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New National and Regional Bryophyte Records, 49

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1. *Alleniella complanata* (Hedw.) S.Olsson, Enroth & D.Quandt

Contributor: J. Enroth

Uganda: ‘Mont Elgon, rochers’, 23 February 1974, *leg.* S. Lisowski 6577 (H, KRAM), and 4100 m, *leg.* S. Lisowski 3433 (KRAM).

This is a temperate–boreal northern hemisphere species, in tropical regions known only from the East African mountains, and extending down to South Africa (Blockeel *et al.*, 2006c). In East Africa it was first reported [as *Neckera complanata* (Hedw.) Huebener var. *maxima* Dixon] from Kenya (Mt Kenya, at 3000 m) by Dixon (1918), and it also occurs in the Taita Hills (Mbololo, at 1650 m) in the SE part of the country (Bytebier & Chuah-Petiot, 2002). It was reported from Tanzania (Mt Meru, at 2375 m) by Blockeel *et al.* (2003). The South African collections came from much lower altitudes (400 and 450 m).

The African specimens reported by Bytebier & Chuah-Petiot (2002), Blockeel *et al.* (2003, 2006c) were all epiphytic. The present Ugandan specimens were collected on rocks. Altitude (4100 m) is given on only one of the two specimens, but as both were collected the same day, the other one probably comes from an approximately similar altitude. They do not represent Dixon’s (1918) var. *maxima*, as the shoots are less than 5 cm long; in var. *maxima* they were up to 15 cm long. The leaves in the Ugandan specimens are slightly narrower than is typical for the species, but otherwise the specimens agree well with the rather variable *A. complanata*.

2. *Andreaea flexuosa* R.Br.bis

Contributor: H. Bednarek-Ochyra

Falkland Islands: East Falkland, Stanley Harbour, 51°41’S, 57°52’W, on block of sandstone [Pí lös sandsten], 14 December 1907, *leg.* C. Skottsberg 119 [Expedition succica 1907–1909] (LD, PC, S).

Although *Andreaea flexuosa* was described from New Zealand relatively early (Brown, 1893), it remained a neglected and poorly known species for over a century, until Murray (2006) recorded it from many sites in SE Australia and Tasmania. The species is distinct and readily known by a set of gametophyte characters, including narrow, scarcely vaginant, smooth and ecostate leaves, with plane, ribbon-like, flexuose-twisted leaf blades and heterogeneous laminal cells that are bulging or smooth, unistratose to partially bistratose in the distal part of the leaf and mostly rectangular at the margins near the base. Apart from Australasia, Murray (2006) reported this species from a number of widely separated regions in the southern hemisphere including New Guinea, Madagascar, southern Africa and South America, and in the northern hemisphere, from the Hawaiian Islands and Madeira in Macaronesia, but

unfortunately, without giving specific localities or citations of specimens. The material from Madeira was recently recognised by Sérgio & Sim-Sim (2012) as a separate subspecies, *A. flexuosa* ssp. *luisieri* Sérgio & Sim-Sim.

When examining a collection of species of *Andreaea* Hedw. from the Falkland Islands, it became evident that the material reported from this archipelago as *A. grimmioides* Dusén (Cardot & Brotherus, 1923) represents *A. flexuosa*, not *A. flabellata* Müll.Hal. as suggested by Matteri (1986). This is a noteworthy addition to the moss flora of the Falkland Islands, which is still not fully known. Matteri (2003) reported 146 species and ten infraspecific taxa from this archipelago, but since then several additions have been made (e.g. Allen & Magill, 2003; Bednarek-Ochyra & Ochyra, 2003; Blockeel *et al.*, 2003; Ochyra & Broughton, 2004; Ireland *et al.*, 2005; Ochyra *et al.*, 2015a), so the moss flora of the Falkland Islands consists at present of over 150 species.

3. *Barbilophozia floerkei* (F.Weber & D.Mohr) Loeske

Contributors: B. Cykowska-Marzencka, M. Węgrzyn, P. Wietrzyk and M. Stryjak-Bogacka

Bolivia: Dept. La Paz, prov. Murillo, Cordillera Central, near Cumbre pass, 16°19’18’’S, 68°04’42’’W, 4550 m a.s.l., on moist soil between the rocks and grass near the creek, 17 June 2006, *leg.* B. Cykowska-Marzencka 7201. (KRAM, LPB).

Svalbard: Spitsbergen, Nordenskiöld Land, Bolterdalen, Rieperbreen glacier marginal zone: 78° 7’30.14’’N, 16°2’54.12’’E, 275 m a.s.l., on immature soil on glacier moraine, 14 July 2015, *leg.* M. Węgrzyn *s.n.* (KRAM).

In Bolivia, *Barbilophozia floerkei* was found in very moist places by a very steep mountain stream, about 100 metres above the road from La Paz to Coroico. In Svalbard, *B. floerkei* was found during work on phytosociology and succession in glacier moraine communities of the Oscar II Land (Węgrzyn *et al.*, 2013; Chrapusta *et al.*, 2015; Węgrzyn & Wietrzyk, 2015). The species was previously reported from Svalbard by Lindberg (1867), Berggren (1875), Arnell (1900), Hagen (1908), Arnell & Mårtensson (1959), Boińska & Gugnacka-Fiedor (1986) and Wegener *et al.* (1992), but later these records were questioned by Grolle (1960) and Frisvoll & Elvebakk (1996), and the species was not included in the island’s bryophyte checklist (Hodgetts, 2015).

Barbilophozia floerkei is a typical boreal-montane species with a subarctic range in the northern hemisphere. In Europe, the species is known from Ireland, Great Britain, Spain, France, Switzerland, Italy, Austria, Germany, the Czech Republic, Slovakia, Poland, Romania, Bulgaria, northern and central Russia and the Caucasus, Denmark, Sweden,

Finland, Norway, Greenland and Iceland (Damsholt, 2002; Osyczka *et al.*, 2007; Cykowska-Marzencka, 2013). Outside Europe, the species had been confirmed in Asia, from Siberia, Taimyr and the Chuchotskiy Peninsula and Japan (Furuki & Mizutani, 1994; Damsholt, 2002). In North America it is recorded from Alaska to Washington and Montana, Colorado, New Mexico and in the east from Ellesmere Island to Vermont (Schuster, 1969). However, in South America the species is known only from high elevations in Peru (Grolle, 1960; Hässel de Menéndez & Rubies, 2009) and this new locality in Bolivia, which is the second record for the continent. A report of *B. floerkei* from the subantarctic islands was considered erroneous by Grolle (2002) and it is not known why it was included in the later publication by Hässel de Menéndez & Rubies (2009).

Recently, there have been many new bryophyte records for Bolivia (Blockeel *et al.*, 2009, 2010; Ellis *et al.*, 2012b, 2013a, 2014a, 2015c, 2016c; Cykowska, 2014), but despite a summary by Churchill *et al.* (2009), the Bolivian bryoflora still remains poorly understood and requires additional study. In Svalbard, the bryoflora appears to be better known. With the addition of *B. floerkei* and the recently discovered *Odontoschisma sphagni* (Dicks.) Dumort., (Hodgetts, 2015; Ellis *et al.*, 2016c) the flora is now known to include 104 species of liverwort.

4. *Barbilophozia hatcheri* (Evans) Loeske

Contributors: Cs. Németh and J. Nagy

Hungary: Pest County, Buda Mountains [8579.2] (Central European Mapping Scheme), south of the village of Budakeszi, Mária-szurdok (on older maps known 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* Schreb. *ex* Hedw.

Barbilophozia hatcheri is characterised by 3–4 lobed leaves, the upper leaves having reddish gemmae at the tips of the lobes. Exact identification, however, needs microscopical examination of the cilia at the base of the leaves. In Hungary two other species of *Barbilophozia* occur, i.e. *B. barbata* (Schreb.) Loeske and *B. floerkei* (F.Weber & D.Mohr) Loeske (Papp *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 the 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 the soil between them.

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

5. *Bryum chryseum* Mitt.

Contributors: J. Bruno Silva, S. Rangel Germano and N. Dias dos Santos

Brazil: Parque Nacional (PARNA) Vale do Catimbau, Pernambuco State, 08°35'03.3"S, 37°14'31.6"W, 846 m a.s.l., on rock outcrop, 22 May 2014, *leg.* J.B. Silva 298 (UFP).

Bryum chryseum is a Neotropical species occurring in the USA (California), Mexico, Guatemala, Costa Rica, Panamá, Colombia, Peru, Bolivia, Brazil and Chile (Churchill & Linares, 1995; Bordin & Yano, 2009; Toren & Heise, 2009). The first record in Brazil was from Rio Grande do Sul State (Bordin & Yano, 2009). There, the species occurred on rock next to a remnant of humid forest. Herein, is the second record for Brazil. It occurred on an outcrop of rock in *Caatinga* (dry forest) vegetation in the Pernambuco State, PARNA Vale do Catimbau, more than 2500 km from the first Brazilian record. The discovery of this moss in northeastern Brazil represents a major eastward extension of its range. In spite of the hot semi-arid climate type (BSH'w) in the PARNA Catimbau, *B. chryseum* is a versatile moss species, and is known from dry and humid habitats (Ochi, 1980). It is also known from areas with a Mediterranean-type climate, e.g. California (USA) and Chile (Toren & Heise, 2009).

In the field, growing in inconspicuous tufts, *B. chryseum* resembles *Bryum argenteum* Hedw. The important diagnostic characters of *B. chryseum*, the glossy shoots and imbricate leaves with hyaline awns at their apices, function as protection from intense solar radiation. Reliable taxonomic characters for the identification of this species include its possession of triangular-ovate leaves with recurved apices, quadrate alar cells and narrowly rhomboid cells in the upper lamina.

6. *Bryum gemmiferum* R.Wilczek & Demaret

Contributor: G. Vončina

Poland: Western Carpathians, Kotlina Orawsko-Nowotarska basin, Huba village, Hubka hamlet, on the backwater of the Czorsztyn reservoir, 49°27'51"N, 20°13'40"E, alt. 528 m a.s.l., on silt on the

bank of the Dunajec river near the outlet into the reservoir, 8 November 2015, *leg. & det.* G. Vončina, *conf.* A. Stebel (KRAM, SOSN).

Bryum gemmiferum occurred in small, scattered patches on sandy or muddy silt together with *B. argenteum* Hedw., *B. dichotomum* Hedw. and *Funaria hygrometrica* Hedw., and also on the sandy bank of a reservoir among *Barbula unguiculata* Hedw., *Bryum argenteum*, *B. caespitium* Hedw., *Calliergonella cuspidata* (Hedw.) Loeske, *Ceratodon purpureus* (Hedw.) Brid., *Funaria hygrometrica*, *Pohlia wahlenbergii* (F. Weber & D. Mohr) A.L. Andrews, *Tortula acaulon* (With.) R.H. Zander and a few species of vascular plants. Part of the locality is periodically inundated. The species is very easy to recognise in the field owing to the yellowish colouration of the plants and the presence of numerous minute gemmae in the axils of their leaves.

Since the species was described by Wilczek & Demaret (1976), its occurrence has been reported in the United Kingdom, the Netherlands, Belgium and Lanzarote island, (Smith, 1978), Denmark, Germany, Portugal and Spain (Smith, 2004), Germany, Portugal and Spain and an uncertain record from Ireland (Düll, 1985). Hill *et al.* (1994) mapped its distribution within Great Britain and Ireland, and other records include Luxembourg (Werner, 1994), the Czech Republic (Soldán & Kučera, 2004), Sweden (Hallingbäck *et al.*, 2006), Balearics, Canary Islands, France, Spain, Portugal and Serbia (Ros *et al.*, 2013), and Hungary (Erzberger & Schröder, 2013). Records have also been published on-line: from Switzerland (Hofmann, 2014), Austria (Köckinger *et al.*, 2016) and Norway (Moen, 2013). The species is also known from California and Florida in North America (Vanderpoorten & Zartman, 2002). It is interesting that the overwhelming majority of its localities were discovered in the last decade.

7. *Bryum klinggraeffii* Schimp.

Contributors: C. Sérgio, D. Claro, J. Castillo Díaz and R. Gabriel

Portugal: Azores, Terceira Island, Praia da Vitória, Paul do Belo Jardim, 38°42' 49.30"N, 27° 03'41.74"W, 4 m a.s.l., on soil, associated with *Leptophascum leptophyllum* (Müll.Hal.) J. Guerra & M.J. Cano and *Barbula convoluta* Hedw., 28 October 2013, *leg.* Javier Castillo Diaz 39 (AZU JCD_20131028/34; LISU 263359).

This is the first report of *B. klinggraeffii* for the Azores and Macaronesia. It is a widespread ephemeral colonist, Red Listed in some European countries (Hodgetts, 2015), and is probably overlooked and undercollected owing to its small size and the difficulties associated with the identification of some *Bryum* species.

Bryum klinggraeffii is a suboceanic species, more frequent in calcareous to slightly acid bare soils in arable fields, but can also occur along the margins of ponds and reservoirs. Dioicous, it can be recognised by its acuminate-lanceolate leaves with a denticulate apex, excurrent costa and by the presence of small rhizoidal gemmae (60–100 µm in diameter), which are red to dark brown, globose to pyriform, composed of irregularly aggregated cells, the exposed surfaces of the cells are convex (Crundwell & Nyholm, 1964).

8. *Bucklandiella didyma* (Mont.) Bednarek-Ochyra & Ochyra

Contributor: H. Bednarek-Ochyra

South Georgia: (1) near river draining into Undine Harbour, between Survey Isthmus and lower glacial plain Hope Valley, grid square GR 037 152, ca 54° 03'25"S, 37°59'W, in crevices of rock faces forming side of small gorge, 3 January 1961, *leg.* S. W. Greene 681 (AAS, KRAM); (2) north-facing scree slopes on south side of valley behind Right Whale Bay, grid square GR 053 153, ca 54°01'22"S, 37°43'01"W, ca 150 m a.s.l., on sheltered east-facing rock ledge, 6 January 1972, *leg.* B. G. Bell 416 & 417 (AAS, KRAM); (3) Royal Bay, rock outcrop on north side of Moltke Harbour, grid square GR 160 099, ca 54°31'03"S, 36°05'01"W, ca 15 m, on very moist sheltered rock surface, 27 January 1972, *leg.* B. G. Bell 1363 (AAS, KRAM).

Bucklandiella Roiv. is a prominent moss genus in the bryoflora of South Georgia, both in terms of frequency and the number of species. So far, eight species of this genus have been recorded from this sub-antarctic island (Bell, 1974; Ochyra *et al.*, 2002a; Bednarek-Ochyra & Ochyra, 2012a). A ninth species, *B. didyma*, is herein added to the island's moss flora. The occurrence of this species was expected on the island and it was actually indicated on the global distribution map for this species (Ochyra *et al.*, 2008a) and here it is substantiated by the citation of the relevant voucher collections. *Bucklandiella didyma* is the most common species of the genus in southern South America where it has a continuous range from the Archipelago Juan Fernández and the VII Región del Maule in central Chile at latitude ca 35°S to Tierra del Fuego (Deguchi, 1984), with some isolated stations in Santa Catarina Province in SE Brazil (Bednarek-Ochyra *et al.*, 1999) and in the Falkland Islands (Ochyra *et al.*, 2015a). It extends to the northern maritime Antarctic where it is known from the South Sandwich Islands and the South Shetland Islands (Ochyra *et al.*, 2008a, 2008b). Thus, the present records of *B. didyma* on South Georgia complete its distribution in the Scotia Arc and bridge its Fuegian and Antarctic localities. *Bucklandiella didyma* is a panholantarctic species, which is also known from South Africa (Ochyra *et al.*, 2008a), SE

Australia, Tasmania and New Zealand (Bednarek-Ochyra *et al.*, 2014).

Beside Heard Island, South Georgia is at present the most heavily glaciated of all subantarctic islands and most studies suggest that it was covered by a huge ice cap during the last glacial epoch (Graham *et al.*, 2008). Nevertheless, the island was deglaciated relatively early and some palaeobotanical data clearly confirm the existence of ice-free refugia during the last glacial period (Van der Putten *et al.*, 2004, 2009), so it is likely that some species of bryophytes, including *B. didyma* could have survived the glaciation *in situ* as is the case with other subantarctic (Van der Putten *et al.*, 2010) and Antarctic islands (Birkenmajer *et al.*, 1985). Considering the present record, as well as recent additions (Ochyra *et al.*, 2002a; Blockeel *et al.*, 2003, 2005, 2007), the moss flora of South Georgia consists of about 120 species and thus it has the second richest moss flora in subantarctica after Îles Kerguelen. *Bucklandiella* is the richest moss genus in the subantarctic, and only a few species are known from other islands in this biome, including *B. ochracea* (Müll.Hal.) Bednarek-Ochyra & Ochyra on Îles Kerguelen and Heard Island (Ellis *et al.*, 2013d), *B. membranacea* (Mitt.) Bednarek-Ochyra & Ochyra on Îles Crozet (Ellis *et al.*, 2013c) and *B. angustissima* Bednarek-Ochyra & Ochyra on Macquarie Island (Bednarek-Ochyra & Ochyra, 2011). Interestingly, *B. lamprocarpa* (Müll.Hal.) Bednarek-Ochyra & Ochyra has also not been recorded from South Georgia, although the species is common in southern South America (Ochyra *et al.*, 1988, 2015a), in South Africa (Bednarek-Ochyra & Ochyra, 2012b; Ochyra & van Rooy, 2013) and is present on the subantarctic Îles Kerguelen (Bednarek-Ochyra & Ochyra, 1998).

9. *Campyllum polygamum* (Schimp.) Lange & C.E.O.Jensen

Contributors: Y.-J. Yoon, H.-G. Choi and J. H. Kim

Antarctica: South Shetland Islands, Nelson Island, Eco-Nelson Base, 62°14'34"S, 058°58'50"W, 5 m a.s.l.; on wetland, 27 January 2016, *leg.* Y.-J. Yoon KG-2047 (KOPRI).

Campyllum polygamum [= *Drepanocladus polygamus* (Schimp.) Hedenäs] is here reported from Nelson Island. It is a bipolar species, infrequently distributed in the South Shetland Islands. To date, *C. polygamum* was known only from the Fildes and Byers Peninsula in the South Shetland Islands. This new record from Nelson Island is not surprising; nevertheless it expands the known range of the species in the Antarctic. In Nelson Island, *C. polygamum* occurred mainly in wet habitats at the margins of melt water channels. Previously, the species was found submerged to a depth of 9 m on Alexander Island and 10 m in Lake Kitezsh on King George

Island (Ochyra *et al.*, 2008a). *Campyllum polygamum* can be distinguished from other species of Antarctic mosses by its short and double, or single costa, which extends up to 3/4 of the leaf length.

10. *Chionostomum hainanense* B.C.Tan & Y.Jia

Contributors: M. Suleiman and K.-T. Yong

Borneo: Sabah, Crocker Range Park, Tambunan District, Mount Alab, along park boundary, 1800 m a.s.l., on a bamboo trunk beside a small pond in a partially shaded area of a mossy forest, 9 September 2008, *leg.* M. Suleiman & D. P. Masundang 3812 (BORH).

Chionostomum hainanense, in the Sematophyllaceae, was previously known only from China (Tan & Jia, 1999) and Thailand (Printarakul *et al.*, 2013). The leaves of this species are characterised by their heterophylloid-type of alar organisation, the alar regions consist of a group of quadrate to rectangular cells, and the plants bear long cylindrical capsules. The specimen from Borneo has all the characters of the species; however the mid-lamina cells are slightly longer, not markedly thick-walled and are less pitted than those in the type specimen (Tan & Jia, 1999). Interestingly, the Sabah collection grew on a bamboo trunk, the same substrate as that of the type specimen from China. The species may be confused with members of the genus *Gammiella* Broth., but the latter genus is not reported for Borneo, and has much smaller plants, characterised by the presence of numerous filamentous propagules in their leaf axils. *Chionostomum hainanense* seems rare in Borneo. It has only been collected from Mount Alab, and was the only sample out of ca 1400 that were collected and studied during the preparation of a floristic report on Crocker Range Park.

11. *Didymodon icmadophilus* (Schimp. *ex* Müll.Hal.) K.Saito

Contributor: J. Kučera

Bulgaria: (1) Pirin Mts., Blagoevgrad Province, Bansko: on southern ridge of Mt Vihren 30 m above (NNW of) the saddle, 840 m S of the summit, 41.7598°N, 23.3979°E, 2600 m a.s.l., in fissure of calcareous schist rocks, 20 July 2010, *leg.* J. Kučera 13963 (CBFS); (2) Rhodope Mountains, Smolyan Province, Trigrad gorge: limestone rocks at the road 150 m below the lower entrance to 'Devil's Throat' cave, 41.6158°N, 24.3799°E, ca 1170 m a.s.l., on accumulated soil in the fissures of limestone rocks, nearly unshaded, 23 July 2010, *leg.* J. Kučera 14024 (CBFS).

Macedonia: Šar Planina Mts., municipality of Tetovo, Popova Šapka, SE slopes of Mt Popova Šapka, 1.30 km W of the main parking lot, 42.0143° N, 20.8662°E, 2050 m a.s.l., vertical unshaded face of a limestone rock in the slope, in small fissures, 14 July 2010, *leg.* J. Kučera 14024 (CBFS).

Didymodon icmadophilus is a taxonomically critical species which has recently been treated either as an independent species, closely related to *D. acutus*

(Brid.) K.Saito (e.g., Hill *et al.*, 2006; Jiménez, 2006), as the infraspecific taxon of the latter (Kučera, 2000) or even of *D. rigidulus* Hedw. (Zander, 2007). Molecular data (Werner *et al.*, 2005; Kučera & Ignatov, 2015) nevertheless support the independent origin of lineages matching *D. icmadophilus*, *D. acutus*, and *D. rigidulus*. *Didymodon icmadophilus* has been reported from mostly mountainous or northern regions of Europe, Asia, North, Central and South America, although the distribution details are obviously obscured by the difficult delimitation from similar taxa, particularly *D. acutus* and *D. validus* Limpr. In southern Europe, the species is only known from countries which include a part of the Alps (France, Italy, Slovenia; Ros *et al.*, 2013) and from the Romanian Carpathians (Ștefănuț & Goia, 2012). The presence of *D. icmadophilus* in the two higher mountain ranges of the Balkans (southern Dinaric Alps of Macedonia, Pirin of Bulgaria) is perhaps not very surprising, as numerous alpine species have been reported recently both from the Šar-Korab Mountains (e.g., Martinčić, 2009; Ellis *et al.*, 2012b) and the high Bulgarian ranges, Rila and Pirin (e.g., Lüth, 2007; Natcheva, 2008). The area surrounding the Macedonian site yielded many alpine bryophyte species of sunny exposed base-rich rock outcrops (*Grimmia alpestris* (Schleich. ex F.Weber & D.Mohr) Schleich., *G. anodon* Bruch & Schimp., *Hypnum vaucheri* Lesq., *Schistidium brunnescens* Limpr., *S. confertum* (Funck) Bruch & Schimp.), and a similar situation was observed at Mt Vihren in Bulgaria. At that site, accompanying species included *Myurella julacea* (Schwägr.) Schimp., *Didymodon rigidulus* Hedw., *Gymnostomum aeruginosum* Sm., *Grimmia tergestina* Tomm. ex Bruch & Schimp., *Schistidium brunnescens* and others. Less expected was the occurrence of *D. icmadophilus* in the Trigrad Gorge in the Rhodopes, where the accompanying calciphilous bryoflora, although generally montane (e.g., *Gymnostomum aeruginosum*, *Preissia quadrata* (Scop.) Nees, *Scapania aspera* Bernet & M.Bernet, *Plagiopus oederianus* (Sw.) H.A.Crum & L.E.Anderson), was more thermophilous, without truly alpine elements, and even included *Didymodon acutus* and *D. vinealis* (Brid.) R.H.Zander, which I had never recorded with *D. icmadophilus* before. The identification of all reported specimens of *D. icmadophilus* was confirmed by molecular barcoding for the purpose of an ongoing study on the taxonomy of *Didymodon* sect. *Didymodon*.

12. *Fossombronia caespitifformis* subsp. *multispira* (Schiffn.) J.R.Bray & D.C.Cargill

Contributors: S. Poponessi, M. Aleffi, D. Gigante and R. Venanzoni

Italy: Boschi di Ferretto–Bagnolo Umbria Region, Province of Perugia. It is a Site of Community

Importance (SCI) IT5210020, 43°9.933'N, 11°59.638'E, ca 272 m a.s.l., on waterlogged soil with *Isöetes histrix* Bory, 24 April 2015, leg. & det. S. Poponessi *s.n.* (PERU).

The investigations focused on a system of Mediterranean temporary ponds categorised as a priority habitat under the EU Directive 92/43/EEC and listed in Annexe I with the code 3170*.

According to Hodgetts (2015), this taxon is considered as Critically Endangered (CR) for Italy. Aleffi & Schumacker (1995), cited by Hodgetts (2015) as the only source for the liverwort assessment, reported this taxon (sub *Fossombronia husnotii* Corb.) without any indication of the threat category.

The present report is the first for the subspecies *multispira* in Umbria, expanding its known distribution range to the NE, towards the inland territories of the Italian peninsula. In Italy, this taxon has a strictly Mediterranean distribution, located along the Tyrrhenian coasts (Aleffi *et al.*, 2008). It has been found in very few, fragmented and scattered sites (Schwab, 1993, *in litteris*; Aleffi & Carratello, 1998; Privitera & Puglisi, 1999a, 1999b; Carratello, 2004; Cogoni *et al.*, 2004; Preston & Blockeel, 2006; Puglisi *et al.*, 2006; Privitera & Cenci, 2007). They highlight a clear connection with the fragile ecosystems of the Mediterranean temporary ponds, thus confirming the Critically Endangered assessment indicated by Hodgetts (2015).

The species is monoecious and often fertile, with spores ripening mainly from late summer or autumn to spring, and it has been assigned to the Tropical-Temperate phytogeographical element (Dierßen, 2001). The distribution range is still poorly known because its taxonomy has only recently been clarified (Lockhart *et al.*, 2012). Two subspecies (*F. caespitifformis* subsp. *multispira* and *F. caespitifformis* subsp. *caespitifformis*) occur in nearly all of the Mediterranean countries, and in Madeira and the Canary Islands (Ros *et al.*, 2007). Only *F. caespitifformis* subsp. *multispira* has been reported further north in W Europe, with recent records confirmed by the studies of elaters of the two subspecies from Ireland, SW England and Belgium (Lockhart *et al.*, 2012). Records of *F. caespitifformis s.l.* from Africa, SW Asia and Australia need to be reassessed to establish which subspecies are involved (Lockhart *et al.*, 2012). Its presence in the Italian peninsula has only recently been confirmed, in Tuscany, Lazio, Campania, Calabria and Sardinia and Sicily (Aleffi *et al.*, 2008).

13. *Hedwigia striata* (Wilson) Bosw.

Contributors: M. Infante and P. Heras

France: Lot, Cornac, river Mamoul, 1 km to the East of Souilhol. 44.90611°N, 1.91999°E; 277 m a.s.l., saxicolous on the most exposed part of a rocky

gneiss outcrop, 5 June 2013, *leg.* M. Infante & P. Heras, *BBF bryo* 376/13.

Hedwigia striata was reinstated at the rank of species by Buchbender *et al.* (2014). The distribution area given in this publication was improved in Hespanhol *et al.* (2013) and Gallego *et al.* (2014). It includes the Iberian Peninsula to the south, and Belgium, Great Britain and Scandinavia to the north. The expected finding of *H. striata* in France fills the distribution gap between these regions. The French locality matches the general ecology of the species, saxicolous on siliceous rock surfaces, in a community dominated by *Hypnum cupressiforme* Hedw. var. *cupressiforme* and *Frullania tamarisci* (L.) Dumort., also with the presence of *Grimmia hartmanii* Schimp. and *G. trichophylla* Grev.

14. *Isopterygium byssobolax* (Müll.Hal.) Paris

Contributors: G. F. P. Bojaca, L. B. Fantecelle, C. A. T. Araújo and A. S. Maciel-Silva

Brazil: Estação Ecológica da Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, 19° 52'34"S, 43°58'21"W, 813 m a.s.l., on tree trunk base, 3 May 2014, *leg.* Maciel-Silva, A. S. 291 (BHCN N° 175342).

Isopterygium byssobolax is one of the smallest species of *Isopterygium* in Latin America (Ireland & Buck, 2009), occurring in Brazil, Bolivia, Paraguay and Argentina. In Brazil, it occurs in the states of Rondônia, Mato Grosso, Espírito Santo, São Paulo, Paraná, Rio Grande do Sul and Santa Catarina, including the phytogeographic domains of Amazonia, Cerrado and Atlantic Forest (Peralta, 2016). During a bryophyte survey of the Ecological Station of the Federal University of Minas Gerais, an important urban reserve of Cerrado and semi-deciduous forest in the municipality of Belo Horizonte, we collected *I. byssobolax* with mature sporophytes. This is the first record of *I. byssobolax* for the state of Minas Gerais. This report extends its distribution in Brazil, >400 km from the other records, and corroborates its distribution in southeastern South America. The Ecological Station of UFMG preserves a significant number of species in a 14 ha area, contributing to maintain ecosystems services, and for development of research studies and environmental education courses (Antonini & Martins, 2003; UFMG, 2015). *Isopterygium byssobolax* is usually found in forests on rotten wood and tree bases up to 1180 m a.s.l.; it is recognised by: (1) small gametophyte size (stems reach 1.3 cm long, 0.5–1 mm wide; (2) leaves (<1 mm long) that are ovate to ovate-lanceolate, concave and acuminate, with a distinct alar region of 2–4 rows of quadrate cells, totalling 4–10 cells; (3) sporophytes with setae 0.6–1 cm long and ovoid to ellipsoid capsules (Ireland, 1992; Ireland & Buck, 2009).

15. *Leptobryum pyriforme* (Hedw.) Wilson

Contributors: H. Bednarek-Ochyra and V. Plášek

Chile: XI Región Aysén del General Carlos Ibáñez del Campo, Provincia de General Carrera: 32 km west of Villa Cerro Castillo on Río Cajón, in grassland at the wayside of Carretera Austral–Ruta 7, 46° 07'535"S, 72°33'605"W, 414 m a.s.l., on spots of bare clay soil in an open and insolated site at the roadside, 16 January 2015, *leg.* H. Bednarek-Ochyra, R. Ochyra & V. Plášek 574/15 (KRAM, SGO).

Leptobryum pyriforme is widely distributed but scattered in most regions of Chile, from IV Región Limari in the north to XII Región Magallanes in the south (Müller, 2009). In XI Región Aysén it has hitherto been recorded from Provincia de Aisén, Provincia de Coyhaique and Provincia de Capitán Prat (Ellis *et al.*, 2015c) and here it is reported from Provincia de General Carrera in the southern part of this Región. Outside mainland southern South America *L. pyriforme* is known from the Falkland Islands (Ellis *et al.*, 2015b), subantarctic South Georgia (Ochyra *et al.*, 2002a) and two stations in the maritime Antarctic (Blockeel *et al.*, 2006b; Ochyra *et al.*, 2008a).

16. *Neckeropsis foveolata* (Mitt.) Broth.

Contributor: J. Enroth

Guinea: 'Près de Macenta. Forêt dense' 24 April 1963, *leg.* S. Lisowski 20501 (KRAM). 'Région de Macenta. Massif du Ziama, près de Zoubrouma. Forêt dense. Epiphyte.' 30 December 1962, *leg.* S. Lisowski 4192 (KRAM). 'Région de Macenta. Massif du Ziama, près de Zoubrouma. Forêt dense. Epiphyte.' 22 May 1962, *leg.* S. Lisowski 600 (KRAM). 'Région de Macenta, près de Zoubrouma. Plantation de *Cola nitida*. Epiphyte.' 13 January 1963, *leg.* S. Lisowski 168 (KRAM). 'Région de Macenta. Massif du Ziama, près de Seredou. Forêt dense.' 12 February 1962, *leg.* S. Lisowski 2628 (KRAM). 'Près de Macenta. Plantation de café. Epiphyte.' 25 January 1962, *leg.* S. Lisowski 723 (KRAM). 'Région de Macenta. Epiphyte sur un arbre de café dans une plantation au S de Macenta, ca 650 m', 25 January 1962, *leg.* S. Lisowski 421 (H, KRAM). 'Près de Macenta. Rochers, dans la forêt secondaire', 25 January 1962, *leg.* S. Lisowski 163 (KRAM). 'Région de Macenta. Massif du Ziama, au-dessus du Poste 5. Forêt de montagne. Epiphyte', 17 December 1962, *leg.* S. Lisowski 111 (H, KRAM). 'Près de Macenta. Env. 750 m. Forêt dense. Epiphyte', 22 May 1962, *leg.* S. Lisowski 4686 (KRAM). 'Près de Macenta. Plantation de café. Epiphyte.' 28 January 1962, *leg.* S. Lisowski 277 (KRAM).

Neckeropsis foveolata is a Neotropical–African species. In Africa it is known from Liberia, Nigeria, Central African Republic and Democratic Republic of the Congo (Enroth, 1993). The Guinean collections

by Lisowski came from the vicinity of the town of Macenta in SE Guinea, several of them from the now protected Ziama Massif forests.

Due to its deeply undulate leaves, *N. foveolata* can in Africa be confused with *N. lepinea* (Mont.) M.Fleisch., but the latter has a very weak and short costa, while *N. foveolata* has a strong, single costa reaching well above midleaf (Enroth, 1993).

17. *Neckeropsis spuriotruncata* (Dusén) M.Fleisch.

Contributor: J. Enroth

Guinea: 'Près de Macenta. Galerie forestière. Epiphyte' 27 March 1963, *leg.* S. Lisowski 74 (KRAM). 'Près de Macenta. Forêt dense' 13 May 1962, *leg.* S. Lisowski 3888 (KRAM). 'Près de Macenta. Forêt dense. Epiphyte sur tronc d'un arbre au bord d'un torrent' 25 January 1962, *leg.* S. Lisowski 571 (KRAM). 'Région de Macenta. Galerie forestière au bord de la Loffa, près de la route Macenta-Nzerekore. Epiphyte', 3 February 1963, *leg.* S. Lisowski 4511 (KRAM), 166 (H, KRAM).

Democratic Republic of the Congo: 'République du Zaïre, Haut-Zaïre, 20 km au NW de Kisangani. Bord de la Lindi'. 24 January 1973, *leg.* S. Lisowski 5830 (KRAM). 'République du Zaïre, Haut-Zaïre, 34 km au N de Kisangani, près du village Bambayo. Rochers au bord de la Lindi', 26 June 1977, *leg.* S. Lisowski 50520 (KRAM).

This is a rare West African species, previously known from Ivory Coast, Cameroon, Gabon and Republic of the Congo (Enroth, 1993). It is morphologically close to, but consistently distinguishable from, *N. liliana* (Renauld) Broth. and *N. madecassa* (Besch.) M.Fleisch., both of which are known from the same areas in Africa, and the latter also from Madagascar and Réunion. *Neckeropsis spuriotruncata* grows on rocks and tree trunks and, according to Potier de la Varde (1936), also on tree stumps.

18. *Orthothecium strictum* Lorentz

Contributors: M. J. Cano and L. Hedenäs

Spain: Barcelona, Berguedà, Creu de Peguera, 48° 08'N, 01°46'E, 12 August 1973, *leg.* Vives *s.n.* (BCB 50198).

During the revision of the genus *Orthothecium* Schimp., as part of the project 'Flora Briofítica Ibérica,' the first author found a specimen deposited in the herbarium BCB, which exhibits the characters of *O. strictum*, a species that was not previously reported from Spain. The sample is rather scanty and grew in a locality with *O. intricatum* (Hartm.) Schimp. Some of this specimen was sent to the second author, who confirmed the material as *O. strictum*.

Orthothecium strictum is an Arctic and northern mountainous species, that is found rarely in mountains further south in Europe, North America and Asia (Ignatov *et al.*, 1996). In addition, it occurs in New

Zealand (Beever *et al.*, 1992). In the Mediterranean area, it has only been reported from the French Pyrenees (*v. gr.* Husnot, 1884–1890, Augier, 1966) and the French and Italian Alps (Augier, 1966; Skrzypczak & Skrzypczak, 2000; Cortini Pedrotti, 2001). The species is recognised by its small size, leaves slightly longitudinally plicate, with recurved and distally denticulate margins, and relatively short leaf lamina cells. The specimen was collected in the protected area Serra d'Ensija-Rasos de Peguera, a calcareous zone belonging to pre-Pyrenean ranges of Catalonia. It was collected at ca 1900 m elevation, although this is not indicated on the label. This collection represents the first record of this species in the Iberian Peninsula.

19. *Orthotrichum bistratosum* (Schiffn.) J. Guerra

Contributors: T. Kiebacher and M. Lüth

Greece: Epirus, Ioannina, Monodendri, at the viewpoint Oxia, 39°54'23"N, 20°45'05"E, 1280 m a.s.l., rock slope, on limestone, together with *Grimmia tergestina* Bruch & Schimp., 06 June 2015, *leg.* T. Kiebacher & M. Lüth *s.n.* (priv. herb. T. Kiebacher).

Orthotrichum bistratosum was originally described from Syria as *Orthotrichum cupulatum* var. *bistratosum* Schiffn. (Schiffner, 1913). Lara & Garilleti (2014), in agreement with Guerra (1985), consider the taxon to be a distinct species. Today *O. bistratosum* is known from the Middle East (Iraq, Israel, Syria and Turkey) and from the Mediterranean (France and Spain) (Ellis *et al.*, 2010; Ros *et al.*, 2013; Lara & Garilleti, 2014). *Orthotrichum bistratosum* differs from *O. cupulatum* Brid. in gametophytic as well as sporophytic characteristics. The most striking difference is the extensively bistratose leaf lamina. The prothome, which is typically well developed in *O. cupulatum*, is rarely present, or low and discontinuous, in *O. bistratosum*. Furthermore, the leaves of *O. bistratosum* are smooth or almost smooth, whereas in *O. cupulatum* they are usually distinctly papillose. In the field *O. bistratosum* may be distinguished from *O. cupulatum* by the blackish colour and the large perichaetial leaves which often completely hide the capsules (Lara & Garilleti, 2014). However, these characteristics can also occur in *O. cupulatum* and the two species can also grow together (Ellis *et al.*, 2010).

At the locality where *O. bistratosum* has been found in Greece it was associated with *G. tergestina*. Several tufts grew on exposed calcareous rocks that are known to be the typical habitat of the species. More rarely the species has also been found growing on siliceous rocks or on the bark of trees (Lara & Garilleti, 2014). This record indicates that the *O. bistratosum* probably also occurs in other Mediterranean countries.

20. *Orthotrichum crenulatum* Mitt.

Contributors: V. Plášek, A. Nowak and M. Nobis

Georgia: 46 km E of Tbilisi city, SE edge of Giorgitsminda town, along a road, on bark of wayside tree (*Fraxinus excelsior* L.), GPS coordinates (WGS 84): 41°43'00.2"N, 45°21'29.6"E, ca 630 m a.s.l., 27 April 2015, leg. A. Nowak & M. Nobis s.n., det. V. Plášek (OSTR #B1549).

To date, 16 taxa of the broadly interpreted genus *Orthotrichum* Hedw. have been reported from Georgia (Chikovani & Svanidze, 2004; Ignatov *et al.*, 2006; Kürschner *et al.*, 2013) and *O. crenulatum* is a new addition to the bryoflora of the country. This epiphytic moss was considered to be endemic to the area around north-eastern Afghanistan, northern India, western Tibet, Turkestan and Kazakhstan (Lewinsky, 1992). However, subsequently it was recorded also from other countries in Central Asia, including Pakistan (Schäfer-Verwimp & Gruber, 2002), Tajikistan (Ellis *et al.*, 2011) and Kyrgyzstan (Ellis *et al.*, 2014b). In 1991 it was found for the first time outside Asia, in France in Europe (Boudier & Pierrot, 1992 as *O. flowersii* Vitt).

In Georgia, *O. crenulatum* was first collected in 2015, during a Polish botanical expedition, on the bark of *Fraxinus excelsior* which was planted in the alley alongside the road-verge within the city of Giorgitsminda. It was found growing together with *O. anomalum* Hedw., *O. diaphanum* Brid. and *O. pumilum* Sw. and the moss produced sporophytes in profusion.

Orthotrichum crenulatum is closely related to *O. pamiricum* Plášek & Sawicki which was recently described as a new species from the western foothills of the Pamir Mountains of the Tajik–Afghan border in Central Asia (Plášek *et al.*, 2014). *Orthotrichum pamiricum* is similar to *O. crenulatum* in gametophyte characters, including an obtuse and crenulate leaf apex, but it can be easily distinguished from the latter mainly by the 16 (papillate) endostome segments. Moreover, *O. pamiricum* has stomata arranged in 2 rows in the upper part of the capsule, whereas in *O. crenulatum* they are concentrated in the median part of the urn. In addition, a prostome was observed in *O. pamiricum*, which is absent from *O. crenulatum*. At the base of the endostome segments short rudimentary appendages sometimes occur in *O. pamiricum* but this would not lead to confusion with *O. moravicum* which was recently also reported from Central Asia (cf. Plášek *et al.*, 2009; Ellis *et al.*, 2012b).

21. *Orthotrichum philiberti* Venturi

Contributors: M. Kırmacı and E. Agcagil

Turkey: Province Aydın, Samsun Mountain, Bademlik locality, 37°39'51.0"N, 27°0.2'52.0"E, 140 m a.s.l., epiphytic on *Quercus cercis* L. with *Orthotrichum diaphanum* Schrad. ex Brid., *O. affine* Schrad. ex Brid. and *Syntrichia montana* Nees, 27

December 2012, leg. and det. M. Kırmacı & E. Agcagil EMA 889, confirmed A. Erdağ. East of Güzelçamlı, *Pinus brutia* Ten., *Quercus ilex* L. and *Q. cerris* mixed forest, 37°41'06.2"N, 27°15'36.1"E, 415 m a.s.l., epiphytic on *Q. ilex*, associated with *Hypnum cupressiforme* Hedw., 12 April 2013, leg. and det. M. Kırmacı & E. Agcagil EMA 1165.

Orthotrichum Hedw. is the richest moss genus in Turkey and the countries of Europe, with 38 taxa (34 species and 4 varieties including *O. rupestre* Schwägr. var. *kurdicum* Schiffn.) (Ros *et al.*, 2013; Ellis *et al.*, 2015a). The new record, *O. philiberti*, raises to 39 the number of *Orthotrichum* taxa known from Turkey. In the last decade many new additions belonging to this genus have been added to the Turkish bryoflora (Ellis *et al.*, 2010, 2015a; Lara *et al.*, 2010). One of the most important reasons for this richness is that Turkey is very well endowed with tree species [630 naturally occurring taxa (Akkemik, 2014)], some of which are especially important for epiphytic bryophytes. *Orthotrichum philiberti* was collected on two different species of *Quercus* L., which with 24 taxa, is the most important genus in the Turkish flora (Akkemik, 2014). Species of *Quercus* are dispersed all around the country, and are especially important for bryophytes owing to the surface of their bark.

The features of our specimen fully match those described for *O. philiberti*. This species differs from *O. alpestre* Bruch & Schimp., *O. pallens* Bruch ex Brid., *O. pumilum* Sw. and *O. schimperi* Hammar by its oblong lanceolate mucronate leaves and thin pale calyptra with thick papillose hairs. It is not surprising that *O. philiberti* should be found in Turkey, as it is very common in Mediterranean countries (Ros *et al.*, 2013). According to Blockeel *et al.* (2006c), *O. philiberti* prefers a mild climate and oceanic-Mediterranean environments. These Turkish collections were from the northern part of Samsun Mountain which has a Mediterranean climate and is influenced by sea moisture.

22. *Orthotrichum tanganyikae* (P.de la Varde) Q.H.Wang & Y.Jia

Contributors: J. A. Calleja, R. Garilleti, V. Mazimpaka, B. Vigalondo and F. Lara

Kenya: Mt Kenya, supra Shipton's camp, rock fields in front of Peter Point, 00°08'35"S, 037°18'23"E, 4600 m a.s.l., basalt outcrops with scattered afroalpine vegetation, in crevices of basaltic rocks, 14 August 2014, leg. F. Lara 1408/12 (with R. Garilleti, B. Vigalondo & J. A. Calleja) (MAUAM 4593, BCB 58437, VAL-Briof 11636); *ibidem*, 4460 m a.s.l., in crevices of basaltic rocks, 14 August 2014, leg. F. Lara 1408/14 (with R. Garilleti, B. Vigalondo & J. A. Calleja), (MAUAM 4843); *ibidem*, Shipton's camp surroundings, 00°08'29"S, 037°18'54"E, 4200 m, afroalpine vegetation dominated by

Dendrosenecio sp. pl. trees, on basalt rock wall, 14 August 2014, leg. J. A. Calleja, F. Lara, R. Garilleti & B. Vigalondo *s.n.* (MAUAM 4844, BCB 58438, VAL-Brief 11637); *ibidem*, Lenana Peak, 00°09'19"S, 037°19'02"E, 4860 m, basalt rock crevices, 15 August 2014, leg. F. Lara 1408/21 (with R. Garilleti, B. Vigalondo & J. A. Calleja) (MAUAM 4845); *ibidem*, 4900 m, basalt rock crevices, 15 August 2014, leg. F. Lara 1408/20 (with R. Garilleti, B. Vigalondo & J. A. Calleja) (MAUAM 4846, BCB 58439, VAL-Brief 11638); *ibidem*, Lenana peak to Mintos camp trail, 00°08'56"S, 037°19'19"E, 4630 m, basalt rock crevices, 15 August 2014, leg. J. A. Calleja, F. Lara, R. Garilleti & B. Vigalondo *s.n.* (MAUAM 4847, BCB 58440, VAL-Brief 11639).

Tanzania: Mt Kilimanjaro, Lava Tower surroundings, 03°03'58"S, 037°19'26"E, 4580 m, afroalpine rocky semi-desert, on an isolated basalt boulder, 22 August 2014, leg. J. A. Calleja, F. Lara, R. Garilleti & B. Vigalondo *s.n.* (MAUAM 4851, BCB 58441, VAL-Brief 11640); *ibidem*, 4640 m a.s.l., basalt outcrop area, in boulder crevices, 22 August 2014, leg. F. Lara 1408/41 (with R. Garilleti, B. Vigalondo & J. A. Calleja) (MAUAM 4852, BCB 58442, VAL-Brief 11.641).

Ulota tanganyikae was described by Potier de la Varde (1955) from a unique locality, found in 1948 in the highlands of Mount Kilimanjaro; there had been no subsequent records. A single herbarium specimen of that original record is available in PC! Recently, Wang & Jia (2014) reinterpreted the taxon as a member of the genus *Orthotrichum* Hedw., and after comparison with other African *Orthotrichum* species, they also placed *O. oreophilum* Lewinsky & van Rooy, from Leshoto (Lewinsky & van Rooy, 1990), in synonymy with *O. tanganyikae*.

Orthotrichum tanganyikae is currently known only from that single Tanzanian locality (Potier de la Varde, 1955) and four close sites in the South African Drakensberg Mountains (Lewinsky & van Rooy, 1990). It seems to be a saxicolous species that inhabits sheltered microhabitats within volcanic environments above 3000 m a.s.l. Our recent gatherings in East Africa confirm and expand the available information on its distribution and habitat preferences.

On Mt Kenya, from where *O. tanganyikae* is reported here for the first time, it is fairly common in the summit area, between 4200 and 4900 m a.s.l. It usually occurs in basalt rocky niches (under basalt boulders, in crevices or on vertical walls) that buffer the strong insolation and dry winds commonly affecting the afroalpine ecosystems. The species grows in areas of afroalpine vegetation dominated by giant trees of *Dendrosenecio keniodendron* (R.E.Fr. & T.C.E.Fr.) B.Nord., but it also lives in zones with scattered cushion-like scrubs and herbs due to the harsh

environmental conditions of higher altitudes (Busmann, 2006). *Orthotrichum tanganyikae* has been frequently found along with *O. rupestre* Schwägr., growing on the same outcrop microhabitats (walls and crevices). However, *O. tanganyikae* has never been observed growing as an epiphyte, yet on Mt Kenya it occurs in some places where other *Orthotrichum* species (including *O. rupestre*) thrive on shrub branches or *Dendrosenecio* trunks.

On Mt Kilimanjaro, *O. tanganyikae* has been newly recorded in only one locality on the western slope of the Kibo Peak. This second locality is ca 15 km from the previously known type locality of the species, on the western slopes of Mawenzi Peak. Within the new locality the species is relatively abundant in a narrow altitudinal range, from 4580 to 4640 m a.s.l., and immersed in the altodesertic vegetation belt (Busmann, 2006). It mainly occurs on the northern walls of lava towers and in boulder crevices, but it could not be found in neighbouring areas with similar environmental characteristics.

23. *Pelekium scabrosulum* (Mitt.) Touw

Contributors: N. Norhazrina and A. Vanderpoorten

Martinique: Northern side of the Montagne Pelée, track between Anse Couleuvre and Cascade Couleuvre, 14°50'N, 60°12'W, ca 100 m a.s.l., epiphytic within moist lowland rainforest in a ravine, with *Neckeropsis disticha* (Hedw.) Kindb., 1 April 2016, leg. A. Vanderpoorten *MARI* (LG).

The species, which is widespread across the Neotropics, is new to Martinique (Lavocat Bernarda & Schäfer-Verwimp, 2011). It is readily distinguished from *Thuidium tomentosum* Schimp., which is very abundant on wet ground and on rocks within the ravine in the area, by its papillose seta and non-branched paraphyllia. It differs from *Pelekium investe* (Mitt.) Touw, which was the only *Pelekium* species reported from Martinique, by its regular bipinnate branching pattern. It also differs from *P. schistocalyx* (Müll.Hal.) Touw, which was recently reported from Guadeloupe (Lavocat Bernarda & Schäfer-Verwimp, 2011), by its longly acuminate, but not ciliate perichaetial leaves, its 3–5-cell long pseudo-paraphyllia, and its spreading leaves in the dry state, leaving the stems clearly visible (Buck, 2003).

24. *Physcomitrella patens* (Hedw.) Bruch & Schimp.

Contributor: C. Sérgio and C. A. Garcia

Portugal: (1) Beira Litoral, Aveiro, Oliveira do Bairro, 40°32'52.99"N, 8°29'56.63"W, 24 m a.s.l., wet soil, along a waterline and around a pond, with *Ptychostomum donianum* (Grev.) Holyoak & N.Pedersen, 16 November 2013, leg. C. Sérgio *s.n.* (LISU 262262); (2) Estremadura, Vila Franca de Xira, Companhia das Lezírias, 38°50'23.30"N, 8°58'37.04"W, 2 m a.s.l., on open saline soil, included in *Phragmites* Adans. community with *Tortula*

truncata (Hedw.) Mitt. and *Entosthodon hungaricus* (Boros) Loeske, 8 October 2013, *leg.* C. Sérgio *s.n.* (LISU 262265).

During recent field studies in central Portugal two specimens of *Physcomitrella patens* were collected. They represent the first records of this species for Portugal, since, despite *P. patens* having been already reported in Flora Briofítica Ibérica (Guerra *et al.*, 2010) based on a sample gathered in the Algarve by Ron Porley, it was later confirmed that this specimen belonged to *P. readeri* (Müll.Hal.) I.G.Stone & G.A.M.Scott (Ellis *et al.*, 2012b).

The overall appearance of the two species is similar in the field, although *P. patens* can be recognised by its spathulate or obovate leaves with a characteristically long costa that extends up to the leaf apex. In *P. readeri* the costa is less well differentiated and only reaches the middle of the leaf. The two species are morphologically very similar, the leaves have a short apiculus and the margins are entire near the base, serrate in the distal third.

The new discoveries of *P. readeri* and *P. patens* in Portugal may indicate that this genus is probably expanding its range. *P. readeri* was found last year in two new localities (Estremadura in Serra de Sintra in Barragem da Mula and Ribatejo near Coruche).

Physcomitrella patens is very well known by the scientific community and numerous researchers use it as a model organism in ecophysiology studies (Glime, 2015). The fully mapped genotype of this species is a resource for understanding gene functioning as well as for implementing different experimental methods of research in plant biology (Rensing *et al.*, 2008; von Schwartzberg, 2009; Beike & Rensing, 2010).

25. *Pohlia cruda* (Hedw.) Lindb.

Contributors: H. Bednarek-Ochyra and M. Lebouvier

Îles Crozet, Île de la Possession: eastern coast, Pointe Lieutard, rock outcrops 300 m south of Alfred Faure Station, 51°51.513'E, 46°26.132'S, 100 m a.s.l., forming small tufts under overhanging rock in shaded and dry situations, 16 November 2012, *leg.* R. Ochyra 2657/12 (KRAM).

In the southern polar regions *Pohlia cruda* is widespread and locally abundant in the maritime Antarctic (Ochyra *et al.*, 2008a) and in the Subantarctic it is frequent on South Georgia (Clarke, 1973) and occasional in Îles Kerguelen (Brotherus, 1906). Here, its range is extended to Îles Crozet where it was found on Île de la Possession. This is a noteworthy addition to the moss flora of this archipelago, which is the least studied bryologically of all sub-antarctic islands. However, recent field studies yielded a number of new additions to the moss flora of the archipelago (e.g. Blockeel *et al.*, 2006a; Ellis *et al.*,

2012c, 2013b, 2014c, 2015a, 2015b; Ochyra & Bednarek-Ochyra, 2013; Ochyra *et al.*, 2015b) and as a result the moss flora of Îles Crozet consists at present of over 70 species. This is still the lowest number of species in comparison with the moss floras of the adjacent archipelagoes of the Prince Edward Islands and Îles Kerguelen. *Pohlia cruda* has a pantemperate distribution in the southern hemisphere and its range covers southern South America, Lesotho in South Africa and SE Australia, Tasmania and New Zealand with some offshore islands (Ochyra *et al.*, 2008a). *Pohlia cruda* is a bipolar species with some intermediate stations in the northern Andes and recently it was also discovered in East Africa (Blockeel *et al.*, 2007; Ellis *et al.*, 2016a).

26. *Pseudocalliergon lycopodioides* (Brid.) Hedenäs

Contributors: A. Koczur and M. Hájek

Poland, Western Carpathians, Kotlina Orawsko-Nowotarska: 'Puścizna Rękowiańska' fen near Czarny Dunajec, 49°27'51"N, 19°51'04"E, 652 m a.s.l, wet depressions in eastern part of the fen, 7 October 2010, *leg.* A. Koczur *s.n.*, *det.* M. Hájek, *conf.* R. Ochyra (KRAM); 3 October 2014, *leg.* and *det.* P. Hájková *s.n.* (BRNU).

This is the first recently confirmed record of *Pseudocalliergon lycopodioides* in the Western Carpathians. Until now, the species was not known from the Polish and Czech parts of the Carpathians (Żarnowiec *et al.*, 2004; Kučera, 2005). *Pseudocalliergon lycopodioides* had been recorded many times from the Slovak part of the Carpathians, but all records were based on misidentifications (Pilous, 1991). Nevertheless, it has occurred in the Záhorská nížina lowland close to the south-western margin of the Western Carpathians (the Malé Karpaty Mts), the last collection being from 1997 (Janovicová & Kubinská, 2002). In the Puścizna Rękowiańska fens the species grows semi-aquatically along with *P. trifarium* (F.Weber & D.Mohr) Loeske and *Scorpidium scorpioides* (Hedw.) Limpr. on abandoned post-exploited areas undergoing natural succession, in wet depressions surrounded by fen vegetation with *Limprichtia cossonii* (Schimp.) L.E.Anderson, H.A.Crum & W.R.Buck., *Campyllum stellatum* (Hedw.) Lange & C.E.O.Jensen, *Hamatocaulis vernicosus* (Mitt.) Hedenäs, *Fissidens adianthoides* Hedw. and other species. Long-term observations from 1998 to the present (our unpublished data) has shown no fluctuation in species abundance or environmental conditions.

27. *Radula mammosa* Spruce

Contributor: A. Schäfer-Verwimp

Costa Rica: Provincia de San José, Cordillera de Talamanca, San Gerardo de Dota, ca 9°33'N, 83°48'W, Weg von Ferienanlage Chacon zu 'Las Cruzes' am Rio Savegre, in Primärwald, epiphyll, 1900 m

a.s.l., 25 December 1999, *leg.* A. Schäfer-Verwimp & I. Holz *SV/H-0128/D* (INB, JE).

Guadeloupe: Basse Terre, Region La Soufriere, Trace Victor Hugues zwischen Matouba und Savane aux Ananas, ca 16°02'N, 61°39'W, Regenwald, epiphyll, 1100 m a.s.l., 31 March 2002, *leg.* A. Schäfer-Verwimp & I. Verwimp 22388/A (JE).

Radula mammosa was described from Bolivia and has subsequently been recorded from Colombia, Brazil and Chile (Castle, 1939; Yamada, 1993); more recent records are from southern Ecuador, in the provinces of Zamora-Chinchiipe and Loja (Nöske *et al.*, 2003; Schäfer-Verwimp *et al.*, 2013); from Brazil (Yamada, 2003, state of Amazonas; Valente & Pôrto, 2006; Berger & Ribas, 2007; Tavares-Martins *et al.*, 2014, states of Pará, Bahia, Rio de Janeiro and Santa Catarina) and from Venezuela (Morales & Moreno, 2010). The collections from Costa Rica and Guadeloupe constitute a considerable extension of range to Central America and the West Indies. The altitudinal range of *R. mammosa* extends from 40 m a.s.l. in N Brazil (Tavares-Martins *et al.*, 2014) up to 2900 m a.s.l. in southern Ecuador (Schäfer-Verwimp *et al.*, 2013).

Gradstein *et al.* (2003) erroneously listed *Radula lindigii* Castle as a synonym of *R. mammosa*. The cited reference ('Castle, 1939') cited *R. longituba* Steph. and *R. verrucifolia* Steph. as synonyms, but *R. lindigii* was described 20 years later (Castle, 1959). The latter species has been accepted by Yamada (1986) and Uribe & Gradstein (1998); however, it is not listed in the recent world checklist of liverworts and hornworts (Söderström *et al.*, 2016).

28. *Riccardia chamedryfolia* (With.) Grolle

Contributor: V. M. Virchenko

Ukraine: the Crimea, Bilohirs'k district, outskirts of Karasivka village, the Karasu-Bashi spring, 44°58'N, 34°36'E; on small stones under the water; 28 May 2013, *leg.* Yu. I. Mala *s.n.*, *det.* V. M. Virchenko (KW-B).

Riccardia chamedryfolia is known from most countries in Europe, as well as in Asia, North Africa and North America (Düll, 1983). In Russia the species has been reported from the European part of the country including the Ural Mountains, Caucasus, Siberia and the Far East (Potemkin & Sofronova, 2009). The plant occurs on moist soil and wet rocks, on pond and lake margins, in fens and on dripping rocks and wet ledges in ravines (Dierßen, 2001). There are about ten localities of *R. chamedryfolia* in the Ukrainian Carpathians, where it grows on soil in wet places and near springs (Zerov & Partyka, 1975). During a field study of bryophytes, the liverwort was also discovered in the SE Crimea, near Karasivka village of the Bilohirs'k district. This is the first record of the species in this peninsula. At

present, including data in Partyka (2005), the bryophyte flora of the Crimea includes 40 species of liverworts.

Contributors: S. Poponessi, M. Aleffi, D. Gigante and R. Venanzoni

Italy: Boschi di Ferretto–Bagnolo Umbria Region, Province of Perugia. It is a Site of Community Importance (SCI) IT5210020, 43°10'24.26"N, 12°00'02.13"E, ca 272 m a.s.l., on waterlogged soil with *Isoetes histrix* Bory & Durieu, drying phase, 8 April 2015, *leg. & det.* S. Poponessi *s.n.* (PERU).

The investigations during which this record was discovered focused on a system of Mediterranean temporary ponds categorised as a priority habitat under the EU Directive 92/43/EEC and listed in Annexe I with the code 3170*.

Riccardia chamedryfolia is considered Vulnerable (VU) in Italy according to Hodgetts (2015). It has been assigned to the Austrosubtropical/Mountain-Arctic phytogeographical element (Dierßen, 2001). This constitutes the first record for Umbria. Its presence in the Italian peninsula has only recently been confirmed, in the Aosta Valley, Piedmont, Tuscany, Puglia, Calabria and Sardinia and Sicily (Aleffi *et al.*, 2008). Its Mediterranean distribution range includes Bulgaria, the Canary Islands, Corsica, Crete, Spain, France, Greece, Madeira, Portugal and Turkey (Ros *et al.*, 2007). In several countries it is considered at risk (Hodgetts, 2015).

29. *Riccia canaliculata* Hoffm.

Contributors: S. Poponessi, M. Aleffi, D. Gigante and R. Venanzoni

Italy: Boschi di Ferretto–Bagnolo Umbria Region, Province of Perugia. It is a Site of Community Importance (SCI) IT5210020, 43°10'24.26"N, 12°00'02.13"E, ca 273 m a.s.l., on clay waterlogged soil in the shadow of *Pinus pinea* L.; 43°10.083'N, 11°58.267'E, ca 272 m a.s.l., at the edge of a clay pond, 8 April 2015, *leg.* S. Poponessi, *det.* S. Poponessi *s.n.* (PERU);

The investigations during which this record was discovered focused on a system of Mediterranean temporary ponds categorised as a priority habitat under the EU Directive 92/43/EEC and listed in Annexe I with the code 3170*.

Riccia canaliculata is considered as Endangered (EN) in Italy both by Aleffi & Schumacker (1995) and Hodgetts (2015). The present record is the first for Umbria. The species is very rarely found in Italy, and has only been confirmed in Lazio (Schwab, 1969, *pers. comm.*) and Sardinia (Bischler & Jovet-Ast, 1971–1972; Aleffi *et al.*, 1995; Cogoni *et al.*, 2004, 2006). According to Aleffi *et al.* (2008), the species is known in other regions of Italy (Piedmont, Lombardy, Veneto and Tuscany) from ancient reports. Its range includes Spain, Portugal, France,

Greece, Corsica (Ros *et al.*, 2007), North Africa, Macaronesia and South America, with a Mediterranean-Boreal phytogeographical element (Dierßen, 2001). It has been included in the Red Lists of several European countries (Hodgetts, 2015).

30. *Seligeria acutifolia* Lindb.

Contributors: Cs. Németh, A. Kovács and P. Erzberger

Hungary: Komárom-Esztergom County, Pilis Mts [8278.4] (Central European Mapping Scheme), ca 3 km south of the town of Esztergom, on the hill Nagy-Strázsa-hegy, on shaded limestone rock, ca 300 m a.s.l., 47°44'35.5"N, 18°45'36.1"E, 17 March 2016, *leg.* Cs. Németh and A. Kovács (Hb. Németh 7895), *det.* P. Erzberger, 11 May 2016, *conf.* C. Schmidt, 23 May 2016.

Seligeria acutifolia is characterised by a short, straight seta, up to 1.5 mm long, and perichaetial leaves that are longer than the cauline leaves and often (nearly) reach the base of the capsule. The capsule is short, widest at the orifice when empty, and has a developed peristome. The spores are (9–) 12–14 µm, and the seta surface cells are short rectangular, not narrowly linear as in the closely related *S. pusilla* (Hedw.) Schimp. The leaf margin is very finely crenulated with slightly protruding cell ends. All these characters (except spore size) could be observed in the Hungarian plants, with many immature and some nearly mature capsules. This species usually grows on calcareous substrates, mostly under overhangs.

In Europe, *S. acutifolia* occurs mainly in western and southern countries; it appears to become rarer towards the east. The species occurs in only a few countries of eastern and south-eastern Europe, e.g. Austria, Croatia, Montenegro, Serbia and Greece, and is Red-Listed e.g. in the Czech Republic, Slovakia and Bulgaria (VU), whereas it is Data Deficient (DD) in Romania (Hodgetts, 2015). In Hungary it has possibly been overlooked for similar, but more common species of the genus. *Seligeria acutifolia* is missing from the latest checklist (Papp *et al.*, 2010); it is new to the bryoflora of Hungary.

31. *Sphagnum molle* Sull.

Contributors: A. Stebel and R. Krawczyk

Poland, Podkarpackie Province: Sandomierz Basin: Nowa Dęba, vicinity of the 'Cietrzewiec' bog, 50° 26'41"N, 21°52'02"E, 175 m a.s.l., 15 July 2012, *leg.* R. Krawczyk *s.n.* (SOSN).

Sphagnum molle is a very rare and threatened moss species in the bryoflora of Poland (Żarnowiec *et al.*, 2004). In Europe it has a suboceanic geographical range (Dierßen, 2001), thus the overwhelming majority of its locations are situated in the western part of Poland, especially in Western Pomerania; single stations are known from the Orawsko-

Nowotarska Basin in the Western Carpathians (Melosik, 1992). A new location for *S. molle* has been found about 500 km south-east from its main centre of occurrence in Poland, near Nowa Dęba town. It occurs on sandy-peat soil in wet heath near a bog, associated with plants such as *Calluna vulgaris* (L.) Hull, *Carex nigra* Reichard, *Drosera rotundifolia* L., *Eriophorum angustifolium* Honck, *E. vaginatum* L., *Juncus effusus* L., *J. squarrosus* L., *Molinia caerulea* (L.) Moench, *Pohlia nutans* (Hedw.) Lindb., *Polytrichum commune* Hedw. and *Sphagnum compactum* Lam. & DC. The vicinity of the 'Cietrzewiec' bog near Nowa Dęba is used as a military training area, thus the soil is disturbed. The population seems to be fairly plentiful and forms many small tufts. In a few of them sporophytes were observed. The present record is the easternmost location for this species in Poland and one of the south-easternmost in Europe (Daniels & Eddy, 1990). Much further towards the south-east, this species is known in Lviv and Zhytomyr oblasts in Ukraine (Bojko, 2014).

32. *Syntrichia subpapillosissima* (Bizot & R.B.Pierrot *ex* W.Kramer) M.T.Gallego & J.Guerra

Contributors: S. Shirzadian and S. Akhoondi Darzikolaei

Iran: Khorasan Razavi province, Kalat, Zavin, 36° 44'N, 59°54'E, 1260 m a.s.l., on rocks, 2 June 2015, *leg.* S. Shirzadian 0553 B (IRAN).

Akhani & Kürschner (2004), in the latest checklist of the Iranian bryoflora, and Kürschner & Frey (2011), in a bryophyte flora for Southwest Asia, list ten species of *Syntrichia* as occurring in Iran. Subsequently, Fereidounfar *et al.* (2011) recorded *S. norvegica* F.Weber from the Alvand Mountains in Hamedan province (Iran) and recently, Akhoondi *et al.* (2014) reported *S. sinensis* (Müll.Hal.) Ochyra from West Azarbaijan province (NW Iran). Consequently, 12 species of *Syntrichia* were recorded for Iran.

Syntrichia subpapillosissima, already known from Turkey (Kürschner & Frey, 2011), usually occurs on calcareous, exposed or protected soils, sometimes on humiferous, sandy or stony soils; it can be saxicolous on granite, slate or sandstones, or rarely epiphytic (on *Quercus* spp. and *Juniperus thurifera* L.). It is usually found at altitudes between 400 and 4300 m a.s.l. The global distribution of *S. subpapillosissima* includes Europe, North Africa and south-western Asia (Gallego, 2005).

Plants of *S. subpapillosissima* reach 5 cm high, their laminal cells bear pedicellate and branched papillae (bifurcate, rarely stellately branched, 2.5–5.0 µm high and more than one per cell). This separates them from plants of the closely related *S. papillosissima* (Copp.) Loeske, which reach 8 cm high and have a lamina with only a single stellately branched papilla

per cell on both sides of leaf, the papillae are 2.5–7.5 µm high.

33. *Tritomaria koreana* Bakalin, S.-S. Choi & B. Y. Sun

Contributor: V. A. Bakalin

Japan: Honshu, Yamanashi Pref., Japanese Minami-Alps, Koma-ga-dake Mt., 35°45'12"N, 138°13'46"E, 2700 m a.s.l., *Abies-Tsuga diversifolia* forest on the ridge, mesic cliff crevices on steep N-facing slope, 30 September 2015, leg. V. A. Bakalin *s.n.* (VBGI: J-87-13-15).

Tritomaria koreana was recently described (Bakalin *et al.*, 2009) from its only locality, in the southern part of the Korean Peninsula, and despite several searches was not found in the mountain systems of the Republic of Korea outside Jiri-san. The taxon was tentatively accepted as a separate species by Váňa *et al.* (2014). The present record in Japan is the first report of the taxon outside Korea. The habitat of *T. koreana* in the Southern Japanese Alps is quite similar to that in the Korean Peninsula. In the both places the species behaves as an acidophilic mesophyte, occupying thin soil in partially shaded cliff crevices in mountain oroboreal (subalpine in Japanese tradition) dark coniferous forests. In both localities the species produced gemmae, but was never found with sporophytes. Despite its copious production of gemmae, the species was observed in a very limited area and has not spread to the similar (at least visually) and fairly abundant cliff crevices in the surrounding mountains. I speculate that *T. koreana* may occur in some other mountain systems of Japan as well as in north-east China.

34. *Vittia pachyloma* (Mont.) Ochyra

Contributors: H. Bednarek-Ochyra and V. Plášek

Chile: XI Región Aysén del General Carlos Ibáñez del Campo, Provincia de General Carrera: Los Alamos south of Lago Negro at the southernmost end of Lago General Carrera, between Puerto Bertrand and Puerto Guadal at Carretera Austral–Ruta 7, 45°54'360"S, 72°19'213"W, 346 m a.s.l., on submerged or exposed stones in a small stream flowing into Lago Bertrand, 16 January 2015, leg. H. Bednarek-Ochyra, R. Ochyra & V. Plášek 564/15 (KRAM, SGO).

Vittia pachyloma has hitherto been recorded from three provinces of the XI Región Aysén in Chile, namely from Provincia de Aysén and Coyhaique (Müller, 2009) and Provincia de Capitán Prat (Ellis *et al.*, 2016b). Here, the species is reported from the fourth province of this Región, the Provincia de General Carrera, and this means that it is known from all provinces in southern Chile which administratively belong to the XI and XII Regiones. *Vittia pachyloma* is a common and abundant rheophytic moss in streams and rivers, usually with fast flowing water, growing firmly attached to rocks and blocks in river

beds, often submerged or temporarily emergent. This is a challenging habitat for mosses, and in Chile *V. pachyloma* often grows together with *Bucklandiella lamprocarpa* (Müll.Hal.) Bednarek-Ochyra & Ochyra and *Scouleria patagonica* (Mitt.) A. Jaeger. All of these species show adaptations for living in this type of habitat and exhibit remarkable convergence in their leaf structure. The most distinctive among these is the presence of fleshy multilayered marginal borders, which extend from the base to the apex of the leaves, where they are confluent with the salient costa (e.g. Touw & Ochyra, 1987; Ochyra, 1987a; Ochyra & Enroth, 1989; Ochyra & Shevock, 2012). In addition, the laminal cells are usually bi- to polystratose (e.g. Ochyra, 1985a; Ochyra & Vanderpoorten, 1999; Ochyra & Bednarek-Ochyra, 2011) and the costa is strong and often occupies more than half the leaf width (e.g. Ochyra, 1985b, 1986a, 1986b, 2013; Ochyra *et al.*, 1998; Shevock *et al.*, 2011). *Vittia pachyloma* has long been considered as a member of the genus *Sciaromium* (Mitt.) Mitt. but this generic name proved to be synonymous with *Echinodium* Jur. (Ochyra, 1987b) and consequently a new generic name, *Vittia* Ochyra, was proposed as a replacement (Ochyra, 1987c).

Vittia pachyloma is a widely distributed species in South America, ranging along the Andes from Columbia to Tierra del Fuego and the Falkland Islands, appearing also in south-eastern Brazil and eastern Argentina (Ochyra, 1987c), and extending to subantarctic South Georgia (Ochyra & Lightowers, 1988). It then recurs at the highly disjunct amphiatlantic stations in Îles Kerguelen in the subantarctic South Indian Ocean. This type of distribution is shown by a number of moss species (e.g. Ochyra & Lewis Smith, 1998; Bednarek-Ochyra & Ochyra, 2010, 2012c, 2013; Ochyra, 2010; Ellis *et al.*, 2012a, 2013a). The important centre of occurrence of *V. pachyloma* is in South Africa where it is known from some scattered localities in Mpumalanga (formerly Transvaal), KwaZulu-Natal (formerly Natal) and the Cape (Ochyra, 1987c). Accordingly, the species is classified as a classical Afro-American species, along with about other 80 species of moss (e.g. Frahm, 1982; Allen & Crosby, 1986; Ochyra *et al.*, 1992, 2002b; Wilbraham & Matcham, 2010; Ellis *et al.*, 2012b, 2014a, 2015b; Ochyra & Ireland, 2016).

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