 41:63–84.
Ellis LT, Akhoondi Darzikolaei S, Shirzadian S, Bakalin VA, Bednarek-Ochyra H, Ochyra R, Claro D, Dulin MV, Eckel PM, Erzberger P, et al. 2011. New national and regional bryophyte records, 29. Journal of Bryology. 33:316–323.
Ellis LT, Aleffi M, Alegro A, Segota V, Asthana AK, Gupta R, Singh VJ, Bakalin VA, Bednarek-Ochyra H, Cykowska-Marzencka, et al. 2016. New national and regional bryophyte records, 48. Journal of Bryology. 38:235–259.
Ellis LT, Aleffi M, Bączkiewicz A, Buczkowska K, Bambe B, Boiko M, Zagorodniuk N, Brusa G, Burghardt M, Calleja JA, et al. 2019. New national and regional bryophyte records, 60. Journal of Bryology. 41:285–299.
Ellis LT, Alikhadzhiev MK, Erzhapova RS, Blomm HH, Bednarek-Ochyra H, Burghardt M, Cano MJ, Czernyadjeva IV, Kuzmina EY, Potemkin AD, et al. 2020. New national and regional bryophyte records, 64. Journal of Bryology. 42:393–412.
Ellis LT, Aranda SC, Asthana AK, Bansal P, Nath V, Sahu V, Bayliss J, Asthana G, Srivastava S, Yadav S, et al. 2013. New national and regional bryophyte records, 37. Journal of Bryology. 35:290–305.
Ellis LT, Asthana AK, Srivastava P, Omar I, Rawat KK, Sahu V, Cano MJ, Costa DP, Dias EM, Dias dos Santos N, et al. 2016. New national and regional bryophyte records, 46. Journal of Bryology. 38:47–63.
Ellis LT, Bayliss J, Bruggeman-Nannenga MA, Cykowska B, Ochyra R, Gremmen NJM, Frahm J-P, Hedderson TA, Heras P, Infante VM, et al. 2014. New national and regional bryophyte records, 38. Journal of Bryology. 36:61–72.
Engel JJ. 2010. Austral Hepaticae 45. A monograph of the genus *Chiloscyphus* Corda (Lophocoleaceae) for Australasia. Fieldiana Botany. 48:1–206.
Erdağ A, Kürschner H. 2017. A reference list of Turkish bryophytes. The state of knowledge from 1829 until 2017. Anatolian Bryology. 3(2):81–102.
Erzberger P, Bednarek-Ochyra H, Ochyra R. 2016. Grimmiaceae subfam. Racomitrioideae (Bryophyta) in Hungary. Polish Botanical Journal. 61(1):23–51.
Fedosov VE, Ignatova EA. 2005. Bryophyte flora of key plot "Ledyanaja Bay" (Central Taimyr, Byrranga range). Arctoa. 14:71–94. DOI:10.15298/arctoa.14.07.
Fedosov VE, Ignatova EA. 2008. The genus *Bryoerythrophyllum* (Pottiaceae, Bryophyta) in Russia. Arctoa. 17:19–38.
Fedosov VE, Ignatova EA, Ignatov MS, Maksimov AI. 2011. Rare species and preliminary list of mosses of the Anabar Plateau (subarctic Siberia). Arctoa. 20:153–174.
Foreau G. 1961. The moss flora of the Palni Hills. Journal of the Bombay Natural History Society. 58:12–47.

Frahm JP. 1997. A second European record for *Aneura maxima* (Schiffn.) Steph. in Finland. Lindbergia. 22:99.
Frahm JP. 2011. *Aneura maxima* (Schiffn.) Steph. new to Norway. Tropical Bryology. 30:17–18.
Frisvoll AA. 1981. Fifteen bryophyles new to Svalbard, including notes on some rare or interesting species. Lindbergia. 7:91–102.
Frisvoll AA, Elvebakk A. 1996. Part 2. Bryophytes. In: Elvebakk A, Prestrud P, editors. A catalogue of Svalbard plants, fungi, algae and cyanobacteria. Norsk Polarinstitutt Skrifter. 198:57–172.
Gallego MT. 2005. A taxonomic study of the genus *Syntrichia* Brid. (Pottiaceae, Musci) in the Mediterranean region and Macaronesia. The Journal of the Hattori Botanical Laboratory. 98:47–122.
Ganeva A, Natcheva R. 2003. Check-list of the bryophytes of Bulgaria with data on their distribution. I. Hepaticae and Anthocerotae. Cryptogamie, Bryologie. 24(3):229–239.
Garilleti R, Albertos B. 2012. Atlas y Libro Rojo de los Briofitos Amenazados de Espana. Madrid: Ministerio de Agricultura, Alimentacion y Medio Ambiente.
Geffert JL, Frahm J-P, Barthlott W, Mutke J. 2013. Global moss diversity: spatial and taxonomic patterns of species richness. Journal of Bryology. 35:1–11.
Geissler P. 1981. Some aspects of high altitude bryoflora of Corsica. In: Szweykowski J, editor. New persperctives in bryotaxonomy and bryogeography. Poznan: Adam Mickiewicz University; p. 119–122.
Gospodinov G, Natcheva R. 2020. Chromosome studies of some thalloid liverworts in Bulgaria. Biologica Nyssana. 11(10):31–33.
Gottsche CM, Lindenberg JBW, Nees CG. 1845. Synopsis Hepaticarum, fasc. 3. Hamburg: Meissner; p. 305–464.
Gradstein SR, Pinheiro da Costa D. 2003. The Hepaticae and Anthocerotae of Brazil. Memoirs of the New York Botanical Garden. 87:1–318.
Gravet F. 1883. Enumeratio Muscorum Europaeorum. Bibjopgraphie – Nouvelles. Revue Bryologiqie. 2:17–40.
Grolle R. 1984. Miscellanea Hepaticologica 221–230. The Journal of the Hattori Botanical Laboratory. 55:501–511.
Grout AJ. 1932. *Plagiothecium*. In: Moss Flora of North America north of Mexico Vol. 3. Newfane: published by the author; p. 155–166.
Grünberg H, Eckstein J, Marstaller R, Meinunger L, Preußing M, Rettig J, Schön M, Schröder W, Thiel H, Hentschel J. 2014. Bemerkenswerte Moosfunde in Thüringen und Nordbayern. Haussknechtia. 13:13–44.
Guerra J. 2004. *Gymnostomum*. In: Guerra J, Cano MJ, Ros RM, editors. Flora Briofitica Ibérica, Vol. III. Murcia: Universidad de Murcia & Sociedad Espanola de Briologia; p. 7–14.
Guerra J, Cano MJ, Brugués M, editors. 2018. Flora Briofítica Ibérica, Vol. 6: Hypnales. Murcia: Universidad de Murcia & Sociedad Espanola de Briologia.
Hallingbäck T, Hedenäs L, Huttunen S, Ignatov M, Ingerpuu N, Konstantinova N, Syrjänen K, Söderström L. 2019. *Pseudoleskeella rupestris*. The IUCN Red List of Threatened Species 2019: e.T87465996A87836635.
Hässel de Menéndez GG. 1987. *Phaeoceros laevis* (L.) Prosk. and *P. carolinianus* (Michx.) Prosk., their spores. The Journal of Hattori Botanical Laboratory. 62:281–288.
Hässel de Menéndez GG, Rubies MF. 2009. Catálogo of Marchantiophyta and Anthocerotophyta of southern South America. Nova Hedwigia, Beihefte. 134:1–672.
He Q, Jia Y. 2019. Reappraisal of the taxonomic status of *Metzgeria fukuokana* Kuwahara (Metzgeriaceae, Marchantiophyta). Journal of Bryology. 41:36–41.
Hedderson TAJ, Gwynn-Evans D, Ah-Peng C, Ribeiro D. 2015. A contribution to the bryophyte flora of Mozambique from the 'Google Forest' Mabu Mountain, Zambesia Province. Journal of Bryology. 37:42–48.
Hedenäs L. 2020a. Disentangling Scandinavian species hidden within *Meesia uliginosa* Hedw. *s.l.* (Bryophyta, Meesiaceae). Lindbergia. 2020(1). DOI: 10.25227/linbg.01125.
Hedenäs L. 2020b. Cryptic speciation revealed in Scandinavian *Racomitrium lanuginosum* (Hedw.) Brid. (Grimmiaceae). Journal of Bryology. 42:117–127.
Hedenäs L, Herben T, Rydin H, Söderström L. 1989. Ecology of the invading moss species *Orthodontium lineare* in Sweden: spatial distribution and population structure. Holarctic Ecology. 12:163–172.
Heinrichs J, Feldberg K, Bechteler J, Scheben A, Czumaj A, Pócs T, Schneider H, Schäfer-Verwimp A. 2015. Integrative taxonomy of *Lepidolejeunea* (Jungermanniopsida: Porellales): ocelli allow the recognition of two neglected species. Taxon. 64:216–228.
Henderson DM. 1957. "1955–1958". Contributions to the bryophyte flora of Turkey: II. Notes from the Royal Botanical Garden Edinburgh. 22:189–193.
Henderson DM. 1958. "1955–1958". Contributions to the bryophyte flora of Turkey: III. Notes from the Royal Botanical Garden Edinburgh. 22:611–620.
Henderson DM. 1961. "1959–1961". Contributions to the bryophyte flora of Turkey: IV. Notes from the Royal Botanical Garden Edinburgh. 23:263–278.
Henderson DM, Prentice HT. 1969. Contributions to the bryophyte flora of Turkey: VIII. Notes from the Royal Botanical Garden Edinburgh. 29:235–262.
Hentschel J, von Konrat M, Pócs T, Schäfer-Verwimp A, Shaw AJ, Schneider H, Heinrichs J. 2009. Molecular insights into the phylogeny and subgeneric classification of *Frullania* Raddi (Frullaniaceae, Porellales). Molecular Phylogenetics and Evolution. 52:142–156.
Herben T. 1994. Local rate of spreading and patch dynamics of an invasive moss species, *Orthodontium lineare*. Journal of Bryology. 18:115–125.
Hernández-Rodríguez E, Aguirre Hidalgo V. 2020. Diversidad de musgos del bosque nublado de la Sierra Juárez, Oaxaca, México. Acta Botanica Mexicana. 127:e1616.
Herrnstadt I, Heyn C, Crosby MR. 1991. A checklist of the mosses of Israel. The Bryologist. 94:168–178.
Herzog T. 1951. Hepaticae Standleyanae Costaricenses et Hondurenses, Pars II. Revue Bryologique et Lichénologique. 20:126–175.
Hill MO, Preston CD. 1998. The geographical relationships of British and Irish bryophytes. Journal of Bryology. 20:127–226.
Hodgetts NG. 2015. Checklist and country status of European bryophytes – towards a new red list for Europe. Irish Wildlife Manuals, No. 84. Dublin: National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
Hodgetts N, Cálix M, Englefield E, Fettes N, García Criado M, Patin L, Nieto A, Bergamini A, Bisang I, et al. 2019. A miniature world in decline: European red list of mosses, liverworts and hornworts. Brussels: IUCN.
Hodgetts N, Lockhart N. 2020. Checklist and country status of European bryophytes – update 2020. Irish Wildlife Manuals, No. 123. Dublin: National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
Ignatov MS, Afonina OM, Ignatova EA, Abolina AA, Akatova TV, Baisheva EZ, Bardunov LV, Baryakina OA, Belkina OA,

et al. 2006. Check-list of mosses of East Europe and North Asia. Arctoa. 15:1–130.
Ignatov MS, Huttunen S. 2002. Brachytheciaceae (Bryophyta). A family of sibling genera. Arctoa. 11:245–296.
Ignatov MS, Ignatova EA. 2020. *Plagiothecium*. Moss flora of Russia. Vol. 5. Hypopterygiales – Hypnales (Plagiotheciaceae – Brachytheciaceae). Moscow: KMK Scientific Press Ltd; p. 101–127. Russian and English.
Ignatov MS, Ignatova EA, Fedosov VE, Ivanova EI, Blom HH, Muñoz J, Bednarek-Ochyra H, Afonina OM, Kurbatova LE, Czernyadjeva IV, et al. 2017. Moss flora of Russia. Vol. 2. Oedipodiales – Grimmiales. Ignatov MS, editor. Moscow: KMK Scientific Press Ltd. (Russian with English keys).
Ignatov MS, Ignatova EA, Fedosov VE, Zolotov VI, Koponen T, Czernyadjeva IV, Doroshina GY, Tubanova DY, Bell NE. 2018. Moss flora of Russia. Vol. 4. Bartramiales – Aulacomniales. Moscow: KMK Scientific Press Ltd. Russian with English keys.
Ignatova EA, Kuznetsova OI, Milyutina IA, Fedosov VE, Ignatov MS. 2017. The genus *Fabronia* (Fabroniaceae, Bryophyta) in Russia. Arctoa. 26:11–34.
Ireland RR. 1969. A taxonomic revision of the genus *Plagiothecium* for North America, north of Mexico. National Museum of Natural Sciences Publications in Botany. Ottawa: The National Museums of Canada.
Ireland RR. 2014. *Plagiothecium*. In: Flora of North America. Editorial Committee, editor. Flora of North America north of Mexico. Vol. 28, Bryophytes: Mosses, part 2. Oxford: Oxford University Press; p. 484–488.
Ivanov OV, Kolesnikova MA, Akatova TV, Afonina OM, Baisheva EZ, Bezgodov AG, Belkina OA, Czernyadjeva IV, Dudov SV, et al. 2017. The database of the moss flora of Russia. Arctoa. 26(1):1–10.
Jimenez JA. 2006. Taxonomic revision of the genus *Didymodon* Hedw. (Pottiaceae, Bryophyta) in Europe, North Africa and southeast and Central Asia. The Journal of the Hattori Botanical Laboratory. 100:211–292.
Jovet-Ast S. 1965. *Riccia crystalina* L. emend. Raddi et *Riccia cavernosa* Hoffm. emend. Raddi. (Note preliminaire). Revue Bryologique. 33:459–483.
Jovet-Ast S. 1966. *Riccia crystallina* L. emend. Raddi et *Riccia cavernosa* Hoffm. emend. Raddi. II. Revue Bryologique. 34:82–90.
Jovet-Ast S. 1986. Les *Riccia* de la région méditerranéenne. Cryptogamie, Bryologie-Lichénologie. 7:287–431. French.
Karczmarz K. 1981. Bryophytes from Nepal. Lindbergia. 7:126–130.
Katagiri T, Furuki T. 2012. Checklist of Japanese liverworts and hornworts. Bryological Research. 10(7):193–210.
Katagiri T, Furuki T. 2018. Checklist of Japanese liverworts and hornworts. Hattoria. 9:53–102.
Kattel LP, Adhikari MK. 1992. Mosses of Nepal. Swayambhu. Kathmandu: Natural History Society of Nepal.
Kiebacher T, Meier M, Büschlen A, Schnyder N. 2019. Additions to the bryoflora of Switzerland. Herzogia. 32:136–153.
Kırmacı M, Agcagil E. 2018. The bryophyte flora of Fethiye Babadağ (Muğla/Türkiye). Anatolian Bryology. 4(1):17–30.
Koponen T, Nguyen T-L, Luong T-T, Huttunen S. 2019. Revision and checklist of the moss families Bartramiaceae and Mniaceae (Bryophyta) in Vietnam. Hattoria. 10:69–107.
Krayesky DM, Crandall-Stotler B, Stotler RE. 2005. A revision of the genus *Fossombronia* Raddi in East Asia and Oceania. The Journal of the Hattori botanical laboratory. 98:1–45.
Kučera J. 2004. Překvapivé nálezy mechorostů v Žofínském a Hojnovodském pralese (Novohradské hory) [Surprising bryophyte records in the old-growth forests Žofínský prales and Hojnovodský prales (Novohradské hory Mts., South Bohemia)]. Bryonora. 34:4–15.
Kürschner H. 2000. Bryophyte flora of the Arabian Peninsula and Socotra. Bryophytorum Bibliotheca. 55:1–131.
Kürschner H, Erdağ A. 2005. Bryophytes of Turkey: an annotated reference list of the species with synonyms from the recent literature and an annotated list of Turkish bryological literature. Turkish Journal of Botany. 29:95–154.
Kürschner H, Erdağ A. 2020. Bryophyte locality data from the near and middle east, 1775–2019. Vol.5. Istanbul: Hıperlınk Yayınevi.
Kürschner H, Frey W. 2011. Liverworts, mosses and hornworts of southwest Asia (Marchantiophyta, Bryophyta, Anthoceroptophyta). Nova Hedwigia. 139:179–180.
Kürschner H, Frey W. 2019. Liverworts, mosses and hornworts of Afghanistan – our present knowledge. Acta Musei Silesiae, Scientiae Naturales. 68:11–24.
Kürschner H, Ochyra R. 2014. Novelties in the moss flora of Oman, Saudi Arabia and Yemen, including the most outstanding *Vesicularia montagnei* (Bél.) Broth. (Hypnaceae). Cryptogamie, Bryologie. 35:93–97.
La Farge-England C. 1998. The infrageneric phylogeny, classification, and phytogeography of *Leucoloma* (Dicranaceae, Bryopsida). The Bryologist. 101:181–220.
La Farge C. 2002. *Leucoloma* III: a species synopsis: typification, synonymy, and excluded names. The Bryologist. 105:606–624.
Lai MJ, Zhu R-L, Chantanaorrpint S. 2008. Liverworts and hornworts of Thailand: an updated checklist and bryofloristic accounts. Annales Botanica Fennica. 45:321–341.
Lara F, Garilleti R, Mazimpaka V. 2000. *Orthotrichum hispanicum* sp. nov. (Bryopsida, Orthotrichaceae), from eastern Spain. Journal of Bryology. 22:263–267.
Larraín J. 2016. The mosses (Bryophyta) of Capitán Prat Province, Aisén Region, southern Chile. PhytoKeys. 68:91–116. DOI:10.3897/phytokeys.68.9181.
Li D-k, Ireland RR. 2008. Plagiotheciaceae. In: Ren-Liang H, You-Fang W, Crosby MR, editors. Moss flora of China. Vol. 7. St. Louis/Beijing: Science Press/Missouri Botanical Garden Press; p. 219–245.
Li X, He S, Iwatsuki Z. 2001. Pottiaceae. In: Li X, Crosby MR, He S, editors. English version. Vol. 2. Fissidentaceae – Ptychomitriaceae. Beijing, New York & St. Louis: Science Press & Missouri Botanical Garden Press; p. 114–249.
Linnaeus C. 1753. Species plantarum exhibentes plantas ritas cognitas ad genera relatas cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas. Tomus II. Cryptogamia. Algae. *Jungermannia*. Holmiae: impensis Laurentii Salvii; p. 1131–1136.
Long DG, Rubasinghe SCK. 2014. Liverworts and hornworts of Sri Lanka: a revised checklist. Ceylon Journal of Science. 43:1–36.
Loskotová E. 2006. Interesting records of *Aneura maxima* (Schiffn.) Steph. (Metzgeriales) in the Czech Republic and Slovakia. Silva Gabreta. 12:15–18.
Maier E. 2002. *Grimmia dissimulata* E.Maier sp. nova, and the taxonomic position of *Grimmia trichophylla* var. *meridionalis* Müll.Hal. (Musci, Grimmiaceae). Candollea. 56:281–300.
Majumdar S, Dey M, Singh DK. 2012. Additions to Himalayan species of *Radula* Dumort. (Marchantiophyta: Radulaceae) from Arunachal Pradesh, India. Indian Journal of Forestry. 35:263–268.

Matcham H, O'Shea B. 2005. A review of the genus *Codonoblepharon* Schwägr. (Bryopsida: Orthotrichaceae). Journal of Bryology. 27:129–135.
Mateo RG, Broennimann O, Petitpierre B, Muñoz J, van Rooy J, Laenen B, Guisan A, Vanderpoorten A. 2015. What is the potential of spread in invasive bryophytes? Ecography. 38 (5):480–487.
McFarland KD. 1992. A new species of *Brachythecium* from Latin America (Brachytheciaceae, Musci). Phytologia. 72 (4):253–255.
Meijer W. 1952. The genus *Orthodontium*. Acta Botanica Neerlandica. 1(1):3–80.
Mishler BD. 2007. *Syntrichia*. In: Flora of North America Editorial Committee, editor. Flora of North America north of Mexico. Vol. 27. Bryophyta, part 1. New York: Oxford University Press; p. 618–627.
Mishra M, Dash PK, Alam A, Sahoo S, Das R. 2016. Current status of diversity and distribution of bryophytes of Odisha. Plant Science Today. 3:186–194.
Mitten W. 1859. Musci Indiae Orientalis, an enumeration of the mosses of the East Indies. Journal of the Proceedings of the Linnean Society, Supplement to Botany. 1:1–171.
Mönkemeyer W. 1927. Die Laubmoose Europas. IV Band Ergänzungsband Andreales – Bryales. In: Rabenhorst L. Kryptogamen-Flora von Deutschland, Osterreich und der Schweiz. Band 4, Ergänzungsband. Leipzig: Akademische Verlagsgesellschaft m.b.h.
Montagne C. 1838. Centurie de plantes cellulaires exotiques nouvelles. Annales des Sciences Naturelles Botanique, Série 2. 9:38–57.
Montagne C. 1850. Plantas Celulares. I. Musgos. In: Gay C, editor. Historia física y política de Chile. Tomo 7. Paris: Thunot y Ca; p. 5–202.
Mucina L, Bültmann H, Dierßen K, Theurillat JP, Raus T, Čarni A, Šumberová K, Willner W, Dengler J, García RG, et al. 2016. Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. Applied Vegetation Science. 19:3–264.
Müller F. 2014. *Bartramia aprica* – the correct name for the Mediterranean and western North American species historically recognized as "*Bartramia stricta*". Herzogia. 27:211–214.
Müller J. 2016. Einwanderung von *Cryphaea heteromalla* (Hedw.) D.Mohr nach Berlin und Brandenburg. Veröffentlichungen des Naturkundemuseums Potsdam. 2:37–43. German.
Müller M. 2009. An updated checklist of the mosses of Chile. Archive for Bryology. 58:1–124.
Ochyra R, Żarnowiec J, Bednarek-Ochyra H. 2003. Census catalogue of Polish mosses. Kraków: Polish Academy of Sciences, Institute of Botany.
Omar I, Nair MC, Asthana AK, Asthana G. 2020. *Orthomnion javense* (Mniaceae, Bryophyta) new to India and Nepal. Phytotaxa. 432:283–288.
Orgaz JD, Cano MJ, Guerra J. 2013. Taxonomic revision of *Brachytheciastrum* (Brachytheciaceae, Bryophyta) from the Mediterranean region. Systematic Botany. 38:283–294.
O'Shea BJ. 2006. Checklist of the mosses of sub-Saharan Africa (version 5, 12/06). Tropical Bryology Research Reports. 6:1–252. https://websites.rbge.org.uk/bbs/Activities/tbg/resources_lit_africa.htm
Paal J, Degtjarenko P. 2015. Impact of alkaline cement-dust pollution on boreal *Pinus sylvestris* forest communities: a study at the bryophyte synusiae level. Annales Botanici Fennici. 52(1–2):120–134.
Pak K, Ch'oe K. 2007. The list of bryophytes in Korea. Korea National Arboretum; p. 66–67.
Pantović J, Milanović D, Janković I, Sabovljević M. 2017. Towards the bryophyte flora of the Sutjeska National Park (The Republic of Srpska, Bosnia and Herzegovina). Glasnik Sumarskog fakulteta Univerziteta u Banjoj Luci. 26:51–74.
Pantović J, Milanović D, Sabovljević M. 2016. Three novelties for the bryophyte flora of Bosnia and Herzegovina. Herzogia. 29:801–804.
Papp B. 2007. Contributions to the bryophyte flora of Eastern Turkey. Studia Botanica Hungarica. 38:71–78.
Papp B, Erzberger P, Marka J. 2010. Contribution to the bryophyte flora of eastern Albania (Korca and Kolonja districts). Studia Botanica Hungarica. 41:61–88.
Papp B, Erzberger P, Ódor P, Zs H, Szövényi P, Szurdoki E, Tóth Z. 2010. Updated checklist and Red List of Hungarian bryophytes. Studia Botanica Hungarica. 41:31–59.
Papp B, Pantović J, Szurdoki E, Sabovljević MS. 2014. Interesting and new species for the bryophyte flora of Serbia. Herzogia. 27:221–225.
Papp B, Pantović J, Szurdoki E, Sabovljević MS. 2016. New bryophyte records for the Republic of Macedonia. Journal of Bryology. 38:168–171.
Papp B, Tzakiri E. 2017. Contributions to the bryophyte flora of the Paiko, Tzena and Pinovo Mts in Greece. Studia Botanica Hungarica. 48:33–49.
Paton JA. 1999. The liverwort flora of the British Isles. Colchester: Harley Books.
Pavletić Z. 1955. Prodromus flore briofita Jugoslavije. Zagreb: Jugoslavenska akademija znanosti i umjetnosti. Serbo-Croatian.
Piippo S. 1986. A monograph of the genera *Lepidolejeunea* and *Luteolejeunea* (Lejeuneaceae: Hepaticae). Acta Botanica Fennica. 132:1–69.
Piippo S. 1990. Annotated catalogue of Chinese Hepaticae and Anthocerotae. The Journal of the Hattori Botanical Laboratory. 68:1–192.
Pisarenko OY, Lapshina ED, Bezgodov AG. 2017. On the bryoflora of Yamal-Nenets autonomous district. Turczaninowia. 20(1):35–51.
Podpěra J. 1954. Conspectus Muscorum Europaeorum. Praha: Nakladatelstvi Ceské Akademie Ved.
Rao P. 2000. Taxonomic studies on *Cryphaea* (Cryphaeaceae, Bryopsida). 2. Revision of Asian species. Annales Botanici Fennici. 37:45–56.
Redfearn PL, Tan BC, He S. 1996. A newly updated and annotated checklist of Chinese mosses. The Journal of the Hattori Botanical Laboratory. 79:163–357.
Reiner ME. 1988. Contribución al conocimiento de las hepáticas del noreste de la provincia de Buenos Aires (Argentina). Frullaniaceae (Jungermanniales). Boletín de la Sociedad Argentina de Botánica. 25:301–325. Spanish.
Ros RM, Mazimpaka V, Abou-Salama U, Aleffi M, Blockeel TL, Brugués M, Cano MJ, Cros RM, Dia MG, Dirkse GM, et al. 2007. Hepatics and Anthocerotes of the Mediterranean, an annotated checklist. Cryptogamie, Bryologie. 28:351–437.
Ros RM, Mazimpaka V, Abou-Salama U, Aleffi M, Blockeel TL, Brugues M, Cros RM, Dia MG, Dirkse GM, Draper I, et al. 2013. Mosses of the Mediterranean, an annotated checklist. Cryptogamie, Bryologie. 34:99–283.
Roy D, Alderman D, Anastasiu P, Arianoutsou M, Augustin S, Bacher S, Başnou C, Beisel J, Bertolino S, Bonesi L, et al. 2019. *Orthodontium lineare*. DAISIE – Inventory of alien invasive species in Europe. Version 1.6. Institute for Nature and Forest (INBO). https://www.gbif.org/species/159500528?checklistDatasetOffset=10
Sabovljević M. 2004. Comparison of the bryophyte flora of the three southern European mainlands: the Iberian, the

Apennine and the Balkan peninsulas. Braun-Blanquetia. 34:21–28.
Sabovljević M, Alegro A, Sabovljević A, Marka J, Vujičić M. 2011. An insight into diversity of the Balkan Peninsula bryophyte flora in the European background. Revue d'Ecologie (Terre et Vie). 66:399–413.
Sabovljević M, Ganeva A, Tsakiri E, Stefanut S. 2001. Bryology and bryophyte protection in the south-eastern Europe. Biological Conservation. 101:73–84.
Sabovljević M, Natcheva R. 2006. Check-list of the liverworts and hornworts of southeast Europe. Phytologia Balcanica. 12(2):169–180.
Sabovljević M, Natcheva R, Dihoru G, Tsakiri E, Dragićević S, Erdağ A, Papp B. 2008. Check-list of the mosses of SE Europe. Phytologia Balcanica. 14(2):207–244.
Schaepe A, Rohner M-S. 2013. Bericht vom 14. Brandenburgischen Mooskartierungstreffen in Altkünkendorf. Verhandlungen des Botanischen Vereins von Berlin und Brandenburg. 146:163–17.
Schaepe A, Rohner M-S. 2014. Bericht vom 15. Brandenburgischen Mooskartierungstreffen in Ützdorf. Verhandlungen des Botanischen Vereins von Berlin und Brandenburg. 147:273–283.
Schäfer-Verwimp A, Pócs T. 2009. Contributions to the Hepatic flora of the Dominican Republic, West Indies. Acta Botanica Hungarica. 51:367–425.
Schäfer-Verwimp A, van Melick HMH. 2016. A contribution to the bryophyte flora of Jamaica. Cryptogamie, Bryologie. 37:305–348.
Schiffner V. 1913. Bryophyta aus Mesopotamien und Kurdistan, Syrien, Rhodos, Mytilini und Prinkipo. Gesammelt von Dr. Heinrich Frh. v. Handel-Mazzetti (Wissenschaftliche Ergebnisse der Expedition nach Mesopotamien, 1910). Annalen des Naturhistorischen Museums in Wien. 27:472–504.
Schljakov RN. 1975. Addimenta ad floram hepaticarum arcticae URSS. Novosti Sistematiki Vysshikh Rastenii. 12:318–323.
Schuster RM. 1953. Boreal Hepaticae. A manual of the liverworts of Minnesota and adjacent regions. American Midland Naturalist. 49:257–684.
Schuster RM. 1969. The Hepaticae and Anthocerotae of North America east of the hundredth meridian. Vol. 2. New York: Columbia University Press.
Schuster RM. 1988. The Hepaticae of south Greenland. Beiheft zur Nova Hedwigia. 92:1–255.
Schuster RM. 1992a. The Hepaticae and Anthocerotae of North America east of the hundredth meridian. Vol. 5. Chicago (IL): Field Museum of Natural History.
Schuster RM. 1992b. The oil-bodies of the Hepaticae. II. Lejeuneaceae (part 2). The Journal of the Hattori Botanical Laboratory. 72:163–359.
Schuster RM, Mårtensson O. 1978. The genus *Cryptocolea* (Jungermanniales) new for Europe. Lindbergia. 4:203–205.
Scott GAM. 1985. Southern Australian liverworts. Australian Flora and Fauna series. No. 2. Canberra: Bureau of Flora and Fauna.
Sérgio C. 2006. A review of the *Gymnostomum calcareum* Nees & Hornsch. Complex (Bryopsida: Pottiaceae) in southern Europe and the Macaronesian Islands, including *G. calcareum* var. *atlanticum* var. nov. Journal of Bryology. 28:38–45.
Sérgio C, Garcia C. 2009. Noteworthy range extensions of two *Aneura* (Jungermanniopsida, Metzgeriales) species new for the Iberian Peninsula: *Aneura maxima* (Schiffn.) Steph. and *A. pseudopinguis* (Herzog) Pócs. Cryptogamie, Bryologie. 30(1):207.
Sérgio C, Garcia CA, Sim-Sim M, Vieira C, Hespanhol H, Stow S. 2013. Atlas e Livro Vermelho dos Briofitos Ameacados de Portugal (Atlas and Red Data Book of Threatened Bryophytes of Portugal). Lisboa: Universidade de Lisboa-Museu Nacional de Historia Natural e da Ciencia. Portuguese.
Sérgio C, Garcia CA, Stow S. 2013. New data on the distribution of *Bryum minii* (Bryaceae, Bryophyta) in Portugal with ecological and chorological considerations. Polish Botanical Journal. 58(2):589–591.
Sérgio C, Pierrot RB, Cros R, Brugués M. 1999. Re-evaluation of *Bryum minii* Podp. (Bryaceae) and remarks about new discoveries in Portugal. Journal of Bryology. 21:299–303.
Sharp AJ, Crum HA, Eckel PM. 1994. The moss flora of Mexico. New York: New York Botanical Garden.
Singh D, Dey M, Singh DK. 2010. A synoptic flora of liverworts and hornworts of Manipur. Nelumbo. 52:9–52.
Singh DK, Singh D, Dey M. 2008. A catalogue of the Hepaticae and Anthocerotae of Sikkim. Bryology in the New Millennium. Kuala Lumpur: University of Malaya; p. 93–135.
Singh SK, Singh DK. 2010. A catalogue of the liverworts and hornworts of Himachal Pradesh, India. Archive for Bryology. 61:1–13.
Skrzypczak R. 1998. Présence de *Bryum minii* Podp. en France. Bulletin de la Société Botanique du Centre-Ouest. 29:477–478. French.
So ML. 2003. The genus *Metzgeria* (Hepaticae) in Asia. The Journal of the Hattori Botanical Laboratory. 94:159–177.
So ML. 2006. *Radula* (Radulaceae, Marchantiophyta) in the South Pacific. The Journal of the Hattori Botanical Laboratory. 99:207–232.
Söderström L, Gradstein SR, Hagborg A. 2010. Checklist of the hornworts and liverworts of Java. Phytotaxa. 9:53–149.
Söderström L, Urmi E, Váňa J. 2002. Distribution of Hepaticae and Anthocerotae in Europe and Macaronesia. Lindbergia. 27:3–47.
Söderström L, Urmi E, Váňa J. 2007. The distribution of Hepaticae and Anthocerotae in Europe and Macaronesia – Update 1–427. Cryptogamie, Bryologie. 28:299–350.
Sofronova EV (editor), Andrejeva EN, Bakalin VA, Beldiman LN, Belyakov EA, Blagovetshenskiy IV, Borovichev EA, Boychuk MA, Doroshina GY, Dulin MV, et al. 2017. New bryophyte records. 8. Arctoa. 26:105–125.
Sollman P. 2016. Taxonomic and nomenclatural notes on *Didymodon austroalpigenus* (Pottiaceae, Bryophyta) from Îles Kerguelen. Cryptogamie, Bryologie. 37:33–38.
Sollman P, Frahm J-P. 2007. *Bryoerytherophyllum rubrum* – funnen i Skandinavien. Myrinia. 17(1):34–35.
Sotiaux A, Sotiaux O. 1996. *Aneura maxima* (Schiffn.) Steph. hépatique nouvelle pour la flore française. Bulletin de la Société Botanique du Centre-Ouest. 27:513–516. French.
Srivastava SC, Udar D. 1975. Taxonomy of the Indian Metzgeriaceae – a monographic study. New Botanist. 2:1–57.
Stebel A, Smoczyk M. 2017. Further spreading of the moss *Orthotrichum pulchellum* in Poland. Herzogia. 30(1):296–299.
Steere WC, Inoue H. 1978. The Hepaticae of Arctic Alaska. The Journal of the Hattori Botanical Laboratory. 44:251–245.
Ştefănuţ S. 2004. *Frullania parvistipula* new to Romania. Lindbergia. 29:110–111.
Ştefănuţ S. 2008. The hornwort and liverwort atlas of Romania. Bucureşti: Ars Docendi, Universitatea din Bucureşti.
Ştefănuţ S. 2012. *Aneura maxima* (Schiffn.) Steph. (Aneuraceae, Marchantiophyta): a new species for Romania. Cryptogamie, Bryologie. 33(1):75–80.

Ştefănuţ S. 2020. Rare liverwort species of Romania from the exsiccatae of K. Loitlesberger. Phytotaxa. 433:9–19.
Ştefănuţ S, Goia I. 2012. Checklist and Red List of bryophytes of Romania. Nova Hedwigia. 95:59–104.
Šumberová K. 2011. MAA02 *Cyperetum micheliani* Horvatić 1931. In: Chytrý M, editor. Vegetace České republiky 3. Vodní a mokřadní vegetace [Vegetation of the Czech Republic. Vol. 3, Aquatic and wetland vegetation]. Praha: Academia; p. 319–324.
Swissbryophytes. 2004–2020. Checkliste. Konzept "Swissbryophytes 2017" [accessed 2020 March 20]. https://swissbryophytes.ch/index.php/de/datenzentrum/checkliste
Taha MA. 2019. A checklist of Saudi Arabian mosses. Egyptian Academic Journal of Biological Sciences. 10:17–26.
Tan BC, Engel JJ. 1986. An annotated checklist of Philippine Hepaticae. The Journal of the Hattori Botanical Laboratory. 60:283–355.
Thingsgaard K. 2002. *Aneura maxima* (Schiffn.) Steph.: an addition to the Danish hepatic flora. Lindbergia. 27:79–80.
Thouvenot L, Gradstein SR, Hagborg A, Söderström L, Bardat J. 2011. Checklist of the liverworts and hornworts of New Caledonia. Cryptogamie. Bryologie. 32:287–390.
Tzonev R. 2015. Muddy and sandy riverbanks with communities of small, annual hygrophytes. In: Biserkov V, Gussev C, Popov V, Hibaum G, Roussakova V, Pandurski I, Uzunov Y, Dimitrov M, Tzonev R, Tsoneva S, editors. Red data book of the Republic of Bulgaria. Vol. 3, natural habitats. Sofia: BAS–MOEW; p. 111–113.
Udar R, Gupta A. 1983. *Targionia lorbeeriana* Mull., from India. Indian Journal of Botany. 6:215–219.
van der Pluijm A. 2016. *Aneura maxima*, een voor Nederland nieuw levermos op wilg in zoetwatergetijdenbossen in de Biesbosch en Klein Profijt bij Rhoon. Buxbaumiella. 105:22.
van der Wijk R, Margadant WD, Florschütz PA. 1964–1969. Index Muscorum. Vols. 3–5. Regnum vegetabile. Utrecht: The International Bureau for Plant Taxonomy and Nomenclature of the International Association for Plant Taxonomy.
Van Rooy J. 2006. Bryophyta. In: Germishuysen G, Meyer NL, Steenkamp Y, Keith M, editors. A checklist of South African plants. Southern African Botanical Diversity Network Report 41. Pretoria: SABONET; p. 1–30.
Vanderpoorten A, Hedenäs L. 2009. New combinations in the Amblystegiaceae. Journal of Bryology. 31:129–132.
Von Konrat M, Hagborg A, Söderström L, Mutke J, Renner M, Gradstein SR, Engel J, Zhu R-L, Pickering J. 2008. Early Land Plants Today: global patterns of liverwort diversity, distribution and floristic knowledge. In: Mohamed HBB, Baki A, Nasrulhaq-Boyce A, Lee PKY, editors. Bryology in the new millennium. Kuala Lumpur: University of Malaya; p. 425–38.
Wachowiak W, Bączkiewicz A, Chudzińska E, Buczkowska K. 2007. Cryptic speciation in liverworts – a case study in the *Aneura pinguis* complex. Botanical Journal of the Linnean Society. 155(2):273–282.
Wang J, Lai M-J, Zhu R-L. 2011. Liverworts and hornworts of Taiwan: an updated checklist and floristic accounts. Annales Botanici Fennici. 48:369–395.
Werner J. 2003. *Aneura maxima* (Schiffn.) Steph. au Luxembourg, et quelques autres bryophytes remarquables observées en 2001 (16e série). Bulletin de la Société des Naturalistes Luxembourgeois. 103:25–30.
Werner O, Rams S, Kučera J, Larraín J, Afonina OM, Pisa S, Ros RM. 2013. New data on the moss genus *Hymenoloma* (Bryophyta), with special reference to *H. mulahaceni*. Cryptogamie, Bryologie. 34:1–18.
Wietrzyk-Pełka P, Otte V, Węgrzyn M, Olech M. 2018. From barren substrate to mature tundra: lichen colonization in the forelands of Svalbard glaciers. Acta Societatis Botanicorum Poloniae. 87(4):3599.
Wietrzyk-Pełka P, Rola K, Szymański W, Węgrzyn MH. 2020. Organic carbon accumulation in the glacier forelands with regard to variability of environmental conditions in different ecogenesis stages of High Arctic ecosystems. Science of the Total Environment. 717:135151. DOI:10.1016/j.scitotenv.2019.135151.
Wigginton MJ. 2009. Checklist and distribution of the liverworts and hornworts of sub-Saharan Africa, including the East African Islands. Edition 3. Tropical Bryology Research Reports. 7:1–114.
Wilson W. 1855. Bryologia Britanica. London: Longman, Brown, Green and Longmans.
Winkler S. 1970. Ökologische Beziehungen zwischen den epiphyllen Moosen der Regenwälder des Chocó (Colombia, S. A.). Revue Bryologique et Lichénologique. 37:949–959.
Wolski GJ, Nowicka-Krawczyk P. 2020. Resurrection of the *Plagiothecium longisetum* Lindb. and proposal of the new species – *P. angusticellum*. PLoS ONE. 15(3):e0230237.
Wynns JT. 2015. Molecular phylogeny and systematic revision of the pleurocarpous moss genus *Plagiothecium* [PhD thesis]. Copenhagen: University of Copenhagen.
Yamada K. 1979. A revision of Asian taxa of *Radula*, Hepaticae. The Journal of the Hattori Botanical Laboratory. 45:201–322.
Yamada K, Iwatsuki Z. 2006. Catalog of the hepatics of Japan. The Journal of the Hattori Botanical Laboratory. 99:1–106.
Yamada K, Piippo S. 1989. Bryophyte flora of the Huon Peninsula, Papua New Guinea. XXXII. *Radula* (Radulaceae, Hepaticae). Annales Botanici Fennici. 26:349–387.
Yi Y-J, He S. 2014. *Orthomnion javense* (Mniaceae), a formerly Malesian species newly confirmed for China and new to Laos, with *O. loheri* as a new synonym. Phytotaxa. 170:41–45.
Zander RH, Toren D, Eckel PM. 2007. *Gymnostomum aeruginosum, G. calcareum* and *G. viridulum* (Pottiaceae, Bryopsida) in California. Journal of Bryology. 29:27–32.
Żarnowiec J, Stebel A, Chmura D. 2020. The alien moss *Orthodontium lineare* Schwägr. in Poland (east-central Europe): a summary of nearly 40 years of invasion. Biological Invasions. 22(4):1249–1263.