Tropical Bryology 27: 9-17, 2006

Bryophytes of Bioko (Equatorial Guinea), Results of an excursion in 2002

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Abstract: 97 species of bryophytes are reported as new for the island of Bioko, 89 of them are new for whole Equatorial Guinea, a remarkable amount is new for tropical West Africa and *Micromitrium tenerum* is new for sub-Saharan Africa. The bryoflora of the highest mountain of Bioko, the Pico Basile, shoes strongly phytogeographic affinities with Mt Cameroon on the African mainland. *Rhabdoweisia lineata* P.W. Richards & Argent, which was made a synonym of *R. fugax* (Hedw.) Bruch, Schimp. & W. Gümbel by Frahm & al. (2000) is regarded as a clear distinct species.

Introduction

In February 2002 the author has made a second travel to Bioko. About results of a first trip it was reported in an earlier paper (Müller 1996). During the first trip only a very limited area of the island was investigated. The investigated area of the present study includes a wider range of collection sites and vegetation types: the highest mountain of the island, the Pico Basile, with heath and grassland vegetation and *Schefflera* forest, the highland of Moca with montane rainforests with *Cyathea* spec., lakeshore and bog vegetation and the southern coast around Ureca with lowland rainforests and coastal cliffs. The recent collections include a lot of new bryophyte species for the island. The area of the highest mountain of Bioko, the Pico Basile, was still undercollected in the past. Most of the new species for Bioko are from this place including *Cephaloziella biokoensis* Váòa & F. Müller, a species new for science, which was published in a separate paper (Váòa & Müller 2003).
The bryophyte collection of the 2002 excursion is examined up to now to nearly 80%. Further studies probably will increase the number of interesting specimens.

List of the collection sites (Fig. 1)

1 Pico Basile: summit and crater NE of the summit, 2840-3010 m, 03°35‘N, 08°46‘E, grassland with Poaceae and Cyperaceae und heath with *Philippia mannii*, *Hypericum lanceolatum* and *Agauria salicifolia*, 6. & 7.2.2002.

2 Pico Basile: NE slope of the mountain along the road to the summit, 2600-2870 m, 03°36‘N, 08°46‘E, heath with *Philippia mannii*, *Hypericum lanceolatum* and *Agauria salicifolia*, 8.2.2002.
3 Pico Basile: NE slope of the mountain along the road to the summit, 2400-2600 m, 03°36‘N, 08°46‘E, mixture of heath and *Schefflera* forest („Bosque de araliaceaes“) with *Polyscias fulva, Schefflera mannii, S. hierniana*, *Mimulopsis solmsii* and *Crassocephalum mannii*, 9.2.2002.
4 Pico Basile: NE slope of the mountain along the road to the summit, 2000-2400 m, 03°36‘N, 08°46‘E, *Schefflera* forest („Bosque de araliaceaes“) with *Polyscias fulva, Schefflera mannii, S. hierniana* mixed with *Hypericum lanceolatum, Mimulopsis solmsii* and *Crassocephalum mannii*, 10.2.2002.
5 Ureca W: coast between the mouth of the Rio Ole and Punta Sagre (= Playa de Moraca), 0-100 m, 03°16‘N, 08°29‘E, lowland rainforest with many montane elements („Bosque monzónica“) and coastal cliffs, 14. & 15.2.2002.
6 Highland of Moca: around the Lago de Biao, c. 1750 m, 03°21‘N, 08°42‘E, montane rainforest („Bosque de montaña“) with *Cyathea* spec., lakeshore and bog vegetation, 19.2.2002.
7 Highland of Moca: along the path from Moca to the Lago de Biao, 1500-1900 m, 03°21‘N, 08°41‘E, cultivated area with rests of forests, 19.2.2002.
8 Highland of Moca: along the path from Moca to the Cascades de Iladyi, 1100-1300 m, 03°20‘N, 08°40‘E, montane rainforest („Bosque de montaña“) with *Cyathea* spec., 20. & 22.2.2002.
9 Highland of Moca: around the Lago Loreto, c. 1050 m, 03°25‘N, 08°40‘E, montane rainforest („Bosque de montaña“) with *Cyathea* spec., 21.2.2002.

Annotated list of new records for Bioko or Equatorial Guinea

Species marked with an asterisk (*) are new for whole Equatorial Guinea, species without asterisk are new for Bioko, but already known from Rio Muni and/or Annobon Is. The nomenclature of the species follows O’Shea (2003a) for the mosses and Wigginton (2002) for the liverworts. Voucher specimens are in the herbarium of the University of Dresden (DR). For specimens sent to specialists for determination or confirmation, duplicates exist in their personal herbaria. The bold numbers refer to the collection sites.

Hepaticae

**Anastrophyllum minutum* (Schreb.) R.M.Schust.
1 rockface in a crater, *B 774* (conf. J. Vana), *B 772*.
The species shows in Africa a montane distribution, the next records are in Cameroon.

Aneura pseudopinguis (Herzog) Pócs
6 on decaying wood along the lakeshore, *B 847*.
9 on wet decaying wood in a valley, *B 878*.
Widely distributed in tropical Africa.

**Asterella abyssinica* (Gottsche) Grolle
1 rockface in a crater, *B 754*; on shady boulders in a crater, *B 988*; on shady boulders, *B 969*.
Afromontane, next records in Cameroon.

**Bazzania decrescens* ssp. *pumila* (Mitt.) Pócs
6 epiphytic in a mountain rainforest on the southern lakeshore, *B 721*.
In Africa restricted to the East African Islands and the East African mountains, first records for West Africa.

**Bazzania roccatii* Gola
2 epiphytic, *B 826*. **3** shady rocks along a path, *B 971*.
Hitherto known from Cameroon, Malawi, Rwanda, Tanzania, Uganda and Zaire.

Calypogeia fissa (L.) Raddi
1 wet rockface in a crater, *B 982, B 984*. **8** on decaying wood in mountain rainforest, *B 431*.
Widely distributed in tropical Africa.

**Cephaloziella kiaerii* (Austin) Douin
1 shady rocks in a crater, *B 677* (conf. J. Váòa), *B 649*; shady boulders in a crater, *B 666*, *B 632*; rockface in a crater, *B 929*.
Afromontane, next records in Cameroon.

**Cyathodium aureonitens* (Griff.) Mitt.
8 wet rocks along a brook in mountain rainforest, *B 825*.
Hitherto only known from Cameroon.

**Frullania depressa* Mitt.
1 epiphytic on *Philippia*, *B 567*.
Widely distributed in tropical Africa.

**Jensenia spinosa* (Lindenb. et Gott.) Grolle
1 shady rockface in a crater, *B 648, B 676*.
In Africa mostly restricted to montane areas.

**Jungermannia borgenii* Gottsche ex Pearson
1 wet rocky slopes, *B 627* (det. J. Váòa). **3** shady rocks along a path, *B 580* (conf. J. Váòa).
Widely distributed in tropical Africa.

**Jungermannia dusenii* (Steph.) Steph.
5 stony slopes along Rio Ole, *B 565* (conf. J. Váòa); wet rocks in a valley, *B 585* (conf. J. Váòa). **8** on wet rocks along a brook, *B 791* (conf. J. Váòa).
Only known from Cameroon and São Thomé.

Lophocolea concreta Mont.
5 on decaying wood, *B 497*; epiphytic, *B 494*.
Widely distributed in tropical Africa.

**Lophozia decolorans* (Limpr.) Steph.
1 slope along a path near the summit, *B 896* (conf. J. Váòa)
Cameroon, Tanzania and Democratic Republic of Congo.

**Marchantia debilis* Goebel
5 stony slopes along Rio Ole, *B 573*.
Widely distributed in tropical Africa.

**Metzgeria agnewii* Kuwah.
1 epiphytic on *Philippia* near the summit, *B 518*; epiphytic on *Philippia* in a crater, *B 685*.
Afromontane, first record for West Africa.

**Plagiochasma eximium* (Schiffn. in Steph.) Steph.
1 rocky slopes, *B 660*
In Africa widely distributed in montane and dry areas, next records in Cameroon and Guinea.

**Plagiochila flabellata* Steph.
3 on decaying wood, *B 599*
Cameroon, Reunion, São Thomé, Seychelles, Tanzania.

**Plagiochila pseudoattenuata* S.W. Arnell
1 epiphytic on *Hypericum*, *B 682*; on shady boulders in a crater, *B 620*.
In Africa hitherto known from the East African mountains and South Africa, first record for West Africa.

**Ptychanthus striatus* (Lehm. et Lindenb.) Nees
6 epiphytic in mountain rainforest, *B 809*.
Widely distributed in tropical Africa.

Radula fulvifolia (Hook.f. et Tayl.) Gottsche et al.
1 soil covered rocks in a crater, *B 933*. **7** epiphytic, *B 854*.
Widely distributed in tropical Africa.

**Radula quadrata* Gottsche
1 epiphytic on *Philippia*, *B 932*. **3** epiphytic, *B 947*.
Afromontane, next records in Cameroon.

**Riccardia fastigiata* (Lehm.) Trevis.
8 slope along a path in mountain rainforest, *B 775*.
Widely distributed in tropical Africa.

**Riccia membranacea* Gottsche et Lindenb.
8 wet rut near Moca, *B 413*.
Widely distributed in tropical Africa.

**Symphyogyna brasiliensis* Nees et Mont.
6 along the lakeshore in a bog, *B 455*.
Widely distributed in tropical Africa.

**Symphyogyna podophylla* (Thunb.) Mont. et Nees
1 wet rockface in a crater, *B 902*.
Afromontane, next records in Cameroon.

**Targionia hypophylla* L.
1 rocky slopes along a path, *B 974*. **3** rocks along a wet rivulet, *B 600*.
Widely distributed in tropical Africa.

**Tylimanthus ruwenzorensis* S.W. Arnell
3 on decaying wood, *B 608*.
East African mountains and Reunion, first record for West Africa.

Musci

**Actinodontium* spec.
8 epiphytic on solitary trees in pasture, *B 436, B 508, B 724*.
The genus *Actinodontium* is represented in Africa by the two species *A. dusenii* Broth. and *A. streptopogoneum* Broth., both hitherto only known from Cameroon. In Demaret (1955) a key for the differentiation of this two species is given. The differentiations mentioned in this work (shine of the plants, length of the nerve) allow no exact determination of the Bioko plants in which the nerves end short beyond mid-leaf. Further studies on the differentiation of this two species are necessary.

**Amblystegium riparium* (Hedw.) Bruch, Schimp. et W. Gümbel
6 on wet decaying wood along the lakeshore, *B 736*; on wet soil and decaying wood along the lakeshore, *B 507*; submerge in the lake and on mud along the lakeshore, *B 716*.
First record in tropical West Africa.

**Amphidium tortuosum* (Horsch.) Cufod.
1 rockface in a crater, *B 729*.
In Africa widely distributed in montane-alpine areas of the eastern and southern part. In tropical West Africa the species was hitherto only known from Cameroon.

**Anomobryum julaceum* var. *julaceum* (P. Gaertn., B. Mey. et Scherb.) Schimp.
1 on rocky slopes, *B 877*. **2** slopes along a path, *B 563*, *B 919* p.p.
The species show in Africa a montane distribution, next records in Cameroon.

**Bartramia halleriana* Hedw.
1 rockface in a crater, *B 972*.
Next records in Cameroon, in Africa otherwise only known from Ethiopia and Tanzania.

**Braunia secunda* (Hook.) Bruch, Schimp. et W. Gümbel
1 rockface in a crater, *B 894*; sonny boulders in a crater, *B 647*.
First record for tropical West Africa. Next records in the East African mountains and in Angola.

**Bryum alpinum* var. *alpinum* Huds. ex With.
1 sonny rocks near the summit, *B 828*
Next records in Cameroon, otherwise in Africa restricted to montane and southern areas.

**Bryum huillense* Welw. et Duby
5 rocks along the coast, *B 468*.
Widely distributed in sub-Saharan Africa.

**Bryum lanatum* (P. Beauv.) Brid.
1 rocky slopes, *B 686*. **2** slopes along a path, *B 919* p.p.
The material was identified using the differentiation features given in Frahm (2002). The taxonomy of the *B. argenteum*-complex follows Frahm (2002).

**Bryum leptoneurum* P. de la Varde
1 on soil in *Philippia* bushes, *B 651*. **2** grass covered slopes along a path, *B 939, B 917*.
First records for West Africa, hitherto in Africa only known from the East African mountains of Ethiopia, Kenya and Tanzania.

**Bryum staudtii* Broth.
8 on boulders along a brook, *B 407*.
Known from Cameroon, Malawi and Sierra Leone.

**Calymperes lonchophyllum* ssp. *saxatile* (Müll. Hal.) S.R. Edwards
5 rocks along the coast, *B 583*; epiphytic, *B 768*.
A West African lowland species.

**Campylopus aureonitens* (Müll.Hal.) A. Jaeger
1 slopes along a path, *C 816* (conf. J.-P. Frahm); sonny rockface near the summit, *C 911*.

A species with an Afromontane distribution, next records in Cameroon.

**Campylopus pilifer* ssp. *pilifer* Brid.
1 rocky slopes, *B 769*; on boulders in a crater, *B 633, B 973*. **2** slopes along a path, *B 577*.
Widely distributed in sub-Saharan Africa.

**Ceratodon purpureus* ssp. *stenocarpus* (Bruch et Schimp. ex Müll.Hal.) Dixon
1 on soil in a crater, *B 851*.
A pantropical species known from many African countries.

**Cyclodictyon aubertii* (P. Beauv.) Kuntze
4 on shady boulders, *B 547*.
Afromontane, next records in Cameroon.

**Cyclodictyon brevifolium* Broth.
2 rocky shady slopes, *B 615*. **3** tree base, *B 478*.
Afromontane, first record for West Africa.

**Cyclodictyon krebedjense* Broth. in Corb.
5 on wet rocks, *B 578*. **6** on wet wood along the lakeshore, *B 776, B 853*.
In Africa known from Cameroon, Central African Republic, Congo-Brazzaville, Democratic Republic Congo, Kenya and Gabon.

**Cyclodictyon preussii* (Broth.) Broth.
1 shady rockface in a crater, *B 657*.
Hitherto only known from Cameroon.

**Ditrichum difficile* (Duby) M. Fleisch.
1 rocky slopes, *B 646*; shady crevices in a crater, *B 921*.
Afromontane, first record for West Africa.

**Drepanocladus aduncus* (Hedw.) Warnst.
6 submerge in the lake, *B 509, B 848*.
First record for West Africa.

**Epipterygium convalleum* Dusén
8 on wet rocks in a valley in mountain rainforest, *B 836*.
Hitherto only known from Cameroon.

**Fabronia bizotii* Pócs
3 epiphytic, *B 946*.
Hitherto only known from Cameroon and Uganda. The Bioko plants were compared with the type specimen in EGR.

**Fissidens asplenioides* Hedw.
1 shady rocks in a crater, *B 654*, *B 639*, on soil covered shady boulder, *B 640*. **2** rocky, shady slopes, *B 743*. **3** on rocks in a wet rivulet, *B 449*. **8** on boulders in a brook, *B 818*. All specimens were confirmed by I. Bruggeman-Nannenga.
Widely distributed in tropical and southern Africa.

**Fissidens borgenii* Hampe s.l.
5 tree base, *B 559* (det. I. Bruggeman-Nannenga).
Widely distributed in tropical Africa.

Fissidens glaucissimus Welw. et Duby
5 on shady rocks in a valley, *B 426* (conf. I. Bruggeman-Nannenga).
Widely distributed in tropical Africa.

**Fissidens lachmanii* Bizot
5 epiphytic, *B 707* (det. I. Bruggeman-Nannenga).
Hitherto only known from Ivory Coast and Uganda.

**Fissidens schmidii* Müll.Hal.
1 wet rocks in a crater, *B 922*; soil covered underside of a boulder, *B 928*; rocky slopes, *B 728*; shady slopes, *B 756*. **2** rocky slopes, *B 603*. **3** on decaying wood, *B 967a*. **4** shady boulders, *B 550*. **7** slopes along a path in the forest, *B 780*.
All specimens were determined by I. Bruggeman-Nannenga.
Widely distributed in tropical Africa.

**Funaria hygrometrica* var. *calvescens* (Schwägr.) Kindb.
2 wet rut, *B 656*. **4** rocky slopes along a path, *B 673*.
Widely distributed in tropical Africa.

**Gammiella ceylonensis* (Broth. in Herzog) B.C.Tan et W.R.Buck
6 epiphytic in a mountain rainforest on the southern lakeshore, *B 765, B 838*; epiphytic on thin branches, *B 442*. **9** epiphytic, *B 534*.

The genus was just reviewed in Africa by O'Shea (2003b). *Gammiella ceylonensis*, the only one African species of the genus was hitherto known from Madagascar, Malawi, Natal, Rwanda, Tanzania and Uganda. *Gammiella foliicola*, reported from Gabon and the Democratic Republic Congo, was excluded by O'Shea (2003b) from the genus. The new occurrence on Bioko marked a widely areal expansion to the West.

**Grimmia trichophylla* Grev.
1 on boulders in a crater, *B 558*; rockface in a crater, *B 987*; sonny rocks, *B 958*; sonny rocks near the summit, *B 841*.
First records for West Africa.

**Hedwigidium integrifolium* (P. Beauv.) Dixon in C.E.O. Jensen
1 sonny boulders in a crater, *B 871*.
Next records in Cameroon.

**Hylocomiopsis cylindricarpa* Thér.
2 epiphytic, *B 612, B 763*.
Afromontane, next records in Cameroon.

**Hypnum cupressiforme* var. *cupressiforme* Hedw.
1 on boulders in bushes, *B 631*; epiphytic on *Philippia*, *B 566*; grassland, *B 678*; epiphytic on an old *Hypericum*, *B 897*; on soil between grass, *B 642*.
Widely distributed in tropical Africa.

**Kindbergia africana* (Herzog) Ochyra
3 on grass covered slopes along a path, *B 681*; on decaying wood, *B 725*.
First records in West Africa.

**Lepidopilidium cespitosum* (Besch.) Broth.
5 on decaying wood, *B 447*.
In Africa hitherto only known from Burundi and Reunion; first records in West Africa.

**Leptobryum pyriforme* (Hedw.) Wilson
2 rocky slopes along a path, *B 733*.
First records in tropical West Africa.

**Leptodontium pungens* (Mitt.) Kindb.
1 on boulders in a crater, *B 668*.
An Afromontane species, next records in Cameroon.

**Leucophanes angustifolium* Renauld et Cardot in Renauld
5 epiphytic, *B 496, B 572*.
In West Africa hitherto only known from Ghana and Cameroon.

**Microcampylopus laevigatus* (Thér.) Giese et J-P. Frahm
1 on bare soil on a path, *B 910*.
First records for West Africa.

**Micromitrium tenerum* (Bruch et Schimp.) Crosby
8 wet slopes along a path near Moca, *B 735* p.p. (mixed with *Physcomitrella patens* ssp. *magdalenae* [De Sloover] Tan).
First record for sub-Saharan Africa. The genus was just reported as new for sub-Saharan Africa by Matcham & Duckett in Blockeel et al. (2002). They mentioned records of *M. perexiguum* Müll. Hal. from South Africa and of *M. megalospermum* Austin from Cameroon.

**Neckera platyantha* (Müll.Hal.) Paris
1 shady boulders in a crater, *B 823*; epiphytic on *Philippia*, *B 755, B 869*.
First records for West Africa.

**Neckera remota* Bruch et Schimp. ex Müll.Hal.
6 epiphytic in mountain rainforest, *B 884*.
Next records in Cameroon.

Neckeropsis foveolata (Mitt.) Broth. ex Paris
5 epiphytic, *B 570*.
A West African lowland species.

**Orthodontium gracile* Schwägr. ex Bruch, Schimp. et W. Gümbel
3 on decaying wood, *B 503*.
Next records in Cameroon.

**Orthotrichum firmum* Venturi
1 epiphytic on *Philippia* near the summit, *B 710, B 830*.
First record for West Africa.

**Pelekium chenagonii* (Müll.Hal. ex Renauld et Cardot) Touw
9 on wet decaying wood, *B 770*.
Widely distributed in tropical Africa.

**Pelekium intricatum* (A. Jaeger) Touw
4 epiphytic, *B 730*.
Next records in Cameroon.

**Phyllodon perplanicaulis* (Broth.) Kis
5 on shady boulders, *B 475*.
In Africa hitherto only known from Cameroon, Central African Republic, Gabon and Reunion.

**Physcomitrella patens* ssp. *magdalenae* (De Sloover) B.C. Tan
8 wet slopes along a path near Moca, *B 544, B 735* p.p.
First record for West Africa.

**Plagiothecium nitens* Dixon
1 grassland in a crater, *B 883*; soil covered rocks in a crater, *B 760*; rocky slopes, *B 731*.
First record for West Africa.

**Pogonatum belangeri* (Müll.Hal.) A. Jaeger
2 shady, rocky slopes, *B 751*. **4** on shady boulders, *B 891*.
Widely distributed in tropical Africa.

**Pogonatum urnigerum* (Hedw.) P. Beauv.
1 sonny rocks near the summit, *B 990*; slopes along a path, *B 895*; rocky slopes along a path, *B 669*.
In Africa the species is restricted to montane areas, the next records are situated in Cameroon.

**Pogonatum usambaricum* (Broth.) Paris
3 rocky slopes along a path, *B 506*.
In West Africa hitherto only known from São Thomé.

**Pylaisiobryum abyssinicum* (Müll.Hal.) Wijk et Margad.
6 epiphytic in mountain rainforest on the southern lakeshore, *B 703*.
In Africa known from Cameroon, Ethiopia, Gabon, Kenya and Nigeria.

**Racomitrium subsecundum* (Hook. et Grev.) Mitt. et Wilson
1 sonny rocks near the summit, *B 840*; rocky slopes along a path, *B 628*.
Next records in Cameroon.

**Rhabdoweisia lineata* P.W. Richards & Argent
1 boulders in a crater, *B 955*; soil covered rocks in a crater, *B 553*; + shady boulders in a crater, *B 626, B 983*. **3** on decaying wood, *B 433*; cavity on a tree base, *B 499*.
Next records in Cameroon.
Rhabdoweisia lineata were made a synonym of *R. fugax* (Hedw.) Bruch, Schimp. & W. Gümbel by Frahm & al. (2000). Frahm & al. (2000) have checked the type specimens of both species, but not the paper with the original diagnosis of *R. lineata* (Richards & Argent 1968) in which the species is described in all details and the main differences of the two species are listened. Detailed illustrations of *R. lineata* are also included in De Sloover (1973, 2003). The comparison of the Bioko collections and of the descriptions and illustrations in De Sloover (1973, 2003) und Richards & Argent (1968) with material of *R. fugax* from Central Europe shows clear differences of both species in peristome structure, leaf shape and spore size. *R. lineata* has regular peristome teeth with longitudinal or oblique striations (vs. irregular peristome teeth without any striations in *R. fugax*), usually more abruptly pointed leaves (vs. leaves gradually tapering to acute to acuminate apex in *R. fugax*) and spore size of 10-14 µm (vs. 14-20 µm in *R. fugax*). The diagnostic features of both species are constant without any transitions. Therefore *R. lineata* is considered here as clear distinct of *R. fugax*.

**Schimperella bello-intricata* (Müll.Hal. ex Broth.) W.R. Buck
4 epiphytic on thin branches, *B 905*.
Next records in Cameroon.

Schoenobryum concavifolium (Griff.) Manuel
1 epiphytic on an old *Hypericum lanceolatum*, *B 953*. **2** epiphytic, *B 520*.
The material at first using the key in Bizot & Pócs (1982) was determined as *S. robustum*. Later the revision of the African species of the

genus by O'Shea (2003c) was published in which all African species were made synonyms of the pantropical *S. concavifolium*. This species is widely distributed in tropical Africa.

**Streptopogon calymperes* Müll.Hal. ex Geh.
2 epiphytic, *B 512*. 3 epiphytic on thin branches, *B 483*.
First record in West Africa.

**Streptopogon erythrodontus* (Taylor) Wilson
1 epiphytic on thin branches, *B 463*. **2** epiphytic, *B 564*.
Next records in Cameroon.

**Syrrhopodon gardneri* (Hook.) Schwägr.
6 epiphytic in mountain rainforest, *B 855*.
Widely distributed in tropical Africa.

**Syrrhopodon gaudichaudii* Mont.
8 epiphytic on trees in pastures, *B 880* (det. S. Orban).
Widely distributed in tropical Africa.

**Tayloria orthodonta* (P. Beauv.) Wijk et Margad.
3 epiphytic on horizontal branch, *B 674*. **6** epiphytic in mountain rainforest along the southern lakeshore, *B 456*. **7** epiphytic, *B 797*. **8** epiphytic in pasture, *B 409*.
Widely distributed in tropical Africa.

**Trematodon longicollis* Michx.
2 rocky slopes along a path, *B 591*.
First record for West Africa.

Wijkia trichocolea (Müll. Hal.) H.A. Crum
6 epiphytic in mountain rainforest, *B 794*.
Widely distributed in tropical Africa.

**Wijkia trichocoleoides* (Müll.Hal.) H.A. Crum
6 epiphytic in mountain rainforest along the southern lakeshore, *B 817*.
Widely distributed in tropical Africa.

**Zygodon intermedius* Bruch, Schimp. et W. Gümbel
2 epiphytic on *Hypericum*, *B 758*.
Afromontane, next records in Cameroon.

**Zygodon reinwardtii* (Hornsch.) A. Braun
1 epiphytic on *Philippia* in a crater, *B 979*. **2** epiphytic, *B 785*. **3** epiphytic on thin branches, *B 532*.
First records for West Africa.

Discussion

The recent collection contains 97 species, 28 liverworts and 69 mosses, as new for the island. O'Shea (2003a), Wigginton (2002) and Heras & Infante (2001) cited 217 bryophytes, 93 liverworts and hornworts and 124 mosses, for the island. In total 314 species, 121 liverworts and hornworts and 193 mosses, are now known from Bioko. Bioko belongs therefore to a centre of bryophyte biodiversity in West Africa with a larger flora than any of the West African countries apart from Cameroon.
Most of the species collected in the Pico Basile and Moca region show an Afromontane range. Most of them are in common with Mt Cameroon. Of special phytogeographic interest are Afromontane species hitherto not known from Mt Cameroon with next occurrences in the East African mountains. To this group belong: *Bazzania decrescens* ssp. *pumila, Metzgeria agnewii, Plagiochila pseudoattenuata, Tylimanthus ruwenzorensis, Bryum leptoneurum, Cyclodictyon brevifolium, Ditrichum difficile, Gammiella ceylonensis, Grimmia trichophylla, Kindbergia africana*, *Lepidopilidium cespitosum, Leptobryum pyriforme, Microcampylopus laevigatus, Neckera platyantha, Orthotrichum firmum, Physcomitrella patens* ssp. *magdalenae, Plagiothecium nitens, Streptopogon calymperes, Trematodon longicollis, Zygodon reinwardtii.* The new records of this species on Bioko are interesting areal extensions westwards.
Amblystegium riparium and *Drepanocladus aduncus* are also new for West Africa. In the African tropics these two species are rare and limited to lakes and wetlands at montane altitudes. The Lago de Biao, where this two species were found, is probably one of the only one sites in West Africa with this conditions.
Among the new elements of the bryoflora of Bioko there are a number of species limited in their distribution to Cameroon and the islands

in the Gulf of Guinea: *Cyathodium aureonitens, Jungermannia dusenii, Actinodontium* spec., *Cyclodictyon preussii, Epipterygium convalleum.* This species with a very narrow distribution range are of special interest for nature protection.

Micromitrium tenerum is recorded as new for sub-Saharan Africa. The species is very easily overlooked, probably better to found in the rainy season and therefore perhaps more widely distributed in the area.

Acknowledgments

For confirmation or determination of material I wish to thank the following persons: I. Bruggeman-Nannenga (Zeist) – *Fissidens*, J.-P. Frahm (Bonn) – *Campylopus*, S. Orbán (Eger) – *Syrrhopodon gaudichaudii*, S. Perold (Pretoria) – *Riccia*, T. Pócs (Eger) – *Bazzania*, J. Váòa (Prague) – *Anastrophyllum, Cephaloziella, Jungermannia, Lophozia*. My special thanks go to B.J. O'Shea (London) for correcting the English text and helpful remarks.

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