

NEW BRYOPHYTE RECORDS FOR WEST AND CENTRAL AFRICAN COUNTRIES

Frank Müller

*Institut für Botanik, TU Dresden, 01062 Dresden, Germany;
E-mail: frank.mueller@tu-dresden.de*

Abstract: Nineteen new country records for Liberia, eleven for Ivory Coast, two for the Democratic Republic of the Congo, and three from Equatorial Guinea (Bioko) are presented. The following new combination is proposed: *Entosthodon cameruniae* (Dixon) N.Wilding ex Frank Müll., comb. nov. (Basionym: *Funaria cameruniae* Dixon). Figure plates are presented for *Entosthodon cameruniae* and *Trachypodopsis normandii*. The latter one, an endemic of mountainous areas of West Africa and hitherto only known from Fouta Djallon in Guinea and the Loma Mountains in Sierra Leone could be the first record for the Nimba Mountains of Liberia.

Keywords: biodiversity, bryophytes, distribution, inventory, tropical forests, liverworts, hornworts, mosses, new records, Palaeotropis, Africa

INTRODUCTION

Beginning in 1991, the author has been on several bryological field trips to West and Central Africa and has published on the results (Müller 1995, 1996, 2006; Müller and Schäfer-Verwimp 1999; Müller *et al.* 2000; Váňa and Müller 2003; Müller and Pócs 2007). The collections include a large amount of material that has not yet been identified to species level. In the meantime, some taxonomical revisions and especially the liverwort and hornwort flora of West Africa (Wigginton 2004) have been published, so that a part of this hitherto undetermined material could now be determined. In addition, through the kindness of Dr. Timm Karisch, a smaller collection of bryophytes collected by him in the Nimba Mountains in Liberia could be examined.

Voucher specimens are deposited in the herbarium of the Institute of Botany of the University of Dresden (DR). If not otherwise stated, the nomenclature of the hornworts and



liverworts follows Söderström *et al.* (2016) and of the mosses the Tropicos database (Missouri Botanical Garden 2023).

RESULTS

The following inventory of taxa lists 19 new distributional records for Liberia, 11 for Ivory Coast, three for Equatorial Guinea (Bioko) and two for the Democratic Republic of the Congo that have not been previously published.

Hornworts

Anthoceros myriandroecius Steph.

Democratic Republic of the Congo. Province Kivu, volcano Nyiragongo 15 km NNW of Goma, c. 3000 m, wet slopes, 1°32'S, 29°15'E, 27 Aug 1991, leg. & det. *F. Müller* Z 191 & Z 193, conf. S.R. Gradstein

An African endemic, hitherto known from montane habitats in Kenya, Rwanda, Tanzania, and Uganda (Wigginton 2018).

Liverworts

Cheilolejeunea krakakammae (Lindenb.) R.M.Schust.

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, Blue Lake viewpoint 6 km SE village, grassland in former mining area, 26 Aug 2022, *T. Karisch s. n.*

A palaeotropical species, known from New Zealand, Australia, Asia and Africa. In Africa the species is mainly distributed from the eastern and southern part of mainland Africa and from the East African islands. Müller and Pócs (2007) reported it first for West Africa from Bioko.

Cheilolejeunea rigidula (Nees ex Mont.) R.M.Schust.

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, Blue Lake viewpoint 6 km SE of village, grassland in former mining area, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE of village, path from end of road towards Blue Lake viewpoint, before ascent, 7°32'N, 8°30'W, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8N, 8°30'8.6W, 26 Aug 2022, *T. Karisch s. n.*

The species is better known in Africa under the name *Ch. serpentina* (Mitt.) Mizut., but Bastos (2012) has synonymized it

with *C. rigidula*. A pantropical species, widely distributed in tropical Africa, but hitherto unknown from Liberia.

Cheilolejeunea trifaria (Reinw., Blume & Nees) Mizut.

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, 25 Aug 1997, *leg.* F. Müller E296 & E298 (DR).

Liberia. Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE of village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

A pantropical species, widely distributed in West Africa, but hitherto unknown from Ivory Coast and Liberia.

Cheilolejeunea usambarana (Steph.) Grolle

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, Blue Lake viewpoint 6 km SE village, grassland in former mining area, 26 Aug 2022, *T. Karisch s. n.*

An African endemic, apparently rare in West Africa (Cameroun, Guinea, Sierra Leone, Gabon [Malombe 2007]), elsewhere in Africa reported from Congo-Brazzaville, Ethiopia, Kenya, Malawi, Réunion, Tanzania (Wigginton 2018), and Madagascar (Marline *et al.* 2012).

Lejeunea abyssinica (Gola) Cufod.

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, with *Cheilolejeunea rigidula* (Nees ex Mont.) R.M.Schust., 25 August 1997, *leg.* F. Müller E306, E326; District des Montagnes, surrounding of the village Gouedie 24 km NW of Man, 07°32'N, 07°45'W, remnant of tropical lowland rainforest, epiphytic, 18–21 August 1997, *leg.* F. Müller E318.

An African endemic, widely distributed in tropical Africa, but hitherto unknown from Ivory Coast (Wigginton 2018).

Lejeunea flava (Sw.) Nees subsp. *flava*

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, with *Thysananthus niger* (Steph.) Sukkharak & Gradst. and *Ceratolejeunea cornuta* (Lindenb.) Steph., 25 August 1997, *leg.* F. Müller E313, E321 & E323 (DR).

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE of village, just south of Blue Lake viewpoint, on the ground, 26 Aug 2022, *T. Karisch s. n.*

A pantropical species, widely distributed in tropical and southern Africa (Wigginton 2018).

***Metzgeria ciliata* Raddi**

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, 25 August 1997, leg. F. Müller E246.

A pantropical species with a montane character in Africa. The African material for a long time has been classified as *M. decipiens* (C.Massal.) Schiffn., but Grolle (2001) and So (2004) have synonymized this with *M. furcata* (L.) Corda. This synonymisation is rejected by Costa (2008) and not followed in the World Checklist (Söderström *et al.* 2016).

***Metzgeria warnstorffii* Steph. (*M. madagassa* Steph.)**

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, 25 August 1997, leg. F. Müller E247.

An African endemic with a mostly montane distribution. In West Africa the species is confirmed only from Cameroon, Nigeria, Ghana (Hodgetts *et al.* 2016) and Liberia, otherwise it is widespread from Ethiopia to South Africa and on the East African Islands (Wigginton 2018). In the African checklist (Wigginton 2018) the species is treated as *M. madagassa* Steph., but Söderström and Hagberg (2023) has shown that the correct name of this taxon should be *Metzgeria warnstorffii* Steph.

***Plagiochila heterostipa* Steph.**

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village, above camp at Celcom Road, on lying fallen tree, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch *s. n.*

African endemic, widespread in tropical Africa.

***Plagiochila moenkemeyeri* Steph.**

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, on lianas, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch *s. n.*

Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE village, just S of Blue Lake viewpoint, on the ground, 26 Aug 2022, T. Karisch *s. n.*

African endemic, frequent in rainforest habitats of West Africa and elsewhere known from Angola, Ethiopia, Tanzania (Wigginton 2004, 2018), Kenya (Enroth *et al.* 2019), South Sudan (a syntype), and D.R. Congo (Jones 1962).

***Schiffneriolejeunea pappeana* (Nees) Gradst.**

Ivory Coast. District des Montagnes, Man, Cascade de Man 4 km W of Man, 07°25'N, 07°53'W, c. 400 m a.s.l., tropical lowland rainforest, epiphytic, 23 August 1997, *F. Müller E347*; District des Montagnes, surrounding of the village Gouedie 24 km NW of Man, 07°32'N, 07°45'W, remnant of tropical lowland rainforest, epiphytic, 18–21 August 1997, *F. Müller E322 & E338*.

African endemic. Usually montane and found above 1000 m, known in West Africa only from Cameroon, Guinea, São Tomé, Annobón, Bioko (Wigginton 2004), and Ghana (Hodgetts *et al.* 2016), but otherwise widely distributed in other parts of tropical and southern Africa (Wigginton 2018).

***Spruceanthus abbreviatus* (Mitt.) X.Q.Shi, R.L.Zhu & Gradst.**

Ivory Coast. District des Montagnes, surrounding of the village Gouedie 24 km NW of Man, 07°32'N, 07°45'W, remnant of tropical lowland rainforest, epiphytic, 18–21 August 1997, *F. Müller E331*.

Very common in the lowland rainforest districts of West Africa (Wigginton 2004) and otherwise known in Africa from Angola, Mauritius, Malawi, Tanzania, and Uganda (Wigginton 2018).

***Thysananthus humilis* (Gottsche) Sukkharak & Gradst.**

Ivory Coast. District des Montagnes, surrounding of the village Gouedie 24 km NW of Man, 07°32'N, 07°45'W, c. 800 m a.s.l., hill north of the village, remnant of tropical rainforest, epiphytic, 18–21 August 1997, *F. Müller E348*.

For a long time, the species was treated as conspecific with *T. auriculatus* (Wilson & Hook.) Sukkharak & Gradst., but it was reinstated as a species worthy of recognition by Sukkharak and Gradstein (2014). Morphologically, *T. humilis* differs from *T. auriculatus* by rather flat, mostly ovate leaves with \pm plane margins, and by the truncate apical margin of the lobule which terminates at the end of the keel (Sukkharak and Gradstein 2004). The general distribution includes Africa, Indomalesia, northeastern Australia and tropical Pacific region. In sub-Saharan Africa the species is widely distributed, but was hitherto unknown from Ivory Coast (Wigginton 2018).

Mosses

Bryum huillense Welw. & Duby

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, Blue Lake viewpoint 6 km SE village, on soil in grassland in former mining area, 26 Aug 2022, *T. Karisch s. n.*

Mexico to Brazil, Africa, India; widely distributed in sub-Saharan Africa (O'Shea 2006).

Bryum kikuyuense (Broth. & Thér.) N.Pedersen

(syn. *Brachymenium philonotula* Broth.)

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE village, path from end of road towards Blue Lake viewpoint, before ascent, 7°32'N, 8°30'W, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

Widely distributed in sub-Saharan Africa (O'Shea 2006) and elsewhere only known from Madeira (Holyoak 2021).

Campylopus obrutus Thér. & P.de la Varde

Liberia. Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE village, path from end of road towards Blue Lake viewpoint, before ascent, 7°32'N, 8°30'W, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

An African endemic, a common element of the flora of the West African lowland rainforest area and otherwise known from Angola, Burundi, Rwanda, and the Democratic Republic of the Congo (O'Shea 2006; Müller 2015).

Chionoloma hyalinoblastum (Broth.) M.Alonso

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, on lying rotten wood, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, *T. Karisch s. n.*

The genus was revised by Alonso *et al.* (2019). *Chionoloma hyalinoblastum* is a pantropical species. The species is known from a few localities in Asia (India, Sri Lanka, and Thailand), tropical Africa (Angola, Benin, Central African Republic, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Malawi, Nigeria,

Sierra Leona, Tanzania, Togo, Zambia, and Zimbabwe) and South America (Brazil) (Cano *et al.* in Ellis *et al.* 2022).

***Ectropothecium anisophyllum* Broth.**

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch *s. n.*

An African element known from Angola, Cameroon, the Central African Republic, Congo-Brazzaville, Gabon, Guinea, Ivory Coast, Liberia, Uganda, and the Democratic Republic of the Congo (Hedenäs 2005; O'Shea 2006; Müller 2015). The material from Liberia agrees well with the description and figures in Hedenäs (2005).

***Entosthodon cameruniae* (Dixon) N.Wilding ex Frank Müll. comb. nov.** Basionym: *Funaria cameruniae* Dixon, Ann. Bryol. 6: 23 (1933). (Figure 1)

Bioko. Pico Basile, top of the mountain and crater NE, 03°35'N, 08°46'E, c. 2840–3010 m, on earthy slopes along paths in alpine grassland and *Philippia-Hypericum lanceolatum* shrubland, 6–7 Feb 2002, F. Müller B641 & B644.

The circumscription of the genera *Entosthodon* and *Funaria* has long troubled taxonomists with *Entosthodon* often being recognized as a subgenus of *Funaria*. As Dixon (1933) has described his new species he treated it under *Funaria*, but gives the information that it belongs to subgenus *Entosthodon*. Fife (1985) in his generic revision of the Funariaceae concluded that *Entosthodon* should be distinguished from *Funaria* based on the absence of a compound, revoluble annulus in the former. This view is followed in the treatment of the African Funariaceae in GBA online (Müller 2000). Furthermore, the separation of the two genera is supported by recent phylogenetic work on the family Funariaceae (Liu *et al.* 2012).

In the meantime a thoroughly revision of the African *Entosthodon* was done (Wilding 2015). In this unpublished doctoral thesis the combination of the species as *Entosthodon cameruniae* is already proposed, but because this online publication doesn't have an International Standard Serial Number (ISSN) or an International Standard Book Number (ISBN) it cannot be considered an effective publication in the sense of the International Code of Nomenclature for algae, fungi, and plants (Article 29).

Entosthodon cameruniae can be distinguished by its oblong-ovate to ovate-lanceolate leaves, zygomorphic, gibbous capsules with rudimentary endostome and verrucate-lirate to reticulate spores (Wilding 2015). The species was originally described from Mt Cameroon in Cameroon and for a long time it was only known from this site, but Wilding (2015) has seen an additional specimen from Gojam in Ethiopia. As already explained by Müller (2006) the bryophyte flora of the highest mountain of Bioko, Pico Basile, shows a great similarity with that of Mt Cameroon. Therefore, it is not surprising to discover *E. cameruniae* here.

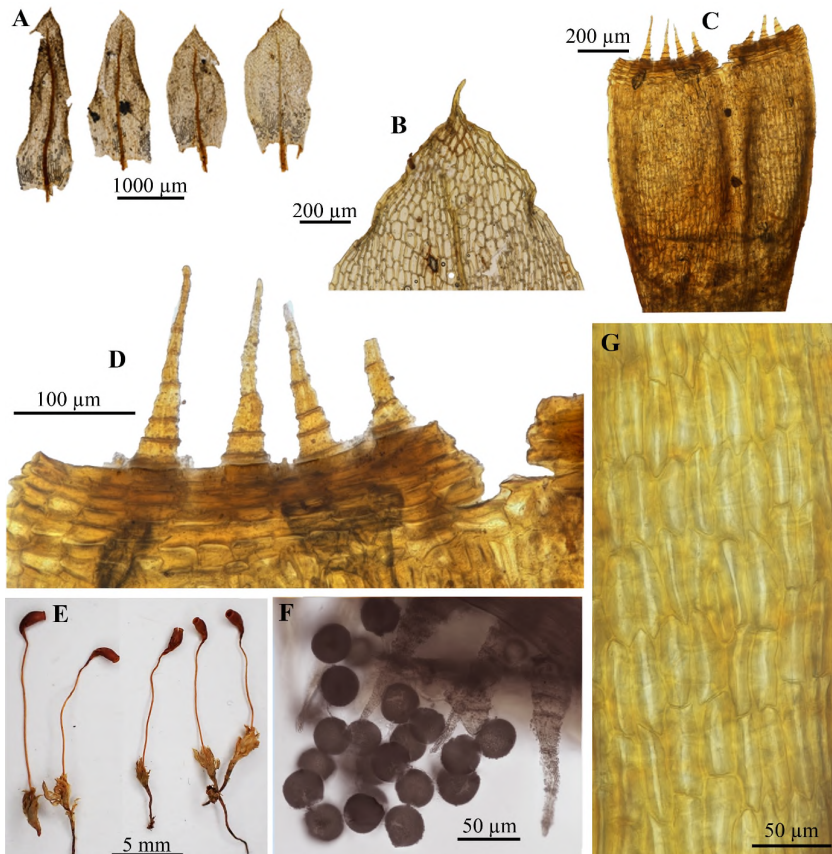


Figure 1. *Entosthodon cameruniae* (Dixon) N.Wilding ex Frank Müll. **A.** Leaves. **B.** Leaf apex. **C.** Part of capsule with peristome. **D.** Capsule mouth with peristome. **E.** Plants with sporophytes in dry condition. **F.** Spores. **G.** Cells of exothecium in middle part of capsule (all from *F. Müller B644*).

Gemmabryum acuminatum (Harv. ex Hook.) J.R.Spence & H.P.Ramsay (syn. *Brachymenium acuminatum* Harv. in Hook.)

Liberia. Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE village, path from end of road towards Blue Lake viewpoint, before ascent, 7°32'N, 8°30'W, 26 Aug 2022, *T. Karisch s. n.*

A pantropical species, widely distributed in sub-Saharan Africa, but hitherto unknown from Liberia (O'Shea 2006).

Gemmabryum exile (Dozy & Molk.) J.R.Spence & H.P.Ramsay (syn. *Brachymenium exile* (Dozy & Molk.) Bosch & Sande Lac.)

Liberia. Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

A pantropical-subtropical species, widely distributed in sub-Saharan Africa (O'Shea 2006).

Groutiella tomentosa (Hornsch.) Wijk & Margad.

(*Groutiella laxotorquata* (Müll.Hal. ex Besch.) Wijk & Margad.)

Bioko. Village Ruiche 5 km S of Luba, 03°25'N, 08°33'E, c. 750 m a.s.l., epiphytic in the village, Aug 1994, *F. Müller B229*; mountain Caldera 10 km S of Luba, on the NNE slope along the path from Ruiche to the summit, 03°24'N, 08°33'E, transition between the cultivated land around the village and rainforest, 20 Aug 1994, *F. Müller B228*.

In Africa the species is better known under the name *Groutiella laxotorquata* and under this it is also included in the recent checklist (O'Shea 2006), but Yu *et al.* (2011) have shown that *G. laxotorquata* is conspecific with the widespread *Groutiella tomentosa* (Hornsch.) Wijk & Margad., which is known from America and Asia. The species is widespread in tropical Africa.

Hyophila involuta (Hook.) A.Jaeger

Liberia. Nimba Mountains, alt. 1220–1240 m, Yekepa, just before Blue Lake viewpoint at old mining area 6 km SE village, on soil in grassland, 7°32'4.8"N, 8°30'8.6"W, 26 Aug 2022, *T. Karisch s. n.*

Nimba Mountains, alt. 1250 m, Yekepa, ca. 6 km SE village, path from end of road towards Blue Lake viewpoint, before ascent, 7°32'N, 8°30'W, 26 Aug 2022, *T. Karisch s. n.*

A subcosmopolitan species, common and widespread in tropical Africa, but hitherto not registered for Liberia.

Isopterygium mbangae (Müll.Hal.) A.Jaeger

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, 25 Aug 1997, F. Müller E397.

An African species, known from Angola, Cameroon, Gabon, Sudan, Tanzania, Uganda, and the Democratic Republic of the Congo (Hedenäs 2005; O'Shea 2006; Müller 2015).

Lewinskya leptocarpa (Bruch & Schimp. ex Müll.Hal.) Vigalondo, F.Lara & Garilleti (syn. *Orthotrichum leptocarpum* Bruch & Schimp. ex Müll.Hal.)

Democratic Republic of the Congo. Province Kivu, volcano Nyiragongo 15 km NNW of Goma, 01°32'N, 29°15'O, c. 3000 m a.s.l., epiphytic on *Dendrosenecio johnstonii* (H.H.Johnst.) B.Nord., 27 Aug 1991, F. Müller Z369.

The above cited specimen was determined by Jette Lewinsky on 9 March 1992 as *Orthotrichum affine*. Lewinsky (1978), in her revision of the African *Orthotrichum*, listed *O. leptocarpum* as a synonym of *O. affine*. In the new revision by Vigalondo *et al.* (2020) *L. leptocarpa* is reinstated as a separate species. The authors assume that all reports of *L. affinis* (*Orthotrichum affine*) in sub-Saharan Africa belong to this species. Confirmed records of *L. leptocarpa* Vigalondo *et al.* (2020) refer for Ethiopia, Kenya and Tanzania. O'Shea (2006) also signalled *Orthotrichum affine* from Rwanda, Uganda and the Democratic Republic of Congo. The above mentioned specimen was re-evaluated and it really belongs to *L. leptocarpa*, so that the occurrence of this species could be confirmed for the Democratic Republic of the Congo. The material shows the characteristics described by Vigalondo *et al.* (2020) for the species: exothecial bands slightly differentiated, short, usually restricted to urn upper third, separated from capsule mouth by a continuous suboral ring of differentiated short cells; leaves broadly ovate-lanceolate with broadly revolute margins; moderately to strongly hairy calyptra; spores of 19–24 µm in diameter (Vigalondo *et al.* 2020 indicate a range of 19–28 µm).

Orthostichella pandurifolia (Müll.Hal.) W.R.Buck

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, on lying rotten wood, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch s. n.

An African endemic, known from West, East, and South Tropical Africa, and South Africa (Allen and Magill 2007).

Pelekium chenagonii (Müll.Hal. ex Renauld & Cardot) Touw

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, on the ground, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch s. n.

An African endemic, widely distributed in sub-Saharan Africa (O'Shea 2006).

Rhacopilopsis trinitensis (Müll.Hal.) E.Britton ex Dixon

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village above camp at Celcom Road, on lianas, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch s. n.

Watling and O'Shea (2000) accepted only two species of *Rhacopilopsis* worldwide. *Rhacopilopsis trinitensis* is characterised by complanate shoots and up to four rows of supra-alar cells and is known from Central America, the West Indies and the northern part of South America, tropical Africa, South Africa and Madagascar (Watling and O'Shea 2000; Ireland and Buck 2009). In sub-Saharan Africa the species is widely distributed, but was hitherto unknown from Liberia (O'Shea 2006).

Rhacopilopsis variegata (Welw. & Duby) M.C.Watling & O'Shea

Ivory Coast. District des Montagnes, Man, Mt. Tonkoui 10 km NW of Man, 07°27'N, 07°38'W, c. 1200 m a.s.l., tropical rainforest, epiphytic, 25 Aug 1997, F. Müller E100, E377 & E396.

Rhacopilopsis variegata differs from *R. trinitensis* in having non-complanate shoots and four or more rows of supra-alar cells (Watling and O'Shea 2000). *Rhacopilopsis variegata* is endemic to Africa, occurring over a similar range to *R. trinitensis*, but less frequently and usually at greater elevations (Watling and O'Shea 2000).

Schlotheimia ferruginea (Burch. ex Hook. & Grev.) Brid.

Ivory Coast. District des Montagnes, surrounding of the village Gouedie 24 km NW of Man, 07°32'N, 07°45'W, remnant of tropical lowland rainforest, epiphytic on branches falling from the treetop, 18–21 Aug 1997, F. Müller E366 & E370.

A palaeotropical species, widespread across sub-Saharan Africa (Wilbraham 2008).

Taxithelium kaernbachii (Broth.) Broth.

Bioko. Ureca W, coast between the river mouth of the Rio Ole and Punta Sagre (= Playa de Moraca), 03°16'N, 08°29'E, c. 0–100 m a.s.l., on shady boulders and on wet rock face in lowland rainforest, 14–15 Feb 2002, F. Müller B476 & B831.

Taxithelium kaernbachii is known only from a few collections but from a wide area, including Malesia (Papua New Guinea, Philippines, Indonesia, Malaysia, Singapore), Cameroon, and the Seychelles (Câmara 2011). It is most likely under-collected due to its small size (leaves are less than 0.5 mm long).

In Africa the species is better known as *Taxithelium perminutum* Broth., a species described on the basis of material collected by Dusén in Cameroon, which made a synonym of *T. kaernbachii* by Câmara (2011). Otherwise the species in Africa is only cited from Seychelles (Câmara 2011).

Trachypodopsis normandii (Broth. & Paris) M.Fleisch. (Figure 2)

Liberia. Nimba Mountains, alt. 1055 m, Yekepa, mountain ridge ca. 4 km SE village, above camp at Celcom Road, on the ground, 7°32'33.3"N, 8°31'21.7"W, 24 Aug 2022, T. Karisch s. n.

A West African endemic, hitherto only known from Fouta Djallon in Guinea (here the type locality is situated; Paris 1902, 1907, 1908) and from the Loma Mountains in Sierra Leone (Potier de la Varde 1947; Taylor and Potier de la Varde 1954). From Liberia and from the Nimba Mountains the species was hitherto not known. The last published records of the species date back about 70 years.

Trachypodopsis normandii is the smallest species of the genus and always easily recognizable by its aberrant alar cells. The alar cells are well developed, consisting of about 5–10 large, rectangular to quadrate cells, abruptly passing into smaller, more or less quadrate leaf cells (Zanten 1959).

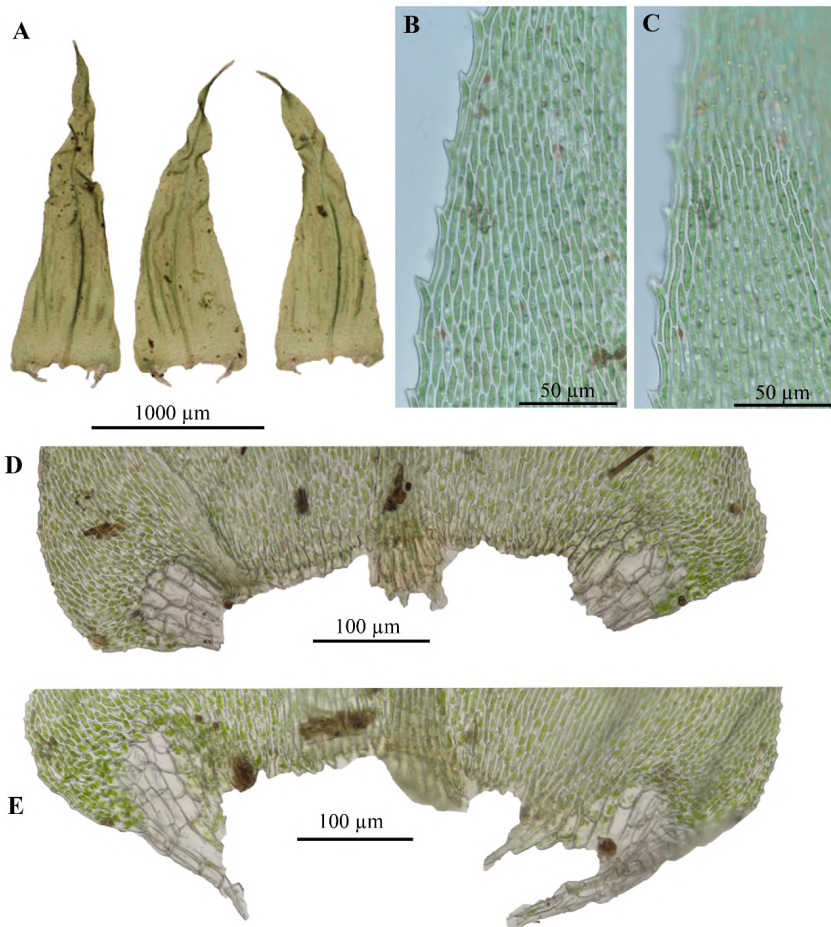


Figure 2. *Trachypodopsis normandii* (Broth. & Paris) M.Fleisch. **A.** Branch leaves. **B.** Mid-leaf cells, focused on the cell walls of the leaf cells. **C.** Mid-leaf cells, focused on the papillae of the leaf cells. **D–E.** Basal part of branch leaves with the characteristic enlarged, clearly separated alar cells (all from *T. Karisch s. n.*).

DISCUSSION

The results indicate that additional bryophyte records are very likely to be documented with ongoing field work and exploration. This observation is especially valid for Liberia, a bryologically very badly documented country (O’Shea 2006; Wigginton 2018). The bryophyte flora of the Liberian part of the Nimba Mountains seems to have been completely unexplored until now. The small collection

of Timm Karisch from there contains with *Trachypodopsis normandii* an interesting local endemic of the mountainous regions of West Africa. The last published records of this species date back about 70 years and the species was not known at all from the Nimba Mountains, only from the Fouta Djallon in Guinea and from the Loma Mountains in Sierra Leone.

Acknowledgement - I am grateful to Timm Karisch for providing a small collection of mosses from the Nimba Mountains in Liberia, to S. R. Gradstein for confirming the identification of *Anthoceros myriandroecius*, to James R. Shevock for careful reading of the manuscript and correcting the English, to Lars Söderström and an anonymous reviewer for critical reading the manuscript and helpful remarks. It is a pleasure to contribute a paper for the special issue of *Acta Biologica Plantarum Agriensis* to celebrate the 90th birthday of Dr. Tamas Pócs.

REFERENCES

- ALLEN, B. & MAGILL, R.E. (2007). A revision of *Orthostichella* (Neckeraceae). *The Bryologist* **110**: 1–45.
[https://doi.org/10.1639/0007-2745\(2007\)110\[1:AROON\]2.0.CO;2](https://doi.org/10.1639/0007-2745(2007)110[1:AROON]2.0.CO;2)
- ALONSO, M., JIMÉNEZ, J.A. & CANO, M.J. (2019). Taxonomic Revision of *Chionoloma* (Pottiaceae, Bryophyta). *Annals of the Missouri Botanical Garden* **104**(4): 563–632. <https://doi.org/10.3417/2019381>
- BASTOS, C.J.P. (2012). New combinations and synonyms in *Cheilolejeunea* (Spruce) Schiffn. (Lejeuneaceae, Marchantiophyta). *Journal of Bryology* **34**(4): 312–315.
<https://doi.org/10.1179/1743282012Y.0000000026>
- CÂMARA, P.E.A.S. (2011). A re-circumscription of the moss genus *Taxithelium* (Pylaisiadelphaceae) with a taxonomic revision of subgenus *Vernieri*. *Systematic Botany* **36**(1): 7–21. <https://doi.org/10.1600/036364411X553081>
- COSTA, D.P. (2008). Metzgeriaceae. *Flora Neotropica, Monograph* **102**: 1–169.
- DIXON, H.N. (1933). Mosses collected on Mt. Cameroon. *Annales Bryologici* **6**: 20–30.
- ELLIS, L.T., AFONINA, O.M., ALIA, M.H.B., BURGHARDT, M., CABEZUDO, B., CANO, M.J., COTTET, A.C., CSIKY, J., DEME, J., ERZBERGER, P., EVANGELISTA, M., GLAZKOVA, E.A., GÓMEZ-GONZÁLEZ, D., GUERRA, J., JIMÉNEZ, J.A., KUZMINA, E.Y., LIKSAKOVA, N.S., MESSUTI, M.I., NATCHEVA, R., NORHAZRINA, N., PANTOVIĆ, J.P., PAPP, B., POTEMKIN, A.D., RODRÍGUEZ-QUIEL, E., SABOVLEVIĆ, M.S., SPITALE, D., ȘTEFĂNUȚ, S., SYAZWANA, N., TOSSOU, M.G. & VILNET, A.A. (2022). New national and regional bryophyte records, 70. *Journal of Bryology* **44**(2): 175–183.
<https://doi.org/10.1080/03736687.2022.2095145>
- ENROTH, J., PÓCS, T., HE, X., NYQVIST, P., STAM, A., MALOMBE, I. & RIKKINEN, J. (2019). An annotated checklist of the bryophytes of Taita Hills region, Kenya. *Acta Musei Silesiae, Scientiae Naturales* **68**: 53–66.
<https://doi.org/10.2478/cszma-2019-0007>

- FIFE, A.J. (1985). A generic revision of the Funariaceae (Bryophyta: Musci). Part 1. *Journal of the Hattori Botanical Laboratory* **58**: 149–196.
https://doi.org/10.18968/jhbl.58.0_149
- GROLLE, R. (2001). Miscellanea hepaticologica 291–300. *Haussknechtia* **8**: 59–69.
- HEDENÄS, L. (2005). Bryophyte flora of Uganda. 4. Rhytidiaceae, Hylocomiaceae and Hypnaceae (Part 1). *Journal of Bryology* **27**(1): 55–66.
<https://doi.org/10.1179/174328205X40734>
- HODGETTS, N.G., ESSLIE, M.K., ADU-GYAMFI, A., AKOM, E., KUMADOH, J. & OPOKU, J. (2016). Bryophytes of Atewa Forest, Eastern Region, Ghana. *Journal of Bryology* **38**(3): 211–222. <https://doi.org/10.1080/03736687.2016.1145525>
- HOLYOAK, D.T. (2021). European Bryaceae. A guide to the species of the moss family Bryaceae in Western & Central Europe and Macaronesia. Pisces, Newbury.
- IRELAND, R.R. & BUCK, W.R. (2009). Some Latin American Genera of Hypnaceae (Musci). *Smithsonian Contributions to Botany* **93**: 1–97.
<https://doi.org/10.5479/si.0081024X.93>
- JONES, E.W. (1962). African hepatics XV. *Plagiochila* in Tropical Africa. *Transactions of the British Bryological Society* **4**(2): 254–325.
<https://doi.org/10.1179/tbbs.1962.4.2.254>
- LEWINSKY, J. (1978). The genus *Orthotrichum* Hedw. (Musci) in Africa south of the tropic of Cancer. *Botanisk Tidsskrift* **72**: 61–85.
- LIU, Y., BUDKE, J.M. & GOFFINET, B. (2012). Phylogenetic inference rejects sporophyte based classification of the Funariaceae (Bryophyta): rapid radiation suggests rampant homoplasy in sporophyte evolution. *Molecular phylogenetics and evolution* **62**(1): 130–145. <https://doi.org/10.1016/j.ympev.2011.09.010>
- MALOMBE, I. (2007). *Systematics of Cheilolejeunea (Spruce) Schiffn. (Lejeuneaceae) in continental Africa and its ecological significance in Conservation of Kakamega and Budongo rainforests*. Dissertation, Universität Koblenz-Landau, 177 pp.
- MARLINE, L., ANDRIAMIARISOA, R.L., BARDAT, J., CHUAH-PETIOT, M., HEDDERSON, T.A.J., REEB, C., STRASBERG, D., WILDING, N. & AH-PENG, C. (2012). Checklist of the Bryophytes of Madagascar. *Cryptogamie, Bryologie* **33**(3): 199–255.
<https://doi.org/10.7872/cryb.v33.iss3.2012.199>
- MÜLLER, F. (1995). Neue und bemerkenswerte Moosfunde aus Zaire. *Tropical Bryology* **10**: 81–90. <https://doi.org/10.11646/bde.10.1.13>
- MÜLLER, F. (1996). Beitrag zur Moosflora der Insel Bioko (= Fernando Poo), Äquatorial-Guinea. *Tropical Bryology* **12**: 75–96.
<https://doi.org/10.11646/bde.12.1.11>
- MÜLLER, F. (2000). *Funariaceae*. In: O'SHEA, B.J. & WIGGINTON, M.J. (eds.): *Guide to Bryophytes of sub-Saharan Africa*. (<https://www.britishbryologicalsociety.org.uk/wp-content/uploads/2021/01/Guide-to-Bryophytes-of-sub-Saharan-Africa.pdf>)
- MÜLLER, F. (2006). Bryophytes of Bioko (Equatorial Guinea), Results of an excursion in 2002. *Tropical Bryology* **27**: 9–17.
<https://doi.org/10.11646/bde.27.1.3>
- MÜLLER, F. (2015). About 150 years after Welwitsch – a first more extensive list of new bryophyte records for Angola. *Nova Hedwigia* **100**: 487–505.
https://doi.org/10.1127/nova_hedwigia/2014/0239

- MÜLLER, F. & PÓCS, T. (2007). A contribution to the knowledge of epiphyllous bryophytes of Bioko Island (Equatorial Guinea), including additional remarks on non-epiphyllous species. *Journal of Bryology* **29**: 81–94.
<https://doi.org/10.1179/174328207X186803>
- MÜLLER, F. & SCHÄFER-VERWIMP, A. (1999). New bryophyte taxon records for tropical countries III. *Tropical Bryology* **16**: 195–201.
<https://doi.org/10.11646/bde.16.1.16>
- MÜLLER, F., WIGGINTON, M.J. & O'SHEA, B.J. (2000). New bryophyte taxon records for tropical countries IV. *Tropical Bryology* **18**: 199–202.
<https://doi.org/10.11646/bde.18.1.23>
- O'SHEA, B.J. (2006). Checklist of the mosses of sub-Saharan Africa (version 5, 12/06). *Tropical Bryology Research Reports* **6**: 1–252.
- PARIS, E.G. (1902). Muscinées de l'Afrique occidentale française. *Revue Bryologique* **29**: 63–72.
- PARIS, E.G. (1907). Muscinées de l'Afrique occidentale française (9e article). *Revue Bryologique* **34**: 93–99.
- PARIS, E.G. (1908). Muscinées de l'Afrique occidentale française (10e article). *Revue Bryologique* **35**: 1–6.
- POTIER DE LA VARDE, R. (1948). Contribution a la flore bryologique de Sierra Leone. *Revue Bryologique Lichénologique* **17**: 16–23.
- SO, M.L. (2004). *Metzgeria* (Marchantiophyta) in Africa. *New Zealand Journal of Botany* **42**: 271–292. <https://doi.org/10.1080/0028825X.2004.9512904>
- SÖDERSTRÖM, L., HAGBORG, A., KONRAT, M. VON, BARTHOLOMEW-BEGAN, S., BELL, D., BRISCOE, L., BROWN, E., CARGILL, D.C., COSTA, D.P., CRANDALL-STOTLER, B.J., COOPER, E.D., DAUPHIN, G., ENGEL, J.J., FELDBERG, K., GLENNY, D., GRADSTEIN, S.R., HE, X., HEINRICH, J., HENTSCHEL, J., ILKIU-BORGES, A.L., KATAGIRI, T., KONSTANTINOVA, N.A., LARRAÍN, J., LONG, D.G., NEBEL, M., PÓCS, T., FELISA PUCHE, F., REINER-DREHWALD, E., RENNER, M.A.M., SASS-GYARMATI, A., SCHÄFER-VERWIMP, A., MORAGUES, J.G.S., STOTLER, R.E., SUKKHARAK, P., THIERS, B.M., URIBE, J., VÁÑA, J., VILLARREAL, J.C., WIGGINTON, M., ZHANG, L. & ZHU, R.-L. (2016). World checklist of hornworts and liverworts. *PhytoKeys* **59**: 1–828. <https://doi.org/10.3897/phytokeys.59.6261>
- SÖDERSTRÖM, L. & HAGBORG, A. (2023). Notes on Early Land Plants Today. 85. *Metzgeria warnstorffii*, an earlier name for the African *Metzgeria madagassa*. *Lindbergia* **2023**: e24522. <https://doi.org/10.25227/linbg.24522>
- SUKKHARAK, P. & GRADSTEIN, S.R. (2014). A taxonomic revision of the genus *Mastigolejeunea* (Marchantiophyta: Lejeuneaceae). *Nova Hedwigia* **99**(3-4): 279–345. <https://doi.org/10.1127/0029-5035/2014/0206>
- TAYLOR, J. & POTIER DE LA VARDE, R. (1954). A contribution to the moss flora of Tropical Africa. *Kew Bulletin* **1954**: 505–516.
<https://doi.org/10.2307/4114536>
- MISSOURI BOTANICAL GARDEN (2023). Tropicos.org. [<https://tropicos.org>; accessed on 27 Mar 2023]
- VÁÑA, J. & MÜLLER, F. (2003). *Cephaloziella biokoensis* sp. nov. (Marchantiopsida, Cephaloziellaceae), from the island of Bioko (Equatorial Guinea). *Tropical Bryology* **24**: 1–4. <https://doi.org/10.11646/bde.24.1.2>
- VIGALONDO, B., DRAPER, I., MAZIMPAKA, V., CALLEJA, J.A., LARA, F. & GARILLETI, R. (2020). The *Lewinskyia affinis* complex (Orthotrichaceae) revisited: species description and differentiation. *The Bryologist* **123**(3): 454–481.

- <https://doi.org/10.1639/0007-2745-123.3.454>
- WATLING, M.C. & O'SHEA, B.J. (2000). British Bryological Society Expedition to Mulanje Mountain, Malawi. 11. A revision of the genus *Rhacopilopsis* Renauld & Cardot (Hypnaceae, Bryopsida). *Journal of Bryology* **22**: 207–216.
<https://doi.org/10.1179/jbr.2000.22.3.207>
- WIGGINTON, M.J. (ed.) (2004). E.W. Jones's Liverwort and Hornwort Flora of West Africa. *Scripta Botanica Belgica* **30**: 1–443. (i–vii.)
- WIGGINTON, M.J. (2018). Checklist and distribution of the liverworts and hornworts of sub-Saharan Africa, including the East African Islands. *Tropical Bryology Research Reports* **9**: 1–138.
- WILBRAHAM, J. (2008). Bryophyte Flora of Uganda. 8. Orthotrichaceae Part 1 – Macromitrioideae. *Journal of Bryology* **30**: 201–207.
<https://doi.org/10.1179/174328208X322242>
- WILDING, N. (2015). *Systematics, biogeography and morphological evolution in Entosthodon Schwägr. (Bryopsida, Funariaceae) with a revision of the genus in Africa*. PhD Theses, University of Cape Town, 330 pp.
- YU, N.-N., JIA, Y. & ZHAO, J.-C. (2011). Synonymy and typifications in *Groutiella tomentosa* (Orthotrichaceae, Bryopsida). *Novon* **21**(2): 290–293.
<https://doi.org/10.3417/2009137>
- ZANTEN, B.O. van (1959). Trachypodaceae: a critical revision. *Blumea* **9**(2): 477–575.

(submitted: 12.01.2023, accepted: 31.03.2023)