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Bryological Note

New national and regional bryophyte records, 55

L. T. Ellis¹, O. M. Afonina², M. Aleffi³, R. L. Andriamiarisoa⁴, M. Bačkor⁵, M. Goga⁵, H. Bednarek-Ochyra⁶, D. A. Callaghan⁷, P. Campisi⁸, M. G. Dia⁸, M. L. Marino⁸, J. Enroth⁹, P. Erzberger¹⁰, V. Hugonnot¹¹, E. A. Ignatova¹², T. Kiebacher¹³, J. Kučera¹⁴, M. Lebouvier¹⁵, G. M. Maria¹⁶, S. Ștefănuț¹⁶, J. Nagy¹⁷, T. Pócs¹⁸, S. Poponessi¹⁹, R. Venanzoni¹⁹, D. Gigante¹⁹, F. Prosser²⁰, C. Reeb²¹, M. S. Sabovljević²², J. R. Shevock²³, S. Shirzadian²⁴, S. Akhoondi Darzikolaei²⁴, E. R. F. Souza²⁵, A. Silva Pinto²⁵, J. B. Silva²⁵, S. F. Lopes²⁵, K. Torzewski²⁶, A. Kazienko²⁶

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1. *Acroschisma wilsonii* (Hook.f.) A. Jaeger

Contributor: H. Bednarek-Ochyra

Venezuela: (1) Mérida, Páramo de Mucubají, vertiente de la Laguna de los Patos, Sierra de Santo Domingo, sobre roca ígnea, 3690 m a.s.l., Julio 1972, *leg.* D. Griffin III 944 (B, KRAM); (2) Mérida, Pico del Águila, Sierra de Santo Domingo, sobre roca, 3800 m a.s.l., Agosto 1972, *leg.* D. Griffin III 1317 (B, KRAM).

Acroschisma wilsonii is endemic to South America, with its main centre of occurrence in the cool-temperate zone (Greene, 1986). It was erroneously recorded from China (Redfearn & Wu, 1986) and regrettably, this Chinese occurrence is continuously indicated in the Tropicos database (<http://tropicos.org/Name/35108242?tab=distribution>). Likewise, in the same

database the type of *Andreaea wilsonii* Hook.f., the basionym of *Acroschisma wilsonii*, is shown to have been collected 'In insulis Aucklandi et Campbelli' south of New Zealand, whilst in fact this species was described from the specimen collected in Hermite Island at Cape Horn (Hooker & Wilson, 1844) and has never been recorded in Australasia. The species is characterised by having long cylindrical capsules dehiscing by 4–8 slits confined to near the apex and the lines of dehiscence form tooth-like processes which are not united at the tips. This is a unique feature of *Andreaea wilsonii* and therefore this species was placed in the separate subgenus *Andreaea* Hedw. subg. *Acroschisma* Hook.f. & Wilson (Hooker & Wilson, 1844) which was soon raised to the separate genus *Acroschisma* (Hook.f. & Wilson) Lindl. (Lindley, 1846).

Acroschisma wilsonii has its main centre of occurrence in the Tierra del Fuego archipelago and in

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southern and western Patagonia, extending northwards to the XIV Los Ríos Región in Chile at lat. ca 39°30'W (Müller, 2009). Then, the species recurs in the northern Andes of Ecuador and Colombia, where it occurs at high elevations of 3385–4100 m and 3040–3750 m a.s.l., respectively (Churchill *et al.*, 2000). It was also reported from Peru (Soukup, 1951) but this record has never been confirmed. Herein, the species is recorded for the first time from Venezuela where it was found at two sites in the Sierra de Santo Domingo range at elevations of 2690 and 3900 m a.s.l. These are the northernmost stations of *A. wilsonii*.

Penetration of austral-derived cool-adapted bryophytes into the equatorial mountains is not a rare biogeographical pattern, yet it has not gained too much attention in descriptive studies and no summary has hitherto been given. A number of moss species extend into the tropics along the transamerican track, which is the most continuous and efficient trans-tropical route, and has served for the northward migration of Gondwanan species. Beside *Acroschisma wilsonii*, the most typical representatives of this group are *Bryum clavatum* (Schimp.) Müll.Hal. and *B. campylothecium* Taylor (Ochi, 1980), *Bucklandiella didyma* (Mont.) Bedn.-Ochyra & Ochyra (Bednarek-Ochyra *et al.*, 1999), *Chrysoblastella chilensis* (Mont.) Reimers (Blockeel *et al.*, 2002), *Dicranella campylophylla* (Taylor) A.Jaeger (Ochyra & Newton, 1985 as *D. cardotii* (R.Br.bis) Dixon), *D. hookeri* (Müll.Hal.) Cardot (Blockeel *et al.*, 2007; Ochyra *et al.*, 2013; Ochyra & Bednarek-Ochyra, 2014), *Hymenoloma antarcticum* (Müll.Hal.) Ochyra (Ochyra & Bednarek-Ochyra, 2015a), *Lepyrodon tomentosus* (Hook.) Mitt. (Allen, 1999), *Notoligotrichum trichodon* (Hook. & Wilson) G.L.Sm. (Smith, 1971; Ellis *et al.*, 2012b), *Plagiothecium orthocarpum* Mitt. (Ochyra *et al.*, 2002, 2008a), *Schistidium andinum* (Mitt.) Ochyra and *S. praemorsum* (Müll.Hal.) Herzog (Ochyra *et al.*, 2008a, 2008b).

2. *Bartramia pomiformis* Hedw.

Contributor: H. Bednarek-Ochyra

Ethiopia: (1) Bale Mountains, above Goba, 3450–3500 m a.s.l., 6°54'N, 39°56'E; upper montane *Philippia–Hagenia* forest on 35–40° steep rocky upper slope with relatively little human disturbance; epiphytic moss, also on smaller branches; 4 March 1990, *leg.* S. & G. Miehe 3295 (KRAM); (2) same locality, 3500 m a.s.l., ericaceous belt, *Philippia* Klotzsch woodlands and thickets merging with upper montane *Philippia–Hagenia* forest, *Philippia keniensis* S.Moore scrub forest on 25° E to SSE-facing slopes of deep valley; grazed, minor associate of ground moss community; 2 March 1990, *leg.* S. & G. Miehe 3128 (KRAM).

Bartramia pomiformis is a boreal-montane species having a continuous circumpolar range in the northern hemisphere and its global geographical distribution was reviewed and mapped by Ochyra *et al.* (1992). The species was reported from some bipolar stations in southern South America (Greene, 1986), New Zealand (Beckett, 1896) and Australia (Streimann & Curnow, 1989), but these records proved to be erroneous and were based upon misdeterminations of the herbarium specimens, which actually belonged to *B. robusta* Hook.f. & Wilson (Dixon, 1926; Fransén, 2004) and *B. halleriana* Hedw. (Matteri, 1984, 1985). Nevertheless, this species does occur outside the Holarctic and was once collected in the Bale Mountains, Ethiopia (Miehe & Miehe, 1994a; O'Shea, 2006). Two specimens have been recorded, one of which is in fine fruiting condition, and because no data of these collections have been provided in the earlier literature, the relevant details of the voucher specimens are cited herein. The species seems to be rare, occurring in woodlands and scrubs in the ericaceous belt dominated by *Philippia keniensis* and *Erica trimera* (Engl.) Beentje at an elevation of 3450–3500 m a.s.l. This community is characterised by a relatively high humidity resulting in the development of a rich bryophyte vegetation (Miehe & Miehe, 1993, 1994a, 1994b), which yielded a number of new moss records for Ethiopia (e.g. Blockeel *et al.*, 2004; Ellis *et al.*, 2016a). Some species recorded by the Miehes in the Bale Mountains proved to be of great phytogeographical importance. Apart from *B. pomiformis*, three other species have been newly recorded in Africa, including *Plagiomnium undulatum* (Hedw.) T.J.Kop. (Koponen, 1993), *Entodon concinnus* (De Not.) Paris (Ochyra & Bednarek-Ochyra, 2000) and *Plagiothecium lucidum* (Hook.f. & Wilson) Paris (Ochyra *et al.*, 2000). The two former species are interesting examples of the deep penetration of northern-derived species into the tropics, and the latter represents penetration of southern-derived species into the tropics (Bednarek-Ochyra & Plášek, 2017).

3. *Brachythecium subpilosum* (Hook.f. & Wilson) A.Jaeger

Contributors: M. Bačkor, M. S. Sabovljević and M. Goga

Antarctica, James Ross Island: rocky wet ground; 63°47.2670'S, 57°47.7330'W, 11 February 2017, *leg.* M. Bačkor *s.n.*, *det.* M. S. Sabovljević and M. Goga (BEOU; Košice University bryophyte collections).

The bryophyte flora of Antarctica is rather poorly known. However, climatic changes and the disappearance of permanent ice increases the interest in new records in the region (Ochyra *et al.*, 2008b).

During a few months research on lichens on James Ross Island, Antarctica, M. Bačkor made a small collection of bryophytes. Among the species identified in

this collection was *Brachythecium subpilosum*. This is an amphiatlantic temperate moss, common in Magellanean region of Western Patagonia reaching north to Valdivia (ca 40°S) (Ochyra *et al.*, 2008b), Tierra del Fuego and the Falkland Islands. It is also reported from the subantarctic islands of South Georgia, Kerguelen, Tristan de Cunha islets and Gough Island (Ochyra *et al.*, 2008b). In the Antarctic it has been collected twice, on the Davis Coast (west side of Antarctic Peninsula) over 100 years ago (Ochyra *et al.*, 2008b) and recently on Livingston Island (South Shetland Islands) (Lara & Pertierra in Ellis *et al.*, 2012a). This present report constitutes a new record for the bryophyte flora of James Ross Island. The collection was sterile, as were the specimens from the Davis Coast and Livingston Island, but the species frequently fruits on South Georgia and Tierra del Fuego.

4. *Bucklandiella curiosissima* (Bedn.-Ochyra & Ochyra) Bedn.-Ochyra & Ochyra

Contributor: H. Bednarek-Ochyra

New Zealand, North Island: Manawatu-Manganui Region, Ruahine Range, Ruahine Forest Park, Wharite Peak, ca 10 km N of Woodville on Whariti Road, 40°15.3'S, 175°51.5'E, 900 m a.s.l., MZMS 260 T2 3 531 018, on grassy verge at side of road through scrub of *Olearia colensoi* Hook.f., *Pseudowintera colorata* (Raoul) Dandy, *Griselinia lucida* G.Forst., *Fuchsia excorticata* (Forst. & Forst.f.) L.f., amongst *Campylopus clavatus* (R.Br.) Wilson and grasses, 10 December 2005, *leg.* Patrick J. Brownsey *s.n.* (WELT M37344 as *Racomitrium pruinosum* (Wilson) Müll.Hal.).

Bucklandiella curiosissima is a New Zealand endemic species which was described as new to science (Bednarek-Ochyra & Ochyra, 1996). Although it is a very large and handsome moss with a unique overall appearance, a few old collections of this species have been mistaken for *Racomitrium pruinosum* or *R. lanuginosum* (Hedw.) Brid. and stored in herbaria under these names. For a long time this species has been known only from Canterbury, Otago and Nelson regions in the South Island (Bednarek-Ochyra & Ochyra, 1996; Fife, 2000; Ellis *et al.*, 2014b). During revisionary studies of the herbarium collections of the broadly conceived genus *Racomitrium* Brid. for a monograph of the subfamily Racomitrioideae in New Zealand, two specimens of *B. curiosissima* were detected from the Wellington region in the North Island (Ellis *et al.*, 2015). Herein, the next collection of this species was discovered in the Ruahine Range in the Manawatu-Manganui region in the central part of the North Island and this is the northernmost locality for *B. curiosissima*.

Bucklandiella Roiv. is the largest segregate of the traditionally understood genus *Racomitrium* (Sawicki

et al., 2015) and it was taxonomically very under-worked, as almost all species of this genus described from the southern hemisphere were lumped with the broadly conceived *R. crispulum* (Hook.f. & Wilson) Wilson (Clifford, 1955; Bednarek-Ochyra, 2015a). However, detailed taxonomic studies on this complex resulted in the discovery of several new species (Fife, 1984; Bednarek-Ochyra & Ochyra, 1996, 2010, 2011; Bednarek-Ochyra *et al.*, 2014), the reinstatement of some species from obsolence (Ellis *et al.*, 2011; Bednarek-Ochyra, 2014) and the discovery of some species described from elsewhere (Blockeel *et al.*, 2008; Ellis *et al.*, 2014a). Accordingly, the genus *Bucklandiella* is represented in New Zealand by 12 species.

5. *Buxbaumia viridis* (DC.) Moug. & Nestl.

Contributors: K. Torzewski and A. Kazienko

Poland: Sudetes, Karkonosze Mountains, Biały Potok Valley on the eastern slope of Mt Turek, 50°45'44"N, 15°43'17"E, 920 m. a.s.l, 10 October 2016, *leg.* K. Torzewski & A. Kazienko *s.n.* (WRSL).

Buxbaumia viridis is broadly but sparsely distributed, and rarely encountered in Poland and Europe (Soldan, 1992). Therefore, it was included in the *Red Data Book of European Bryophytes* (Schumacker & Martiny, 1995) as Endangered (category V), in the list of species in Annex I of the Bern Convention (1979) and in Annex II to Habitats Directive 92/43/EEC (1992). Since 2001, *B. viridis* has been protected by law in Poland (Regulation of 2014). Historically the species was common in the Sudetes, but now only two locations are known in the western mountain range (Smoczyk & Wierzcholska, 2008; Cykowska & Vončina, 2011). *Buxbaumia viridis* was recorded in the Czech part of the Karkonosze Mountains (Horáková, 2011), but never in the Polish part (Fudali & Wojtuń, 2013). The new stand of *B. viridis* was found in the Karkonosze National Park in Biały Potok Valley on the eastern slope of Mt Turek. The new site was located in a 50-year-old spruce forest, resembling the association *Calamagrostio villosae-Piceetum*. There was only one sporophyte on an 0.8 m log of *Picea abies* (L.) H.Karst. Co-occurring species: *Cephalozia bicuspidata* (L.) Dumort., *Dicranum scoparium* Hedw., *Herzogiella seligeri* (Brid.) Z.Iwats. and *Lophocolea heterophylla* (Schrad.) Dumort.

6. *Cephalozia elachista* (J.B.Jack ex Gottsche & Rabenh.) Schiffn.

Contributor: F. Prosser

Italy: northern province of Trento, Rendena Valley, about 1 km SW of Madonna di Campiglio, in the bog named Palù Marc (Natura 2000 area IT3120070), 9730/4 (Central European Mapping Scheme); 46°12'50.2"N, 10°48'43.9"E, 1695 m a.s.l., growing in association with *Sphagnum subnitens* Russow &

Warnst., 31 August 2017, *leg.* F. Prosser & G. Tomasi *s.n.*, *det.* F. Prosser, *confirm.* M. Aleffi (01080 Prosser priv. herb.).

Cephaloziella elachista is a boreal atlantic species growing mainly in *Sphagnum* L. bogs (Nebel & Philippi, 2005). It is easily recognised by its small, distant leaves that are deeply divided into two acute lobes, and most of which carry an obvious tooth close to their base. Due to its small size, the species is easily overlooked. The present record was found during botanical surveys to monitor Natura 2000 areas. The plot where *C. elachista* occurred was rich in *Sphagnum subnitens*. In the same plot uncommon vascular plants were present, such as *Carex pauciflora* Lightf., *Drosera anglica* Huds., *Scheuchzeria palustris* L. and *Vaccinium microcarpum* (Turcz. ex Rupr.) Schmalh. Aleffi (2005; see also Aleffi *et al.*, 2008), after a review of literature and herbarium data, excluded *C. elachista* from Italy. In particular, he considered as uncertain two records by Gerdol (1993) from two *Sphagnum* bogs in the southern Carnian Alps, as voucher specimens were lacking. The confirmation of *C. elachista* in Italy is not surprising. Although rare and threatened, it is reported in neighbouring countries such as Austria and Switzerland (Hodgetts, 2015). Although further findings in *Sphagnum* bogs in the Italian Alps are to be expected, the species is surely rare in Italy because its potential habitat is scarce.

7. *Codriophorus mollis* (Cardot) Bedn.-Ochyra & Ochyra

Contributor: H. Bednarek-Ochyra

Colombia: Departamento del Putumayo, Municipio de Colón, Reserva Natural La Rejoia, Orillas río Negro, 2700 m a.s.l., 1°17'N, 76°53'W, moss on rocks in river, growing as a small admixture in patches of *Bucklandiella subsecunda* (Harv.) Bedn.-Ochyra & Ochyra and very scarce *B. lamprocarpa* (Müll.Hal.) Bedn.-Ochyra & Ochyra, 10 November 1996, *leg.* B. R. Ramírez P. 10.254A (MO, duplicate from Herbario Universidad de Nariño, PSO).

Codriophorus mollis is a distinct species. It differs from its close relative, *C. acicularis* (Hedw.) Bedn.-Ochyra & Ochyra, by a set of morphological and anatomical traits, including its soft texture and the often unbranched, thread-like appearance of its plants. The leaves also possess a slender costa, which is commonly spurred and forked at the apex, and reaches half to three quarters of the way up the leaf (Bednarek-Ochyra, 2006). It is a hydrophyte growing attached to periodically flooded stones and boulders in rivers, stream beds and watercourses, as well as on wet cliffs, seeping outcrops and wet rock ledges. Although ecologically it can be classified as rheophytic, *C. mollis* does not exhibit any adaptations to habitats with swiftly flowing water, which has a destructive

impact on plants. The leaves have an entirely unistratose lamina with a fairly narrow and not markedly strong costa. Although such features are not unique among rheophytic mosses (Ochyra, 1986, 1987; Touw & Ochyra, 1987; Shevock *et al.*, 2006, 2011), they do contrast with many species growing in similar habitats that possess typical rheophytic adaptations.

Codriophorus mollis is a typical Beringian, circum-north Pacific moss species, which is frequent in north-western North America. It ranges from Washington to south-eastern Alaska, and through the Aleutian arc reaches the Far East of Asia, where it extends from Kamchatka to northern Honshu in Japan. Additionally, this is the only species of the genus that penetrates deeply into the tropics. Hitherto, it was recorded at an altimontane elevation of 4100 m a.s.l. in the páramo of the Sierra Nevada del Cocuy Chita within the Cordillera Oriental of the northern Andes in the Province of Boyacá in Colombia. Herein, the species is recorded from Departamento del Putumayo, bordering Ecuador and Peru in the south-west of Colombia. It was found at a relatively low elevation of 2700 m a.s.l. in the Colombian Massif in the Amazonian Region. The collection was found on rocks in a river, growing as a small admixture in patches of *Bucklandiella subsecunda*, which occasionally occurs in such habitats, and some plants of *B. lamprocarpa*, which is an Afro-American cool-adapted rheophyte, occurring in the Subantarctic (Bednarek-Ochyra & Ochyra, 1998), South Africa (Bednarek-Ochyra & Ochyra, 2012a; Ochyra & van Rooy, 2013) and southern South America (Bednarek-Ochyra & Ochyra, 1994, 2012b; Bednarek-Ochyra *et al.*, 1996), extending to the central and northern Andes (Bednarek-Ochyra, 2015b) and East Africa (Ochyra *et al.*, 1988). Thus, the equatorial mountains in Colombia are a meeting point of southern cool-adapted moss species with the northern-derived Laurasian moss species that occur on remote stations in the tropics. The northern Andes are a well documented outpost for many northern bryophytes in the Neotropics (Menzel, 1986; Gradstein & Vána, 1987; Ochyra & Bednarek-Ochyra, 2002).

8. *Crossidium squamiferum* (Viv.) Jur.

Contributors: J. Nagy and P. Erzberger

Hungary: Pest County, Börzsöny Mountains (8279.2, Central European Mapping Scheme), south-west of the settlement Nagymaros, on exposed andesitic rocks partially covered by a thin layer of loess, at the hill Szürke-hegy, ca 160 m a.s.l., 47°46'12.8"N, 18°56'15.9"E, 19 May 2017, *leg.* József Nagy & Peter Erzberger (B-Erzberger 23160, dupl. BP, herb. J. Nagy, herb. Cs. Németh), *det.* P. Erzberger, *conf.* B. Papp.

Bryophytes associated with the collection include *Didymodon acutus* (Brid.) K.Saito, *Encalypta vulgaris* Hedw., *Microbryum curvicollum* (Hedw.) R.H.Zander, *Pseudocrossidium hornschuchianum* (Schultz) R.H.Zander, *Pterygoneurum sessile* (Brid.) Jur., *Syntrichia calcicola* J.J.Amann (det. P. Erzberger, conf. M. T. Gallego), *S. caninervis* Mitt. var. *gypsophila* (J.J.Amann ex G.Roth) Ochyra, *Grimmia laevigata* (Brid.) Brid., *G. orbicularis* Wilson, *G. ovalis* (Hedw.) Lindb., *G. plagiopodia* Hedw., *G. pulvinata* (Hedw.) Sm., *Pleurochaete squarrosa* (Brid.) Lindb., *Weissia longifolia* Mitt., *Campyliadelphus chrysophyllus* (Brid.) R.S.Chopra, *Phascum cuspidatum* Hedw. var. *piliferum* (Hedw.) Hook. & Taylor, *Schistidium brunnescens* Limpr. and *Tortella fasciculata* (Culm.) Culm. Some of the bryophyte taxa growing in the vicinity of *C. squamiferum* were collected during subsequent visits with B. Papp, Cs. Németh and A. Mártonffy on 17 and 21 June 2017.

Our plants of *Crossidium squamiferum* were in fine fruiting condition, with a twisted peristome, corresponding to the typical variety (straight peristome in var. *pottioideum* (De Not.) Mönk.). Of the seven species of the genus occurring in Europe (Hill *et al.*, 2006), two were already known to occur in Hungary (Papp *et al.*, 2010): *C. crassinervium* (De Not.) Jur. and *C. laxefilamentosum* W.Frey & Kürschner. From these, *C. squamiferum* differs by its conspicuously hyaline, broad, flat to incurved upper leaf margins, consisting of very incrassate cells with small lumina. The photosynthetic filaments on the ventral surface of the costa have papillose end cells (smooth in *C. laxefilamentosum*) and are also strongly thick-walled.

The site of this newly discovered member of the Hungarian bryoflora is at the southern limit of the Börzsöny Mountains, facing the valley of the Danube. The vegetation and flora indicate a submediterranean climate, with extensive stands of *Quercus pubescens* Willd. and the occurrence of locally rare vascular plant species. The site is a very steep slope of volcanic bedrock (andesite), very difficult to access and fully exposed, with the cover of loess partially removed by erosion, but also loess is at times washed onto the slope from deposits above with loess steppe and woody vegetation. This explains the remarkable mixture of acidophytic and basiphytic bryophytes found. The population of *C. squamiferum* covers an area of ca 0.5 ha, the number of its cushions, several of them palm-sized, was estimated to amount to at least 1000.

It is difficult to decide whether this is a relatively new arrival to the country or whether the species has been growing here for decades without being noted. Although *C. squamiferum* is a very distinctive plant easily recognised in the field when viewed with a hand lens, at a superficial glance from some distance

a cushion of *C. squamiferum* might be passed over as some other hoary moss, e.g. a species of *Grimmia*. There is no mention of the locality 'Szurke-hegy' in Vajda's account of the bryophytes of the Börzsöny Mountains (Vajda, 1966), nor is there any evidence in Boros's field diaries (Boros, 1915–1971) that the site had been visited by the most outstanding Hungarian bryologists of the 20th century. These facts together with the extensive size of the population of *C. squamiferum* suggest that the species became established a rather long time ago.

Among the countries surrounding Hungary, *C. squamiferum* occurs in Austria (red-listed 3, corresponding to EN=Endangered), Slovenia (DD=Data Deficient), Croatia, Serbia, and Romania (EN) (Hodgetts, 2015). The most northerly occurrences of *C. squamiferum* in Europe are in England, where it has also been discovered only recently (Bosanquet, 2014), Germany (Meinunger & Schröder, 2007) and the Czech Republic (Kučera *et al.*, 2012). Outside Europe, Macaronesia, North Africa, eastern, central and south-western Asia, North America, and New Zealand constitute the range of this submediterranean species (Zander, 1993; Ahrens, 2000).

9. *Ephemerum cohaerens* (Hedw.) Hampe

Contributor: V. Hugonnot

France: Landes, Saint-Cricq-du-Gave, 10 m a.s.l., 01°00'38"W, 43°32'12"N, 18 November 2017, *leg.* V. Hugonnot *s.n.* (Private herb. of author); Haute-Garonne, Portet-sur-Garonne, Réserve naturelle de la confluence Garonne-Ariège, 140 m a.s.l., 01°24'37.39"E, 43°31'4.21"N, October 2011, *leg.* M. Wright *s.n.*, (*comm.* J. Celle); Alpes-de-Haute-Provence, Moustiers-Sainte-Marie, Lac de Sainte-Croix, 480 m a.s.l., 06°13'11"E, 43°48'46"N, 7 November 2017, *leg.* V. Hugonnot *s.n.* (Private herb. of author).

Ephemerum cohaerens is a 'European Temperate' moss, scattered through Europe, eastern Asia and eastern North America. The three localities reported here are in south-eastern and south-western France, where the species had not been previously recorded. This means that *E. cohaerens* is undoubtedly more widespread than the few French records would suggest.

The habitats of these collections consisted of periodically inundated muddy soil in open vegetation of vascular plants. Remarkably, associated bryophytes were the same at all three sites: *Physcomitrella patens* (Hedw.) Bruch & Schimp., *Bryum klingraeffii* Schimp., *Dicranella staphylina* H.Whitehouse and *Riccia cavernosa* Hoffm. *emend.* Raddi. All sites are artificial reservoirs and two of them are gravel excavations fed with aquifers. For unknown reasons, the populations of the species seemed to be extremely patchy at one site in spite of the homogeneous and mostly very open belts

of vegetation. The observations were made during the same period (mid November), but the sporophytes in the Alpes-de-Haute-Provence locality were only beginning to differentiate, whereas those in Landes were fully ripe. This probably reflected the time elapsing since exposure of the substrate that allowed the ephemerals to grow. The gametophyte, including protonemata and leaves, was sufficiently distinctive to be identified without difficulty. The protonemata had distinctive fastigiated branches, and the leaves had a characteristically erect, sub-sheathing, abruptly shouldered, broadly oblong base, some leaves possessed a squarrose-recurved, linear apex.

10. *Fissidens curvatus* Hornsch.

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

Italy: Umbria Region, (1) Province of Terni, 'Parco Fluviale del Nera' Regional Park, Marmore Waterfall, 'Petrifying springs with tufa formation (*Cratoneurion*)', 42°33.212'N, 12°42.802'E, ca 307 m a.s.l., in a rock slit (on a thin soil layer), 23 March 2016, *leg.* and *det.* S. Poponessi *s.n.* (PERU). (2) Province of Perugia, Boschi di Ferretto—Bagnolo. This is a Special Area of Conservation (SAC IT5210020), 43°9.578'N, 11°59.466'E, ca 275 m a.s.l., on clayey soil at the edge of a temporary pond, 05 May 2016, *leg.* and *det.* S. Poponessi (PERU).

These investigations focused on a system of Mediterranean temporary ponds categorised as a priority habitat under the EU Directive 92/43/EEC and listed in Annex I with the code 3170* 'Mediterranean temporary ponds.' The research was carried out during a study of the bryophyte component started in 2015 (Ellis *et al.*, 2015, 2016b; Poponessi *et al.*, 2016; Ellis *et al.*, 2017a).

The locality for the first collection, from 'Parco Fluviale del Nera', is in a Special Area of Conservation (SAC IT5220017) and a Special Protection Area (SAC IT5220025) of the Natura 2000 EU-wide network due to the presence of the EU Directive 92/43/EEC Annex I priority Habitat 7220* 'Petrifying springs with tufa formation (*Cratoneurion*)' (Biondi *et al.*, 2012).

This is the first record of *Fissidens curvatus* for two areas in the Umbria region. The ecological features and substrate at the two sites were very different, but the humidity of the environment was similar during the period of observation. According to Dierßen (2001), this species is subneutrophytic and mesohygrophytic, which agrees with the climatic features of the localities in which our specimens were discovered. We confirm, as already noticed for the British sites, that the habitat of this species cannot be described unequivocally, because it was reported both on clay soils in open spaces and on rock (Lockhart *et al.*, 2012).

The present discovery of *F. curvatus* is an interesting addition to the moss flora of Italy (Aleffi *et al.*, 2008). Recent records include only Sardinia (Frahm *et al.*, 2008), while older records included Calabria (Giacomini, 1938) Tuscany (Levier, 1905) and Sardinia (Venturi, 1883), showing a preeminently Thyrrenian distribution for this species in Italy.

Indeed, this taxon has been assigned to the Mediterranean-Atlantic geographical element (Smith, 2004). According to Hodgetts (2015), it is considered as DD (Data Deficient) for Italy, Hungary and Montenegro, DD* (Data Deficient but recently recorded) for Albania and Bulgaria, CR (Critically Endangered) for Slovakia, RE (Regionally Extinct) for Ireland and EN (Endangered) for Great Britain. Its range includes south-western and Mediterranean regions in Europe, occurring from Macaronesia and the Iberian Peninsula, northwards to Great Britain, eastwards to Croatia, Montenegro, Hungary, Bulgaria and Greece (Lockhart *et al.*, 2012; Ros *et al.*, 2013). The worldwide distribution includes Iran, Turkey, China, India, Japan, North Africa, sub-Saharan Africa and Central and South America (Lockhart *et al.*, 2012).

Fissidens curvatus can be distinguished from other small terricolous *Fissidens* species with bordered leaves by its tapering leaves with elongate, papillose cells, but it has possibly been overlooked owing to its small size, sporadic occurrence and typically small amounts (Lockhart *et al.*, 2012).

11. *Fossombronia foveolata* Lindb.

Contributors: S. Ștefănuț and G. M. Maria

Romania: Sibiu County: 'La Mlăcă', near Arpașu de Sus, 45°42'49"N, 24°38'18"E, 555 m a.s.l., on mud, 28 September 2017, *leg.* S. Ștefănuț & G. M. Maria, *s.n.*, *det.* S. Ștefănuț (BUCA B4840-B4842).

Fossombronia foveolata was collected from the vicinity of a slow-flowing stream. The plants grew along with other bryophytes including *Fossombronia wondraczekii* (Corda) Dumort. ex Lindb., *Solenostoma gracillimum* (Sm.) R.M.Schust. and *Ephemerum serratum* (Schreb. ex Hedw.) Hampe.

This is the first report of *Fossombronia foveolata* for Romania (Ștefănuț, 2008; Ștefănuț & Goia, 2012). The nearest locality for this species is in Hungary (Hodgetts, 2015). The conservation status of *F. foveolata* in Romania is Critically Endangered—CR B1ab(ii,iii)+2ab(ii,iii).

Note, *Fossombronia* spore samples were examined and photographed under a JEOL JSM-6610LV microscope.

12. *Hygrohypnum styriacum* (Limpr.) Broth.

Contributor: T. Kiebacher

Italy: Trentino-Alto Adige, South Tyrol, Pfitsch, on the path between Gliederscharte and Wiener Neustatt, 46°57'20.1"N, 11°40'18.6"E, ca 2400 m a.s.l., on

siliceous rocks in a mountain stream, 17 August 2017, leg T. Kiebacher 1589 (priv. herb. T. Kiebacher), *conf.* N. Schnyder.

Hygrohypnum styriacum is a northern hemisphere, arctic-alpine species (Jamieson, 1976; Rothero, 2006). It is known from North America (Canada, Greenland, United States) and Europe (Jamieson, 1976; Goldberg, 2003). In Europe, the species has been recorded in Austria, France, Great Britain, Iceland, Norway, Poland, Romania, Slovakia, Spain, Sweden and Switzerland (Hodgetts, 2015).

In the Alps *H. styriacum* seems to be rare. It is known from a few sites in Austria and Switzerland (Grims, 1999; Swiss bryophytes, 2017) and is classified as Vulnerable in the Swiss Red List (Schnyder *et al.*, 2004). The type locality of *H. styriacum* is located in the Austrian Alps (Limpricht, 1882) and approximately 120 km ENE of the locality where the species has now been found in Italy.

Like most species of the genus, *H. styriacum* is mostly restricted to running waters (Grims, 1999; Jamieson, 2014). The only report of the species from the Sierra Nevada, however, comes from ‘shady hollows on boulder-rich ground in alpine glaciers’ (Oliván *et al.*, 2007). At the locality presented here, *H. styriacum* grew submerged on siliceous rocks in a small stream (*ca* 0.5 m wide). The specimen was collected in passing and only later determined. Hence, information about the size of the population cannot be provided.

13. *Hypnum cupressiforme* Hedw. var. *filiforme* Brid.

Contributors: P. Campisi, M. G. Dia and M. L. Marino

Tunisia: Jendouba, 4.5 km S of Aïn Draham, roadside, 680–700 m a.s.l. 36°44'20"N, 08°40'57"E, 03 April 2014, in a humid *Quercus* L. forest, leg. F. M. Raimondo *s.n.*, *det.* P. Campisi & M. G. Dia (PAL).

This report concerns a specimen collected during the 12th ‘Iter Mediterraneum’ planned in Tunisia by OPTIMA, some records of which were published in Campisi *et al.* (2015) and Ellis *et al.* (2017b). This is the first discovery of *Hypnum cupressiforme* var. *filiforme* in Tunisia.

Hypnum cupressiforme var. *filiforme*, characterised by slender filiform plants and almost straight leaves, is a Mediterranean-boreal, moderately acidophytic-subneutrophytic, mesophytic, moderately sciophytic-considerably photophytic species that grows on tree trunks and vertical cliffs (Dierßen, 2001; Ando, 2012). *Hypnum cupressiforme* var. *filiforme* is reported in several countries in Europe and the Mediterranean area, while in North Africa, according to reports that date back more than half a century (Ros *et al.*, 2013), it was known only in Morocco. Its discovery in Tunisia

extends its known range in North Africa and improves our knowledge of its total distribution.

14. *Jungermannia atrovirens* Dumort.

Contributors: S. Shirzadian and S. Akhoondi Darzikolaei

Iran: East Azerbaijan province, 20 km SW Kalibar, 47°02'N, 38°52'E, 2100 m a.s.l., on moist soil, 20 July 1971, leg. S. Shirzadian 0558 B (IRAN).

During an investigation of unidentified bryophyte specimens in the IRAN herbarium, an interesting liverwort species was found new for the bryoflora of Iran.

According to the checklist of the Iranian bryoflora (Akhani & Kürschner, 2004), four species of *Jungermannia* L. (i.e. *J. gracillima* Sm., *J. hyalina* Lyell, *J. leiantha* Grolle., and *J. subulata* A. Evans) were known from Iran. Later, a fifth species, *Jungermannia caucasica* Váňa was reported for Iran by Kürschner & Frey (2011). Hitherto, *Jungermannia atrovirens* in south-western Asia was known only from Turkey and Lebanon (Kürschner & Frey, 2011).

The species is characterised by dioicous, small, yellowish- to dull-green plants (Kürschner & Frey, 2011); elliptic, cordate or ovate leaves; and a sporophyte with eplicate perianths that gradually taper to an un-beaked mouth. The species usually grows on basic rock along streams, mostly in forest belts at higher montane elevations, usually between 1200 and 2200 m a.s.l.

15. *Microlejeunea strasbergii* Bardat & Ah-Peng

Contributors: T. Pócs, D. A. Callaghan, C. Reeb and R. L. Andriamiarisoa

Madagascar: Manjakatempo-Ankaratra New Protected Area, Vakinankaratra Region, Antananarivo Province, 19°20'31.5"S, 47°17'15.9"E, 2140 m a.s.l., corticolous on stems and twigs of *Maesa lanceolata* Forssk. at edge of native humid forest remnant, associated with *Cololejeunea tanzaniae* Pócs and *Drepanolejeunea pentadactyla* (Mont.) Steph, 16 May 2016, leg. D. A. Callaghan, *det.* T. Pócs (EGR).

A recently described species assumed endemic to Réunion Island (Ah-Peng & Bardat, 2011), was classified as ‘Vulnerable’ under the IUCN Red List criteria due to a small and restricted range on the slopes of the Piton des Neiges volcano (1750–2350 m) (Ah-Peng *et al.*, 2015). The new site in Madagascar has been subject to large-scale deforestation and only remnants of the original humid forest survive. The protected area was established in 2013, though cutting of trees within the native forest, presumably for charcoal production, was witnessed in the reserve during the visit. As on Réunion Island (Ah-Peng & Bardat, 2011), no male shoots were observed. However, perianths were present, providing the first evidence of sexual reproduction.

16. *Neckeropsis cyclophylla* (Müll.Hal.) S.Olsson, Enroth & D.Quandt

Contributors: J. Enroth and J. R. Shevock

U.S.A. Hawai'i: Hawai'i Island, Hawai'i County, North Hilo District. Kolekole stream about 50 yards from Pacific Ocean. Kolekole Beach Park, Highway 19 near milepost 14 between Hakalau and Honomu, 19°53'00"N, 155°7'15"W, 25 ft a.s.l. In shaded zone of stream on volcanic rocks with soil. Hardwood forest dominated by the Moluccan albizia, 29 October 1999, *leg.* James R. Shevock 18736 (CAS, H, PTBG).

This tropical species of the Neckeraceae was known as *Himantocladium cyclophyllum* (Müll.Hal.) M.Fleisch., but it was transferred to *Neckeropsis* Reichardt by Olsson *et al.* (2010). A more detailed phylogenetic analysis of *Neckeropsis* and *Himantocladium* confirmed that it indeed belongs in *Neckeropsis* s.s. (Olsson *et al.*, 2016). The species has been illustrated (as *H. cyclophyllum*) e.g. by Enroth (1989) and Wu (2011).

Neckeropsis cyclophylla has a wide distribution. According to Enroth (1992), it occurs from the Seychelles through India, southern China, throughout the tropical and subtropical SE Asia, and in many island groups in the Pacific, easternmost in the Society Islands. It has not however been reported from Hawai'i before (Staples *et al.*, 2004). The Hawai'ian habitat near sea level is quite typical for the species, as it favours shaded habitats in lowland forests, and grows on trees and rocks.

17. *Pohlia andrewsii* A.J.Shaw

Contributor: J. Kučera

Czech Republic: North-eastern Bohemia, Krkonoše Mts., Obří důl valley: E slopes of Mt Studniční hora, boulder scree below the 'Čertova zahrádka' ravine, 50°43'37"N, 15°43'28"E, 1010 m a.s.l., soil bank along a temporary stream in the scree, 6 September 2017, *leg.* J. Kučera 19804 (CBFS).

Pohlia andrewsii was described relatively recently (Shaw, 1981) from collections originating from a relatively broad distribution in the northern hemisphere (northern North America, Norway including Svalbard, High Tatra Mountains in Slovakia). Subsequently, the moss was reported from numerous European countries with high or northern montane ranges (Austria, Switzerland, Germany, Italy, France, Finland, Russia; Hodgetts, 2015); in Russia, the species is known to extend to the Far East (Ignatov *et al.*, 2006). The new record represents one of its lowest altitudinal occurrences in Central Europe (only in Switzerland, was the species once recorded at 840 m, www.swissbryophytes.ch) but the site has a typically alpine character, located in the avalanche track in scree (mica-schist, gneiss and porphyrite). *Ditrichum heteromallum* (Hedw.) E.Britton,

Oligotrichum hercynicum (Hedw.) Lam. & DC., *Barbilophozia sudetica* (Nees ex Hübener) L.Söderst., DeRoos & Hedd. and *Diplophyllum obtusifolium* (Wahlenb.) Dumort. were recorded as immediate accompanying species, and the alpine *Grimmia sessitana* DeNot. and *Weissia wimmeriana* (Sendtn.) Bruch & Schimp. were recorded nearby. The whole site of the ravine is renowned for the rich flora of moderately to strongly basiphilous montane and alpine bryophytes (Kučera *et al.*, 2004).

18. *Rhodobryum roseum* (Hedw.) Limpr.

Contributors: E. R. F. Souza, A. Silva Pinto, J. B. Silva and S. F. Lopes

Brazil: Fazenda Ipuarana, Lagoa Seca, Paraíba State, 7°9'29"S, 35°52'02"W, 700 m a.s.l., on litter, 20 September 2017, *leg.* E. R. F. Souza 1864 (ACAM).

Rhodobryum roseum is recorded from Europe, Japan, China, eastern and southern Africa, Madagascar, Thailand, North America, Central America, and Brazil (Magill, 1987; Smith, 2004; Tropicos, 2017). In Brazil, it is rare and of the three catalogued records, two are for the north-eastern region in Atlantic forest, ombrophilous and mixed ombrophilous forests (Peralta, 2015).

We collected the moss at 700 m a.s.l. in submontane semideciduous forest of As-type climate, according to the Köppen-Geiger classification (Alvares *et al.*, 2014) with an annual mean rainfall of 970 mm, and a dry season from four to five months (Andrade *et al.*, 1999). Leaves with bordered margins, fast leaf reorientation, and strong costal bands of stereids are attributes potentially adaptive to the conditions of dry environments, since they avoid damage by excess luminosity and optimise water conduction (Kürschner, 2004; Crandall-Stotler & Bartholomew-Began, 2007; Vanderpoorten & Goffinet, 2009).

Taxonomic characteristics that facilitate its identification are the terminal rosette formed by large leaves with a recurved margin up to 2/3 or more from the leaf base and a serrated upper margin. *Rhodobryum roseum* is a species very similar to *R. ontariense*, although the latter has a broadly acute apex and longer marginal teeth (Iwatsuki & Koponen, 1972).

19. *Rhynchostegiella litorea* (De Not.) Limpr.

Contributors: P. Campisi, M. G. Dia and M. L. Marino

Tunisia: ca 5 km SW of Bizerta, sandy coast N of Habib Arifa, 0–5 m a.s.l. 37°15'16"N, 09°55'20"E, 31 March 2014, *leg.* F. M. Raimondo s.n., det. P. Campisi & M. G. Dia (PAL).

In the course of studying the bryophyte specimens collected during the 12th 'Iter Mediterraneum' organised by OPTIMA (Tunisia, 24 March–4 April 2014), some noteworthy taxa were found. In addition to the results already published (Campisi *et al.*, 2015; Ellis *et al.*, 2017b), the species *Rhynchostegiella litorea* is

here recorded for the first time from Tunisia. This small light green-yellowish moss has been frequently treated as a variety of *R. tenella*. At present, it is recognised as a separate species because of some morphological features that differentiate it from the former, such as the papillose seta, the shorter costa, the larger spores and the wider axillary hairs (Guerra *et al.*, 2014). Moreover, in recent years molecular data have supported this separation (Aigoïn *et al.*, 2009). *Rhynchostegiella litorea* is a Mediterranean-oceanic species, growing on rocks, boulders, tree stems and roots; it is a basiphytic, considerably hygrophytic and shade loving, a hemerobous-oligohemerobous moss (Dierßen, 2001).

The species is widely distributed in Europe and in Macaronesia, where it is listed as Near Threatened in Great Britain and in the Canary Islands (Hodgetts, 2015). In northern Africa, it was already known in Algeria, Morocco and, based on old reports (before 1962), in Libya (Ros *et al.*, 1999, 2013). The new report from Tunisia improves our knowledge of the distribution of this species in North Africa.

20. *Rhytidiadelphus loreus* (Hedw.) Warnst.

Contributors: S. Shirzadian and S. Akhoondi Darzikolaei

Iran: E. Azerbaijan province, 20 km SW Kalibar, 47°02'N, 38°52'E, 2100 m a.s.l., on moist soil, 20 July 1971, *leg.* S. Shirzadian 0559 B (IRAN).

During an investigation of unidentified bryophyte specimens in the IRAN herbarium, this moss was found new for the bryoflora of Iran.

According to Kürschner and Frey (2011), the Hylocomiaceae in Iran included three valid genera, namely, *Ctenidium* (Schimp.) Mitt., *Pleurozium* Mitt., and *Hylocomiadelphus* Ochyra & Stebel. In both the checklist of Akhani and Kürschner (2004) and the bryophyte flora for south-west Asia (Kürschner & Frey, 2011), no species of *Rhytidiadelphus* is reported from Iran. However, Sharifnia *et al.* (2012) reported *R. squarrosus* (Hedw.) Warnst., which was already known from Turkey, from Guilan province (N. Iran), and Kürschner and Frey (2011) listed another species of the family Hylocomiaceae; *Rhytidiadelphus triquetrus* (Hedw.) Warnst., as *Hylocomiadelphus triquetrus* (Hedw.) Ochyra & Stebel., reporting the latter from both Iran and Turkey.

Rhytidiadelphus loreus reaches to 15 cm high, has plicate stem leaves and angular cells not much differentiated. These two characters separate it from both *R. squarrosus* and *R. subpinnatus* (Lindb.) T.J.Kop., which have stem leaves without plications and angular cells that form distinct groups (Smith, 2004). Procumbent or stoloniform shoots, arcuate branches, falcato-secund leaves and denticulate margins are the main distinguishing characters of the species.

Rhytidiadelphus loreus is already known from Turkey (Kürschner & Frey, 2011). It generally occurs on rocks, fallen logs, humus and at the base of trees in woodlands and other humid habitats.

21. *Schistidium falcatum* (Hook.f. & Wilson) B.G.Bremer

Contributors: H. Bednarek-Ochyra and M. Lebouvier

South Indian Ocean, Iles Crozet, Île de la Possession:

(1) valley south of station, east of Mont Branca, 180 m a.s.l., 46°26'49"S, 51°50'06"E, on rocks at streamside, 29 December 1978, *leg.* B. G. Bell 1588 & 1589 (AAS, KRAM); (2) river in valley leading to Crique de la Chaloupe, 25 m a.s.l., 46°24'40"S, 51°51'29"E, on rock in stream, 7 January 1979, *leg.* B. G. Bell 1655 (AAS, KRAM); (3) Malpassée River west of junction with northern tributary, 160 m a.s.l., 46°27'02"S, 51°49'31"E, on rock in river, 27 January 1979, *leg.* B. G. Bell 2007 (AAS, KRAM); (4) Grande Cascade, 270 m a.s.l., 46°25'36"S, 51°48'01"E, on very wet rock surface, 28 January 1979, *leg.* B. G. Bell 2080 (AAS, KRAM); (5) valley leading to Crique du Sphinx, 0.5 km from the sea, 60 m a.s.l., 46°24'56"S, 51°51'42"E, on rock in stream, 7 February 1979, *leg.* B. G. Bell 2285 (AAS, KRAM); (6) stream leading to Crique du Sphinx, 0.5 km from beach, 20 m a.s.l., 46°24'53"S, 51°51'52"E, on rock near stream, 9 February 1979, *leg.* B. G. Bell 2325 & 2330 (AAS, KRAM); (7) Vallée des Branloires, Moby Dick Rivière, 1 km east of les Deux Rouquines, 95 m a.s.l., 46°24'37"S, 51°46'27"E, on rocks in river, 10 February 1979, *leg.* B. G. Bell 2336 (AAS, KRAM); (8) north side of Vallée des Branloires, south-east of Mont de l'Alouette, 60 m a.s.l., 46°23'04"S, 51°44'48"E, on rocks in stream, 6 March 1979, *leg.* B. G. Bell 2775 (AAS, KRAM); (9) near river leading to Crique de la Chaloupe where its two main tributaries join, north-east of Le Donjon, 50 m a.s.l., 46°24'39"S, 51°51'03"E, on surface of moist rocks at riverside, 13 March 1979, *leg.* B. G. Bell 2896 (AAS, KRAM); (10) in the valley of the Rivière du Camp, north of the Alfred Faure base, 60 m a.s.l., 46°25'20"S, 51°50'E, on stones in swiftly flowing water in the stream, 10 November 2006, *leg.* R. Ochyra 100/06 & 106/06 with Marc Lebouvier (KRAM).

The occurrence of *Schistidium falcatum* on Île de la Possession in the Îles Crozet archipelago in the subantarctic was incidentally mentioned by Ochyra & Bell (1984), but no specimens or details of this record were cited. The deficiency of the formal background of the record of this species in this area is substantiated herein by the citation of a number of specimens collected on Île de la Possession. As a typical rheophyte, this species appears to be frequent in stream beds and small rivers, growing attached to stones and boulders

and usually submerged in swiftly flowing water. The vast majority of species of the genus *Schistidium* Bruch & Schimp. are xerophytic, growing on dry and exposed rocks, but hydrophytes are also present in this genus and *S. falcatum* is a typical representative of this group. Most of the hydrophytic species of *Schistidium* are placed in subg. *Canalicularia* Ochyra, and were reviewed by Ochyra (2003) who included nine species in the group. However, since then additional species have been described, for example, *S. frahmianum* Ochyra & Afonina from Chukotka and Alaska (Ochyra & Afonina, 2010), *S. mucronatum* H.H.Blom, Shevock, D.G.Long & Ochyra and *S. riparium* H.H.Blom, Shevock, D.G.Long & Ochyra from China (Blom *et al.*, 2011), and *S. deguchianum* Ochyra & Bedn.-Ochyra from Peru (Ochyra & Bednarek-Ochyra, 2011), so this group presently consists of 15 species (Ochyra & Bednarek-Ochyra, 2015b).

Schistidium falcatum is an amphiatlantic subantarctic species having the main centre of its distribution on subantarctic islands, including South Georgia (Bell, 1984) in the South Atlantic Ocean and the Prince Edward Islands (Ochyra & Hertel, 1990), Îles Crozet and Îles Kerguelen from where it was originally described (Hooker & Wilson, 1844 as *Grimmia falcata* Hook.f. & Wilson) in the Kerguelen Biogeographical Province in the South Indian Ocean. It is most probable that *S. falcatum* is a postglacial coloniser on Île de la Possession, which could have reached this island via long distance aerial dispersal after the Last Glacial Maximum, as is the case with the flora of other subantarctic (Van der Putten *et al.*, 2004, 2009, 2010) and periantarctic islands (Birkenmajer *et al.*, 1985). Potential sources for the origin of the subantarctic populations may be the southern South American localities of the species in Tierra del Fuego and Western Patagonia. They are situated about 7250 km west of Île de la Possession but the prevailing westerly winds are an excellent dispersal vehicle for plants and animals in the southern hemisphere (Muñoz *et al.*, 2004). This distribution pattern is exhibited by some austral cool-adapted species of liverworts (e.g. Blockeel *et al.*, 2009; Vána *et al.*, 2010, 2014; Ochyra *et al.*, 2014a) and mosses (e.g. Ochyra & Lewis Smith, 1998; Ochyra & Singh, 2008; Li *et al.*, 2009; Ochyra, 2010; Bednarek-Ochyra & Ochyra, 2013; Ochyra & Bednarek-Ochyra, 2013; Ochyra *et al.*, 2014b, 2015) which are bicentric in distribution in the austral cool-temperate regions. Considering the present record the moss flora of Îles Crozet consists currently of over 70 species.

22. *Schistidium pruinosum* (Wilson) G.Roth

Contributors: O. M. Afonina and E. A. Ignatova

Russia: Southern Siberia, Republic of Buryatia, Zabaikalsky National Park, Baikal Lake, Svyatoy

Nos Peninsula, near Kurbulik settlement, 53°42'05.2"N, 109°02'06.5"E, 480 m a.s.l., E-facing cliffs on lake shore, in crevices, 29 July 2014, *leg.* Yu.S. Mamontov, 421/1 (LE); Southern Siberia, Zabaikalsky Territory, near Nizhniy Tsasuchei settlement, 50°31'N, 115°02'E, 512 m a.s.l., bank of Onon River, on rocks, 18 July 2006, *leg.* Afonina, 5306 (LE).

Schistidium pruinosum is a mainly European species. It is distributed from Great Britain and the south of Scandinavia to the south of France and the mountains of Central Europe. In Asia, it is known from the east of Asia Minor and the Caucasus. It is recorded from the Russian Far East (Khabarovsk Territory, Botchinsky State Nature Reserve) (Ignatova *et al.*, 2013) and recently was found in the Urals (Bashkortostan) (Ignatova & Blom, 2017). The present localities are the first in Siberia.

Schistidium pruinosum differs from other *Schistidium* species with a papillose lamina in its small (6–9 µm) rounded and ovate leaf cells and the irregularly bistratose lamina in the upper half of the leaf (Blom, 1996).

23. *Sematophyllum substrumosum* (Hampe) E.Britton

Contributor: V. Hugonnot

France: Tarn, Arfons, Parc Naturel Régional du Haut-Languedoc, Montagne Noire, forêt domaniale de la Montagne Noire, 750 m a.s.l., 43.45240; 2.17467, 7 July 2017, *leg.* V. Hugonnot *s.n.* (Private herb. of author).

In Montagne Noire, *Sematophyllum substrumosum* occurred in a plantation of *Pseudotsuga menziesii* (Mirb.) Franco, on small pieces of spongy textured wood almost incorporated in the litter. More exceptionally the plant colonised logs or stumps. It formed small colonies of several cm², 5–10 m distant from each other, most probably a reflection of the availability of adequate substrate. Patches were generally embedded in overlying pleurocarpous mats, which probably contribute to maintaining conditions of high humidity. This is especially significant since these conifer plantations are dry habitats during summer. Most frequently associated species were *Hypnum cupressiforme* Hedw. var. *cupressiforme* and *H. jutlandicum* Holmen & Warncke. *Campylopus flexuosus* (Hedw.) Brid. and *C. introflexus* (Hedw.) Brid. are not frequently associated with *Sematophyllum substrumosum* since they seem to prefer larger woody debris. On soil, 80% of the surface was colonised by *Pseudoscleropodium purum* (Hedw.) M.Fleisch., *Thuidium tamariscinum* (Hedw.) Schimp. and *Polytrichastrum formosum* (Hedw.) G.L.Sm. The local ecology is comparable to the available data derived from published records (Matcham *et al.*, 2005; De Zuttere & Watzet, 2008). Given the dull habitat *Sematophyllum substrumosum* may colonise,

it is probably more widespread in France than current records suggest.

In France, to date *Sematophyllum substrumulosum* has been reported only from a narrow coastal stretch of Oceanic and Mediterranean regions (Hugonnot, 2010). In Montagne Noire, it grows 100 km from the coast in a montane environment. The species is likely expanding its range by taking advantage of abundant sporophyte production and small spores as underlined by Sérgio *et al.* (2011) and Bosanquet (2013). The record in Montagne Noire does not fit the modelling of Sérgio *et al.* (2011) which mostly predict an Oceanic invasion by 2050. Such predictions are based upon robust climatic scenarios and the assumption that a given species does not change its behaviour across time. This is possibly not the case, as a growing number of studies have shown that species are able to evolve rapidly in response to climate change. Droughts or changes in precipitation may be potent selective factors that lead to modifications of ecological dynamics. This is backed-up by the findings of Bosanquet (2013), which demonstrate more rapid changes in the repartition of *Sematophyllum substrumulosum* than initially predicted. The question needs to be studied in more detail.

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