THE PTERIDOPHYTA
OF BIOKO (FERNANDO PO)

(Contributions to a Flora of the island)


by G. BENL

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Aquest volum ha estat publicat mercès a l’ajut concedit per al foment de la investigació a la Universitat.
Family ASPLENIACEAE

ASPLENIUM L.

1 – Fronds simple
   2 – Rhizome thick, erect; lamina subentire, long-decurrent to a winged petiole
       ... ... ... africanum Desv. (1)
   2 – Rhizome thin, creeping; lamina sinuate to dentate, sometimes with a bud at apex, petiole mostly unwinged
       ... ... ... variabile Hook. (2)

1 – Fronds divided
   3 – Fronds lobed or simply pinnate
      4 – One to three pairs of small frond-lobes broadly adnate below; large apical portion of frond often proliferous at tip
          ... ... ... isabelense Brause (3)
      4 – Frond with one to many pairs of free pinnae
      5 – Apical portion of frond similar in shape (not always in size) to lateral pinnae
      6 – Terminal pinna acuminate, proliferous at apex
          7 – Terminal pinna not much larger than lateral ones, not long-caudate
              ... ... ... paucijugum Ballard (4)
          7 – Terminal pinna usually much larger than lateral ones
          8 – Pinna abruptly attenuate to a filiform apex; rachis scaly
              ... ... ... annetii (Jeanp.) Alston (6)
          8 – Pinna tapering to a long-caudate apex; rachis subgla-brous
              ... ... ... longicauda Hook. (5)
      6 – Terminal pinna not as above
      9 – Pinnae emarginate, the sinus with a bud
          ... ... ... emarginatum P. Beauv. (7)
      9 – Pinnae not emarginate
      10 – Pinnae rhomboidal to trapezoid, lacerate, veins flabel-late; terminal pinna non-proliferous
           ... ... ... megalura Hieron. (22)
      10 – Pinnae otherwise, veins forking; terminal pinna generally with a bud at base
11 – Sori swollen, ca 0.5 cm long; bud always present; terminal pinna larger than subterminal ones

... ... aff. boltonii Hook. ex Schelpe (9)

11 – Sori thin, to 1.8 cm long; bud not always present; terminal pinna equalling the largest lateral pinna in size

... ... gemmiferum Schrader (8)

5 – Apical portion of frond normally different in shape from lateral pinnae

12 – Fronds usually gemmiferous near apex

13 – Apex flagelliferous by an elongated rachis

... ... sandersonii Hook. (26)

13 – Apex not flagellate, formed by an attenuate frond segment

14 – Rachis distinctly winged, at least towards apex

... ... barteri Hook. (10)

14 – Rachis not winged

15 – Rachis subglabrous; pinnae crenate

... ... macrophelebium Baker (11)

15 – Rachis densely pubescent throughout, mainly with glandular whitish hairs; pinnae lobed or toothed

... ... protensum Schrader (16)

12 – Fronds not gemmiferous near apex

16 – Rachis green-winged, at least towards apex

17 – Rhizome long-creeping

... ... unilaterale Lam. (12)

17 – Rhizome erect or suberect

18 – Up to ca 60 pairs of pinnae shorter towards base and apex

... ... erectum Bory ex Willd. var. usambarense (Hieron.) Schelpe (13)

18 – Up to ca 20 pairs of pinnae shorter towards apex only

... ... inaequilaterale Willd. (14)

16 – Rachis not green-winged

19 – Sori usually 1 (2,3) per pinna

... ... monanthes L. (15)

19 – Sori several or many per pinna

20 – Sori to 2 mm or more wide, usually set close along costa

... ... friesiorum C. Chr. (20)

20 – Sori thinner, extending to margin

21 – Lateral pinnae lanceolate-acuminate

... ... biafranum Alston & Ballard (21)

21 – Lateral pinnae rhomboid to subtrapeziform
22 – Pinnae subequal at base, lower side not cut away; rhizome scales to 7 mm long
... ... subaequilaterale (Baker) Hieron. (17)
22 – Pinnae distinctly unequal at base
23 – Rhizome scales to 5 (6) mm long, blackish, opaque; costa not conspicuous to apex
... ... hemitomum Hieron. (18)
23 – Rhizome scales ca 3 mm long, translucent brown, clathrate; costa distinct to apex
... ... cancellatum Alston (19)
3 – Fronds pinnate-pinnatifid or more divided
24 – Fronds pinnate-pinnatifid with a bud towards apex; pinnae cuneate at base, lobed almost to costa; one sorus per lobe
25 – Pinnae strongly asymmetric, trapeziform, with 1-3 basiscopic pinna-lobes
... ... dregeanum Kunze subsp. brachypterum Pichi Serm. (28)
25 – Pinnae more symmetric, lanceolate, with 6-16 basiscopic pinna-lobes
... ... preussii Hieron. (29)
24 – Fronds bi- to pluripinnate
26 – Fronds bipinnate
27 – Plants with stolon-like proliferous fronds beside normal leaves
... ... ... mannii Hook. (30)
27 – Plants without stolonoid fronds
28 – Rhizome short-creeping, scales closely reticulate; rachis not scaly
... ... ... aemilii-guineae Alston (24)
28 – Rhizome scale and rachis characters not combined as above
29 – Rachis bicolorous; ultimate segments broadly cuneate at base, toothed apically, with several sori
... ... ... buettneri Hieron. var. buettneri (25)
29 – Rachis unicolorous; ultimate segments not cuneate, entire, with one sorus each
30 – Ultimate segments not prolonged beyond sorus
... ... theciferum (Kunth) Mett. var. concinnum (Schrader) Schelpe (32)
30 – Ultimate segments prolonged beyond sorus
... ... ... theciferum var. cornutum (Alston) Benl (33)
26 – Fronds divided to 4pinnate in part
31 – Fronds pinnate-pinnatifid to tripinnatifid and tripinnate; ultimate segments narrowly cuneate

... ... *aethiopicum* (Burm. f.) Bech. (23)

31 – Fronds 2- to 4pinnate; ultimate segments not narrowly cuneate

32 – Fronds mostly 3pinnate to 4pinnatifid, stipe reddish-brown shining; indusium inconspicuous

... ... *abyssinicum* Fée (23)

32 – Fronds 3- or 4pinnate, stipe matt-brown, densely hairy towards base; indusium cup-shaped

... ... *hypomelas* Kuhn (31)


**Synonymy:** see SCHELPE 1977: 137.

Rhizome erect or shortly creeping, to 3 cm in diameter, the apex densely paleate, producing tufted stiff fronds attaining 80-100 cm in total length. Rhizome scales dark brown, subentire, clearly clathrate, long-subulate tapering to curved, sometimes intricately curled hair-points vanishing with age, 8-14 (18) mm long by 1.2-2.2 (3) mm wide near an ovate base, more or less continued to the basal portion of the stipe. This 5-15 cm long, thick, winged with the decurrent lamina of the frond. Blade simple, to 9 cm wide at middle, subcoriaceous to firm-chartaceous in texture when dried, usually dark green, glossy on both sides, linear-lanceolate, acuminate, gradually and long-attenuated from middle to base. Costa elevated and channelled on lower surface; veins free, mostly forked, ending in hydathodes near the (sub)entire and scarcely thickened margin. Sori abundant, narrow-linear, irregular in length to 3.5 cm, mostly close together, oblique; indusia glabrous, ca 1.5 mm wide.

**Ecological notes:** A tropical and subtropical epiphyte on trunks and higher branches of trees in virgin forest as well as in plantations. In Bioko especially common on *Elaeis*, ca 1.5 m and more above ground-level, in subcoastal area; also reported from mountain forest of the Pico up to 1400 metres elevation.

**Citations:** VOGEL 129, Clarence, K; MANN 123 (12/1859), K; 443 (1860), K; MILDBRAED 6382, Pico above Basíle 800-1000 m (16/8/1911), B, HBG; THOROLD TF 29 & 31, Laka 150 m (24/8/1951), BM; ESCARRÉ 3657, Playa de Carboneras (2/1965), BC; 3676, Ureka (3/1965), BC; G. & U. BENL FP 4, Playa de Carboneras (16/1/1974), M, Hb. Pic. Ser., YA; FP 46, Maule oil palm plantation 380 m (21/1/1974), FR, M; FP 249, Highway Malabo-Airport Km 2 – 3, ca 10 m (23/12/1975), BC, M; FP 293, above Musola 400 m (29/12/1975), BOL, M, Hb. Pic. Ser., TNS, Z; FP 299, Oloita 620 m (29/12/1975), M; FP 502, Balea 490 m (12/1/1976), GC, M.

(2) Asplenium variabile Hook., Sp. Fil. 3: 93, t. 185 (1860).

Synonymy: see TARDIEU-BLOT 1953: 174; t. 32, 3 & 4.

Rhizome short-creeping, ascending, slender, to 4 mm in diameter, sometimes branching, copiously rooting, moderately paleaceous, sending up several fronds spaced 2–6 mm apart. Scales blackish, clathrate, ovate- to deltate-subulate, hair-pointed, ca 5–8 mm long, 1.5 mm wide at base, smaller with curled hair-points along young stipes. Fronds somewhat dimorphic, the fertile attaining more than 30 x 5 cm, the sterile much smaller. Stipe rarely reaching half the length of mature frond, unwinged or with narrow wings grading into the cuneate base of blade. Lamina thinly herbaceous or membranous, light green with the costa stramineous on lower surface, broad- or oblong-lanceolate in outline; margins entire, but irregularly serrate or lobed to pinnatifid in young and sterile fronds; larger fronds developing a bud at tip of the gradually acuminate apex. Veins more or less arching, usually once-forked near costa, most of them soriferous. Sori conspicuously raised, 0.5–2 cm long, 2–4 mm apart, extending almost to margins; indusia firm, persistent.

Fronds of young specimens are very similar to those of Asplenium paucijugum, A. longicauda, and A. annetti; mature plants are easily recognized by key-features.

Ecological notes: Not infrequent in wet situations in secondary forest. Reported as a terrestrial fern, also saxicolous in a stream or ravine, in continental West Africa. From Bioko formerly known as an epiphyte only on trunks and low branches of trees; it is now reported as a terrestrial plant from Río Maloho and Río Bososo.

Citations: BARTER 2047 (6/1857), K; MANN 123 (12/1859), K; MILDBREAD 6821, Bococo (1911), B, HBG; 6946, Bococo (10/1911), B, HBG, phot. M; GUINEA 393, Balea (28/12/1946), BM, MA; ADAMS 1135, Pico 900 m (14/12/1951), GC; G. & U. BENL FP 34, Río Maloho near Km 41–42 of Western Highway (19/1/1974), M; FP 156, Eastern Highway near Río Bososo 280 m (26/1/1974), M; FP 509, Balea 500 m (12/1/1976), M, YA; FP 526 “Pantano del Km 35” of Western Highway Malabo-Luba 10 m (14/1/1976) BC, M; FP 537, Río Laric near Basakato del Oeste 100 m (14/1/1976), FR, M.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Niger, Nigeria, Cameroon, Equatorial Guinea (Río Muni, Bioko-holotype), S.Tomé & Principe, Gabon, Congo, Zaire.—West tropical Africa.
(3) **Asplenium isabelense** Brause in Brause & Hieron., in Bot. Jahrb. Syst. 53: 382 (1915).

Rhizome short, ascending, 2-2.5 cm in diameter, copiously rooting, apex densely clad with entire clathrate elongate-deltate scales 5-6 mm long, cordate and ca 1.4 mm wide at base, extending to stipe-bases. Fronds clustered in a rosette. Stipe 6-11 cm long by 3-4 mm in diameter, greyish-brown, deeply grooved above, initially bearing scales which become smaller upwards, at length glabrescent. Blade oblong in outline, to 60 x 7.5 cm, glabrous, chartaceous and transparent when dry, entire or slightly undulate, acuminate and often proliferous at tip; in lower third dissected almost to costa, forming 1 to 3 pinna-like subopposite lobes (without a midrib), 2 – 2.5 cm apart, broadly and decurrently adnate, merging with each other by a narrow wing, 1-2.2 x 1-3.5 cm, decrescent towards base. Veins forking, not reaching margins. Sori confined to apical half or third of the blade, to 3 cm long, not reaching costa or margin; indusia entire, 1-1.2 mm wide.

*Ecological note:* Epiphyte in lower mountain rain forest, 800-1000 metres elevation.

*Citation:* MILDBREAD 6413, Pico above Basile 800 – 1000 m (16/8/1911), B (holotype, phot. M), HBG. – Endemic to Bioko, very rare.

(4) **Asplenium paucijugum** Ballard, in Hooker's Icon. Pl. 33: t. 3287 (1935).

*Synonym:* **Asplenium variabile** Hook. var. **paucijugum** (Ballard) Alston, in Bol. Soc. Brot. 30 (2.ser.): 7 (1956 a).

Rhizome erect or widely creeping, to 1 cm in diameter, scaly towards apex. Scales pale or dark brown, clathrate, lanceolate, acuminate, varying in size, eventually caducous. Fronds approximate or tufted, to 50 cm tall, finally arching; usually bearing 1 or 2 (rarely to 4) pinna-pairs, but simple fronds occasionally intermingled. Stipe firm, canaliculate on upper face, pale with a violaceous flush, initially more or less paleate with narrowly lanceolate to hair-like scales, at length glabrescent, often up to 30 cm and longer than the dark to dirty green blade when fully developed. Pinnae oblong-elliptical, lanceolate or ovate, acuminate, 4-20 x 1.8-6.5 cm, herbaceous or slightly coriaceous in texture, margins sinuate or crenate-serrate, cordate to oblique-cuneate at base and abruptly narrowed to a short petiolule, often short-caudate (1-2 cm) at tip, glabrous throughout; sometimes provided with a bud. Lateral pinnae often irregularly lobed. Terminal pinna somewhat longer than, or equalling, the lateral pinnae. Rachis dark, narrowly winged, glabrous like the costae. Veins forking, forming an angle of ca 50-60 degrees with the costa, sometimes only part of them soriferous. Sori numerous, often raised, varying in length from 0.5 to 2.5 cm without reaching the paler costa or the margin; indusia glabrous, persistent.

This species is rather polymorphous, and immature specimens may be confounded with those of **Asplenium variabile** and **A. longicauda**.
Ecological notes: Frequent in suitable habitats of the continent, from where the species is recorded primarily as a saxicolous plant in stream-beds, or as an epiphyte on shrubs and trees in moist evergreen forest, more rarely terrestrial in wet shaded sites; few collections, however, from Bioko.

Citations: GUINEA 531, Boloko de San Carlos (3/1/1974), BM; ADAMS 1130 A, Pico 900 m (14/12/1951), GC, phot. M.


(5) Asplenium longicauda Hook., Second Cent. Ferns: t. 69 (1861).

See fig. in TARDIEU-BLOT 1964 a: t. 26, 3.

Rhizome short-creeping, ca 6 mm in diameter, copiously rooting, apically bearing deltate-subulate, dark brown, clathrate scales of varying length. Fronds few, tufted, 30-75 (90?) x 15-25 cm, firm, with (2) 4 to 7 (9) pairs of lateral pinnae; stipe ca 15-30 cm long, mostly shorter than the blade, straw-coloured to brownish, canaliculate, sparsely paleate at base. Blade of herbaceous parchment-like texture, greyish green to almost glaucous when fresh, becoming dirty olivaceous-brown with age. Terminal pinna narrowly oblanceolate, 15-25 (45) x 2.5-4 cm, acuminate, usually very long-caudate and then proliferous at apex, margin entire or undulate. Lateral pinnae subopposite, similar in shape to the terminal one when also proliferous, eventually with an apical notch after the layer has fallen away; upper pinnae often shortly decurrent, lower pinnae shortly stalked; all irregularly lobed at times. costa raised underneath, paler than leaf-tissue. Veins once-forked, forming an angle of ca 40 degrees with the costa; usually only partly soriferous. Sori comparatively remote, ranging from 3 to 18 mm in length, not reaching either the margin or midrib, markedly prominent.

Ecological notes: A lowland element from near sea-level to rarely above 1200 metres elevation, commonly epiphytic low down on trees in shady forest, sometimes on vertical rocks.

Citations: MANN 341, Pico 900 m, K; MILDBRAED 6260, above Basilé 600–800 m (15/8/1911), B; 6294, l.c., B, HBG; 6295, l.c., B; 6945, Bococo (10/1911), B, HBG; 6983, Musola 600 – 1200 m (11/1911), B, HBG; GUINEA 532, Balea (28/12/1946), MO; 533, l.c., BC; 538, l.c., MA; 693, “Bosque de la carretera de San Carlos, Km 35” (31/12/1946), BC; G. & U. BENL FP 105 a, Loreto 1070 m (24/1/1974), M; FP 144, Pico 880 m (26/1/1974), GZU, K, M; FP 306, Oloita 610 m (29/12/1975), BOL, FR, M, TNS; FP 432, Pico 1260 m (6/1/1976), BC, M, YA.

Geogr. distribution: Cameroon, Equatorial Guinea (Río Muni, Bioko), Príncipe, Gabon; Madagascar.
See figs. in TARDIEU–BLLOT 1964 a: t. 28, 1 & 2.


Rootstock creeping, to more than 8 mm in diameter, becoming woody; scales dark brown, deltoid- to linear-lanceolate, acuminate, ca 5 x 2 mm, clathrate, entire, extending almost continuously along stipe and rachis but becoming smaller, narrower and more hair-pointed higher up. Fronds borne in a rosette, upright, normally long-stalked, with (1) 3 to 5 (9) pinna-pairs. Stipe 12-30 cm long, dark brown, provided with hairy root-fibres near base in addition to scales. Blade green when fresh, then olivaceous, deltate to ovate-acuminate in outline, attaining 75 x 30 cm or more, firmly membranous in texture. Pinnae oblong-elliptical to broadly lanceolate, margin subentire, coarsely dentate towards apex, terminated by a long-subulate to thread-like point with a bud. Lateral pinnae opposite or alternate, 3-8 cm apart, 5.5-18 x 2.5 – 8 cm, denticate or subsessile, rarely provided with a basal lobe. Terminal pinna evidently larger, 18-32 x 3.5-6.5 cm, often more elongated than the lateral ones, with a proliferating tip to 8 cm long. Veins obsolete, usually once- or twice-forked. Sori varying in length and distance, obviously prominent and nearer to costa than to margin.

This species is easily recognized by its thread-like pinna-apex and paleate stipe and rachis.

Ecological notes: Favouring dark shady situations in mountain rain forest and near running water, at about 1000 metres altitude; common in Bioko.

Citations: MANN 445 (4/1860), K; GUINEA 1137, Musola (10/1/1947), MA; 1138, l.c., BC; 1139, l.c., BM; ADAMS 1130, Pico 900 m (14/12/1951), BM, GC; ESCARRÉ 3648, Basile (4/1965), BC; G. & U. BENL FP 98 a & b, Loreto 980 m (24/1/1974), M; FP 148, Pico 880 m (26/1/1974), BM, M; FP 443, above Belebú-Baláchá path to Ureka 720 m (8/1/1976), BC, M, TNS, YA; FP 446, l.c., GZU, M; FP 469, above Bocoricho path to Laguna Lombé 720 m (10/1/1976), M; FP 473 a, above Bocoricho path to Laguna Lombé 770 m (10/1/1976), M.

Geogr. distribution: Cameroon (holotype), Equatorial Guinea (Bioko), Gabon.

See t. 80 in HOOKER 1861.

Rhizome short, erect, ca 1 cm in diameter; apex protected by ovate-subsulate acuminate hair-pointed clathrate scales ca 8.5 x 1.5 mm, light brown turning blackish, with tiny superficial hairs. Fronds several, close-set, 30–50
x 10-25 cm, rarely larger. Stipe attaining length of the blade, paleate in its lower portion with hairlike scales, otherwise subglabrous like the pale rachis and costae, sulcate. Lamina lanceolate in outline, submembranaceous, bright green remaining virescent when dry. Pinnae oblong-ovate, obtuse and emarginate with a small bud at the base of a V-shaped sinus, obliquely cuneate at the base, margin regularly dentate-serrate when mature. Terminal pinna large, ca 10-20 x 4.5 cm, shortly decurrent to the rachis. Lateral pinnae 2- to 7-paired, ca 3.5 cm apart, 8-12 x 2-3 cm, shortly stalked or subsessile. Veins close, most of them once- or twice-forked. Sori thin, linear, very irregular in length, often borne near costa, and never reaching the margins; indusia narrow, persistent.

Ecological notes: Terrestrial in moist ground of lowland tropical forest, rarely epiphytic.

Citations: MANN 343, 300 m (1860), K; G. & U. BENL FP 216, road to Basilé 20 m (16/12/1975), BC, BOL, GC, GZU, M, MO, TNS, YA, Z.


Rootstock erect or short-creeping, becoming stout with age, to 3 cm in diameter; apex close-set with grey-brown to blackish, broadly lanceolate-acuminate to hair-pointed scales up to 9 x 2 mm, clathrate with very thin-walled cells. Fronds borne in a tuft, up to 1.2 m long but usually smaller, arching. Stipe firm, grey to greenish, to 30 (40) cm long and 3-6 mm in diameter at base, channelled, at first more or less densely clothed in its lower portion with linear-lanceolate scales and higher up by hairlike and curled ones, eventually subglabrous. Lamina up to ca 80 x 30 cm, ovate- or oblong-lanceolate in outline, imparipinnate with the terminal pinna similar in shape and size to largest lateral ones, and often bearing a bud at its base; submembranaceous or leathery to fleshy when fresh, light green not turning brownish, subglabrous. Lateral pinnae 6 to 12 pairs, alternate or subopposite, 3-10 cm apart up to ca 20 x 5 cm, oblong- to ovate-lanceolate, very unequally cuneate at base, shortly stalked; apex long-acuminate; margin subentire, shallowly crenate or bluntly toothed. Rachis grey-green on upper face, narrowly winged towards apex. Veins fairly distant, usually once-forked. Sori thin, to 1.8 cm long, oblique to slightly falcate, running from near the pale costa more than halfway to margin; indusia linear, membranous, entire, permanent.

Not always gemmiferous but well distinguished from related species by the light green colour of the pinnae; becoming relatively large when settling on wet ground.
Ecological notes: Most vigorous plants grow as terrestrials in deep shade of mountain rain forest; in Bioko tallest in high rainfall areas of southern upland.

Citations: MILDRAED 6368, Pico above Baslé 1100-1400 m (16/8/1911), B, HBG; 6984, woodland between Musola and Moka 600-1200 m (11/1911), B; ADAMS 1034, Moka 1260 m (7/12/1951), BM, GC, MA; MELVILLE 428, Moka 1380 m (1/9/1959), BM; ESCARRÉ 3649, Belebú-Balachá (3/1965), BC; G. & U. BENL FP 58, Mte Baká 1460 m (22/1/1974), M, Hb. Pic. Ser.; FP 72, Biaó inside the crater border 1750 m (22/1/1974), M; FP 89, Biaó inside the crater border 1800 m (22/1/1974), M; FP 450, above Belebú-Balachá path to Ureka 730 m (8/1/1976), M; FP 571, between Residencias de Moka and Riasaca 1160 m (15/1/1976), M.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko), Zaïre, Rep.S.Afr. (holotype), Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda.—Tropical and southern Africa.


Rhizome short, erect, ca 8 mm in diameter, densely clad in fine light brown hairs as on roots, and with appressed dull brown to blackish scales. These ovate-lanceolate, hair-pointed, ca 5-12 x 2.2 mm, entire, distinctly clathrate, extending sparsely up the young stipes and rachises, but here smaller, narrower, reddish-brown and with more curled hair-points, vanishing with age. Fronds 4 to 6 or more, tufted, herbaceous to coriaceous, arching falciform with age. Stipe greyish-green to-brown, wiry, 10-35 cm long and up to 3 mm in diameter at base of mature fronds, channelled. Blade imparipinnate, to 85 x 25 cm, linear- to ovate-lanceolate. Rachis greenish, partly winged towards apex, regularly producing (in our material), at the base of ultimate pinna, a bud which soon develops a new plant. Lateral pinnae about 10 to 15 on each side, alternate throughout, central ones 7-14 x 1.2-2 cm and spaced 3-4.5 cm apart, all lanceolate-attenuate or -caudate, with a broad unequally cuneate base, shortly but distinctly petiolulate (to ca 5 mm), with margins slightly sinuate to shallowly crenate or obtusely dentate-incised, glabrous on both faces; veins forking; basal pinnae slightly reduced or not; apical pinna more irregularly and deeply incised, occasionally furcate and far larger than subterminal lateral pinnae. Sori 4-6 mm long, elliptic with a broad entire indusium aligned along veins from near costa to halfway or more to margin, swollen and up to 3 mm broad when mature.

Ecological notes: Found growing exclusively as an epiphyte, especially in mist forests, in wet situations near lakes and by running waters, 740-1800 metres elevation.

Citations: MANN s.n. (1861), K; GUINEA 1671, Finca Puente (20/1/1947), BM, MA; 2237, Lago de Biaó (30/1/1947), MA; ADAMS 1009, Lago
Loreto 914 m (6/12/1951), BM, GC; 1114, near Lago de Biaó 1620 m (9/12/1951), BM, GC, MA; ESCARRÉ 3651, “sin localidad” (1965), BC; G. & U. BENL FP 84, Biaó inside the crater border ca 1800 m (22/1/1974), M, Hb. Pic. Ser., Z; FP 185, Bosque del Río Chubá 1310 m (28/1/1974), M; FP 313, Carretera de Valle Moka 1160 m (29/12/1975), B, M; FP 367, Pico ca 1700 m (4/1/1976), BC, GZU, M, Z; FP 394, Pico 1790 m (4/1/1976), G, M; FP 453, above Belebú-Balachá path to Ureka 740 m (8/1/1976), M, TNS.

Geogr. distribution: Apart from Equatorial Guinea (Bioko) no reliable records available, so far.

Taxonomic notes: Asplenium anisophyllum Kunze (Type from S. Africa, see fig. 56, 2 in SCHELPE & ANTHONY 1986), syn. A. geppii Carruth. (Type from Angola), has non-proliferous fronds and regularly crenate serrate pinna-margins, whilst A. boltonii Hook. ex Schelpe (Type from Natal at K and BM, phot. M), syn. A. anisophyllum var. latifolium Hook., has persistently gemmiferous fronds and coarsely double serrate-dentate pinna-edges with alternating deeper and shallower incisions, the terminal pinna deeply cut down. Asplenium anisophyllum sensu Sim and sensu Tardieu seems to include the two species (see JACOBSSEN 1983 : 334). Our proliferous plant is close to A. boltonii (t. 166 in HOOKER, Sp. Fil. 3; fig. 56, 1 in SCHELPE & ANTHONY), but its pinna-margins are different, i.e. less deeply incised in comparison with the type material at BM and K. Hence Prof. PICHISERMOLLI (litt. 22/5/1976) suggested we should name it as we did above. According to the late Prof. SCHELPE (litt. 30/7/1976) the entire Asplenium anisophyllum complex needs critical revision.

(10) Asplenium barteri Hook., Second Cent. Ferns: t. 75 (1861).

Synonymy: see TARDIEU-BLOT 1964 b : 130.

Rhizome short, erect, to about 1.5 cm in diameter, densely rooting; scales copious, 0.2 – 0.5 cm long, deltate with ciliate fragile projections, strongly attenuate to a pseudoserrate hair-point, light brown aging to blackish, closely investing juvenile shoots. Fronds 5 – 15 borne in a tuft, varying from ca 15 to 50 (70) cm in total length when fertile, simply pinnate throughout except for an apical pinnatifid segment, dark green when fresh. Stipe upright, slender, attaining 20 cm, sparsely scaly, soon turning greyish to stramineous, grooved, winged toward the blade. This oblong-lanceolate in outline, abruptly contracted apically into a linear or caudate irregularly lobed segment up to about 4 cm long, with a bud at its base. Pinnae subcoriaceous, with some minute scales on both faces. Lateral pinnae numbering ca 15 to 35 pairs, alternate or opposite, approximate or remote (1-2 cm apart below middle), varying from obtuse to acute-acuminate at apex, very shortly petiolulate; base to nearly 2 cm broad, unequal-sided, cuneate(-auriculate) on acroscopic, obliquely truncate on basiscopic side; margins slightly crenulate to bluntly toothed, veins simple or once-forked toward the edges, ending in hydathodes. Longest pinnae near middle, 1.5 – 4 cm, the lower somewhat reduced and sometimes mo-
derately deflexed. Rachis greyish-green to brownish, compressed and evidently winged towards apex. Sori oblong, to 5 x 2 mm when mature, falling short of both midrib and margin; indusia entire, glabrous, attached laterally to the oblique veins.

A variable fern showing a great range in size and shape of pinnae but the apical segment almost constantly bearing a bud or young plant at its base.

Ecological notes: A rather common low-level epiphyte on tree trunks (also in cocoa estates), from the sea-shore up to ca 1200 metres elevation, rarely saxicolous in very wet shady undergrowth.

Citations: VOGEL 128, "Clarence Peak" (11/1841), K; MANN s.n., K; MILDRAED 6397, above Basile 800-1000 m (16/8/1911), B, HBG; 6837 & 6966, Bococo (26/10/1911), B, HBG, P; GUINEA 442, Balea (28/12/1946), MA; THOROLD TF 32, Laka ca 170 m (24/8/1951), BM; G. & U. BENL FP 147, Pico 800 m (26/1/1974), M, Hb.Pic.Ser., YA; FP 246, Río Co 20 m (21/12/1975), FR, M; FP 254, Highway Malabo-Airport Km 2 – 3, ca 10 m (23/12/1975), M; FP 268, above Basupú del Este (“Fishtown”) 185 m (26/12/1975), M; FP 283, above Rebola 320 m (27/12/1975), BC, M; FP 305, Oloita 610 m (29/12/1975), GC, M; FP 505 a, Balea on the shore of the “Lago” 490 m (12/1/1976), M.


See Hooker’s Icon. Pl. 17: t. 1646 (1886).

Rhizome short-creeping to obliquely ascendent, densely clothed in short ovate to broadly lanceolate, light to dull brown, membranous scales. Fronds up to ten, loosely approximate, gradually decreasing to summit including an attenuate pinnatifid apex. Stipe erect, ca 10 – 15 cm long, brownish at base otherwise green, grooved, sparingly paleaceous. Lamina oblong-lanceolate, ca 20 – 30 (50) cm long, dull green, imparipinnate, glabrous on both surfaces. Lateral pinnae about 15 to 25 pairs or more, close-set, opposite below, alternate towards apex, subsessile, 3.5 (6) x 1 (2) cm below middle, lanceolate, always obtuse at apex, margins equally and deeply crenate, base unequal-sided, oblique at the basiscopic side, auriculate acroscopically mainly on lower pinnae; auricles often with discrete venation although not separated by a sinus; lowest pinnae somewhat deflexed; terminal pinna pinnatifid. Midrib pale yellow, prominent, clearly visible; veins simple or once-forked towards margin. Rachis greenish, usually unwinged, subglabrous, gemmiferous at base of the gradually tapering terminal pinna. Sori narrow, sublinear, medial or nearer to midrib, averaging 3 – 5 mm long, mostly parallel; indusia narrowly linear, glabrous.
Differs from preceding species by a less variable habit of fronds, having uniformly obtuse lateral pinnae with crenate margins.

**Ecological notes:** Terrestrial in moist intermediate forest, but more often reported as an epiphyte on trunks at ca 600 to 1650 metres altitude. Rare in Bioko; ADAMS’ collection came from undisturbed forest of the Pico.

**Citations:** MANN 338, “Fernando Po” 600 m (1860), K; ADAMS 1141, Pico 1050 m (14/12/1951), GC.

**Geogr. distribution:** Guinea, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Bioko – holotype), Gabon, Zaïre, Tanzania, Kenya, Burundi, Sudan.– Diffused throughout tropical Africa in wet forest regions.

See figs. in TARDIEU-BLOT 1964 a: t. 29, 1 & 2.

**Synonymy:** see SCHELPE 1970: 174.

Rhizome slender, branched, creeping to 10 cm or wider, 2 – 3.5 mm in diameter, greenish, dorsiventral; scales inconspicuous, light to dull brown, narrow-lanceolate, clathrate, rarely up to 3 (4) mm long. Fronds erect, to 35 (45) cm long, usually 1 – 1.5 cm rarely to 4 cm apart. Stipe soon becoming atrocastaneous to dark purplish along the apically winged rachis, glabrescent, shining, ca 8 – 15 (20) cm long, thin, sulcate above, scaly near base. Lamina very variable in size and shape, (10) 25 (30) x 4 – 8 (10) cm, deltoid-ovate to narrowly lanceolate-oblong in outline, dark green, thinly herbaceous, glabrous throughout, pinnate, the tip attenuate and pinnatisect. Pinnae in 10 to 25 (30) pairs, alternate in our material, rather close-set, shortly stalked, 2.5 – 5 by 0.5 - 1.5 cm, mostly rhombic- or trapezoid-ovate, often falcate or curved, subdimidiate, midrib forming the lower truncate border up to more than half the pinna-length, thus often dividing the pinna into a narrower basal and a wider distal part; apex acute or rounded, base broadly cuneate and parallel with the rachis acroscopically, margins equally or unequally toothed or doubly serrate on acroscopic and distal basiscopical sides. Upper pinnae often abruptly reduced to a pinnatifid acuminate apex, lowest pinnae slightly smaller. Veins usually once-forked, distinctly raised. Sori 5 to 9 per pinna, medial, chiefly arranged in apical part, 3 – 4 (6) mm long, becoming oblong and thick; indusia thin, entire.

The very variable fern differs from similar species primarily by its long-creeping rhizome.

**Ecological notes:** Locally abundant; terrestrial in dense rain forest up to ca 1800 m elevation, on and near wet rocks by streams, on moist banks, or in undergrowth in deep shade. In Bioko found as an epiphyte in southern upland.
Citations: BARTER 1917 & 2053, K; MANN 134 (12/1859), K; 369, 1200 m (1860), BM, K; GUINEA 1433, Musola (16/1/1947), BC; 1434, l.c., MA; 1804, Finca Puente (21/1/1947), BM, K, MA; ADAMS 1022, Lago Loreto 900 m (6/12/1951), GC, MA; MELVILLE 613, Moka 1365 m (19/9/1959), BM, K; G. & U. BENL FP 35, Río Maloho near Km 41 – 42 of Western Highway (19/1/1974), G, M; FP 99, Loreto Crater 985 m (24/1/1974), M, TNS; FP 155, Eastern Highway near Río Bososo 280 m (26/1/1974), G, M; FP 198, S of Bococo between Río Bama and García ca 120 m (29/1/1974), M, Z; FP 335, Río Mioko near Carretera de Valle Moka between Km 20 and 21, 1450 m (31/12/1975), M, FR, Z; FP 381, Pico 1730 m (4/1/1976), BC, M; FP 421, Pico 1590 m (6/1/1976), M, YA; FP 538, Río Laric near Basakato del Oeste 100 m (14/1/1970), B, M.


Plants with large pinnae, i.e. 5 – 7 (10) x 1 – 1.5 cm ought to be interpreted as Asplenium unilaterale var. majus (C. Chr.) Sledge, in Bull. Brit. Mus. (Nat. Hist.), Bot. 3: 246 (1965).

See fig. in SCHELPE 1970: t. 53, F.


Rhizome short-creeping to erect, up to 1 – 1.5 cm in diameter, densely paleate at apex. Scales subulate, attenuate-flexuose to a hair-point, 3 – 4 mm long by up to 0.8 mm broad at base, reddish-brown to ferruginous, clathrate. Fronds long and linear, in a clump of 20 or many more. Stipe dull grey to chestnut-brown, rigidly erect, to ca 15 cm long by 2 mm in diameter at the base, thinly paleate with narrow light brown fugacious scales, terete, evidently green-winged toward the blade. Lamina up to ca 50 cm long and 2.5 – 4 cm wide near middle, linear or rarely lanceolate in general outline, strongly decrescent towards base and linear-lobed apex, sometimes arching, simply pinnate. Pinnae up to 50-70 on each side, mostly alternate, usually attaining 2.5 x 0.8 cm at the middle, thin-textured to herbaceous, glabrous on both surfaces when fully grown, ovate-oblong to falcate, roundish to acute at apex, serrate to bluntly lobed on upper edge, shortly petiolulate (ca 1 mm); base cuneate unequal-sided, auriculate on acroscopic side of lower pinnae with a large, and
sometimes (not always!) separate, free lobe; lower pinnae often deflexed, deltoid-flabellate, more widely spaced, lowermost dwarfed. Rachis matt-grey turning dark brown, with green wings, glabrous, without a bud. Veins usually once-forked, ending in elongated hydathodes. Sori 1.5-2 mm long, oblique, up to 12 (16) per pinna; indusia membranous, smooth, entire.

Ecological notes: A mountain species locally frequent in rich soils of submontane and montane zones, often epipetric in deep shade and on wooded stream banks, more rarely epiphytic on trunks of trees and tree ferns, up to 2700 metres elevation. In Bioko common in higher rainfall area, i.e. up to the Pico and in southern upland.

Citations: MANN 362, 900 m (1860), K; 450, 900 m (4/1860), K; MILD-BRAED 6320, Pico above Basilé 1400 – 1500 m (16/8/1911), B, HBG; 7139, l.c. 1400 – 1900 m (11/1911), B, HBG; GUINEA 2950, 2955, 2988, Pico (2/3/1947), MA; 2976, i.c., BM; 2983, l.c., MA, MO; 2987, 2990, l.c., BC; ADAMS 1036, Moka 1260 m (7/12/1951), BM, GC, P; 1112, near Moka Lake 1590 m (9/12/1951), GC, K, MA; 1174, Pico 1860 m (14/12/1951), GC; MELVILLE 496, “South inner slope of Crater Biaó” 1890 m (14/9/1959), BM; ESCARRÉ 3665, “Casa Banana” (4/1965), BC; 3671, Biaó (2/1965), BC; G. & U. BENL FP 69, above Moka-Malabo 1350 m (22/1/1974), FR, M, b. Pic. Ser.; FP 90 a, Biaó outside the crater border 1750 m (22/1/1974), M; FP 94, Biaó inside the crater border 1800 m (22/1/1974), M, YA; FP 334, Carretera de Valle Moka 1550 m (31/12/1975), BC, M, YA; FP 383, Pico 1750 m (4/1/1976), M.


Taxonomic note: The type variety occurring in southern Africa and its islands has a narrowly elliptic lamina with acute deeply toothed pinnae and darker rhizome scales, but gradations between the two varieties are well known and extend through Central to West Africa. In Bioko only the var. usambarensis is represented.


Rhizome short, erect, to 4 mm in diameter; scales at apex dark brown, ca 2.5 mm long, lanceolate-attenuate, rigid, entire, clathrate. Fronds tufted, to about ten, erect, usually 20 – 40 (50) cm long including stipes; these slender, 8 -16 (20) cm long, grey- to greenish-brown, faintly channelled, soon glabrescent. Blade 4 – 8 (10) cm broad, lanceolate to oblong-deltate in outline, tapering to an apical pinnatifid segment, finally glabrous throughout, herbaceous, simply pinnate with about 12 to 15 (20) pairs of alternate, well spaced asymmetric pinnae. These shortly stalked (1 mm), oblong to trapezoid-lan-
ceolate, often falcate, acute to obtuse, ca 2 – 5 by 1 cm near middle of blade, lowermost not or hardly reduced; pinna-margins obtusely serrate, crenate or double-crenate, pinna-base unequally cuneate, acroscopically subauriculate, parallel to rachis; midrib becoming pale; veins simple or once-forked towards margin, not reaching tips of teeth. Rachis pale brown or brown, narrowly greenish-winged especially toward the apical segment, non-proliferous. Sori linear becoming thickly oblong, usually to 3 – 4 mm long, about 10 – 12 per pinna, halfway between costa and margins, oblique in two rows; indusia membranous, entire, finally obscured by the copious sporangia.

Distinguished from the preceding species at once by the markedly different frond-shape.

Ecological notes: Recorded from cool mountain forests up to ca 2000 metres altitude, terrestrial on moist substrate, saxicolous along stream, rarely epiphytic in undergrowth.

Citations: MANN s.n., K; GUINEA 2954, “regreso del Pico”, K; ADAMS 1023, Lago Loreto 900 m (6/12/1951), BM, GC, P; 1035, Moka 1260 m (7/12/1951), BM, GC, MA; WРИGLEY 556, Moka 1380 m (4/9/1959), K; G. & U. BENL FP 333, Carretera de Valle Moka 1550 m (31/12/1975), M, TNS; FP 550, Mte Baká 1410 m (15/1/1976), M, YA; FP 604, Mioko Fountain 1350 m (17/1/1976), M; FP 614, Laderas de Moka 1400 m (17/1/1976), BC, GZU, M. – Chiefly collected in southern upland.


(15) Asplenium monanthes L., Mant. Pl.: 130 (1767).

Synonymy: see ALSTON 1959 a: 57.

Rhizome suberect to erect, ca 1 – 3 mm in diameter, copiously rooting, forming a dense clump of up to 20 – 30 upright fronds; rhizome scales dark with lighter edges, clathrate, to 4 mm long, lanceolate-subulate to a fine pseudoserrate hair-point. Stipe stiffly-wiry, subglabrous, reddish-castaneous and lustrous like the rachis, rarely attaining 10 cm. Lamina narrowly linear in general outline, usually 10 – 40 x 1.8 – 2.5 cm, attenuate to an acute pinnatifid extremity, firmly herbaceous, at length glabrous throughout. Lateral pinnae up to about 45 pairs, horizontal, shortly petiolulate, alternate or subopposite, to 1.4 x 0.6 cm at about middle, slowly decreasing toward ends of blade, close-set except for the few lower reduced ones; normally shaped pinnae trapezoid-oblong, rounded, subdimidiate, crenulate-serrate on upper and outer margins, acroscopic sides of their bases parallel to rachis. Veins mostly forked, inconspicuous. Sori solitary as a rule, occasionally two or more, parallel and
close to basiscopic margin of pinnae, linear, 3 – 4 mm long, swollen at maturity; indusia membranous, entire, finally covered by sporangia.

Ecological notes: A shade- and moisture-loving terrestrial species from forests between 200 and 2500 metres altitude; in Bioko apparently restricted to montane evergreen forest of the Pico.

Citation: MANN 667, Pico ca 2400 m (12/1860), K.– MANN’s collection so far represents the only record in Bioko.


Rootstock erect or obliquely ascending or horizontal, firmly rooted, occasionally divided, becoming woody with age, to 1 cm diameter, covered with strongly appressed scale-remnants; apices densely paleate. Scales brown, ovate, ca 2.8 x 0.4 mm, clathrate, minutely pseudoserrate. Fronds up to ten, tufted or approximate, to 4 mm apart at their bases, (30) 70 (150) cm in total length, arching towards apex, pendent. Stipe firm, erect, up to 20 cm long by 2 – 4 mm in diameter, grooved, mostly chestnut-coloured, pubescent with ovate scales ca 1.5 mm long, mingled with copious soft-whitish glandular hairs, later glabrescent. Lamina narrowly lanceolate or elliptic in outline, tapered to both ends, attaining more than 1 m long and 15 cm wide at middle, firmly subcoriaceous, pinnate and sometimes pinnatifid at the attenuate tip. Pinnae spreading horizontally, 20 to 55 on either side, opposite or mostly alternate, asymmetric, linear-lanceolate to oblong-triangular or -rhombic, often falcate, central ones ca 5 – 8 x 1 – 1.5 cm and to 1.8 cm apart when fully developed, often attenuate to a long point, shortly petiolulate or almost sessile; base unequal-sided, subtruncate on acroscopic, obliquely cuneate on basiscopic side; margins (except for frond-apex) deeply incised halfway or more to midrib into 5 – 12 (15) linear-oblong, blunt or acute 2- to 4-fid lobes, the acroscopic basal ones often auriculiform. Veins 1- or 2-furcate, sometimes flabellate near the acroscopic base. Rachis proliferous by one or two buds borne at the bases of uppermost (2) 5 to 10 (14) pinnae; pubescence as for the juvenile stipe but persisting and continued into pinna-costae and to a lesser degree into pinna-surface on either side. Sori linear, later broadly oblong, 3 – 6 (8) mm long in two oblique rows near midrib; indusia entire, membranous.

This fairly conspicuous species is distinctive in its unique rachis pubescence.

Ecological notes: Frequent as an epiphyte in mountain rain forest and up
to the montane zone, from 1200 to 2800 metres, reported also as a lithophyte on shaded mossy boulders and on roadside walls; we found it on lava ground at the Pico of Bioko.

Citations: MANN 360 (1860), K; s.n. (1861), K; MILDBRAED 6331, Pico above Basilé 1100 – 1400 m (16/8/1911), B; 6395, Pico above Basilé 800 - 1000 m (16/8/1911), B, HBG; ADAMS 1100, near Moka Lake 1680 m (9/12/ 1951), BM, GC, MA; 1172, Pico 1860 m (14/12/1951), GC; GUINEA 2972, Pico (2/3/1947), BM; 2986, l.c., MA; 2991, l.c., MO; ESCARRE 2013, “Casa Banana a Refugio del Pico” (4/1965), BC; G. & U. BENL FP 343 a & 345, Pico 1620 m (2/1/1976), B, BC, G, GZU, M, YA; FP 356, Pico 2090 m (2/1/ 1976), M; FP 404, Pico 1700 m (6/1/1976), M, TNS, Z; FP 416, Pico 1600 m (6/1/1976), M.


Synonymy: see ALSTON 1959 a : 59.

Rhizome suberect, 3 – 5 cm long, 1.5 – 2.5 cm in diameter, copiously and finely rooting, apex comose with scales. Scales elongate-deltate, clathrate, ca 0.5 mm broad basally, to 7 mm long, hair-pointed, pseudoserrate. Fronds few, clustered, 25 – 55 cm long. Stipe 12 – 25 cm long, ca 2.5 mm in basal diameter, initially scaly below, otherwise glabrescent and dull brown like the rachis. Lamina ovate or oblong in outline, equalling length of the stipe, to 12 cm wide, subcoriaceous, tawny when dry, simply pinnate. Pinnae 7- to 16jugate, alternate or subopposite, to 1.5 cm apart, subtrapezoid-acuminate, the basal ones ca 7 by 1.8 cm, all more or less cuneate at their bases and sometimes obtusely auriculate acroscopically, short-petiolute; margins shortly and irregularly toothed; terminal segment incised, with apically denticulate lobes. Midrib distinct, lateral veins dichotomous or repeatedly forked. Sori up to 30 or more per pinna, close-set, to 1.8 cm long, thin, almost reaching margins; indusia membranous, entire, ca 0.5 mm wide.

Citations: MANN 366, Pico 900 m (1860), K; 379, Pico 900 m (1860), K - holotype; MILDBRAED 6441, Pico above Basilé 800 – 1000 m (8/1911), B, BM, HBG, K, P, phot. M. -A very rare epiphytic fern apparently restricted to Bioko.


See figs. in TARDIEU-BLOT 1964 a : t. 31, 5 – 8.
Synonymy: see SCHELPE 1977: 143.

Rhizome short-creeping to -ascending, 2 – 5 mm in diameter, densely pal­leaceous at apex; scales dark mainly in the centre, opaque, to 5 (6) mm long, cordate at base, narrowed to a pseudoserrate hair. Fronds up to ten, tufted, to 40 (80) cm long, upright or pendent, subcoriaceous. Stipe sometimes as long as the blade, canaliculate, leaden-grey turning nigrescent mainly towards the scaly-haired base, up to 3 mm in diameter. Blade deltoid-oblong in outline. Rachis olivaceous-green and evidently compressed towards apex, only slightly scaly-haired initially. Lateral pinnae 5 to 15 pairs, (sub)opposite, patent, 2 – 4 cm apart, oblong-rhomboid, unequally cuneate-subtruncate at their bases, more or less auriculate acroscopically, petiolulate, 5 – 8 (10) x 2 – 3 (5) cm in the middle, margins crenate or irregularly serrulate; upper pinnae subfalcate, terminal segment decurrent, deltoid-elongate in outline, often 3lobed. Midrib inconspicuous towards apex, nerves subflabellate, more or less reaching margins. Sori 7 to 20 per pinna, linear, thin, 0.5 – 2 cm long, converging toward the base of leaflets; indusia clearly visible.

Ecological notes: A polymorphous plant varying in size depending on the site, epiphytic on tree trunks (e. g. Elaeis) close to ground and on lower branches, also saxicolous by streams in moist forest. In Bioko chiefly in Schefflera mountain woodland and the southern districts.

Citations: BARTER 558 (6/1857), K; MANN 247 (1/1860), K; s.n. (1860), BM; GUINEA 2628, Pico (27/2/1947), BM, MA; 2667, l.c., K, MA; ADAMS 1117, near Moka Lake 1620 m (9/12/1951), GC; G. & U. BENL FP 44, Maule oil palm plantation 380 m (21/1/1974), FR, M, Hb.Pic.Ser.; FP 151, Pico 890 m (26/1/1974), M; FP 257, Road to Basupú del Este (“Fishtown”) 40 m (16/12/1975), M, YA.


Synonymy: see ALSTON 1959 a: 59.

Rhizome short-creeping or suberect, ca 7 mm in diameter, densely pal­leaceous; scales uniformly pale to reddish brown, distinctly clathrate and translucent, ca 3 mm long, deltate-lanceolate, narrowed in upper half to a filiform hair-point. Fronds approximate, ca 20 – 50 (100) cm long, subcorio­aceous, upright, sometimes flexuous. Stipe usually shorter than the blade, canaliculate, black and shining like the rachis, to 3 mm in diameter near the scaly-haired base, otherwise glabrescent. Blade oblong-lanceolate in outline, lateral pinnae 6- to 15jugate, opposite or alternate, 2 – 4 cm apart, asymmetric,
subtrapezoid, attenuate towards apex, cuneate in lower, cuneate-truncate and more or less auriculate on upper side of base, petiolulate, 4 – 8 (11) x 1 – 1.5 (2) cm, margins irregularly denticulate; terminal segment longer than upper pinnae and irregularly lobed. Midrib quite conspicuous all along its length, lateral nerves furcate, subflabellate, reaching margins. Sori linear to falcate, 15 – 30 (40) per pinna, often very close-set, to 2.5 cm long and thin; indusia membranous, clearly visible.

This variable species is closely related to *Asplenium hemitomum*, but by comparing the rhizome scales a clear distinction is at once possible.

Ecological notes: Epiphyte on tree trunks in mountain rain forest; in Bioko found at 1000 – 1500 metres altitude on the Pico and in southern upland.

Citations: MILDBRAED 6369, Pico above Basile 1100 – 1400 m (16/8/1911), G, HBG, phot. M; G. & U. BENL FP 110, S of Praderas de Moka 1250 m (24/1/1974), BM, M; FP 540, Mte Baká 1470 m (15/1/1976), M, Z; FP 581, between Residencias de Moka and Riasaca 1160 m (15/1/1976), M; FP 584, l.c., BC, BOL, M.

Geogr. distribution: Ghana, Cameroon (holotype), Equatorial Guinea (Bioko), Gabon.


See t. 3366 in Hooker's Icon. Pl. 34 (1938).


For more synonyms see SCHELPE & ANTHONY 1986: 181 & 185; fig. 59, 1, 1a, 1b.

Rootstock widely creeping, to 1 cm in diameter, branched, densely clad with brown markedly iridescent scales; these ovate- to lanceolate-acuminate, hair-pointed, subentire, to 4 mm long, persistent. Fronds to 1.6 (2) m long, to 4 – 5 cm or more apart, erect or arching. Stipe brown to castaneous, shining, eventually glabrescent like the unwinged rachis. Lamina simply pinnate, attaining 80 x 30 cm, dull-green, narrowly oblong in outline, acuminate, subcoriaceous. Pinnae in up to 25 (35) pairs, mostly alternate, ca 1 – 3 cm apart, to 15 x 2 cm, shortly stalked, linear-attenuate, commonly tapering in larger fronds to a long-caudate dentate apex, broadest usually toward the unequally cuneate base; margin varying according to age, shallowly lobed to doubly serrate; lower surface with small scattered caducous scales; basal pinnae scarcely reduced. Apical segment narrowly deltoid, sometimes pinnatifid. Veins mostly 2- or 3forked. Sori ca 8 – 15 per pinna, thick, up to 10 x 2 – 3.5 mm at maturity, subcostal, more or less appressed to the prominent midrib; indusia hyaline, entire.

Ecological notes: A fern of higher regions, known from 1000 to 2800 me-
tres altitude, preferably growing in wet montane forests, epiphytic and terrestrial on rocky floor, in dark mossy clefts.

Citations: G. & U. BENL FP 352, Pico 1720 m (2/1/1976), M, Z; FP 368, Pico 1700 m (4/1/1976), M. – The first record of this fern discovered so far in the island.


(21) Asplenium biafranum Alston & Ballard ex Ballard, in Hooker’s Icon. Pl. 34: t. 3367 (1938).

Rhizome wide-creeping, to 1 cm in diameter, branching, densely paleaceous; scales brown, iridescent, linear-lanceolate, acuminate, entire, ca 5 mm long, persistent. Fronds ca. 1.5 cm apart, 1 m tall, erect or arching. Stipe dark brown, more or less shining, finally becoming smooth. Lamina attaining 55 x 25 cm, ovate to lanceolate in outline, alternately pinnate. Pinnae up to 15 (20) each side, 3 – 4 cm apart, to 10 (15) x 2 – 3 cm, short-petiulolate or sub-sessile, lanceolate, usually broadest towards middle, tapering to an acuminate-caudate apex; margins serrulate, sharply serrate or unequally biserrate, lower surface with some minute scales; terminal segment subrhomboid, often 3 lobed. Veins conspicuous, 2- or 3 forked near costa. Sori ca. 15 – 30 per pinna, thin, to 2 cm long, oblique, divergent halfway to margins; indusia hyaline, entire.

Closely related to the preceding species and perhaps within the wide range of this taxon; there are specimens showing some intergrading feature, e.g. BENL FP 585; see also TARDIEU-BLOT 1953: 185.

Ecological notes: Another fern of higher altitudes, recorded from 900 to 2000 metres elevation; an epiphyte in moist forest and on isolated trees, but also seen as a ground fern at bottoms of craters.

Citations: MANN 346, 900 m (1860), BM, K; ADAMS 1124, Moka 1350 m (9/12/1951), BM, GC, MA; G. & U. BENL FP 87, Biaõ outside the crater border 1750 m (24/1/1974), BC, BM, M, HB. Pic. Ser.; FP 383, Pico 1750 m (4/1/1976), BOL, M; FP 397, Pico 1800 m (4/1/1976), BC, M, YA.

Geogr. distribution: Benin, Nigeria, Cameroon, Equatorial Guinea (Bioko-holotype), S. Tomé.– Tropical West African element from the Guinean Gulf area.


See fig. 5 b in BENL 1988: 13.
Rhizome upright or obliquely ascending, usually to 3.5 cm long by 0.5 cm in diameter, densely paleate, producing up to about 30 arching and pendent fronds in a tuft. Scales lanceolate-acuminate to hair-pointed, peltate-based, 6 to 12 mm long, atrocastaneous lustrous with paler edges, mostly extending to stipe-bases of juvenile leaves. Fronds 50 – 80 (100) cm in total length, with a stipe to ca 35 cm long by 2 – 3.5 mm in diameter at base, castaneous, shining like the shallowly grooved rachis. Blade narrowly oblong to linear-oblong, ca 20 – 50 (65) x 12 – 20 cm, imparipinnate. Pinnae polymorphous, always with a long-cuneate unequal base, coriaceous, glaucous-virescent, glabrous either side; veins flabellate. Lateral pinnae in up to 15 pairs, subopposite, usually at right angles to rachis, 3 – 6 cm apart, sessile or very short-petiolute, 5 – 12.5 x 2 – 3.5 cm, trapezoid-rhomboidal in general outline, usually trilobate with a terminal serrate lobe tapering to a 6 (8) cm long tip, the much shorter lateral lobes irregularly serrulate-laciniate; apical pinna equalling the subterminal ones or larger and distinctly tricuspidate; basal pinnae not reduced. No bud present. Sori linear, 5 – 20 by 0.7 mm, following the fan-shaped venation in all pinnae; indusia membranous, entire.

An unmistakable species immediately recognized by its ornamental wedge-shaped pinnae.

Ecological notes: Pendulous epiphyte on tree stem and branches, rarely terrestrial (saxicolous), tending to higher rainfall areas above 1000 metres elevation.

Citations: G. & U. BENL FP 583, between Residencias de Moka and Riasaca 1160 m (15/1/1976), B, BC, BM, G, GZU, M, MO, TNS; FP 618, Bioko 1360 m (17/1/1976), BC, BM, M, YA, Z. – New for the island of Bioko, found as an epiphyte in southern upland.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Cameroon, Equatorial Guinea (Bioko), S. Tomé, Gabon, Zaïre, Mozambique, Zambia, Malawi, Tanzania (lectotype), Kenya, Uganda, Rwanda, Burundi, Sudan. – Widely diffused in tropical Africa, but locally rare.

(23) Asplenium aethiopicum (Burm. f.) Bech., in Candollea 6: 23 (1935).

Synonymy: see SCHELPE & ANTHONY 1986: 205; fig. 67, 2 & 2 a.

Rootstock up to 1.5 (2) cm in diameter, ascending with tufted fronds or creeping with closely spaced fronds. Rhizome scales linear, attenuate with a hair-point, reddish-brown to blackish, clathrate but opaque near apex, to 6 mm long. Fronds erect later arching, not proliferous. Stipe to 30 cm long, dark brown, covered at base with two kinds of scales: linear-lanceolate mixed with hairlike ones to 8 mm long. Blade in mature stage 10 – 50 x 4 – 15 cm, mostly bipinnate-pinnatifid to tripinnate, brownish-green, subcoriaceous, narrowly oblong to lanceolate in outline, apical segment acute or acuminate and deeply lobed. Pinnae in ca 10 to 20 pairs, 3 – 12 x 1.5 – 3 cm, alternate or subopposite, shortly stalked, triangular to lanceolate-deltoid in outline, point-
ed to subcaudate, divided into up to 8 narrowly cuneate pinnules, the upper ones adnate, lower ones distinct and divided into narrowly oblong segments subglabrous above, with fibrillose scales underneath. Rachis dark brown with two types of caducous scales, the woolly-hairy ones in abundance. Sori 2 – 4 per ultimate segment, linear, to 8 mm long; indusia very narrow, subentire.

This most common species has been treated here in a broad sense, its polymorphism generally in accordance with ecogeographical as well as with cytological variation (see BRAITHWAITE 1986). The presence of two kinds of scales on the stipe-base is characteristic of all forms of this polyploid complex.

Ecological notes: Epiphytic in various habitats, especially in mist forest at 1000 to 2500 metres elevation, occasionally in evergreen bushland, also lithophytic in moist rock crevices. In Bioko in Schefflera mountain forest of the Pico and in southern upland.

Citations: MANN 359 (1860), K; MILDBRAED 6330 & 6379, Pico above Basile 1100-1400 m (16/8/1911), B, HBG; 6381, above Basile 800 – 1000 m (16/8/1911), B, HBG; 7181, Pico 2400 – 2850 m (16/11/1911), B, HBG; GUI- NEA 1951, Pico Serrano (25/1/1947), BC; 2854 & 2856, Pico (1/3/1947), BM & MA resp.; 2879, Pico (2/3/1947), MO; ADAMS 1054, Moka – Río Iladyi 1260 m (8/12/1951), BM, GC, MA; 1099, near Moka 1440 m (9/12/1951), GC; 1109, near Lago Biaó 1680 m (9/12/1951), BM, GC, MA; 1157, Pico 1350 m (14/12/1951), GC; 1161, Pico 1500 m (14/12/1951), GC; 1166, Pico 1650 m (14/12/1951), GC; WRIGLEY 514, Moka 1380 (31/8/1959), K; ESCARRÉ 2016, Pico (4/1965), BC; 2017, Refugio del Pico 1900 m (4/1965), BC; 2018, Valle Moka (1/1965), BC; G. & U. BENL FP 88, Biaó outside the crater border 1750 m (22/1/1974), M, YA; FP 317, Carretera de Valle Moka 1350 m (29/12/1975), FR, M, TNS; FP 344, Pico 1620 m (2/1/1976), M; FP 351, Pico 1720 m (2/1/1976), G, M; FP 389, Pico 1760 m (4/1976), M, Z; FP 393, Pico 1790 m (4/1976), M; FP 399, Pico 1800 m (4/1976), M; FP 610, Laderas de Moka 1310 m (17/1/1976), BC, M.


Rhizome short-creeping, densely paleaceous; scales deltate, subcordate at base, acuminate with a long hair-point, closely reticulate with all cells translucent, ca 6 x 0.75 mm. Stipe to 20 cm long, blackish, sparsely paleate
with deltoid scales. Blade ca 30 cm long, to ca 10 cm wide, bipinnate with 12 to 16 pairs of subopposite lateral pinnae. These triangular to lanceolate-oblong in outline, pointed to short-caudate, with hairy scales beneath; apical segment acute and deeply lobed. Pinnules 4–8 on each side, narrowly cuneate or sublinear, more or less adnate, the lower acutely dissected into narrow lobes. Rachis black, not scaly; indusia entire.

Ecological notes: This very rare species, apparently endemic to Bioko, was found growing as an epiphyte above 1250 metres altitude.

Citations: GUINEA 1950, Moka “ascensión al Pico Serrano” (25/1/1947), BM, MA; see also ADAMS 1957: 491.


Rhizome 4–6 mm in diameter, creeping to ascending, becoming woody, densely scaly; scales elongate-deltoid, subulate to a long-pointed hair, dark brown, clathrate, to 4.5 mm or more long, to 0.8 mm wide at base. Fronds erect, closely to loosely spaced, (12) 20–40 (65) cm long. Stipe (6) 12–18 (30) cm long, subequal in length to the lamina, dull brown with deciduous hairs resembling those of the rhizome. Blade broadly lanceolate to deltate in outline, acute, herbaceous or subcoriaceous, pinnate-pinnatifid to mostly bipinnate. Pinnae in 10 to 15 pairs, alternate to opposite and up to 3 cm apart, ca 3–7 x 2.5–3.5 cm, elongate-oblanceolate, rhombic towards apex, dissected into broadly and subequally cuneate elliptic-oblong or -obovate pinnules, irregularly and closely dentate at the truncate apex, the larger divisions lobed; basal pinnae scarcely reduced, apical segment of blade deeply pinnatifid; all pinnae glabrous on both faces, darker green on upper side. Rachis bicolorous, black on lower, green on sulcate upper surface, scaly. Sori linear to 6–8 mm, neither reaching margin nor base; indusia membranous, entire.

Distinguished from Asplenium aethiopicum by the lack of hairy scales on stipe base, by less divided segments and the bicolorous rachis. Erroneously cited and recorded as the closely related American species A. cuneatum Lam.

Ecological notes: Usually terrestrial on rocks and boulders in more or less shaded riverine forests, and on rocky slopes near permanent water, from sea-level to ca 2000 metres altitude.


Var. *hildebrandtii* Hieron., with the rhizome widely creeping and fronds 5–10 mm apart from each other, was described by the author from Tanzania.


**Synonyms:** *Asplenium sandersonii* var. *vagans* (Baker) C. Chr., Ind. Fil. Suppl. 3: 39 (1934).


For further synonymy see SCHELPE 1977: 145 – 146.

Rhizome usually short, erect, ca 3 – 5 mm in diameter, obscured by roots, paleaceous at apex; scales reddish-brown, subulate-attenuate, clathrate, to 3.5 mm rarely to 6 mm long; smaller scales extend to the stipes, and there often become hair-pointed to almost hairlike and pseudoserrate. Fronds 5 to 10, clustered, erect-spreading, arching and forming a rosette in larger specimens; sometimes appressed to tree trunks. Stipe pale brownish-green like the rachis, 1 – 3.5 cm, rarely longer than 5 cm. Lamina ca 10 – 20 x 1.5 – 2.5 cm (considerably larger in some East and South African specimens), linear-lanceolate, simply pinnate. Pinnae in 8–12 (30) pairs, alternate or opposite, distinctly spaced and petiolulate (to 2.5 mm), herbaceous to fleshy-coriaceous, dimidiate, subflabellate to rhomboidal or obliquely cuneate in outline, deeply crenate or obtusely lobed at acroscopic and outer margins: larger pinnae up to 1.5 by 0.8 cm, basal pinnae slightly or not reduced; apical ones gradually decreasing. Venation immersed. Rachis compressed, narrowly winged, mostly subglabrous, extending apically to about 10 mm, sometimes much longer and ending with a bud developing when in contact with the substrate. Sori 1 – 5 to a pinna, oblong, 1 – 2.5 mm in length, close to margin of lobes, becoming swollen when mature; indusia laciniate-ciliate, pale membranous, persistent.

Being very variable in size, texture, and shape of pinnae, this species had been described several times under different names, but it is characterized by its prolonged proliferous rachis lacking a terminal pinna.

**Ecological notes:** Recorded as locally abundant in wet forests from sea-level up to about 3000 metres elevation; commonly a low-level epiphyte, rarely terrestrial on mossy boulders or on forest floors in deep shade.

**Citations:** GUINEA 487, Balea ca 500 m (28/12/1945), BM; G. & U. BENL FP 267, above Basupú del Este (“Fishtown”) 180 m (26/12/1975), BC. GZU, M, MO, YA; FP 298, Oloita 620 m (29/12/1975), B, GC, M.– Infrequent in the island.
Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea, (Bioko, Annobon), S.Tomé, Gabon, Zaïre, Angola, Rep.S.Africa (holotype), Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sudan; Madagascar, Mascarene Is, Comoro Is.– Wide-ranging in humid regions of tropical and subtropical Africa including islands.

(27) Asplenium abyssinicum Fée, Gen. fil.: 199 (1852).

Synonymy: see TARDIEU-BLOT 1964 a: 216; t. 33, 6.

Rootstock short-creeping, ascending or erect, stout to 1.5 (2) cm in diameter, fibrous rooting, paleaceous; scales glossy brown, lanceolate, hair-pointed, metallic lustrous, 6–8 (12) x 1–1.5 mm. Fronds approximate to tufted, about 10–15 in number, up to 50 (100) cm long, very fragile. Stipe 10–15 (30) cm long, glabrous, reddish to dark brown shining like the narrowly winged rachis. Blade broadly lanceolate to ovate-oblong in outline, ca 20 – 35 (80) cm long, up to 10 – 15 cm broad, bright green, glabrous, thinly herbaceous, delicately dissected, mostly tripinnate to quadripinnatifid; apex pinnatifid to lobed; ultimate segments with obtuse lobes. Pinnae to ca 20 (30) pairs, usually alternate, spreading, widely spaced towards base, sessile or nearly so. Lower pinnae reduced in size; mid-pinnae lanceolate, to ca 7 (9) x 2 cm, with 10 to 15 (20) pairs of oblong-obtuse unequal-sided pinnules about 12 x 6–8 mm, further cut into 2 or 3 pairs of rhomboid-ovate or roundish cuneate, entire or 2- to 4-lobed pinnules. Veins simple in the lobes. Sori solitary in each lobe, oblong or ovate, finally markedly swollen.

Ecological notes: Terrestrial plants from damp and densely shaded localities in montane forest or along streams, rarely epiphytic. In Bioko most collections from Schefflera mountain woodland on the Pico at about 2000 metres altitude.

Citations: MANN 375, 900 m (2/1860), BM, K, P; s.n. (2/1861), BM, K; GUINEA 2984, 2992 & 2993, Pico (2/3/1947), BC; 2994, l.c., BM; 2995, l.c., MA; ADAMS 1167, Pico 2100 m (14/12/1951), BM, MA; G. & U.BENL FP 355, Pico 1950 m (2/1/1976), BC, M; FP 360, Pico 2140 m (2/1/1976), M, TNS.

Geogr. distribution: Liberia, Cameroon, Equatorial Guinea (Bioko), Zaïre, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Somalia, Ethiopia (isotype), Sudan.– A native of tropical Africa.


See figs. in TARDIEU-BLOT 1964 a: t. 34, 1 & 2.

Synonym: see PICIHI SERMOLLI 1985 a: 130.

Rhizome 3 – 6 mm in diameter, stout, usually erect, slightly paleaceous,
producing a tuft of ca 10 – 35 upright, later arching, fronds; scales broadly ovate, convex, to 2.4 x 1.3 mm, very shortly acute, clathrate, blackish-brown with a broad or narrower light margin, conspicuous mainly on basal parts of the stipe. Stipe ca 6 – 20 cm long, greyish-brown, narrowly greenish winged when fresh. Rachis slender, somewhat winged towards apex. Blade very variable in size, ca 10 – 35 (40) x 2 – 5 (80) cm, membranous, narrowly oblong to elliptic in outline, pinnate-pinnatifid, often proliferous with a bud near the apex. Pinnae ca 15 – 30 pairs, approximate, alternate, spreading almost horizontally, shortly petiolulate, about 1.5 – 3 (4.5) x 1 cm, narrowly oblong to oblong-triangular, very unequal-sided, deeply lobed into 3 – 6 small linear-clavate obtuse subglabrous acroscopic segments, and 1 – 3 basiscopic segments; basal acroscopic segment emarginate or more often 2- to 4fid; lower pinnae scarcely reduced; apical leaf-segment linear, deeply 3- to 5 lobed. Vein one per lobe, not reaching the margin. Sori solitary on ultimate lobes, arising from costal side of vein, ca 2 mm long, broadly elliptic, finally almost occupying the whole lobe.

Ecological notes: Epiphytic on tree trunks in mountain forest, lithophytic on moist rocks in shade, terrestrial on mossy ground, always gregarious, sometimes forming a dense cover. Found abundantly up to over 2000 metres altitude; in Bioko chiefly on the Pico and in southern upland near and above 1500 metres.

Citations: MANN 376, Pico 1200 m, K; s.n., BM; MILDBRAED 6347, above Basilé 600 – 800 m (16/8/1911), B, HGB; 7016, between Musola and Moka 600 – 1200 m (11/1911), B, HBG, P; GUINEA 487, Balea (28/12/1946), MA; 1216, Musola (10/1/1947), MO; 1227, l.c., BC; 1699, Finca Puente (20/1/1947), MA; 2974, Pico (2/3/1947), MA; 2978, l.c., K, MA; ADAMS 1027, Lago Loreto 900 m (6/12/1951), GC; 1030, Moka 1260 m (7/12/1951), BM, GC, MA; 1087, Moka 1200 m (8/12/1951), BM, GC; 1119, near Moka Lake 1650 m (9/12/1951), GC; 1164 A, Pico 1500 m (14/12/1951), GC; WRIGLEY 520, Moka 1380 m (1/9/1959), BM, K; ESCARRÉ 2015, Moka (1/1965), BC; 3660, Valle Moka (3/1965), BC; G. & U. BENL FP 61, Mte Baká 1450 m (22/1/1974), M; FP 90, Biaó outside the crater border 1750 m (22/1/1974), M; FP 176 a, Rio Iladyi above the Falls 1450 m (28/1/1974), M, YA; FP 309, Carretera de Valle Moka 1160 m (29/12/1975), FR, G, M; FP 339, Rio Mioko near Carretera de Valle Moka between Km 20 and 21, 1450 m (31/12/1975), M, Z; FP 545, Mte Baká 1470 m (15/1/1976), BC, M.


Subsp. dregeanum from Southern Africa with generally shorter stipe and larger lamina (the pinnae more distant from each other, lower ones more reduced) is clearly differentiated from subsp. brachypterum by having elongate-
ovate to ovate-lanceolate uniformly rusty brown rhizome and basal stipe-
scales without slighter margins. The two infraspecific taxa are rather polymor-
phic.

(29) Asplenium preussii Hieron. in Brause & Hieron., in Mildbr., Wiss.

Synonymy: see SCHELPE & ANTHONY 1986: 193; fig. 63, 2.

Rhizome erect or suberect, up to 8 mm in diameter, clothed with deltoid-
ove or ovate-lanceolate acuminate scales which are rusty to dark brown,
clathrate, 4 - 7 by 1.2 - 2 mm. Fronds ca 10 to 12, tufted, upright or arching,
20 - 60 (70) cm long. Stipe about 10 - 20 cm long, bisulate above like the ra-
chis, greyish-green, at length subglabrous except for some broad dark brown
basal scales. Blade 15 - 40 (50) x 6 - 8.5 (15) cm at the middle, oblong-lanceo-
late to narrowly elliptic in outline, attenuate, pinnate-pinnatifid; apical seg-
ment lanceolate, deeply pinnatifid, proliferous behind the tip. Up to 25 (30)
pairs of lateral pinnae usually close-set, alternate, membranous, oblong-lan-
ceolate, sometimes subfalcate, dark green, more or less reduced towards
lamina-base, deeply pinnatifid, nearly pinnate at their bases; larger pinnae,
near the middle, 3 (8) x 1 - 1.5 (2) cm, petiolulate, with up to 10 (15) pairs of
linear to spatulate-oblong lobes to 10 x 2 mm; the basal acrosopic lobe sepa-
rate, larger, broadly cuneate to subfalcate, usually 3- to 5(7)fid; basal bas-
sicopic lobe mostly emarginate or obtuse like the others. Rachis greyish-
green, fugaciously scaly, compressed, winged toward the summit. Pinna-cos-
ta flattened. Segments one-nerved. Sori linear to slightly curved, 2 - 4 (8) x
0.5 - 0.7 mm, near the middle of each ultimate segment, attached to the
acrosopic side of the vein; indusia narrowly oblong, membranous, entire,
more or less persistent.

Ecological notes: A variable and uncommon species mostly terrestrial in
undergrowth of upland riverine forest, epipetric on mossy boulders in deep
shade, rarely as a low-level epiphyte, ca 600 to 1800 metres elevation. In Bio-
ko we found it only once on the Pico, whilst on Cameroon Mountain we saw
it locally abundant.

Citations: MANN 665, Pico 1200 m (12/1860), K; s.n. (1861), BM; G. &
U. BENL FP 428, Pico 1260 m (6/1/1976), BC, M, Z.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Nigeria, Cameroon,
Equatorial Guinea (Bioko – holotype), Congo, Zaire, Rep.S.Afr., Mozam-
bique, Zimbabwe, Malawi, Tanzania, Kenya, Ethiopia, Sudan.– Tropical
and southern Africa.

(30) Asplenium mannii Hook., Second Cent. Ferns: t. 60 (1861).
See figs. in SCHELPE 1970: t. 54, E1 & E2.

Synonymy: Loxoscaphle mannii (Hook.) Kuhn, in Von der Decken's Rei-
Rhizome erect to shortly creeping, 1–3 mm in diameter, covered by tufted fibrous roots, with thin dorsiventral stolonoid procumbent axes of fronds (consisting of stipe and rachis), reaching 45 cm or more in length, producing buds alternately and finally a terminal segment like a normal frond. Rhizome scales dark brown, triangular, acuminate, pseudoserrate, clathrate, ca 1.5–3.5 mm long. Normal fronds erect, closely spaced to tufted, herbaceous or thinly coriaceous, to 12 (16) cm long. Stipe greyish-green, ca 4–5 cm long, glabrous, flattened and grooved on upper surface. Blade narrowly deltoid to broadly lanceolate in outline, attenuate, 5–7 by 2–3 cm, bipinnatifid to bipinnate. Pinnae (3) 4 to 7 (10) pairs, alternate, 0.5–1.5 cm apart, 1–1.5 (2) cm long, glabrous on both faces; winged petiolules broadening gradually into simple ovate or club-shaped pinnae or into pinnae with 2–4 (5) linear to narrowly cuneate pinna-lobes in sterile fronds, or into obliquely semi-ovate to spatulate fertile lobes. Rachis narrowly winged, subglabrous, sometimes elongated and producing buds. Veins simple in each lobe. Sori single per lobe at the acroscopic side of vein, up to 2.5 mm long, thick, surrounded by the lamina of the lobe; indusia cup-shaped, membranous, lax, subentire.

By its dimorphic fronds, i.e. stolonoid ones of indeterminate growth for vegetative reproduction in addition to normal leaves the species is unique among all taxa in question; hence its taxonomic relationships remain uncertain (FADEN 1973: 89; see also TARDIEU-BLOT 1953: 200).

Ecological notes: Locally frequent in loose mats as a low- to high-level epiphyte on tree trunks and branches, and as a lithophyte on rocks, in deep shade of montane evergreen forest, from 1000 to ca 2600 metres elevation. In Bioko also on isolated tree in the Moka area.

Citations: MANN 372, 900 m (1860), K; s.n. (1861), B, BM; ADAMS 1128, near Moka 1290 m (9/12/1951), BM, MA; WRIGLEY 519, Moka 1380 m (1/9/1959), BM; G. & U. BENL FP 310, Carretera de Valle Moka 1160 m (29/12/1975), B, GZU, M, YA; FP 376, Pico 1780 m (4/1/1976), M; FP 384, Pico 1750 m (4/1/1976), M; FP 390, Pico 1760 m (4/1/1976), M; FP 558, Mte Baká 1465 m (15/1/1976), BC, G, M, Z; FP 588 a, descent to Mioko Fountain 1410 m (17/1/1976), M, TNS.

Geogr. distribution: Guinea, Sierra Leone, Cameroon, Equatorial Guinea (Río Muni, Bioko – holotype), Zaire, Angola, Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sudan; Madagascar.- A widespread tropical Afro-Malagasy species.

(31) Asplenium hypomelas Kuhn, Fil. Afr.: 104 (1868).

Synonyms: see SCHELPE & ANTHONY 1986: 197; fig. 64, 1 & 1a.

Rhizome ca 7 mm in diameter, creeping or erect and then with tufted fronds; rhizome scales deltoid to narrowly lanceolate, clathrate, hair-pointed, to 1.3 cm long. Fronds soon arching, sometimes exceeding 1 m in length. Stipe stout, to 6 mm in diameter at base, ca 15 – 30 cm long, sulcate, covered
in lower region with a matted hairlike indumentum in addition to broad pale brown translucent scales. Blade 25 – 90 (140) x 10 – 30 (50) cm, ovate-deltoid to broadly lanceolate, 3- or 4pinnate, finely dissected, not proliferous, dark green when fresh, texture herbaceous, apex acuminate. Rachis and costae with twisted hair-pointed scales. Pinnae 10 to 20 (25) pairs, 10 – 15 (25) by 3 – 5 (9) cm, alternate or subopposite, lanceolate in outline, acuminate to caudate. Pinnules up to 20 pairs, 2.5 – 5 x 1.2 – 1.8 cm, deltoid, unequal-sided, cut down to secondary pinnules. Ultimate segments linear or oblanceolate, 1.2 mm wide, finally subglabrous. Veins solitary in segments. Sori ca 1.3 mm long, thick, solitary, lateral on acroscopic side of ultimate division; indusia broadly elliptic, pouchlike, entire.

This delicately divided fern is characterized by its dense-hairy stipes and the half-cupshaped indusia open only at the top.

Ecological notes: A high-altitude plant (up to 2250 metres elevation) preferring, or almost confined to, tree fern trunks and often climbing there, very rarely terrestrial or saxicolous.

Citations: MANN 448, 900 m (4/1860), K; s.n. (1861), BM; MILDBRAED 6332, Pico above Basilé 1100 – 1400 m (16/8/1911), B, HBG; 7053, above Musola 600 – 1200 m (11/1911), B, HBG; GUINEA1800, Finca Puente (21/1/1947), MA; ADAMS 1041, Moka 1260 m (7/12/1951), BM, GC, MA, P; 1043 & 1046, l.c., GC; 1052, l.c. (8/12/1951), GC; WRIGHTLEY 561, Moka 1200 m (7/9/1959), K; ESCARRÉ 3667, Belebú-Balachá (3/1965), BC; G. & U. BENL FP 57, Mte Baká 1460 m (22/1/1974), M; FP 92, Biaó outside the crater border 1510 m (22/1/1974), BM, M; FP 190, Bosque del Río Chubá 1310 m (28/1/1974), M; FP 330, Carretera de Valle Moka on roadside 1550 m (31/12/1975), FR, M; FP 547, Mte Baká 1460 m (15/1/1976), M.


Synonymy: see SCHELPE & ANTHONY 1986: 195; fig. 64, 2.

Rhizome upright or short-creeping, stout, up to 5 mm or more in diameter, paleate; scales lanceolate-attenuate, rigid and dark brown by thick-walled cells, with hyaline and irregularly fimbriate margins, ca 3 – 4 mm long. Fronds clustered, erect or arching, up to ca 30 cm in total length. Stipe stout and normally shorter than the blade, channelled, pale green with some scattered clathrate scales. Lamina generally elongate-oblong to oblong-elliptic in outline, up to
18 by 4.5 cm, pinnate-pinnatifid to bipinnate, texture coriaceous; apex acute
with truncate lobes. Rachis flattened, narrowly winged and scaly like apical re­
gion of the stipe. Pinnae in 6 to 12 pairs, alternate, decrescent downward from
the middle, oblong-ovate to subtrapezoid, ca 2 – 4 x 0.5 – 1.5 cm, petiolulate,
with 3 to 5 (7) pairs of linear-spathulate lobes or pinnules, dark green above,
paler beneath, smooth, the apex broadened or bi-rarely trifid. Sori large, one on
each segment, fully terminal or nearly so with a basiscopic wing of the lamina;
indusia membranous, semi-orbicular to half-cupshaped, ca 1 mm broad, united
to the leaf-tissue at both ends.

Ecological notes: This wide-spread and locally abundant taxon is variable
in shape of its frond as well as in the range of its habitats. It was recorded
from 200 to 2700 metres altitude as a low-, mid- or high-level epiphyte on tree
branches on steep mountain slopes, on rotten tree trunks, occasionally lith­
ophytic on moss-covered rocks, rarely terrestrial, e.g. on steep roadside
banks. In Bioko often found on more or less isolated trees in southern upland
with its high rainfall.

Citations: MILDBREAD 6449, Pico above Basilé 1400 m (8/1911), B,
HBG; 7118, Moka grassland 1200 m (11/1911), B; ADAMS 1094, Moka 1200
m (8/12/1951), GC; MELVILLE 414, Moka 1390 m (31/8/1959), BM, K; G.
& U. BENL FP 93, Biaó inside the crater border 1750 – 1850 m (22/1/1974),
GZU, M; FP 311 a, Carretera de Valle Moka 1160 m (29/12/1975), M; FP
563, between Residencias de Moka and Riasaca 1190 m (15/1/1976), BC, M.

Geogr. distribution: Cameroon, Equatorial Guinea (Río Muni, Bioko),
Zaïre, Angola, Rep.S.Afr. (holotype), Mozambique, Zimbabwe, Zambia,
Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia; Madagascar,
Mascarene Is, Comoro Is.– Tropical and southern Africa with islands.

Note: Our material is defined by fertile segments without a hornlike prol­
gation beyond the sorus. The stipes are clearly shorter than the blade, never ex­
ceeding its length except for one specimen (FP 577) regarded as a form transient
into the following variety.

(33) Asplenium theciferum (Kunth) Mett. var. cornutum (Alston) Benl, in
See figs. in TARDIEU-BLOT 1964 a: t. 25, 6 – 8.

Synonymy: Asplenium (Loxoscaphe) cornutum Alston, in Bol. Soc.
Brt. 30 (2. ser.): 8 (1956 a).
Loxoscaphe theciferum (Kunth) T. Moore var. cornutum

Differs from var. concinnum mainly in having a hornlike projection be­
yond the lateral sorus. In general its scales are shorter, the stipes more slen­
der and longer (to 18 cm) than the lamina (ca 10 by 5 cm) which is usually
oblong-deltoid in outline with the basal pinnae not reduced.
Regarding the “horn” the type variety in tropical South America more approaches var. *cornutum* than var. *concinnum*, but the fronds of American specimens are ovate, with the stipe usually shorter than the lamina. Some authors tend to identify var. *cornutum* with the American type variety; see KUHN 1879: 36, SCHHELPE & ANTHONY 1986: 195.

Ecological notes: Reported from 600 to 2250 metres altitude as an epiphyte on tree trunks in mountain forest. In Bioko it appears to be more frequent than var. *concinnum*, occurring in similar situations and sometimes found together with it.

Citations: MANN 371 (1860), K; s.n. (2/1861), K; ADAMS 1097, near Moka 1270 m (9/12/1951), BM, GC, K, MA; 1125, near Moka, 1290 m (9/12/1951), GC: 1147, Pico 1250 m (14/12/1951), GC: MELVILLE 414, Moka 1380 m (31/8/1959), BM, K; ESCARRÉ 3661, Moka (3/1965), BC; G. & U. BENL FP 107, Rio Chubá 1280 m (24/1/1974), M, Z; FP 161, Praderas Moka 1250 m (28/1/1974), FR, G, M; FP 311, Carretera de Valle Moka on roadside 1160 m (29/12/1975), BC, GZU, M, YA; FP 329, l.c. 1500 m (31/12/1975), M; FP 479, above Bocoricho path to Laguna Lombé 880 m (10/1/1976), M; FP 544, Mte Baká 1470 m (15/1/1976), M; FP 555, Mte Baká 1460 m (15/1/1976), M, TNS; FP 350 a, Pico 1635 m (2/1/1976), M -transiens in var. *concinnum*.

Geogr. distribution: Cameroon (holotype), Equatorial Guinea (Bioko), Kenya, Uganda.– Tropical West African taxon, as far as ascertained.

There is another variety, “var. *schimperi* (Hook.) Pichi Serm.”, hitherto reported from Burundi, Somalia and Ethiopia; see PICI SERMOLLI 1985 a: 125.

**Family ASPIDIACEAE**

Syn. DRYOPTERIDACEAE

1 – Costae with raised edges on upperside; pluricellular hairs never present

2 – Pinnae jointed to rachis, pinnules dimidiate; sori broadly elliptic

… … *Didymochlaena* Desv. (1)

2 – Pinnae not jointed to rachis, pinnules non-dimidiate; sori orbicular

3 – Teeth of pinnules not aristate; indusia reniform when present, with a sinus

… … *Dryopteris* Adans. (2 – 4)

3 – Teeth of pinnules aristate; indusia peltate, without a sinus

… … *Polystichum* Roth (5)

1 – Costae without raised edges on upperside; frond-axes with pluricellular (septate, ctenitoid) hairs

4 – Veins free
5 - Basiscopic margins of laminal segments thickened. Ctenitoid hairs usually present on stipe and/or rachis; rhizome scales never iridescent nor clathrate

5 - Basiscopic margins of laminal segments not thickened. All frond-axes more or less pubescent with ctenitoid hairs; rhizome scales lustrous, sometimes clathrate

6 - Rhizome erect or oblique; lamina of young plants not 3branched. Scales on upper stipe and rachis clathrate, hair-pointed. Cylindric unicellular glands on pinna-surface

6 - Rhizome long-creeping; lamina of young plants 3branched. Upper stipe and rachis without clathrate hair-pointed scales; rhizome scales of greatly elongated dark-walled cells. Cylindric glands as in Ctenitis absent

4 - Veins anastomosing; areoles mostly with included free veinlets. Rhizome scales of greatly elongated, usually dark-walled cells

DIDYMOCHLAENA Desv.

(1) Didymochlaena truncatula (Sw.) J. Smith, in J. Bot. (Hooker) 4: 196 (1841).

Synonymy: see SCHELPE & ANTHONY 1986: 243; fig. 83, 1 & 1 a.

Rhizome (sub)erect, forming (like a small tree fern) a short trunk up to 20 cm tall and 15 cm thick, very densely covered with large lanceolate-aciculate shining brownish scales to 3.5 x 0.2 cm, subentire or lacerate, grading into trichomes. Fronds fascicled, arching, herbaceous becoming chartaceous, 0.7 to 2 m exceptionally more than 3 m in total length, variable in shape. Stipe stramineous to light brown, soon turning woody, 4angled, up to about 0.6 (1) m long by over 1 cm thick, provided with hairy reddish-brown scales to 1 cm long and equal at stipe-base to those of the rhizome. Blade oblong-ovate to lanceolate-elliptic in outline, bipinnate with pinnate apex. Rachis and pinna-costae with scales similar to those of stipe, deeply grooved with raised edges on upper surface. Lateral pinnae alternate, spaced 3 - 5 cm apart, lanceolate, attaining 38 by 5 cm in our material, pinnate with up to ca 30 (40) pairs of close (sometimes contiguous), one-sided parallelogram-shaped, shortly stalked pinnules. These to 5 x 1 cm, apically rounded, somewhat jointed to costa as are the pinnae to rachis (therefore deciduous with age); inner edge parallel with the costa, basal edge entire, acroscopic and apical margins crenulate to slightly toothed, both faces glabrescent at maturity. Veins forked to subflabel-
late, free. Sori (1) 3 to 5 (9) per segment, ca 2.5 x 2 mm, broadly elliptical, borne in a depression near acroscopic vein-tips; indusia elliptic, with a paler entire rim, fixed to the vein along a median line.

Ecological notes: Didymochlaena is a monotypic genus occurring single or in small colonies locally abundant in Schefflera mountain forest on Pico! Handsome plants growing normally as shade ferns, terrestrial in moist forest, preferably on stream banks and in wet gullies, between about 1000 and 2000 metres elevation.

Citations: MANN 356, 1200 m (1860), K; s.n. (1861), BM; MILDBRAED 6366, above Basilé 1200–1300 m (16/8/1911), B, HBG; GUINEA 1034, Musola (9/1/1947), BC; 1037, Musola Monkey Bush (9/1/1947), MA, MO; 1038, l.c., BM, MA; 1039 & 1041, l.c., MA; 2971, Pico (2/3/1947), MA; ADAMS 1014, Lago Loreto 900 m (6/12/1951), BM, GC; 1141 A, Pico (epiphytic on tree trunk) 1050 m (14/12/1951), GC; 1150, Pico 1350 m (14/12/1951), GC; MELVILLE 664, SW of Lago de Biaö 1050 m (24/9/1959), BM, K; ESCARRÉ 2024, “Casa Banana” (4/1965), BC; G. & U. BENL FP 100, Loreto Crater 980 m (24/1/1974), M; FP 143, Pico 880 m (26/1/1974), M; FP 301, Oloita 620 m (29/12/1975), M; FP 369, Pico 1700 m (4/1/1976), M; FP 427, Pico 1320 m (6/1/1976), BC, FR, M; FP 476, above Bocoricho path to Laguna Lombé 790 m (10/1/1976), M.


Didymochlaena microphylla (Bonap.) C. Chr. from Madagascar is regarded as a small-pinnuled form of D. truncatula.

DRYOPTERIS Adans.

1 – Rachis and costae provided with copious dark spreading scales … … …squamiseta (Hook.) Kuntze (4)

1 – Rachis and costae glabrous or with scattered light-brown scales

2 – Proliferous buds usually present; indusia wanting … … …manhiana (Hook.) C. Chr. (3)

2 – Proliferous buds wanting; indusia persistent … … …pentheri (Krasser) C. Chr. (2)

(2) Dryopteris pentheri (Krasser) C. Chr., Ind. Fil.: 284 (1905);
see also PICHI SERMOLLI 1985 a: 163 & fig. 4.

Synonymy: *Dryopteris elongata* (Sw.) Sim, Ferns S. Africa, 2. edn.: 104; t. 17 (1915).

*Dryopteris inaequalis* auctt. non Kuntze, p.p.

For further synonyms see SIM 1915: 105, PICIHER SERMONI-LI 1985 a: 164, 166.

Rootstock suberect or ascending, short, to 3.5 cm or more thick, protected by a mass of large scales; these up to 2.5 x 0.5 cm, yellowish-brown to pale castaneous, thinly membranous, consisting of very narrow cells with a sinuous course, ovate-lanceolate, excurrent into a long twisted hair-point and also with filiform marginal outgrowths. Fronds 4 to 6, clustered, varying greatly in size from ca 30 x 20 cm to 130 (180) x 80 cm, arching. Stipe up to 1.2 cm in diameter above the widened base, (10) 30 – 50 (80) cm long, stramineous and deeply grooved like the rachis, densely beset in lower portion with paleae mainly resembling those of the rhizome; rachis and costae bearing light-brown hair-scales crowded only in pinna- and pinnula-axils, the more or less winged costules with scales mainly hairlike beneath. Lamina firmly herbaceous becoming chartaceous in texture, polymorphic, ovate-triangular to subdeltoid in outline, bipinnate-pinnatifid and tripinnate to quadripinnatifid in lower half, pinnatifid to lobed in the acute extremity. Pinnae ca 10 to 25 on each side, oblong- to ovate-lanceolate to unequally deltoid and falcate, short-stalked, distinctly spaced towards base; middle pinnae commonly 10 – 20 x 3 – 6 cm, the basal developed basiscopically. Pinnules usually all close-set, those of middle pinnae 2 – 3.5 by 0.6 – 1.2 cm on average. Ultimate segments obliquely oblong, cuneate, evidently crenate to serrate-dentate distally. Sori 1.5 mm across; indusia large when young, subentire, glabrous, long persistent.

Ecological notes: A ground fern mainly of the montane forest belt, in moist semi-shaded habitats, along forest edges, in damp rock-crevices, near waterfalls and on stream banks; rarely recorded as an epiphyte. In Bioko up to now collected in Pico woodland and the summit grassland at an elevation of ca 2000 to 3000 metres.

Citations: MANN s.n. (1861), BM, K; GUINEA 2725, Pico ca 2900 m (1/3/1947), MA, MO; 2769, l.c., BM; 2771, l.c., K, MA; 2773, l.c., MA; ESCARRÉ 3629, “Cima del Pico” (4/1965), BC; G. & U. BENLFP 357 a, Pico 2090 m (2/1/1976), BC, M; FP 363, Pico 2650 m (2/1/1976), GC, M, YA, Z.


Taxonomical note: The species, easily recognizable by its basal entangled mass of large pale brownish persistent scales with twisted hair-points and by long twisted hairlike paleae on lower surface of costules, had often been
confused, or treated as conspecific, with *D. inaequalis* (Schldl.) Kuntze, until in 1985 PICHI SERMOLLI pointed to clear and distinctive features of *D. pentheri* among the "*D. inaequalis group" (cf. ALSTON 1959 b: 448). Specimens with lanceolate bullate scales on underside of costules belong to *D. fadenii* Pichi Serm. (1984), confined to Kenya highlands. *D. inaequalis* (see PICHI SERMOLLI 1985 a: 172 – 174) seems to be restricted to South Africa.

(3) *Dryopteris manniana* (Hook.) C. Chr., *Ind. Fil.*: 276 (1905).

**Synonyms:** see SCHELPE 1970: 223; t. 63.

Rhzome erect to short-creeping, up to 1.5 cm in diameter, very densely clad in scales; these ovate to narrowly lanceolate, hair-pointed, light brown to ferruginous, up to 15 x 1.5 mm. Fronds (4 to 7) tufted, usually with one or several proliferous buds in axils of upper pinnae. Stipe ca 10 – 30 (50) cm long, slender and flexuose, deeply grooved and straw-coloured like the rachis, palaaceous towards base with scales like those of the rhizome. Lamina to 40 (50) by 25 cm, glossy dark green and thick-textured, deltoid- to ovate-lanceolate in outline, bipinnate to tripinnatifid below, bipinnatifid in the middle, terminal segment pinnatifid to lobed, acuminate. Pinnae ca 10 to 15 pairs, glabrous at maturity, basiscopically more developed, shortly petiolulate, subssesil and adnate towards apex, 4 – 6.5 cm apart towards base; middle pinnae commonly 14 x 5 cm, narrowly ovate to triangular and falcate, basal ones not reduced, apical ones simply lobed. Pinnules subssesile to adnate, pinnatifid or lobed or crenate; ultimate segments generally with acute teeth below a rounded apex. Rachis greenish winged in upper part, subglabrous with few linear or filiform light-brown scales to 4 mm long especially at pinna-axils. Costa with very narrow fibrillose scales. Veins pinnate in the lobes, often raised like the costa. Sori medial, ca 1 mm in diameter, exindusiate!

**Ecological notes:** A usually terrestrial, saxicolous, species from moist and deeply shaded montane areas, mainly in undergrowth. In Bioko frequent in southern upland sites with about 2700 – 3600 mm rainfall as well as in Pico *Schefflera* mountain forest with ca 4000 mm rainfall.

**Citations:** MANN 351, 610 m (1860), K; ADAMS 1020, Lago Loreto 900 m (6/12/1951), BM, GC, MA; 1038, near Moka 1260 m (7/12/1951), GC; 1078, near Iladyi Falls "in Cytarea-woodland" 1440 m (8/12/1951), GC; 1120, near Moka Lake ("terrestrial or epiphyte on trees") 1650 m (9/12/1951), GC; 1127, near Moka 1290 m (9/12/1951), GC; 1170 & 1176, Pico *Schefflera* forest 1800 – 1860 m (14/12/1951), GC; G. & U. BENLFP 56, Mte Baká 1460 m (22/1/1974), M; FP 120, forest along Rio Iladyi above the Falls 1180 m (24/1/1974), M; FP 348 a, Pico 1620 m (2/1/1976), M, YA; FP 374, Pico 1780 m (4/1/1976), BC, M; FP 386, Pico 1750 m (4/1/1976), FR, M; FP 408, Pico 1700 m (6/1/1976), M; FP 474 a, above Bocoricho path to Laguna Lombé 780 m (10/1/1976), M; FP 492, above Ruiche path to Caldera 820 m (10/1/1976), M; FP 597, Mioko Fountain 1350 m (17/1/1976), M.
**Geogr. distribution:** Guinea, Sierra Leone, Liberia, Ivory Coast, Nigeria, Cameroon, Equatorial Guinea (Bioko – holotype), S.Tomé, Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi; Madagascar.—Tropical African element.


See fig. in HOOKER, Sp. Fil. 4: t. 268 (1862) – sub “Nephrodium (Lastrea) squamisetum”.

**Synonymy:** see SCHELPE & ANTHONY 1986: 245.

Rhizome stout, erect or shortly creeping, up to 1.5 cm in diameter, paleaceous; scales copious, narrowly attenuate-ovate to -deltoid, entire, brown, to 1.4 x 0.3 cm. Fronds tufted, arching. Stipe stramineous to castaneous, darker towards base, ca 15 – 30 (50) cm long, setose with scales; these linear-subulate, hairlike, dark brown, 4 – 5 cm long, rigid, at right angles to stipe, basally mixed with larger scales like those of the rhizome. Leaf-blade herbaceous to subcoriaceous, glabrous, ovate to subdeltoid in outline, up to about 60 x 40 cm, dissected to 3pinnate or 4pinnatifid; terminal acute segment lobed; lateral pinnae oblong-deltoid to falcate, lowest pair largest (to 25 x 12 cm), petiolulate and more developed basiscopically, with pinnules ovate-lanceolate, to ca 5 cm long and pinnately lobed into oblique obtuse segments. Rachis stramineous, fibrillose with spreading to reflexed sometimes hairlike dark scales as on stipe and costae. Veins pinnate or forked in ultimate segments. Sori costular, one in each lobe; indusia kidney-shaped with a deep sinus, persistent.

**Ecological notes:** Sporadically in wet undergrowth of mountain forest and on rocks at stream banks, under deep shade at higher elevation.

**Citation:** MANN 380, Pico ca 1200 m (1860), K.—In Bioko only known from the type collection.

**Geogr. distribution:** Cameroon, Equatorial Guinea (Bioko-holotype), Rep.S.Afr. (incl. Swaziland), Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Somalia, Sudan; Madagascar, Mascarene Is. North India, Himalayas, West China, Taiwan.—Afro-Indian distribution.

**POLYSTICHUM** Roth

(5) **Polystichum fuscopaleaceum** Alston var. *fuscopaleaceum*, in Bol. Soc. Brot. 30 (2. ser.): 22 (1956 a).

Rhizome short, ascending to upright, to 1.5 cm thick with persistent leaf-bases and a dense mass of paleae; scales various in size and shape, to ca 2 cm long, most broadly lanceolate, the larger ciliate toward the top, reddish-brown to dark chestnut-brown, the smaller with a black false vein or with very laciniate edges. Fronds few, tufted, ca 80 (100) cm in total length, arching; all axes densely clothed with scales and hairs. Stipe straminaceous turning brown, to 30 (40) cm long, grooved; scales copious, of different kinds, the longer reddish-brown, ovate-acuminate with various outgrowths, the smaller and paler ones sublinear, those at the very base dark brown in the centre, those near the blade mostly one-coloured and broader. Rachis with two kinds of reddish-brown scales, the smaller linear and laciniate. Blade up to ca 50 (60) x 25 (30) cm, subcoriaceous, oblong- to ovate-lanceolate in outline, olive-green in colour, paler on lower face, bipinnate, with a pinnatifid terminal segment of 3 – 5 cm. Lateral pinnae in about 30 pairs, the largest in the middle 6 – 12 cm long, alternate, (sub)sessile, usually rectangular to the rachis, 1 – 2 cm apart in lower portion, overlapping in the middle, all lanceolate, tapering to an attenuate incised apical part devoid of sori; basal pinnae somewhat deflexed. Pinnules shortly stalked to subsessile, 15 – 20 close-set pairs, to 1 (1.5) cm long, distinctly auricled on upper base; apex sharp-pointed; marginal teeth with bristle-like awns; surface fibrillose on either side with twisted hairs. Venation becoming dark and well marked. Sori small, 6 to 10 (12) per segment; indusia peltate, erose, long-persistent.

Ecological notes: Afroalpine terrestrial from lightly to deep-shaded shelters, mainly preferring wooded rocky gullies in montane grassland. In Bioko found in Pico Schefflera mountain forest and grassland at about 2700 metres altitude.

Citations: MANN 349, Pico 2700 m (1860), BM, K; MILDBRAED 7180, Pico ca 2700 m (16/11/1911), B; ESCARRÉ 3628, “Cima del Pico” (4/1965), BC.

Geogr. distribution: Cameroon (holotype), Equatorial Guinea (Bioko), Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda, Rwanda, Somalia, Ethiopia.—A native of higher mountains in tropical Africa.

A var. ruwensoriense (Pirotta) Pichi Serm., defined in Webbia 32: 90 (1977 c), is known from higher elevation.

CTENITIS (C. Chr.) C. Chr. ex Tard. & C. Chr.

1  – Lamina oblong-lanceolate; basal pinnae not enlarged basiscopically

    … … …cirrhosa (Schum.) Ching (6)

1  – Lamina broadly triangular; basal pinnae markedly enlarged basiscopically

    … … …lanuginosa (Willd. ex Kaulf.) Copel. (7)
(6) Ctenitis cirrhosa (Schum.) Ching, in Sunyatsenia 5: 250 (1940).


Rhizome erect or suberect, woody, with lanceolate very narrowly attenuate, entire golden-brown scales up to 15 x 1 mm. Fronds tufted, arching. Stipe 30 – 60 cm long, sulcate, stramineous to light castaneous, initially covered with a short indumentum of articulate hairlets and fewer large linear-attenuate to filiform scales spreading from minute tubercles. These scales are very dense and copious toward the thickened dark brown base of the stipe. Rachis finely pubescent with short ctenitoid hairs on upper face, and on both sides, but mainly beneath, longer patent subulate scales like those on the stipe. Lamina oblong-lanceolate, bipinnatifid throughout, ca 40 – 80 (90) x 25 – 40 cm, acute, thinly herbaceous. Pinnae to about 25 pairs, spaced 2 – 4 cm apart, narrowly oblong-lanceolate, acuminate. Basal pinnae with a petiolule 2 – 6 mm long, the rest sessile. Largest pinnae below middle (15) 20 (25) x (2) 3 – 3.5 cm, all deeply incised. Lobes linear-oblong up to 1.6 cm, entire, rarely crenate or lobulate, with obtuse or subacute tips. Veins ca 10 – 15 on each side of the costule. Costae bearing beneath slender short light brown hairs and thin subulate brownish clathrate scales 1 – 1.5 mm long, grading into 1 mm long hairs; densely covered on upper side with thick-ctenitoid hairs 0.3 – 0.4 mm long; shorter hairs on costules. Lamina with numerous appressed cylindrical pale glands between veins beneath and erect non-ctenitoid hairs near margins of pinna-lobes. Sori very small, ca 12 to 20 per lobe, arranged along costules in two median lines; indusia orbicular-reniform, ciliate and with tiny cylindrical glands.

*Ecological notes:* Terrestrial rarely epiphytic fern with light green and very delicate fronds, preferably growing in shady places especially along stream banks, in evergreen swampy forest at 650 to 1300 (1600) metres elevation.

*Citations:* MILDBRAED 6982, between Musola and Moka 600 – 1200 m (11/1911), B, HBG, phot. M; G. & U. BENLFP 321, between Maule and Parador de Musola 700 m (31/12/1975), BC, GC, M, TNS, YA.


See fig. in SCHELPE 1970: t. 67, B.

Attractive forest species somewhat reminiscent of a small tree fern when fully grown. Rootstock soon becoming woody, forming a trunk up to 45 cm tall and 15 cm thick; rhizome scales linear, acuminate, minutely serrate, golden-brown, attaining 2.7 x 0.25 cm. Fronds in a tuft, arching. Stipe up to 1 m or longer, green to straw-coloured and brownish, sulcate; the lower ca 5 cm dark purplish, densely covered with thin light brown scales similar to those of the rhizome, softly villous higher up, later glabrescent. Blade broadly ovate-deltoid, acute in general outline, dark green, herbaceous, commonly attaining 1.5 by 1 (1.2) m, finely dissected. Pinnae petiolulate, the basal largest or somewhat reduced, to 60 (70) cm long, unequally triangular, acute and developed basiscopically with petiolulate pinnules to 30 (40) cm long; these bearing tertiary sessile lanceolate to oblong-acute leaflets similar to the pinnules of upper pinnae. Ultimate pinnatifid segments oblong or acute, incised into weakly crenate, truncate or almost free rounded lobes. Terminal segment of lamina pinnatifid, ca 6 cm long. Rachis and costae softly pubescent with short ctenitoid hairs; rachis becoming glabrous towards base especially underneath, remaining denser and longer-hairy on upper sulcate face. Costae like rachis on upperside, their pubescence on underside intermingled with longer hairs and few bullate light brown scales. Costules and veins of segments bearing longer (to 1 mm) stiff spreading articulate white hairs on both sides and copious reddish-brown bullate scales beneath; scattered shorter hairs on lower blade-tissue, marginal white hairlets fringing the lobes. Sori numerous, medial, ca 5 to 12 per segment, 1 mm in diameter; indusia orbicular-reniform, erose, persistent, with pale hairs and glands.

Ecological notes: Rare and local, especially collected between ca 1000 and 2200 metres elevation, favouring deep shade of stream banks in moist montane forest; in Bioko mainly on the Pico above 1200 metres.

Citations: MANN 349, Pico 1500 & 2100 m (1860), K; ADAMS 1145, Pico 1200 m (14/12/1951), BM, GC; G. & U. BENL FP 378, Pico 1750 m (4/1/1976), BOL, M, Hb.Pic.Ser., TNS, YA, Z; FP 589, descent to Mioko Fountain 1410 m (17/1/1976), BC, M; FP 600, Mioko Fountain 1350 m (17/1/1976), M.

Geogr. distribution: Equatorial Guinea (Bioko), S.Tomé, Rep.S.Afr., Mozambique, Zimbabwe, Malawi, Tanzania, Kenya; Madagascar, Mascarene Is (Mauritius – holotype), Comoro Is, Syechelles.– Disjunct distribution in subtropical and tropical Africa including islands.

TRIPLOPHYLLUM Holttum

1 – Lamina of mature plants tripartite or broadly deltoid-pentagonal; basal pinnae much longer than those of the next pair; veins consistently free
2 – Lamina tripartite; all three branches bearing many subequal oblong pinnae, glabrous on upperside

... ... ...securidiforme (Hook.) Holttum (8)
2 - Lamina deltoid-pentagonal; suprabasal pinnae deeply lobed or pinnate at their bases

3 - Hairs wanting on lower surface of veins and between veins; sori at ends of veins; quaternary leaflets present on larger fronds

... ... *pilosissimum* (T. Moore) Holttum (9)

3 - Hairs present on lower surface of veins and sometimes between veins; sori at about middle of veins; quaternary leaflets absent

4 - Leaf-tissue subglabrous; hairs at top of stipe 1 mm long at most

... ... *protensum* (Sw.) Holttum (10)

4 - Leaf-tissue fine hairy beneath; hairs at top of stipe to 2 mm long

... ... *vogelii* (Hook.) Holttum (11)

1 - Lamina of mature plants elongate; basal pinnae at length not much longer than those of the next pair; veinlets forming occasional anastomoses

5 - Basal pinnae to 30 cm long; buds may be present on old fronds near pinna-bases; costules glabrous on upperside

... ... *jenseniae* (C. Chr.) Holttum (12)

5 - Basal pinnae to 20 cm long; buds never present; costules with scattered thick hairs on upperside

... ... *fraternum* (Mett.) Holttum (13)


See figs. in TARDIEU-BLOT 1953: t. 24, 3 & 4; 1964 a: t. 41, 5 (sub *Ctenitis securidiformis*).


For more synonymy see SCHELPE 1977: 181, HOLTTUM 1986 a: 242 – 243 (sub var. *securidiforme*).

Rhizome stout, obliquely creeping, up to ca 1 cm in diameter, paleate at the apex with dark brown subulate hair-pointed scales about 1 cm long, composed of longitudinal thick-walled cells throughout. Fronds close together, up to over 70 cm tall, but greatly varying in size. Stipe equalling or exceeding lamina in length, brownish turning dark purplish when mature, grooved; lower stipe paleaceous like the rhizome, upper stipe covered with a brownish pubescence of multicellular hairs more or less evanescent with age. Blade normally tripartite. The axial division with up to ca 30 pinnae on each side and an asymmetric apical segment up to 5 cm long; the two lateral branches spreading, often basiscopically enlarged. In larger plants the lateral branches sometimes produce near their base a pinnate side-branch irregular in shape and length, rendering the whole blade bipinnatifid at its base and sangled in outline. Upper pinnae trapezoid or roughly rectangular, petiolulate or shortly adnate, apically obtuse, truncate or acute, with an oblique midvein; margins subentire, upper surface glabrous. Rachises and bases of midveins densely short-hairy underneath with the same tomentum as the stipe. Veins usually twice or thrice forked. Sori submedial, very numerous, in smaller pinnae of-
ten in rows parallel to midvein; indusia very small, reniform-orbicular, glabrous.—Triploid species.

Ecological notes: A terrestrial fern of damp shady places, on ground or commonly on rocks in forest, often by water-courses. In the island locally frequent at elevations below 1000 metres.

Citations: BARTER 2042 (6/1857), K; MANN 130, at the beach (12/1859), K; s.n. (1860), BM; MILDBRAED 6420, Pico 600 – 800 m (8/1911), B; GUINEA 411, Balea (28/12/1946), BC; 421 & 425, I.c., MA; 696, “Km 35 de la carretera de San Carlos” (31/12/1946), MA, MO; 698, I.c., BM; 746, I.c., MA: THOROLD TF 27, Ureka 150 m (17/8/1951), BM; ADAMS 1140, Pico 900 m (14/12/1951), GC; BARLEICÓN 2032, Ureka (5/1965), BC; BENL & MALEST FP 30, Río Maloho near Km 41 – 42 of Western Highway (19/1/1974), FR, M, MO; G. & U. BENL FP 141, Pico 880 m (26/1/1974), M; FP 152, Pico 890 m (26/1/1974), BM, M, Hb. Pic. Ser.; FP 232, Río Borababo (“Borabecho”) 10 m (18/12/1975), M, Z; FP 278, Basilé 510 m (27/12/1975), M; FP 462, above Belebú-Balacha path to Río Lombé 810 m (8/1/1976), BC, G, M, TNS; FP 471, above Bocoricho path to Laguna Lombé 750 m (10/1/1976), M; FP 523, “Pantano del Km 35” of Western Highway Malabo-Luba 10 m (14/1/1976), BOL, M, YA; FP 528, I.c., BC, M.

Geogr. distribution: Senegal, Gambia, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Río Muni, Bioko – lectotype), S. Tomé & Príncipe, Gabon, Zaïre, Angola.—West Africa.

A “var. nana” from nearly the same areas had been established by R. BONAPARTE (1923: 211), but was not generally accepted (see SCHELPE 1977: 181). We collected a specimen in Cameroon (Ka 70-71/95) clearly matching BONAPARTE’s frond measures of 0.25 x 0.10 m, but there are distinctively intergrading plants from Bioko (e.g. BENL & MALEST FP 30).


See figs. in TARDIEU-BLOT 1953: t. 25, 1 & 2 (sub Ctenitis variabilis).


For more synonyms see HOLTTUM 1986 a: 246.

Rhizome stout, creeping, densely paleate towards apex with brown, deltoid, subulate scales of ca 3 x 1.3 mm. Fronds approximate, to ca 1 m tall, long-stalked. Stipe as long as the blade on average, greyish brown to dark castaneous in its lower portion, finely puberulous throughout with spreading ctenitoid hairs up to 1 mm long toward the rachis; this covered by the same persistent indumentum but with some very narrow scales basally. Blade deltate-acuminate to 5angled in general outline, tripinnate to quadripinnatifid at
base of large fronds, commonly 30 – 40 (50) cm long and wide, of firm-membranous to coriaceous texture. Pinnae 8- to 12-paired, shortly petiolulate, spaced to ca 5 cm apart towards base, gradually decrescent in length above, alternate, (sub)falcate; the lowest pair opposite and almost as large as the rest of blade, bearing up to 12 or more petiolulate or adnate pinnules, very asymmetric with strong basitonic development; deflexed proximal pinnule finally about 3 times the length of the respective acrosopic one, bearing up to 12 oblong secondary pinnules (pinnulets) and resembling the upper pinnae. Pinnulets obtuse, obliquely cuneate, more or less deeply and variably lobed, becoming more asymmetric towards pinnule-apex. Costae and costulae with the same pubescence as on rachis, with scattered longer hairs on upper surface. Veins bifurcate, glabrous like the tissue between them. Sori comparatively few per ultimate segment, roundish, generally at ends of veins; indusia fringed with short hairs.– Tetraploid species.

Ecological notes: A terrestrial fern, especially in exposed places including rock faces under shade, also in lowland swamps and rain forest. In Bioko, collections made only near sea-level with 1200 to 2500 mm rainfall.


Geogr. distribution: Guinea, Sierra Leone (type cult.), Liberia, Ivory Coast, Ghana, Cameroon, Equatorial Guinea (Bioko), Gabon, Congo, Zaire, Angola.— Widely distributed in West Africa.

(10) Triplophyllum protensum (Afzel. ex Sw.) Holttum, in Kew Bull. 41: 247, fig. 1 A (1986 a).

Synonymy: Ctenitis protensa (Afzel. ex Sw.) Ching, in Sunyatsenia 5: 250 (1940).

For more synonyms see SCHELPE 1977: 180 (sub var. protensa), HOLTTUM 1986 a: 247.

Rhizome slender, widely creeping, 2 – 3 mm in diameter, thinly or densely paleate with brown or blackish subulate scales to about 3.5 mm long. Fronds 1 - 3 cm apart, up to 50 (70) cm in length. Stipe slender but firm, brownish, canaliculate, equalling or markedly exceeding the blade in length, paleate toward the base, with short ctenitoid hairs up to 1 mm long near base of blade. Lamina thin-textured to subcoriaceous, dark green when dry, broadly deltate to Sangled in general outline, to 30 cm or more long and wide, bipinnate-pinnatifid to tripinnate, with the lowest pair of petiolulate acuminate strongly asymmetrical pinnacles nearly twice as long as the next pair. Proximal basiscopic pinnules of the lowest opposite pinnae much longer than adjacent pinnules, bearing several pairs of obtuse adnate pinnules, up to 2.5 x 1 cm, which resemble the pinnules of the second pinna-pair. Pinnae of the symmetric central blade-portion alternate, sessile, unequal at base, gradually decreasing and becoming broadly obtuse towards top of blade. Short hairs on costae
and costulae beneath, and also scattered on veins; longer and evidently thicker septate hairs on upperside of costae, costules and midveins. Leaf-tissue subglabrous on both sides. Veins mostly forked, lower ones not always reaching margin. Sori small, to about ten per ultimate segment; indusia often caducous.

Ecological notes: A fairly common terrestrial fern favouring damp shady or partial shady places in moist forest, in swamps as well as in plantations, generally at low elevation, showing much variation in accordance with its sites.

Citations: VOGEL 111, “ad Clarence” (11/1841), K; MANN 129 (1859), B; s.n. (1860), BM; MÖNKEMEYER (5/1885), B; STODDART s.n., K.– In Bioko, former gatherings are from “near sea-level”, recent collections unknown; see ADAMS 1957: 483.


For further synonyms see HOLTTUM 1986 a: 249.

Rhizome slender, long-creeping, attaining 3.5 mm in diameter, moderately paleaceous with brown to dingy rufescent, ovate-lanceolate scales ca 3 mm long, more or less caducous with age. Fronds spaced to ca 2 cm apart, long-petiolate when fully grown, to 50 cm or more in total length. Stipe firm-filiform, up to ca 30 cm tall in large plants, straw-coloured becoming reddish-brown, canaliculate; the ctenitoid pubescence of long, very dense tangled hairs (to about 2 mm) intermingled toward the somewhat thickened stipe-base with few narrow hair-pointed clathrate scales to 2.5 mm long; hairs near apex of stipe, continuing to basal parts of rachis and costae of lower pinna-pairs. Lamina initially subtriangular-ovate becoming deltoid-pentagonal and acuminate with age, commonly 20 by 20 – 25 cm, texture firm-membranaceous to subcoriaceous, mostly dull green on upperside, paler green on underface, tripinnatifid to tripinnate at base; the lowest pair of petiolulate acuminate strongly asymmetric pinnae by far longer than the second pinna-pair. Proximal basiscopic pinnules of the lowest opposite pinnae at length much longer than next pinnules, bearing several pairs of obtuse leaflets (pinnulets). Pinnae of the symmetric central lamina-portion alternate, sessile or decurrent, unequal at base, gradually decreasing toward the acute apex, their lobes,
as well as those of the basal pinnae, finally smaller and closer toward their apices than in the preceding species. Upper surface of costae, costules and veins with strikingly thick-septate spreading fragile hairs to 1.2 mm long. Veins, veinlets and leaf-tissue bearing dense fine pale hairs beneath, to 0.5 mm long on veins. Sori ca 4 – 12 in ultimate segments (one per lobe), usually nearer to midvein than to margin; indusia more or less hairy.

The species is similar in frond-form, and closely related, to the likewise tetraploid T. protensum; see HOLLTTUM 1986 a: 249.

**Ecological notes:** An ecologically variable fern in damp shade on wet banks and rocks in lowland rain forest and in more open situations (plantations) of litoral zones. In Bioko not recorded from above 30 metres elevation.

**Citations:** VOGEL 250, “ad rivuli litt. sax.” (11/1841), B, K; G. & U. BENL FP 11, Río Sampaka near sea-level (16/1/1974), FR, M; FP 19, Western Highway Malabo-Luba ca 10 m (19/1/1974), M; FP 27 a, Playa de Aleña sea-level (19/1/1974), M; FP 207, Río Matadero sea-level (14/12/1975), M; FP 218, Road to Básilé ca 20 m (16/12/1975), GC, M, MO, Hb.Pic.Ser.; FP 233, Río Borabaabo (“Borabecho”) ca 10 m (18/12/1975), BC, BOL, M, YA; FP 239, Eastern Highway near Río Bososo 30 m (21/12/1975), M; FP 243, Río Coca ca 20 m (21/12/1975), M.


See figs. in TARDIEU-BLOT 1953: t. 25, 5 & 6 (sub Ctenitis jenseniae).

**Synonymy:** Ctenitis jenseniae (C. Chr.) Tard., in Notul. Syst. 14: 342 (1952).

For further synonyms see TARDIEU-BLOT 1964 a: 268, 270.

Rhizome wide-creeping, woody, reaching 4 mm in diameter with age, paleate; scales 5 – 6 mm, narrow-lanceolate, entire, chestnut-brown, evanescent, composed of very elongate cells. Fronds of 0.5 to 1.5 cm apart, long-stalked, (semi-)erect. Stipe reddish-brown, glabrous, glossy, grooved, to 30 – 50 cm or more tall, minutely hairy on abaxial face like rachis and costae with linear castaneous scales especially at the thickened base. Leaf-blade initially ovate-triangular becoming deltoid-lanceolate but sometimes quite irregularly dissected in old plants, 50 cm or more long by 20 – 30 cm wide near base, light green drying to olivaceous-brown with very fine to coriaceous texture, bipinnate to subtriplinmate at base, bipinnatifid towards summit, the attenuate apex pinnatifid. Underside of costae and costulae appearing reddish-velvety. Pinnae free, to ca 8 pairs, the lower distantly spaced, lowest to 30 cm long including stalk, ascending, unequal-sided by a pronounced basiscopic devel-
opment; on large fronds basal pinnae bearing at least one pair of free pinnules and up to 15 pairs of adnate ones; proximal basiscopic pinnules at least 10 cm long, lanceolate, again incised almost to costule, forming about 10 pairs of close-set obtuse segments (pinnulets); successive pinnules less deeply lobed; proximal acroscopic pinnules subequal, following pinnules on both sides cuneate and often auricled at the acroscopic base. Uppermost pinnae are subsessile and similar to pinnules of basal pinnae; pinna- apex roundish or abruptly acuminate. In larger fronds buds often developed on margins of upper pinnae and pinnules near their base. Midvein pinnate, veinlets mostly forked; all veins distinct underneath, raised in young fronds, free but with occasional anastomosis of veinlets. Leaf-tissue quite glabrous on either side, without glands. Sparse marginal hairlets not infrequent near bases and sinuses of pinnae and lobes. Sori rather small, medial between costa or costule and margin; indusia kidney-shaped, brown, usually persistent.—Tetraploid species.

**Ecological notes:** This fern is recorded to be largest when growing in mud at edges of rivers but much smaller in forest where common in low-lying places, especially by pathside banks.

**Citations:** GUINEA 691, “Bosque Km 35 S.Carlos” (31/12/1946), BC; 946, Musola (9/1/1947), MA; ADAMS 1064, near Iladyi Falls in Cyathea-woodland (8/12/1951), GC; G. & U. BENL FP 487, above Bocoricho path to Laguna Lombé 710 m (10/1/1976), BOL, M.


(13) **Triplophyllum fraternum** (Mett. ex Kuhn) Holttum var. fraternum, in Kew Bull. 41: 253, fig. 5 A (1986 a).
See figs. in TARDIEU-BLOT 1953: t. 26, 1 & 2 (sub Ctenitis fraterna).

**Synonymy:** Ctenitis fraterna (Mett. ex Kuhn) Tard., in Notul. Syst. 14: 342 (1952).

For further synonyms see PICIHI SERMOLLI 1985 b: 8, 10.

Rhizome creeping, stout and woody with age, 5–8 mm in diameter, with brown 4–5 mm long, lanceolate acuminate scales of the Tectaria-type, as on stipe bases. Fronds to 80 cm rarely to 100 (150) cm high, up to 6 in number, closely spaced, long-stipitate. Stipe slender but comparatively firm, to 30 (40) cm long, canaliculate, dusky purple to rufescent, ctenitoid-hairy throughout with intermingled scattered narrow-linear scales as on upper face of rachis. Lamina ovate-lanceolate in outline, up to 40 x 20 cm but sometimes shorter than the stipe, of rigid-membranous texture, drying to brown-olivaceous, variously dissected but commonly bipinnate nearly all along, tripinnate at base, pinnate(-pinnatifid) towards a deltate and deeply lobed apex. Pinnae ca 5 pairs, short-petiolulate, free, to 4 cm apart, subfalcate, with about 6 adnate
pairs above them. Basal pinnae commonly 15 – 20 cm long, ascending, une-
qual-sided with one or two proximal pairs of free pinnules; basiscopic pinnules
to 12 cm long, with ca 8 pairs of sessile pinnulets, the acroscopic ones to 4.5
cm long. Suprabasal pinna-pairs up to 10 – 15 x 3 – 4 cm, mostly bearing one
free sessile pinnule and several apically roundish increasingly adnate ones.
Upper pinnae decreasing in length, usually lobed throughout most of their
length; uppermost pinnae confluent. Costa densely short-hairy beneath, cos-
tules with sparser pubescence; upper surface of costules bearing scattered
thick-septate hairs 0.5 mm or more long; hairs of this kind also present on cos-
tae. Leaf-tissue glabrous; pinna- and pinnula-margins sometimes with short
sparse hairs near their base. Veinlets translucent, occasionally forming an
elongate areole as in T. jenseniae. Sori minute, roundish, attached almost me-
dially to veinlets; indusia reniform, small, brownish, mostly persistent.
This species shows much resemblance to the preceding taxon, but the pu-
bescence is different and buds are always wanting.

Ecological notes: Recorded mostly from banks of water-courses in low-
land rain forest; in Bioko found only once near sea-level.

Citations: VOGEL 121, “ad Clarence” (11/1841), B, K.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Came-
eroon, Equatorial Guinea (Bioko), Zaïre, Angola, Tanzania; Madagascar
(lectotype).– A native of West tropical Africa, stretching to East Africa and
Madagascar.

Triplophyllum fraternum var. elongatum was cited as a new combination
by HOLTTUM 1986 a: 254. This taxon known with certainty only from Prin-
cipe Is had been treated by PICHI SERMOLLI (1985 b: 13) as a new species
named “Ctenitis attenuata”.

LASTREOPSIS Ching

1 – Sori oblong; rachis commonly with scaly buds near apex; glandular hairs
on underside of the lamina present or not
   ... ... ...subsimilis (Hook.) Tind. (14)
1 – Sori orbicular; glandular hairs always present
2 – Rachis without buds; stipe and blade densely villous with long white
   acicular hairs; indusia absent
   ... ... ...barteriana (Hook.) Tard. (18)
2 – Rachis with scaly buds; stipe and blade not densely villous with long
   white acicular hairs
3 – Costa villous on underside mainly towards base
   ... ... ...nigritiana (Baker) Tind. (15)
3 – Costa not villous on lower face
4 – Indusia present but shrivelled when old, or fugacious; sori usual-
ly small, 0.5 – 1.2 mm in diameter; appressed glandular hairs numerous on costae, costules and veins

... ... ...currorii (Mett. ex Kuhn) Tind. (16)

4 – Indusia absent; sori usually larger, 1 – 1.8 mm in diameter; appressed glandular hairs scarce or absent on costae, costules and veins

... ... ...vogelii (Hook.) Tind. (17)


Rootstock prostrate, short-creeping, attaining 2 cm in diameter, densely paleate; scales linear, acuminate, hair-pointed, golden-brown to dark brown, up to 12 x 1 mm and often with a few tiny prolongations near the broad base. Fronds borne in a tuft, upright, ranging from 50 to 135 cm in total length. Stipe 15 – 50 cm long, straw-coloured, brick-red brown towards a copiously paleate base, subglabrous on lower surface; dorsal groove broadened higher up to a wide channel densely tomentose with ctenitoid hairs of various length and shape, continuous into rachis; this normally with scaly buds near apex. Lamina to ca 40 – 70 by 25 – 45 cm, subdeltoid-acuminate, mostly tripinnatifid basally, pinnatifid to bipinnate above middle, firmly membranous, dark green on upper, paler green on lower surface, turning brownish when dry. Pinnae petiolulate; those of the lowest pair to more than 30 cm long, gradually attenuate, strongly produced basiscopically; proximal basal pinnulae to ca 15 cm long, divided at their base into stalked sometimes denticulate segments; distal pinnulae lobed, often adnate and subdecurrent. Intermediate pinnae deeply dissected into obtuse segments resembling the basal proximal pinnules, decreasing and crenate rather than lobate towards leaf-apex. Costae and costules densely short-villous on upper surface, subglabrous beneath; midveins mostly pinnate; veinlets forked in ultimate segments. Blade-tissue smooth on upper side, with a few hairs underneath especially along margins. Sori small, more or less elongated, reddish, exindusiate, often lined up in two rows near the middle of superior veins; sporangia-pedicels sometimes with a glandular hair.

Ecological notes: A terrestrial fern recorded from lowland to mountain evergreen rain forest, also observed in secondary and semi-deciduous forest on moist places; nowhere common.

Citations: MANN 125 (12/1859), B, K; s.n. (1860), BM; ESCARRÉ 3675, Ureka (3/1965), BC; G. & U. BENL FP 137, Pico 820 m (26/1/1974), M.

Geogr. distribution: Liberia, Ivory Coast, Benin, Nigeria, Cameroon, Equatorial Guinea (Bioko – holotype), Gabon; Madagascar.– Native of West tropical Africa.

Synonymy: see TARDIEU-BLOT 1964 a: 280; t. 43, 3 & 4.

Rootstock upright, to 4 cm in diameter, clothed in subentire, narrowly subulate golden-brown to dark brown persistent scales which are 5 – 10 mm long by 1 – 1.5 mm wide at their base. Fronds tufted, attaining 1.5 to 1.9 m in total length. Stipe 15 – 45 (70) cm long, stramineous to fawn, paleate in its lower 5 - 10 cm brown portion with scales like of the rhizome, canaliculate on upper surface, brownish-tomentose in the widened apical part of the channel with plurisepate hairs to 1.5 mm long and continuous into rachis; this hairy also on lower surface with ctenitoid hairs, winged towards frond-apex and usually provided there with a scaly bulbil. Leaf-blade 20 – 95 (120) x 15 – 65 cm, deltoid-pentagonal, tripinnate to tripinnate-pinnatifid basally, acuminate, darker green turning nigrescent on upper side when dry, of firm-membraneous to subchoriaceous texture. Primary pinnae ca 25 pairs. Pinnae of lowest pair to ca 30 by 15 cm, petiolulate, much enlarged and developed basiscopically; proximal acroscopic pinnules sometimes only 1/3 the length of the basiscopic ones which are commonly 10- to 15jugate, with oblong-lanceolate segments stalked near base of the pinnula; distal pinnules increasingly adnate and decurrent towards apex; ultimate segments unequal at their base, lobed, obtuse at apex. Middle pinnae petiolulate to subsessile, acuminate, similar in outline to proximal pinnules of the basal pinnae; upper pinnae (sub)sessile, pinnatifid higher up, uppermost crenate. Costae with a short tomentose ferruginous pubescence on upper side, densely villous underneath. Costulae, veins and veinlets bearing on lower face spreading jointed whitish hairs up to 1.2 mm long. Veins simply pinnate or forked. Yellow glands densely scattered on lower lamina-surface. Sori clearly circular, submarginal; indusia vestigial, fugacious.

Ecological notes: Terrestrial usually in shady ravines and on rocks by stream in tropical rain forest; from Bioko known as an uncommon fern from coastal region up to ca 1000 metres elevation.

Citations: MANN 352, ca 600 m (1860), BM, K; MILDBRAED 6887, Bococo (10/1911), B; G. & U. BENL FP 468, above Bocoricho path to Laguna Lombé 700 m (10/1/1976), M.

Geogr. distribution: Ivory Coast, Nigeria, Cameroon, Equatorial Guinea (Bioko – lectotype), Principe, Gabon, Congo.– West tropical African element.

See figs. in TARDIEU-BLOT 1964 a: t. 44, 1 – 4 (sub Lastreopsis efulensis).

Rootstock upright, to 6 cm high and 3.5 cm in diameter, covered with golden-brown to dark brown scales; these thin, mostly narrow-lanceolate, ca 5 – 10 x 0.5 – 1 mm, with a few marginal prolongations. Fronds crowded, attaining more than 1.5 m in total length. Stipe often longer than the blade, light brown with a darker basal portion bearing scales like those of the rhizome, (sub)glabrous on the smooth lower surface, shortly tomentose on upper side in the apically widened channel. Rachis clothed with a dense tomentum of brownish ctenitoid hairs on adaxial side, with spreading fibrillose scales and numerous appressed oblong glandular hairs beneath, especially near base; proliferous scaly buds usually present in pinna-axils near blade-apex. Lamina ca 20 – 60 x 15 – 60 cm, deltoid, tripinnate-pinnatifid to quadripinnate basally, 14- to 18jugate, pinnatifid at top, membranous to subcoriaceous, darker green above. Pinnae rather deeply lobed, sessile and decurrent higher up. Lowest pinna-pair usually much enlarged, long deltoid, unequally ovate-lanceolate, strongly developed basiscopically, 15 – 60 by 12 – 30 cm, with 12 to 20 pairs of lanceolate sub-sessile deeply dissected pinnules of ca 4 – 5 x 1.5 – 2 cm; tertiary segments obtuse. Veins forked or pinnate. Costae and sometimes also costulae and veinlets provided with a few spreading whitish septate hairs on lower surface; costae and costulae tomentellous above with brownish hairs. Glands abundantly present along costae, costulae, veinlets and on leaf-tissue on lower face, as well as on the long pedicels of the sporangia. Sori mostly small, orbicular (0.5 – 1.2 mm in diameter), commonly in one line on either side between costule (midvein) and margin; indusia almost vestigial, fugacious.

Ecological notes: Terrestrial on woody mountainside, in forest ravines, in wet rocky stream-beds, occasionally abundant in undergrowth. In Bioko recorded from lower regions not exceeding 900 metres altitude.

Citations: ADAMS 1029, near Lago Loreto 900 m (6/12/1951), GC; G. & U. BENL FP 153 a, Pico 890 m (26/1/1974), M; FP 274, Basilé 460 m (27/12/1975), BC, M; FP 468 a, above Bocoricho path to Laguna Lombé 700 m (10/1/1976), BOL, M; FP 507, Balea 500 m (12/1/1976), BC, M, YA.


See figs. in TARDIEU-BLOT 1964 a: t. 44, 5–7.

Synonymy: see TINDALE 1965: 286.

Rhizome short, stout and ascending, to ca 12 mm in diameter, densely clad with light reddish-brown to dark brown scales; these narrowly subulate,
hair-pointed, ca 8 – 12 x 0.5 mm, with long marginal fragile processes. Fronds crowded, up to nearly 3 m in total length. Stipe not longer than the blade, stramineous, reddish-brown toward the base bearing scales similar to those of the rhizome; furrowed when dry, glabrous and glossy or slightly scabrous on abaxial side, dorsal surface with some scales in the grooves and densely tomentose in the apically broadened channel. Rachis and costae with a dense vestiture of light brown ctenitoid hairs on upper side, glabrous or with a few hairs beneath; scaly bud present towards apex. Lamina 60 – 150 x 30 – 80 (100) cm, deltoid-ovate to pentangular, tripinnate-pinnatifid basally, ca 8- to 15jugate, dark green, firm-membranaceous to subcoriaceous. Pinnae petiolulate, rather deeply lobed, sessile and decurrent toward the acuminate apex; apical segment pinnatifid to crenulate. Pinnae of the lowermost pair much enlarged, long-deltoid, ca 30 – 50 x 25 – 30 cm (petiolule to 4 cm long), unequally ovate-lanceolate, basiscopically produced; the proximal pinnules up to 25 by 6 cm, deeply dissected into tertiary segments, resembling in shape the narrowly ovate middle pinnae of the blade. Veins pinnate, prominent, veinlets one to each tooth or lobe. Costae and costules provided on upper surface with copious brownish appressed ctenitoid hairs. Glandular hairs sparsely scattered on lower side, and also on the pedicels of sporangia. Sori exindusiate, rather distant, mostly (but not always!) broader and larger than in the preceding species.

Ecological notes: Terrestrial on semi-exposed locations of mountain slopes, in wet gullies and riverine and swamp forest.


Geogr. distribution: Guinea, Ivory Coast, Nigeria, Cameroon, Equatorial Guinea (Bioko – lectotype), Gabon, Congo, Zaire, Uganda (?).- West tropical Africa.


Synonymy: see TINDALE 1965 : 287.

Rhizome short (ca 1.3 cm high), suberect to erect, densely paleaceous; scales lanceolate-acuminate, thick-walled, 5 – 7 x 0.5 – 0.7 mm, yellowish- to dark brown, with margins sparsely fimbriate or denticulate. Fronds close together, up to 90 cm in total length. Stipe yellowish-brown to fawn, 30 – 35 cm long, canaliculate, bearing scales near base like those of the rhizome and whitish acicular pluricellular, sometimes glandular hairs all along its abaxial side. Rachis with two ridges on upper surface, the intervening channel with short villous hairs, lower side with whitish spreading hairs somewhat longer than on stipe. Blade ca 25 – 55 x 10 – 40 cm, deltoid-ovate in general outline, acuminate
apically, pinnate- to tripinnate-pinnatifid, firm-membranous to subcoriaceous, dark green. Pinnae with villous petiolules, subfalcate, acuminated; basal ones largest, to 10 – 20 x 5 – 15 cm, obliquely ovate, basiscopically developed, their proximal lower pinnules 3 – 11 by 1.3 – 3 cm, with tertiary segments at base. Middle and upper pinnae widely spaced, acuminated to acute apically. Costae and costules whitish villous beneath, on upper side with ctenitoid hairs shorter than those of the rachis. Veins forked or pinnate; veinlets simple or forked, glabrous. Oblong glands appressed, sessile, unicellular, red, thickly, scattered along rachis, costae, costulae, minor veins and on the surface of the lamina; red glands also on pedicels of the sporangia. Sori exindusiate, rather small.

Ecological notes: Found on ground in lowland rain forest, up to about 300 metres elevation.

Citations: BARTER s.n. (6/1857), B, K; HENDERSON s.n. (3/1880), K; reported from “near sea-level” by ADAMS 1957: 482. The above description is widely based on TINDALE 1965: 286-287.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (Bioko - holotype).

TECTARIA Cav.

1 – Terminal segment entire, similar in shape to lateral pinnae
   ... ... ...barteri (J. Smith) C. Chr. (19)
1 – Terminal segment lobed, broad-ovate to deltoid
2 – Rhizome horizontal, long-creeping; fronds not tufted, not gemmiferous; blade triangular; sori exindusiate
   ... ... ...angelicifolia (Schum.) Copel. (20)
2 – Rhizome ascending, stout; fronds tufted; blade elongate-deltoid; indusia present but often deciduous
3 – Fronds not gemmiferous; stipe purplish to dull brown; rhizome forming erect trunk up to 60 cm tall; scales blackish brown, narrow, firm
   ... ... ...camerooniana (Hook.) Alston (21)
3 – Fronds usually gemmiferous with buds on both surfaces; stipe grey or castaneous; rhizome short, suberect; scales light brown, broad, soft
   ... ... ...fernandensis (Baker) C. Chr. (22)

(19) Tectaria barteri (J. Smith) C. Chr., Ind. Fil. Suppl. 3: 177 (1934).
   See fig. in TARDIEU-BLOT 1953: t. 27, 6.


Rhizome stout, erect, ca 1 cm in diameter, its scales ca 6 – 8 x 1 mm, longitudinally thick-walled, entire. Fronds approximate. Stipe to more than 60
cm long (in our material), stramineous, greyish-brown, bearing light to dark brown scales (sometimes with a darker median region) like those of the rhizome toward the base, otherwise glabrous except for very short ctenitoid hairs in the groove. Blade up to 60 – 75 x 30 – 45 cm, lanceolate in general outline, simply pinnate; large terminal pinna similar to lateral ones in ovate-oblung shape, up to 20 – 30 (45) x 8 – 10 (12) cm, slightly decurrent; 2 to 4 (5) pairs of usually smaller subopposite lateral pinnae, ca 5 – 7 (8) cm spaced, at an angle of 50 – 60 degrees to rachis, shortly decurrent; the lowest petiolulate, 10 – 20 by 3 – 6 (7) cm, unequally cuneate at base. All pinnae with entire slightly waved margin, apex abruptly narrowed, (long-)caudate; texture thin-herbaceous to subcoriaceous. Rachis glabrous and stramineous like the prominent costae. Main veins arcuate, distinct, up to 10 – 25 (30) in number; veins forming copious irregular areoles with free included veinlets. Sori rather small, circular, placed in two (sub)regular rows along main veins; indusia minute, fugacious.

**Ecological notes:** A terrestrial fern established mainly in rocky lowland forest; in Bioko found near sea-level up to ca 300 metres altitude.

**Citations:**
- BARTER s.n. (6/1857), B, BM, K; MANN 143 (12/1859), K; s.n., BM; HENDONERSON s.n., K; MILDBRAED 6912, Bococo (10/1911), B, HBG; G. & U. BENL FP 43, Río Ruma 20 m (21/1/1974), BM, BOL, FR, G, GZU, K, M; FP 198, between Río Togocha and Río Co 290 m (25/1/1974), B, BC, BM, M; FP 202, Río Ococo 230 m (29/1/1974), FR, M, Z; FP 231, Río Borabaabo (“Borabecho”) ca 10 m (18/12/1975), GC, M, YA; FP 534, Río Laric near Basakato del Oeste 100 m (14/1/1976), M, TNS.

**Geogr. distribution:** Nigeria, Cameroon, Equatorial Guinea (Bioko – holotype).– Restricted to Guinean Gulf regions.

(20) **Tectaria angelicifolia** (Schum.) Copel., in Philipp. J. Sci. 2: 410 (1907).


Rhizome long-creeping, ca 4 – 8 mm in diameter, moderately paleate; caducous scales 4 – 6 x 0.5 – 1.5 mm, lanceolate to subulate and hair-pointed, entire, blackish brown. Fronds up to 1.2 m apart, long-stalked, attaining ca 1.2 m tall, usually shorter. Stipe slender, (20) 30 – 45 (60) cm long, canalicate, greyish to castaneous toward the base, tomentose with ctenitoid hairs intermingled with scales like those of the rhizome, higher up very sparsely short-hairy, finally subglabrous and polished. Blade thin membranaceous, becoming darker green on upperside, broadly (cordate-)deltoid, ca 25 – 45 (60) x 20 – 40 (60) cm, subternate, tripinnatifid at the base, deeply pinnatifid below an acute apex. Lateral pinnae usually 3 to 5 (7) pairs, falcate, the lowest stalked (2 – 5 cm), unequal-sided, basiscopically developed, about 15 – 25 (30) x 8 – 10 (15) cm, irregularly pinnate to deeply lobed, the proximal basiscopic pinnules again pinnatifid; intermediate pinnae ovate-lanceolate, short-
ly petiolulate or sessile, superior ones more or less confluent; terminal segment broad-ovate acuminate, deeply lobed at its decurrent base. Rachis and costae minutely ferruginous-tomentose with ctenitoid and glandular hairlets above, subglabrous glossy and often turning blackish beneath. Veins and leaf-tissue on upper side with sparse whitish glandular hairs; underside of main vein (midrib), veins and tissue with brownish glands and longer white hairs, margins puberulous on both sides in young stages. Veins uniformly reticulated forming copious areoles with free included veinlets; costular areoles elongated. Sori exindusiate, irregularly scattered or 1 to 3 serial between midrib and margins of ultimate lobes, mostly on connected veins (compital).

Ecological notes: Terrestrial in forest and plantations (cocoa farms), colonizing in damp shady places; in Bioko locally common in the coastal zone.

Citations: BARTER s.n. (1857), K; MANN 142 (12/1859), BM, K; s.n. (1860), BM; HENDERSON s.n. (3/1880), K; GUINEA s.n. (1947), BC; G. & U. BENL FP 12, Rio Sampaka near sea-level (16/1/1974), BM, M; FP 27, Playa de Aleña sea-level (19/1/1974), M; FP 195, Bococo-Drunen sea-level (29/1/1974), M; FP 215, Road to Basilé ca 20 m (16/12/1975), M; FP 224, Rio Consul 45 m (17/12/1975), M.


Rootstock 1.2 cm or more thick, long-creeping then ascending to erect, forming a trunk 20 to 60 cm tall; rhizome scales blackish brown, lanceolate to elongate-subulate and hair-pointed, ca 6 x 2 mm, subentire, more or less appressed. Fronds tufted, very variable when adult, long-stalked. Stipe stout, up to 120 cm tall, purplish to dull brown, scaly near base, canaliculate on the adaxial side with minute ctenitoid hairs in and along the groove; hairs more conspicuous higher up on the dark rachis; otherwise scabrous to glossy. Lamina 40 – 120 cm or more long, to 60 (90) cm broad, herbaceous to firm-membranous, dark olivaceous when dry, greener beneath, elongate-deltoid in outline, predominantly bipinnatifid with 3 to 5 pairs of lateral more or less adnate decurrent pinnae (these pinnatifid partite or with pinnules connected by a wing) below a long-deltoid apical extremity deeply lobed to a broad wing on the rachis, the many remote segments up to ca 8 x 2.5 cm; lowermost pinnae commonly attaining 40 by 25 cm, distinctly petiolulate, greatly enlarged basiscopically, cut down into pinnatifid lanceolate lobes. Costae, costulae and veins evidently puberulous with short ctenitoid and glandular hairs on upper side; upper lamina surface in young stages with longer hairs, especially in the sinus-
es; very sparse hairlets and glands underneath. Veins forming an irregular network with elongate costal areoles and free included veinlets in part. Sori numerous, large, finally in rows parallel to the costules; indusia dark, often glandular on the margins, fugacious or persistent and becoming folded.

Ecological notes: This species is an infrequent ground-fern in shady primary forest as well as in open clearings. In Bioko it was collected in moist woodland on the Pico up to 1350 metres elevation and down to sea-level.

Citations: GUINEA 1477, Balachá (15/1/1947), BM, MA; ADAMS 1153, Pico 1350 m (14/12/1951), BM, GC; ESCARRÉ 3639, Parador de Musola (12/1965), BC; 3640, S.Carlos (12/1965), BC; G. & U. BENL FP 22, Río Musola near mouth (19/1/1974), M.

Geogr. distribution: Nigeria, Cameroon (holotype), Equatorial Guinea (Bioko), S.Tomé, Zaïre, Uganda. – West tropical African fern.

(22) Tectaria fernandensis (Baker) C. Chr., Ind. Fil. Suppl. 3: 179 (1934).
See fig. in TARDIEU-BLOT 1953: t. 28, 1.

Synonymy: see ALSTON 1959 a: 74.

Rootstock short, suberect, woody, to 3 cm thick; scales at the top light brown and thin, broadly ovate-acuminate, 3–5 (8) x 2–2.5 mm. Fronds borne in a tuft of 12 or more, attaining ca 1.2 m in total length. Stipe slender, canalicate, about as long as the lamina, grey to stramineous turning castaneous, moderately beset basally with scales similar to those of the rhizome, higher up appearing glabrous and rather glossy, with tiny white hairs soon vanishing but increasing towards the short-hairy rachis; this obviously winged near its apex. Leaf-blade broadly to elongate deltate in general outline, about 30 – 60 cm long by 20 – 40 cm wide, thinly coriaceous, light to medium green, olive- to reddish-brown when dry, usually bipinnatifid with 3–5 pairs of stalked to sessile and more or less deeply divided free pinnae; the two lowest opposite pairs up to ca 12 cm apart. Pinnae of the lowermost pair unequally deltate, 15 – 25 by 12 – 18 cm, decidedly developed basiscopically with the proximal pinnules free in adult stage, the others usually united by a broad wing; terminal leaf-segment lanceolate deltoid, acuminate, decurrent, cut into more or less crenulate pinnules and lobes to about 10 in number. Costae and costules densely tomentose with pale brown ctenitoid and glandular hairs on upper side, subglabrous or with small glands underneath; lamina-tissue sparsely pubescent with longer whitish septate hairs sometimes concentrated at the sinus margins. Venation densely reticulate with elongate costal areoles and occasional or frequent free included veinlets. Sori numerous, circular, large, often terminating included veinlets, lined up close to costules. Several proliferating bulbils of about 7 mm in diameter mainly in apical region of rachises and costae, on the upper surface, the lower surface, or both. Indusia brownish, finely hairy, with fimbriate margins.
Ecological notes: On moist rocky ground and fairly dry slopes in secondary (also in *Elaeis*) forest, on shady rocks near sea-shore, and also reported up to 2500 metres altitude. In Bioko recorded as rather frequent in shaded habitats between 300 and 1470 metres elevation.

Citations: MANN s.n. (1861), K; HENDERSON 461, K; GUINEA 1437, Musola (16/1/1947), MA; ESCARRÉ 3638, Valle Moka (3/1965), BC; G. & U. BENL FP 37 a, between Maule and Musola Km 10 – 11, 660 m (21/1/1974), BC, M; FP 119, forest along Río Iladiyí above the Falls 1180 m (24/1/1974), FR, M; FP 308, Carretera de Valle Moka 1160 m (29/12/1975), M; FP 441, above Belebú-Baláchá path to Úreka 700 m (8/1/1976), M; FP 455, l.c. 760 m (8/1/1976), BOL, M; FP 489, above Ruiché path to Caldera 800 m (10/1/1976), BC, GZU, M, YA; FP 546, Mte Baká 1470 m (15/1/1976), M; FP 552, Mte Baká 1465 m (15/1/1976), M.


The close related *Tectaria gemmifera* (Fée) Alston, native of East Afri­ca, has the fronds somewhat larger and more compound, the rhizome scales very dark brown with paler borders, and generally no included veinlets.

Family LOMARIOPSIDACEAE

1 – Pinnae continuous with the rachis, veins forming areolae with or without free included veinlets; rhizome creeping; stipe with two grooves along a median ridge on upper side

... ... *Bolbitis* Schott (1 – 4)

1 – Lateral pinnae jointed to rachis, veins free and parallel; rhizome scande­dent; stipe with a single groove on upper side

... ... *Lomariopsis* Fée (5 – 11)

BOLBITIS Schott

1 – Leaves entire or pinnatifid

... ... *fluviatilis* (Hook.) Ching (2)

1 – Leaves simply pinnate when fully developed

2 – Terminal segment lobed, confluent with upper pinnae, usually lacking a bud; rhizome wide-creeping

... ... *auriculata* (Lam.) Alston (1)

2 – Terminal segment not lobed, conform to lateral pinnae or prolonged, bearing a bud near apex; upper pinnae free; rhizome short-creeping

3 – Lateral pinnae 5 – 20 mm across, attenuate at base; terminal seg-
ment not prolonged; lateral veins not prominent; sporangia usually spreading over the entire surface.

\[ \ldots \ldots \text{salicina} \ (Hook.) \ Ching (4) \]

3 - Lateral pinnae 15–45 (50) mm across, abruptly truncate or cuneate at base; terminal segment prolonged, sometimes proliferous; lateral veins prominent; sporangial arrangement exclusively or mainly on veins.

\[ \ldots \ldots \text{acrostichoides} \ (Afzel. \ ex \ Sw.) \ Ching (3) \]

(1) **Bolbitis auriculata** (Lam.) Alston, in J. Bot. 72, Suppl. 2: 3 (1934).

**Synonymy:** see HENNIPMAN 1977: 136; fig. 34.

Rhizome far-creeping in wet ground, up to 30 cm or more long, sometimes branched, 3 – 7 mm in diameter, becoming woody, beset with dull brown or blackish elongate-subulate paleae to 7 x 0.5 – 1.5 mm, often appressed behind the rootstock-tip and later deciduous. Fronds up to 12 or more, spaced in two rows, ca 1 – 4 cm apart in mature plants, occasionally caespitose, glabrous, strongly dimorphic. Stipe with two grooves and spreading attenuate subclathrate scales especially towards base, (15) 40 – 50 (65) cm long in adult sterile, (35) 60 – 65 (90) cm in fertile fronds. Rachis narrowly winged in part towards apex, where axillary subglobular scaly buds which develop into a short rhizome are rarely produced. Sterile leaf-blade ovate-lanceolate in general outline, ca (15) 30–60 (70) x (10) 25 (50) cm, herbaceous to subcoriaceous sometimes chartaceous, olivaceous. Lateral pinnae alternate or subalternate, normally (2) 3 to 7 (10) on each side, ca 1.5 – 4 (6) cm apart, lanceolate-oblong, (8) 15 (30) x 3 – 7.5 cm, cuneate at base, with margins usually entire or undulate and apex acute or acuminate with a point of up to 2 cm; uppermost pinnae often decurrent on the rachis; lowermost with a short winged stalk and sometimes auricled basiscopically. Terminal segment lobed, asymmetrically triangular in outline, continuous with the rachis, ca 10 – 20 x 10 – 15 cm when full grown, composed of (2) 3 or 4 rarely more lobes similar to upper lateral pinnae. Venation obvious: costa (primary vein) markedly raised, the pinnately arranged and prominent lateral veins running parallel; tertiary veins anastomosing, forming a subregular reticulate pattern with costal areoles and several asymmetric rows of areoles between the secondary veins, rarely including an excurrent free veinlet. Fertile lamina longer stalked, usually smaller and mostly contracted to about 25 (60) x 12 – 15 cm; lower pinnae free and short-stalked; mid-pinnae about 8 – 12 x 1.5 – 2.5 cm in our material, upper ones adnate; terminal segment 5 – 10 (20) cm long. Texture more coriaceous. Sporangia spreading over the entire surface.

**Ecological notes:** The tetraploid species (with a series of atypical forms!) occurs as a terrestrial forest plant rooting in rich soil of undergrowth, in swampy places, near permanent waters or close to streams, but also liking humid rocks; a lowland element as well as a colonizer in mountain rain forest regions. In Bioko collected by sea-shore and rather plentifully between 600 and 1200 metres altitude on the Pico and in southern upland.
Citations: BARTER 1451 (5/1857), K; MANN 133, “at the beach” (12/1859), K; MANN s.n. (1860), BM; MILDBRAED 6421, Pico above Basile 600–800 m (16/8/1911), B, HBG; 6944, Bococo (10/1911), B; GUINEA 943, Musola Monkey Bush (9/1/1947), MA; 944, l.c., BC; 1222, Musola (10/1/1947), BM; G. & U. BENL FP 265, Río Borabaabo (“Borabecho”) 160 m (26/12/1975), G, M; FP 307 a & b, Oloita 610 m (29/12/1975), B, M; FP 324, between Maule and Parador de Musola 700 m (31/12/1975), M; FP 473, above Bocoricho path to Laguna Lombé 770 m (10/1/1976), M; FP 519, “Pantano del Km 35” of Western Highway Malabo–Luba 15 m (14/1/1976), GC, M; FP 527, l.c. 10 m (14/1/1976), BC, GZU, M, TNS, YA.


(2) Bolbitis fluviatilis (Hook.) Ching in C. Chr., Ind. Fil. Suppl. 3: 48 (1934).

Synonyms: see Hennipman 1977: 142; fig. 36.

Rhizome firm, widely creeping, to 20 cm long by 0.7 cm across, sometimes branching, paleaceous with entire chestnut-brown opaque scales (sub)appressed, to 15 x 2.5 mm; fronds spaced to 2.5 cm apart in mature plants, dimorphic, without buds. Stipe becoming 20 to 35 (45) cm long in sterile fronds, 55 cm in fertile ones, straw-yellow to greenish when fresh, channelled by two grooves, sparsely scaly toward the dark, ca 0.5 cm thick base. Sterile leaf-blades about 50 – 60 cm long, glabrous, herbaceous or pergamentaceous, oliveaceous to dark grey-green turning blackish, greatly varying in size and form. Entire blades narrow-oblong to broad-lanceolate, up to 12 cm wide near middle, short to long-decurrent at cuneate base; margin rarely sinuate or shallowly lobed in lower half; apex acute to acuminate. Deeply pinnatifid blades commonly longer-stalked, to ca 25 (35) cm wide below middle, more or less hastate in outline, with 2 to 8 mostly opposite, acute or rounded lobes of up to about 20 x 7 cm and a much larger terminal segment which may be lobed again near base. Costa elevated on both surfaces; lateral veins not distinct more than halfway to margin, veinlets anastomosing into copious angular areoles without free included veinlets; row of costal areoles not always distinct. Fertile leaves also entire or pinnatifid, but the lamina decidedly smaller as a rule and longer stalked. Sporangia commonly occupying lower surface throughout.

Ecological notes: Terrestrial fern creeping in earth especially on wooded river banks, less frequent on submerged rocks in stream-beds of rain forests. In Bioko not rare, recorded from near sea-level to ca 1200 metres elevation.

Citations: MANN 442, “bank of river 300 m” (4/1860), K; MILDBRAED 6286, above Basile 600 – 800 m (15/8/1911), B, HBG; GUINEA
416, Balea (29/12/1946), BM;ADAMS 1086, Moka 1200 m (8/12/1951), GC; ESCARRÉ 3642, Basilé (4/1965), BC; G. & U. BENL FP 463, Rio Lombe ca 800 m (8/1/1976), B, BC, G, GZU, M, TNS, Z; FP 493, above Ruiché path to Caldera 810 m (10/1/1976), M; FP 510, Balea 500 m (12/1/1976), BC, M, YA.

Geogr. distribution: Liberia, Ghana, Cameroon, Equatorial Guinea (Rio Muni, Bioko - lectotype), S. Tomé & Principe, Gabon, Zaïre.– Western tropical Africa and islands.

There are specimens with leaves intermediate between those of *Bolbitis auriculata* and *B. fluviatilis*. The latter species is closely related to, and obviously derived from, *B. auriculata* (see HENNIPMAN 1977: 140, 144).

A hybrid with *Bolbitis heudelotii* (Fée) Alston is known from Zaïre; see HENNIPMAN 1977: 290–291.

(3) *Bolbitis acrostichoides* (Afzel. ex Sw.) Ching in C. Chr., Ind. Fil. Suppl. 3: 47 (1934).

Synonymy: see HENNIPMAN 1977: 149; figs. 38, a – i.

Rootstock creeping, at most 12 cm long and 10 mm thick, bearing narrow-lanceolate and subulate scales which are opaque to subclathrate, entire or pseudoserrate, dark brown to blackish, up to 8 x 1.5 (2) mm; rhizome producing fronds in two rows, approximate or spaced to 1.5 cm apart, stiffly erect or arching, long-stalked, dimorphic. Stipe of sterile fronds to 40 (70) cm long by 5 mm across near the darker base, otherwise stramineous usually all along like the rachis; scales on basal parts only, similar to those of the rhizome. Sterile blade ca 30 – 60 (80) x 10 – 25 (35) cm, deltoid-lanceolate in outline as a rule, pinnate, apex formed by a single large segment; texture herbaceous to subcoriaceous, chartaceous when dry, light green to olivaceous, glabrous. Lateral pinnae in 7 to 10 (25) pairs, opposite or alternate, at most 6 cm apart in basal portion, shortly petiolate (lowermost stalked only to 1 cm), linear-lanceolate, ca 7 – 20 x 1.5 – 5 cm (broadest about middle); base cuneate or abruptly rounded; margin entire or irregularly sinuate-dentate; apex acute or acuminate to caudate. Terminal segment not lobed, joined to the unwinged glabrous rachis, similar to central lateral pinnae but somewhat or much longer and then narrowly triangular, with a bud below the extenuate extremity, long proliferous (to 5 cm) at times; occasionally one of the uppermost lateral pinnae may also bear a subterminal bud. Venation obvious: pinna-costa and lateral veins markedly raised on lower face; veinlets forming distinct costal areoles and 3 or 4 rows of more irregular smaller ones with few or several excurrent included veinlets. Fertile fronds 35 – 140 cm long, similar to sterile ones in cutting, but stipe comparatively longer, blade narrower (5 – 30 cm), pinnae usually more distant and evidently narrower (to 1.8 cm wide), terminal segment shorter. Sporangia developed exclusively or chiefly on veins beneath, eventually more or less densely confluent.
**Ecological notes:** This polymorphous terrestrial herb is locally abundant in humid, though not excessively wet, half-shaded places along road-sides in damp forest, but especially on rock faces in stream-beds. In Bioko recorded from near sea-level to 800 metres, in other territories ranging up to 1000 (1500) metres elevation.

**Citations:** BARTER s.n. (1857), K; HENDERSON s.n., K; GUINEA 2381, Ureka (15/2/1947), BC; 2382, Ureka forest (15/2/1947), MA; G. & U. BENL FP 20, Río Musola near mouth (19/1/1974), M, Hb.Pic.Ser.; FP 157, Eastern Highway near Río Bososo 280 m (26/1/1974), FR, M; FP 536, Río Larric near Basakato del Oeste 100 m (14/1/1976), M.

**Geogr. distribution:** Senegal, Guinea Bissau, Guinea, Sierra Leone (lectotype), Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr.Afr.Rep., Equatorial Guinea (Bioko), S.Tomé, Gabon, Congo, Zaire, Angola, Mozambique, Tanzania, Uganda, Sudan.—Tropical African element.

Hybrids with *Bolbitis auriculata* may exist (see HENNIPMAN 1977: 152).

(4) *Bolbitis salicina* (Hook.) Ching in C. Chr., Ind. Fil. Suppl. 3: 50 (1934).

**Synonymy:** see HENNIPMAN 1977: 161; figs. 38, j-1.

Rhizome short-creeping, 10 cm long and 8 mm thick at most, becoming stout with age, moderately paleaceous; scales subclathrate, shining, mostly subentire, lanceolate with a widened base, blackish, up to 3.5 x 1.5 mm. Fronds arising at short intervals, long-stipitate, dimorphic. Stipe slender, stramineous (like the rachis and often pinna-costae), dark- and scaly-based, glabrous higher up, two-furrowed; of the sterile leaves ca 10 – 30 cm long, of fertile ones attaining 55 cm. Sterile blades fully pinnate, the pinnae resembling willow-leaves, ovate-oblong to -lanceolate, firm-membranous to subcoriaceous, light to dark green, about 15 – 45 by 8 – 20 cm, glabrous. Lateral pinnae to about 20 pairs, usually alternate, ca 2 – 4 (6) cm apart, erecto-patent, linear-lanceolate, narrowed to both ends, the base narrowly attenuate, symmetrically or asymmetrically oblique, petiolulate, margin subentire or slightly wavy, lower pinnae stalked to about 1 cm, ca 8 – 10 (12) x 0.8 – 1.5 (2) cm; central pinnae widest at their middle; apex usually acute to more or less abruptly acuminate; terminal segment decurrent on rachis which is narrowly winged at top, usually similar to lateral pinnae but longer extenuate, with a distinct subterminal sometimes proliferous bulbil. Veinlets anastomosing into one or two rows of distal irregular areoles beside costal ones, these occasionally including a free-ending veinlet. Areolae fewer and comparatively larger than in *B. acrostichoides*. Fertile blades ca 15 – 35 x 3 – 10 cm, similar to sterile ones in shape, but pinnae much smaller, ca 3 – 6 by 0.3 – 0.5 cm, more obtuse and longer stalked. Sporangia usually covering the whole lower surface, rarely arranged on or near veins only.
Ecological notes: Primarily on rocks in lowland forest streams or submerged in periodically running waters; seen also in ravines and on wet mossy rocks in higher places, up to 1300 metres altitude. In Bioko collected only in litoral zones.

Citations: MANN 133, K ("probably B. acrostichoides", HENNIPMAN 1969, note on label); MALEST & BENL FP 31, Río Maloho near Km 41 – 42 of Western Highway (19/1/1974), FR, M (determination confirmed by Prof. HENNIPMAN, 28/10/1974); FP 235, Río Borabaabo ("Borabecho") ca 10 m (18/12/1975), BC, M, YA.

Geogr. distribution: Guinea, Sierra Leone (lectotype), Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Bioko), Gabon, Congo, Zaire.– West tropical Africa.

"Obviously derived from a fern like B. acrostichoides" (HENNIPMAN 1977: 162).

LOMARIOPSIS Fée

1 – Largest pinnae of sterile fronds 3 – 5 cm broad
2 – Fertile pinnae with a sterile tip
   ... ... guineensis (Underw.) Alston (5)
2 – Fertile pinnae completely soriferous
3 – Young fronds simple; terminal segment of sterile frond clearly larger than lateral pinnae; rhizome with dull brown long narrow scales, which leave prominent warts when they fall off
   ... ... muriculata Holttum (6)
3 – Young fronds pinnate; terminal segment of sterile frond about as long as lateral pinnae; rhizome with light brown broad scales not leaving warts
   ... ... rossii Holttum (8)
1 – Largest pinnae of sterile fronds to 1.5 – 2.5 cm broad
4 – Up to 15 (20) pairs of sterile pinnae remotely spaced, cuneate at base
   ... ... warneckei (Hieron.) Alston (7)
4 – To 25 – 40 or more pairs of approximated sterile pinnae, rounded or truncate at base
5 – Base of lamina gradually but clearly contracted
   ... ... decrescens (Baker in Hook. & Baker) Kuhn (9)
5 – Lowest 2 or 3 pairs of pinnae slightly or not reduced
6 – Sterile pinnae cultrate-attenuate; fertile pinnae up to 15 cm long, distinctly auriculate
   ... ... manni (Underw.) Alston (10)
6 – Sterile pinnae oblong, obtusely acuminate to caudate; fertile pinnae less than 7.5 cm long, non-auriculate
   ... ... hederacea Alston (11)
(5) Lomariopsis guineensis (Underw.) Alston, in J. Bot. 72, Suppl. 2: 5 (1934).
See fig. in HARLEY 1963: 67.

Synonymy: Lomariopsis guineensis Kuhn, Fil. Afr.: 53 (1868), n.n.

Scandent fern attaining a height of ca 3 m. Rootstock fleshy becoming stout, ridged, 3 – 4 cm or more wide with age, rarely branched, dorsiventral with short adventitious roots to secure the plant to tree trunks. Apex densely clad in dull reddish-brown scales, these black-centered, to 8 mm long by 2.5 mm wide at base, ovate-subulate, narrowed to a curled tip, the edges fringed with numerous hairlike twisted processes, eventually caducous. Fronds always borne at the top of the high-climbing rootstock, stiffly spreading, 3 to 5 (8) cm apart, imparipinnate, strongly dimorphic; sterile ones attaining a total length of 50 – 70 cm. Stipe of adult fronds ca (10) 15 – 20 cm long, (greyish-)stramineous, canaliculate, decurrent to a ridge on the rhizome, towards base paleaceous like the rhizome. Blades subovate-oblong to linear in outline. Rachis almost glabrous, subalate, sulcate like the costae. Lateral pinnae of sterile fronds (3) 5 to 7 (9) each side, up to 5 cm apart, jointed to rachis, usually alternate, middle ones ca 10–20 x 3 – 4 (5) cm, basal ones somewhat smaller, all broadly elliptic, obliquely cuneate at base, medium green drying olive-green (darker on upperside), abruptly contracted to a caudate occasionally serrulate apex of 1 – 2 cm, subcoriaceous in texture when fresh, margin cartilaginous; lower ones usually shortly stalked to 0.3 cm; terminal segment pinna-like but continuous with the rachis. Lateral veins strongly marked, to 2 mm apart, simple or bifurcate. Fertile fronds only seen in upper parts of mature plants; pinnae in 4 to 9 pairs, smaller and much narrower, 7 – 10 x 0.4 – 0.6 (0.8) cm, castaneous to creamy-yellow beneath due to colour of developing sporangia, rounded-obtuse at the base, petiolulate to 0.8 cm in lower pinnae only, acuminate with 0.3 – 0.8 cm long apical portion sometimes caudate; sporangia not reaching within 3 – 6 mm of tips.

Young plants producing conspicuous more or less approximate simple fronds; their lamina lanceolate to lanceolate-caudate, subcrenulate, ca 10 – 25 cm x 1.5 – 3.5 cm, decurrent on a shorter stipe, later becoming trifoliolate in part; tiny scattered scales on surfaces soon disappearing.

Distinguished from other members of the genus by having sterile tips to the fertile pinnae.

Ecological notes: Locally abundant in low-lying parts of humid and shad-y woods where the root-climbing fern is attached like ivy to the stems of trees and shrubs by its flattened rhizome ascending from ground level. In Bioko, mostly collected near sea-shore, rarely up to 1000 metres elevation on the Pico.

Citations: BARTER 1462 (6/1857), K; MANN 139, “at the beach” (12/1859), K; MILDBRAED 6416, Pico above Basilé 800 – 1000 m (16/8/1911),
B, HBG; 6417, l.c., B; 6941, Bococo (10/1911), B. HBG; 6943, l.c., B; GUI­NEA 414, Balea (28/12/1946), BM, MA: 423, l.c., MO: 734, "Bosque de la carretera de San Carlos" (31/12/1946), BM; G. & U. BENL FP 134, Pico 780 m (26/1/1974), BM, M, Hb.Pic.Ser.; FP 234, Río Borababo ("Borabecho") ca 10 m (18/12/1975), M, YA; FP 261, Road to Basupú del Este ("Fishtown") 115 m (25/12/1975), BC, GC, M; FP 522, "Pantano del Km 35" of Western Highway 15 m (14/1/1976), FR, M.


(6) Lomariopsis muriculata Holttum, in Kew Bull. 1939: 624, fig. 10 (1940).

Rootstock flattened, creeping or climbing, up to 6 m long when winding around tree trunks, turning woody, bearing, besides broader paleae, numerous very narrow brownish scales with the margins finely ciliate, up to about 1 cm long and less than 1 mm wide, densely covering young shoots. Older parts of the rhizome provided with small warts after fall of scales, thus becoming muriculate – hence the specific epithet. Fronds remote, to over 80 cm in total length, imparipinnate, dimorphous. Stipe of sterile fronds ca 10 – 15 cm long, gradually decurrent to a ridge on rhizome, firm, dull brown, clothed towards base with scales like those of the rhizome; rachis of same colour as stipe, glabrous, unwinged in adult stage of plant. Sterile lamina varying from ca 30 to 65 cm long by 12 to 25 cm wide, obovate-lanceolate in outline, 5- to 12juga­te. Pinnae about 3 – 5 cm apart, articulated to rachis, narrowly oblong oblique; basal and apical pinnae somewhat reduced, upper ones sub.sessile, lower ones short-stalked. Largest middle pinnae ca 13 – 15 cm long and 3.5 – 4 cm wide, subequally cuneate at base; apex usually rather abruptly acuminate or sub­caudate (to about 1.5 cm), margins entire; texture thin but vigorous, colour dark brown upperside when dry, paler olivaceous beneath, pinna-costa and veins brown. Terminal segment unjointed, 1.5times the length of median lateral pinnae. Veins slender, distinctly raised on both surfaces like the midrib. Stipe of fertile fronds ca 15 – 20 cm long, rachis glabrous; pinnae in 5 to 12 pairs, up to ca 9 cm long x 0.9 cm wide, dark brown, all petiolulate (lowest with stalks of 0.3 cm); base narrowly cuneate, apex gradually attenuate obtuse. Sporangia over the whole surface.

Like in Lomariopsis guineensis, young plants have entire fronds attaining here only a length of about 8 cm, with a stipe of 2.5 cm and a lamina-width of 1.7 cm; the cartilaginous margins here somewhat crisp when drying.

This fern is remarkable for its verrucose rhizome in the adult state.

Ecological notes: Occurring in swamy shady lowland forest; found once in undisturbed Pico woodland, now perhaps extinct in the island.

Citation: ADAMS 1134 A, Pico 900 m (14/12/1951), GC, phot. M.
Geogr. distribution: Sierra Leone(?), Nigeria, Equatorial Guinea (Bioko), Zaïre (holotype).– Infrequent in West tropical Africa.

(7) Lomariopsis warneckei (Hieron.) Alston, in J. Bot. 72, Suppl. 2: 6 (1934).

See fig. in SCHELPE 1970: t. 61.


Rhizome long-creeping and high-climbing up to 4 (9) m, ca 8 mm across, densely clad in ferruginous scales; these concolorous or with a dark blotch, broadly ovate to ovate-oblong from a roundish base, narrowly acuminate hair-pointed, margins fimbriate or lacerate-ciliate, 7–11 x 1–4.5 mm, more or less continuing into stipes and rachises. Fronds widely spaced at 2–5 cm intervals, arching, strongly dimorphous. Sterile fronds up to 1 m in total length; stipe firm, simply furrowed, pale chestnut-brown, 12 to 25 cm long, sparsely fibrillose-scaly with paleae like those on the rhizome, eventually glabrous all along. Sterile lamina to ca 60 (80) x 25 cm, narrowly ovate-deltoid, imparipinnate with up to 15 or rarely more pairs of lateral pinnae; these usually alternately arranged, about 2–4 cm apart, linear-oblong to lanceolate, gradually attenuate, largest below the middle to 14–24 cm long by 1.5–2.5 cm wide; upper sessile more or less reduced, lower short-stalked, with the petiolule to 2 mm long, scarcely reduced; all thickly chartaceous to thinly coriaceous in texture, the tissue shining, dark green turning blackish on upperside, paler green ageing to olivaceous underneath, subglabrous throughout on both surfaces, with base subequally or unequally cuneate, apex (1.5 cm) gradually or abruptly acuminate and the pale cartilaginous margin finely and irregularly undulate-crenate. Terminal pinna lanceolate-linear from a more or less equally roundish-cuneate base, larger than the subterminal pinnae. Rachis pale brown to dark purple, winged in upper part, bearing delicate pluricellular vanishing hairs (reminding of ctenitoid ones) and some large scales similar to those of stipe and rhizome. Pinna-costae elevated on both sides, sulcate above, with occasional hairy scales beneath mainly near to rachis. Lateral veins oblique, clearly raised, unbranched or once-forked, to 1.5 mm apart from each other. Fertile fronds up to 60 (85) cm with the lamina 45–50 cm long, narrowly lanceolate-triangular in outline, ca 15–25jugate; rachis pale brown, glabrous at maturity. The fertile pinnae narrowly linear, attenuate, 7.5–17 x 0.4–0.8 cm, non-caudate, distantly (ca 2 mm) spaced, articulated to the rachis as are the lateral sterile pinnae. Apical sessile pinnae gradually decrescent, basal ones commonly non-reduced, unequally cuneate at base and provided with up to 3 mm long petiolules. Lower surface packed with sporangia.

Ecological notes: Trailing as a terrestrial along (swampy) floor and on
rock faces, more often climbing from ground level by adhering to tree trunks; in well-shaded damp places of the mountain zone up to ca 1200 metres elevation (rarely higher), needing an annual rainfall of more than 1200 mm.

**Citation:** MANN s.n., K; i.e. the type of *Lomariopsis nigrescens* Holttum, “near sea-level” (fide ADAMS 1957: 483).

**Geogr. distribution:** Cameroon (?), Equatorial Guinea (Bioko), Principe, Mozambique, Zimbabwe, Malawi, Tanzania (holotype), Kenya, Rwanda, Burundi.—Well-known from East African tropics, with a disjunct rare occurrence in the Guinean Gulf area.


See fig. in TARDIEU-BLOT 1964 a: t. 49, 3.

Rhizome dorsiventral with adventitious roots on ventral surface for climbing, 0.5 cm or more wide, sulcate, branched. Scales covering rhizome and frond-base, light brown with thin-walled cells in adult condition, broadly o-vate-acuminate, hair-pointed, up to 8 x 1.5 mm, ciliate in juvenile stage with short marginal prolongations. Fronds always appearing solitary at the rhizome extremity, eventually spreading at 2 – 4 cm intervals, long-stipitate, attaining at most 70 cm in total length, dimorphous. Stipe comparatively slender, to ca 15 cm long in sterile fronds, stramineous ageing to (grey-)brown, simply grooved distally, subglabrous above the paleaceous base, narrowly winged. Sterile leaf-blade up to about 50 cm long by 20 cm wide, elongate-ovate in outline, subcoriaceous when fresh, chartaceous when dry, dark olivaceous surface paler beneath, imparipinnate. Rachis channelled on adaxial side, stramineous ageing to dull brown, evidently winged especially in apical part, almost glabrous in both sterile and fertile fronds. Lateral pinnae of sterile leaf numbering up to 12 on each side, alternately arranged, 1.5 – 4 cm apart, elliptic to narrowly oblanceolate, almost sessile; base unequal-sided, broadly cuneate to subrounded, upper 1 to 2.5 cm tapering to a subcaudate apex, cartilaginous margins obscurely undulate; mid-pinnae of ca 8 – 14 x 3 – 4 cm, the lower somewhat reduced; terminal pinna similar to the others, but not articulated like the lateral ones. Venation obvious, raised on both faces, veins parallel, to 1.5 mm apart, often bifurcate. Pinnae of fertile fronds in about ten pairs, 2 – 2.5 cm distant, much smaller than the sterile ones, of 5 to 7 x 0.7 cm, with the base rounded and the apex non-caudate; upper pinnae (sub)sessile, more or less curved upwards; lower pinnae petiolulate, lowermost on stalks up to 0.3 cm long. Sporangia occupying the whole underface.

Differs from allied *Lomariopsis guineensis* mainly in having pinnate fronds from beginning, the sterile pinnae broadly cuneate at base and less abruptly contracted towards apex, the fertile pinnae completely soriferous without a sterile tip.

**Ecological notes:** A lowland species occupying similar habitats to the more common *L. guineensis*, mostly climbing on mossy trunks of forest trees but also observed creeping on ground.
**Citations:** MANN 374 (1860), K; 444, 300 m (4/1860), K.– Seems to be very rare in Bioko; see ADAMS 1957: 484.

**Geogr. distribution:** Guinea, Liberia, Ivory Coast, Ghana, Nigeria (holotype), Cameroon, Equatorial Guinea (Bioko), Gabon, Congo, Uganda.– Native to West African tropics.


**Synonyms:** see SCHELPE 1969 a : 38.

Conspicuous fern with high-climbing flattened rhizome, ca 0.5 cm across, fleshy turning woody, copiously rooting on ventral surface, densely paleaceous in younger parts; scales ovate-acuminate, often long-tapering to hair-points, ca 0.8-1.0 cm long by 0.10 – 0.15 cm wide near their peltate base, spreading, subclathrate, initially light brown, later darkening and more or less appressed; scale-margins with some small processes. Fronds borne solitary in two (or more?) rows, at intervals of 2 to 4 cm or more in adult condition, attaining a total length of 95 cm in our material, dimorphic. Stipe from 5 to 15 cm long, stout, like the rachis plicate especially toward the decurrent base with patent subulate brown scales of varying length, the larger ones equalling those of the rhizome. Lamina (narrow-)lanceolate in outline, strongly attenuate basally, ca 10-15 (20) cm broad near middle, firm-membranous to coriaceous when fresh, drying to olive-green on lower side and blackish-green on the glabrous upper side, imparipinnate. Rachis winged near the top. Pinnae to more than 40 each side, for the most part alternately arranged, rounded or truncate at base, jointed to rachis; the middle ones oblong-acuminate, usually up to 10 (12.5) x 1.5 cm in sterile fronds, petiolulate or sessile, caudate or evenly attenuate towards apex, the cartilaginous margin crenulate to subdenticate, with scattered tiny hairs in young state; lower pinnae gradually decreasing, lowest reduced to small orbicular auricles of 0.5 to 0.8 cm in diameter; terminal segment equal to lateral pinnae in shape but not articulated and distinctly larger than subterminal ones. Pinna-costa conspicuously prominent on upper side, with deciduous scales underneath; lateral veins obvious, free, usually once-forked near costa. Fertile fronds smaller, up to 72 x 15 cm in our material, rachis more scaly, the pinnae long-linear and much narrower (0.3-0.5 cm across) than in sterile blades, petiolulate (to about 0.25 cm), gradually decreasing towards base of frond. Sporangia reaching the non-caudate extremity.

**Ecological notes:** A very distinct species growing mainly in undisturbed woodland, where it thrives on forest floor and rocks but preferably on trees. In Bioko we found it climbing on tree trunks and stumps in the mountain rain forest region from ca 780 to 1260 metres altitude.

**Citations:** MILDBRAED 6334 (a), Pico above Basilé 1100-1400 m (16/8/1911), B; ADAMS 1154, Pico 1350 m (14/12/1951), BM, GC, MA; G. & U.

Geogr. distribution: Nigeria, Cameroon (holotype), Equatorial Guinea (Bioko).—Seems to be a native to the Gulf of Guinea.

(10) Lomariopsis mannii (Underw.) Alston, in J. Bot. 72, Suppl. 2 : 6 (1934).


Rootstock widely creeping and climbing, to 1.5 cm or more thick, fleshy becoming woody, dorsiventral, copiously beset with more or less appressed scales which are continued to stipes and rachises; scales ovate-acuminate, gradually narrowed to a short hair-point, becoming more than 1 cm long by about 0.2 cm broad at the widened base, entire or weakly pseudoserrate, with a few small deciduous marginal processes, uniformly olive-brown ageing to blackish. Fronds arising singly, up to ca 70 – 80 (90) cm in total length, strongly dimorphic. Stipe of sterile fronds 15 – 25 (30) cm long, vigorous, markedly covered throughout, like the rachis, with scales as on the rhizome but obviously spreading. Leaf-blade firm-herbaceous in texture, broadly subovate-lanceolate in shape, short-tapering to a pinna-like apex, commonly 50 – 60 x 25 – 30 cm, olivaceous-brown with the underside paler, imparipinnate, up to 30jugate. Pinnae subsessile and distinctly jointed to rachis, close together, central ones to 17 cm long by 1.5 – 2 cm broad, cultrate attenuate with a rounded-truncate base, cartilaginous edges and an acute subcaudate apex to 2 cm long; lowest 2 or 3 pairs a little shorter, subterminal ones gradually reduced to (3) 5 – 7 cm; terminal segment to over 10 cm long with one or two lobes or a basal pinnule, transient into rachis. This deeply sulcate in lower parts, strongly winged towards apex, scaly all along. Pinna-costae evidently prominent on either face, somewhat scaly underneath, tissue and the marked lateral veins glabrous; margins undulate. Fertile leaves smaller than the sterile, with up to 25 petiolulate or almost sessile pinnae 1.5 – 1.8 cm apart from each other, slightly decreasing or not towards base; the medial pinnae ca 8 – 12 (15) cm long, 0.5 – 0.7 cm across at the rounded auriculate base, tapering gradually to a non-caudate point; rachis scaly and winged, similar to that in sterile fronds. Sporangia covering entire undersurface.

Ecological notes: Creeping on rocks and rooting on trees preferably in undisturbed regions of the mountain rain forest zone. In Bioko, only known from the Pico down to 900 metres altitude, rarer than Lomariopsis decrescens from which it is easily distinguished in any stage of development by the shape of lamina not being contracted, as in the latter species, into auriculiform rudiments towards base.

Citations: MANN 354, Pico 1500 m (1860), K; 446, Pico 900 m (4/1860), K;
MILDBRAED 6334 (b), Pico above Basilé 1100 – 1400 m (16/8/1911), B; ADAMS 1134, Pico 900 m (14/12/1951), GC.

_Geogr. distribution:_ Nigeria, Cameroon, Equatorial Guinea (Bioko – holotype).—Apparently confined to the Guinean Gulf area.

(11) _Lomariopsis hederacea_ Alston, in J. Bot. 72, Suppl. 2: 5 (1934).

See fig. in TARDIEU-BLOT 1964 b: t. 29, 4.

Rhizome appressed scandent on trunks of forest trees, attaching itself like ivy, to over 2 m high, flattened, fleshy, densely paleaceous; scales narrowly (falcate-) lanceolate, reddish-brown turning dark brown, non-clathrate; well-spaced spreading fronds often paired, suberect or arching, attaining a total length of about 0.5 m, strongly dimorphous. Stalk of sterile fronds 5 to 10 cm long, straw-coloured, channelled, winged in young leaves, moderately scaly in adult condition. Sterile lamina ca 40 cm long, up to 12 cm across towards middle, imparipinnate, linear-lanceolate in outline, evenly contracted to an acutely pointed apex. Rachis flattened, evidently winged in juvenile stage, trisulcate on underside, pale brown on drying, sparsely paleate. Lateral pinnae opposite in middle portion of the blade or alternate, up to about 25 each side, close-set, short-petiolulate to almost sessile, firmly membranaceous or subcoriaceous in texture, linear-oblong with a rounded or truncate equal-sided base and an abruptly or obtusely acuminate apex; well developed mid-pinnae ca 8 x 2 cm, strongly decrescent towards apex (of 1.5 x 1 cm), the terminal unjointed pinna ovate-lanceolate ca 3 x 1 cm; lower pinnae not or scarcely decreasing, basal pinna-pair sometimes a little deflexed. Midrib of pinna prominent on both sides, raised lateral veins ca 1 mm distant, curved upwards near the pale cartilaginous margin, a little decurrent at the costa, usually simple rarely once-forked. Fertile fronds somewhat smaller than sterile ones, up to 35 cm long; stipe and rachis copiously scaly, ca 20 contracted pinnae on each side, 1.5 – 2.6 mm apart; longest pinnae attaining about 5 to 7 cm, straight, oblong-oblique, cordate at base, subsessile or petiolulate, basal pinnae almost equal to middle ones; underside covered with sporangia throughout.

_Ecological notes:_ The lianous plant climbs on tree trunks in equatorial rain forest, favouring shady constantly humid habitats up to about 800 metres altitude.

_Citation:_ MANN 144 (12/1859), K. In Bioko, apparently once collected near sea-level (ca 2600 mm rainfall), this fern must be regarded as very rare or extinct in the island.

Family ELAPHOGLOSSACEAE

ELAPHOGLOSSUM Schott ex J. Smith

1 – Sterile lamina glabrous or beset with inconspicuous substellate appressed scales less than 0.5 mm in diameter (without the cilia); margins never scaly nor ciliate

2 – Stipe-scales to 2 mm long; laminar scales minute with long cilia
   ... ...salicifolium (Willd. ex Kaulf.) Alston (3)

2 – Stipe-scales ca 5 – 8 mm long
3 – Rhizome creeping; midrib large-scaly; lamina surface with stellate scales
   ... ...acrostichoides (Hook. & Grev.) Schelpe (1)

3 – Rhizome short-creeping to erect; midrib small-scaly; lamina surface glabrescent
   ... ...isabelense Brause (2)

1 – Sterile lamina with conspicuous scales 1 mm or more long and/or with ciliate to scaly margins; scales spreading

4 – Laminar scales long-ciliate, imbricated, honey-coloured
   ... ...kuhni (Hieron. (6)

4 – Laminar scales entire or serrulate, not imbricated, reddish- to dark brown
5 – Scales finely serrulate, evenly distributed over the lamina
   ... ...cinnamomeum (Baker) Diels (7)

5 – Scales entire, borne mainly on midrib and margins
6 – Sterile fronds 3 – 6 cm broad
   ... ...hybridum (Bory) Brackenr. (4)

6 – Sterile fronds 1 – 2 cm broad
   ... ...aubertii (Desv.) T. Moore (5)

The family name had been proposed in 1940 by HERTER and by CHING, but was validly published only in 1968 by PICI SERMOLLI. Elaphoglossum is one of the largest fern-genera, composed of more than 500 species (MICKEL & ATEHORSTUÁ 1980: 47), most of them native to New World tropics. Relationship to Lomariopsis see HOLTTUM 1978b: 256–257.

(1) Elaphoglossum acrostichoides (Hook. & Grev.) Schelpe, in J. S. African Bot. 30: 196 (1964);
   See fig. in SCHELPE & ANTHONY 1986: t. 80, 1.

Basionym: Vittaria acrostichoides Hook. & Grev., Icon. Fil. 10: t. 186 (1830).

Synonymy: Acrostichum conforme var. angustum Kunze, in Linnaea 10: 495 (1836).
**Drymoglossum acrostichoides** (Hook. & Grev.) T. Moore, Ind. Fil. I: XXXI (1857).

*Elaphoglossum conforme* var. *lineatum* (Kuhn ex Christ) C. Chr. 1932 a: 166, 1932 b: 61.

For further synonyms see JACOBSEN 1983: 413.

Rhizome creeping with varying length, comparatively slender (ca 1 – 3.5 mm in diameter), branched, becoming woody, young parts protected by soft spreading scales; these up to 7 x 2 mm, concolorous pale to yellowish-brown or in part atro-castaneous, deltate-ovate to ovate-lanceolate, long acuminate, pointed, subentire or with ciliate to dentate projections along margins. Fronds numerous, shortly to well spaced, at intervals of 0.5 to 1.5 cm apart, erect or arching, stipitate, weakly to strongly dimorphous. Stipe straight or curved, stout or mostly slender, pale brown and stramineous to reddish, grooved and narrowly winged in distal portion, jointed (by a swelling) on a 1.5 – 2 cm long projection (phyllopodium, phyllobasis) of the rhizome; stipe bearing, like the prominent midrib, broad-ovate, ca 5 x 3 mm, flat, entire or mostly lacinate, pale brown, dense or scattered scales, persistent or deciduous with age. Stipe of fertile frond usually longer than that of the sterile frond, attaining here 1/4 to 3/5 the length of leaf-blade, exceptionally to twice the lamina length. Leaf-blade commonly atenuate at both ends, widest in the middle, with a long decurrent or obliquely cuneate base, the apex varying from bluntly acute to subacuminate, texture herbarceous, thinly coriaceous or chartaceous, colour deep green ageing to brownish; costa (midrib) concave to grooved on upper surface, margins cartilaginous and often reflexed, entire or slightly and irregularly undulate, never scaly. Veins free, furcate, ca 0.8 mm apart, obscured. Sterile lamina narrowly elliptic-acuminate, varying from about (10) 20 to 30 (50) cm in length and 1 to 2.5 (3.5) cm in width, beset with substellate paleae on both sides, glabrous with age. Fertile lamina longer-stiped and somewhat narrower, often more linear, subacute to acuminate, usually to 25 x 2 cm, upper face scaly, underside completely occupied by stalked sporangia.

This rhizomatous fern is polymorphic in its size and form, length of stipe and density of lamina-scales, probably depending on environmental factors.

**Ecological notes:** Mostly as a mid-level epiphyte on tree trunks and branches, in damp mountain forest, rarely terrestrial in shade between mossy rocks on moist mountain slopes, in stream-beds and on wet cliff faces. Ranging from sea-level to 2400 (2900) metres, but usually found growing above 750 metres elevation.

**Citations:** GUINEA 2939, “Regreso del Pico” (2/3/1947), BM, MA; MELVILLE 442, Moka (2/9/1959), BM, K.

**Geogr. distribution:** Guinea, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Bioko), S.Tomé, Congo, Zaïre, Angola, Rep.S.Afr. (holotype), Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia; Madagascar, Réunion, Comoro Is.– Widespread in tropical and subtropical Africa and its islands; not very common in Bioko.
A hybrid with *E. coursii* Tard., named *Elaphoglossum x cadetii* Lorence, is described from Réunion in Fern Gaz. 12: 346 (1984).

See figs. in TARDIEU-BLOT 1964 a: t. 46, 1 - 4.

Rootstock short-creeping to obliquely erect, attaining over 1 cm in diameter, densely covered, chiefly towards apex, by firm, clathrate, pale to reddish-brown, lanceolate-acuminate scales arising from a widened base up to 8 x 1 mm, with hair-points curled up and irregularly fringed margins. Fronds fascicled or approximate, to about 6 in number, dimorphic. Stipe ca 8 – 15 (20) cm long in sterile fronds, becoming vigorous, canalicate on upper, roundish on lower side, pale to reddish-brown, bearing, mainly toward the dark phyllopodium, scattered scales resembling those of the rhizome. Sterile blades narrowly oblong-elliptic to lanceolate, up to about 35 (50) x 5 (6) cm, chartaceous, greyish-green, sparsely set with minute brownish substellate scales when young, eventually almost glabrous; midrib with small lacinate scales like those in apical region of the stipe. Lateral veins simple or once-forked, parallel to each other, not reaching, at their thickened end, the entire cartilaginous margin which is sometimes reddish tinged. Fertile blades smaller, ca 15 – 25 x 2 – 3 cm, with a stipe 12 to 14 (25) cm long; sori spreading over the entire underside.

Beside key-features the rhizome scales with their curled hairlike tips are of diagnostic importance.

Ecological notes: An epiphytic species mainly occurring in undisturbed wet forest of the submontane zone, up to 1800 metres elevation. In Bioko preferably growing on trees in *Cyathea* woodland, to ca 4 m above ground level.

Citations: MANN 370, Pico ca 600 m (1860), K; s.n. (1861), K; MILDBRAED 6367, Pico 1100 – 1400 m (16/8/1911), B; 7187, Pico above Basilé 1200 m (17/11/1911), B; ADAMS 1061, near Iladyi Falls 1080 m (8/12/1951), GC; 1075, l.c. 1200 m (8/12/1951), BM, GC, MA; 1152, Pico 1350 m (14/12/1951), GC; G. & U. BENL FP 74, Biaó inside the crater border 1780 m (22/1/1974), BM, M.

Geogr. distribution: Guinea, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Bioko – holotype), S.Tomé & Principe.– West African tropics from Guinea to the Guinean Gulf islands.

See figs. in TARDIEU-BLOT 1964 a : t. 48, 7 – 9.


For more synonyms see SCHELPE 1970 : 215.

Rhizome creeping, 2.5 – 7 (10) mm in diameter, paleate with numerous chestnut-brown to blackish glossy, narrowly lanceolate-attenuate subentire scales, up to 4.5 (6) x 0.7 mm. Fronds approximated or tufted in thick clumps (20 – 30 cm), erect to arching, dimorphous. Stipe articulated, green turning to stramineous and pale brown, canalicate, with scales at the very base as on the rhizome but shorter (2 mm), otherwise initially densely beset with ciliate, variably shaped, more or less appressed, light brown scales; stipe of sterile blade 8 to 13 (20) cm long. Sterile lamina oblong-linear or narrowly lanceolate and tapering to both ends, pale green darkening to olivaceous, about (15) 25 – 30 (60) x 1.5 – 2 (3) cm when full sized, both faces furnished with evenly dispersed, small to minute brownish scales bearing cilia usually much longer than the scale-diameter and deciduous with age; apex acute, base short-decurrent, margins entire, inrolled; texture thinly herbaceous to firm-membranaceous. Underside of costa markedly prominent with pale oblong star-scales like those of the stipe; upperside subglabrous. Venation hardly evident; veins fine, simple, forming angles of ca 40 degrees with the costa. Fertile lamina comparatively longer-stalked, to (15) 20 (25) x 0.4 – 1.0 cm, linear, acute, sometimes abruptly cuneate-truncate at base, with star-scales on upper face, completely covered by sporangia underneath; stipe 9 to 20 cm long.

Quickly identified within the genus by having substellate long-ciliate loose pale brown scales on stipe and costa.

Ecological notes: Recorded from 970 to 1900 metres altitude as a lithophyte on rocky slopes and among boulders in deep shade of evergreen forests, occasionally as a low-level epiphyte on mossy tree branches. In Zambia the plant may shed its fronds in dry season (KORNÁŠ 1979 : 110) by breaking at the joint. In Bioko most collections were made in rainfall areas exceeding 3800 mm.

Citations: MANN 370, 600 m (1870), K; MILDBRAED 6453, Pico 1100 – 1400 m (8/1911), B, HBG; GUINEA 2143 a, “Las Costeras” (28/1/1947), MA; ADAMS 1111, near Moka Lake 1580 m (9/12/1951), BM, GC, MA; 1159, Pico 1500 m (14/12/1951), GC; MELVILLE 443, Moka 1380 m (2/9/1959), BM, K; G. & U. BENL FP 430, Pico 1260 m (6/1/1976), BC, M, Hb.Pic.Ser., YA.


See figs. in TARDIEU-BLOT 1964 a: t. 47, 1-4.

Rootstock mostly knotty-creeping, rarely obliquely upright, massive, attaining 1.4 cm in diameter, soon becoming woody, densely paleaceous with silky chestnut-brown to blackish, lanceolate-attenuate, subentire scales up to 6 (15) by 1 mm. Fronds approximate to subtufted, erect to arching, brittle, deep green turning greyish-green on drying, strongly dimorphous. Stipe usually ca 5 - 10 rarely to 20 cm long, stramineous to pale brown, comparatively slender, canaliculate, abundantly furnished with horizontally patent, linear-lanceolate to acicular blackish deciduous scales to 4 (6) mm long. Sterile lamina variable in size and form, ca 8 – 20 (40) x 3 – 5.5 (6.5) cm, narrowly to broadly obovate or elongate-elliptic, acuminate; texture firmly herbaceous to subcoriaceous; base narrowly to broadly cuneate, non-decurrent; midvein shallowly grooved above; margins and midvein with soft blackish subulate, entire scales to 4 mm long all along; minute substellate mostly 3-branched scales on lamina-tissue. Fertile blade much smaller, ca 3 – 12 (17) x 1 – 3 cm, but often longer stalked, lanceolate-elliptic or narrowly ovate in small fronds; base broadly cuneate; sporangia spread over the entire surface. Venation immersed but visible; veins usually once-forked, parallel to each other.

Ecological notes: Mostly recorded from wet and deeply shaded submontane forest up to ca 2000 metres altitude, as a low-level epiphyte on tree trunks or more often as a lithophyte favouring moss-covered boulders along streams and beside waterfalls. In Bioko collected in Pico forest and in southern upland.

Citations: MANN 663, Pico 1200 – 1500 m (12/1860), K; s.n. (1861), BM; G. & U. BENL FP 111, Praderas de Moka, tree fern forest margin 1250 m (24/1/1974), M; FP 124, forest along Rio Iladyi above the Falls 1180 m (24/1/1974), BM, M.

Geogr. distribution: Cameroon, Equatorial Guinea (Río Muni, Bioko), Zaire, Rep.S.Afr., Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda, Rwanda, Ethiopia; Madagascar, Mascarene Is (Réunion – holotype), Comoro Is, Tristan da Cunha.– Tropical and extra-tropical Africa and America (Brazil, Mexico).

A hybrid of Elaphoglossum hybridum with E. lanatum (Bojer ex Baker) Lorence, named Elaphoglossum x setaceum Lorence, is described from Mauritius in Fern Gaz. 12: 348 (1984).

Elaphoglossum hybridum var. vulcanii Lepervanche ex Fée, with smaller elliptic leaves and a decurrent part of the fertile blades free of sporangia, was also described from Réunion, but it proved to be “only a depauperate form of E. hybridum”; see ROUX 1982: 524.


Rhizome short-creeping to suberect, to 8 mm in diameter, firmly rooting, becoming woody, densely clothed with somewhat appressed scales; these lanceolate-acuminate, with a spoon-like base, hair-pointed, entire, bright or reddish-brown, up to 6.5 x 0.7 mm. Fronds clustered, to 10 or more in number, upright or arching, to about 40 (60) cm in total length, strongly dimorphic. Stipe stramineous to brownish, basally blackish, sulcate. Scales of stipe copious, (reddish-)brown, linear-lanceolate to subulate, hair-pointed, ca 3 – 5 mm long, spreading or reflexed and twisted, persistent, more or less continued along the pale brown midrib of sterile blades. Sterile blades ca (20) 30 (45) cm long and 1.5 – 2 (2.5) cm wide, on (2) 6 to 10 (15) cm long stipes, firmly membranous, drying reddish-green on upper, paler on lower side, narrowly oblong or linear-lanceolate, tapering gradually both to the acute apex and the cuneate non-decurrent base; margins entire or irregularly wavy, glabrous or sparsely provided with linear, inrolled, reddish-brown, more or less deciduous scales of ca 1 mm in length; both surfaces with scales of the same colour but smaller than those on midrib and margins. Veins oblique to patent, ca 2 mm apart, simple or once-forked near costa, ending short of the margin in dark hydathodes conspicuous on upper face. Fertile blade ca 4 – 10 x 1 – 1.3 (2) cm, on a much longer stipe about 10 to 18 (30) cm, elliptical-oblong, narrowed quickly to apex and the truncate or subcordate base; upperside almost glabrous, underside fully occupied by the acrostichoid sori.

Ecological notes: Sometimes forming big clumps in sites up to 2800 metres elevation, living there under similar conditions to E. hybridum, with which it may be associated. In Bioko the fern seems to be confined to Pico Schefflera forest.

Citations: MANN 662, Pico 2100 m (12/1860), K; GUINEA 2941, “Regreso del Pico” (2/3/1947), MO; 2944, Pico ca 2000 m (2/3/1947), BM, K, MA; ADAMS 1171, Pico 1860 m (14/12/1951), BM, GC.


Allied forms of this Afro-Malagasy plant are known from tropical America; see SCHELPE (1969 a: 33), conf. KUHN 1879: 23.


Rhizome short-creeping to obliquely ascending, attaining 5 – 11 mm in diameter, firmly rooted, paleaceous with densely crowded flat scales which are narrowly deltate to linear-acute from a subcordate base, 3 – 5 (7) mm long, dark fulvous or pale brown with the margins occasionally darker and spinulose-ciliate,
the cilia short, rigid, dark. Fronds in a clump of up to ten at the rootstock-tip, dimorphic. Sterile fronds varying in total length from ca 10 to 30 (38) cm, with a slender more or less curved stipe 3 – 10 (15) cm long and up to 2.5 mm across, densely covered with scales (continuing into midrib) irregular in length but usually larger, up to 10 x 2 mm in part of our material, longer-ciliate and brighter by their uniform honey to golden colour than those of the rhizome, especially toward the short phyllopodium. Sterile blade oblong or subspathulate-oblong from a cuneate base, to about 20 (30) x 2.5 (3.5) cm, somewhat obtuse or slightly acute, coriaceous to soft-textured, initially covered on both surfaces and on edges with smaller imbricate honey-coloured transparent irregularly ovate (-oblong) scales varying in size to at most 4.5 x 1 mm, bordered with flaccid cilia up to 0.35 mm long; smaller scales appearing stellate; underside becoming somewhat darker rusty-brown, upper surface glabrescent and dark green with age. Venation hidden. Fertile fronds commonly much smaller than sterile ones, with blades ca 5 – 8 x 0.6 cm; upperside provided with scales similar to those of the sterile leaves, undersurface completely covered with distinctly stipitate sporangia.

Readily distinguished within the Bioko species of *Elaphoglossum* by the markedly ciliated scales different in various parts of plant.

**Ecological notes:** Locally abundant, preferably growing as a terrestrial by shaded mossy rock faces and near waterfalls in 1200 – 1400 metres altitude range; epiphytic in wet mountain woodlands at 600 to 2100 metres elevation. In Bioko collected in *Schefflera* forest of the Pico mainly about 1800 to 1900 metres.

**Citations:** NEWTON s.n., Pico 600 m (7/1895), K; MILDBRAED 7147, Pico above Basile 1900 – 2000 m (11/1911), B; ADAMS 1173, Pico 1860 m (14/12/1951), BM, GC, MA; ESCARRÉ 2031, Refugio del Pico 1900 m (4/ 1965), BC, phot. M; G. & U. BENL FP 365, Pico 1700 m (4/1/1976), M; FP 398, Pico 1800 m (4/1/1976), M.

**Geogr. distribution:** Sierra Leone, Liberia, Cameroon (lectotype), Equatorial Guinea (Bioko).– West trocupal Africa from Sierra Leone to the Guinean Gulf area.


**Synonymy:** see SCHELPE 1969 a : 31 – 32.

Rhizome short-creeping to shortly erect, 4 – 6 mm in diameter, its apex clothed with crowded spreading paleae; scales sublinear to lanceolate-attenuate and shortly hair-pointed, to about 5.5 x 0.8 (1.0) mm, membranous, pale to bright reddish-brown. Fronds closely spaced, to about ten in number, to 22 cm in total length, upright or somewhat curved, soft-scaly throughout when young, dimorphous. Stipes varying in length from (4) 7 to 10 cm, greyish-brown to grey on drying, sulcate, jointed closely to the rhizome, firm, usually densely beset
with squarrose scales; these narrowly lanceolate, 3 – 5 mm long, mostly hairlike in distal third to half, peltate to almost funnel-shaped at base, yellow- to rusty-brown and finely ciliate, persistent, strongly continuing into the evident midrib and bordering lamina-margins. Sterile leaf-blade (7) 10 – 15 cm long by 1 – 2.5 cm wide, lanceolate or linear-oblong, gradually narrowed to both ends or (obliquely) cuneate at the base, coriaceous; both surfaces, especially the lower bearing scales similar to but shorter than those of the midvein, regularly serrulate as a rule, later often caducous especially on upper face. Veins obliquely arranged, simple or once-forked, becoming visible on upperside of glabrescent blades. Fertile leaves shorter (5 – 6 cm) and blunter than the sterile, with the stipe comparatively longer.

This species has sometimes been confused with the very plastic and more widely distributed Elaphoglossum chevalieri Christ which, however, is clearly separated from E. cinnamomeum by its entire laminar scales (see ALSTON 1956 b: 8 and SCHELPE 1969 a: 32, 34).

Ecological notes: An epiphyte established in mountain rain forests on tree branches and upon very humid rocks, ranging there up to about 2000 metres elevation. In Bioko present in southern upland and not infrequent in the submontane and montane zone of the Pico.

Citations: MANN 668, Pico 1500 m (12/1860), K; NEWTON s.n., Pico 600 m (7/1895), K; MILDBRAED 6303, Pico above Basilé 1100 – 1400 m (16/8/1911), B; ADAMS 1063, near Iladyi Falls “in Cyathea-woodland” 1100 m (8/12/1951), GC; G. & U. BENL FP 113, Rio Iladyi above the Falls 1180 m (24/1/1974), FR, M; FP 126, l.c., K, M; FP 173, Forest above Rio Iladyi ca 1180 m (28/1/1974), BM, M; FP 415, Pico 1600 m (6/1/1976), GZU, M, YA; FP 425, Pico 1390 m (6/1/1976), BC, M; FP 426, Pico 1320 m (6/1/1976), M.

Geogr. distribution: Cameroon (syntype), Equatorial Guinea (Rio Muni, Bioko).– Seems to be restricted to the Guinean Gulf area.

ADDENDUM

To Family CYATHEACEAE (see part I: 26 – 29)


In a taxonomic account in 1981 of all known African tree ferns (Kew Bull. 36 : 463 – 482) HOLTUM had dealt with the genus Cyathea and subdivided C. camerooniana Hook. into 7 varieties, among which only var. camerooniana is relevant to Bioko.
Later on HOLTTUM’s rejection of TRYON’s proposal was approved by SCHELPE & ANTHONY (1986), whilst other authors, such as C. V. MORTON, in Amer. Fern J. 61: 143 (1971), and PICHISERMOLLI, in Webbia 27: 405 (1972), were following TRYON. According to JACOBSEN (1983 : 198) “TRYON’s classification has now generally been accepted”, but possibly that is not the end of the matter.

To Family HYMENOPHYLLACEAE (see part II : 4 – 25)

In my account of this family I adopted a conservative treatment retaining only the genera Hymenophyllum and Trichomanes, following in this respect a majority of relevant authors (ALSTON, BROWNLIE, FADEN, HOLTTUM, JACOBSEN, KRAMER, LEllINGER, PROCTOR, SCHELPE, SEH- NEM, SLEDGE, STOLZE, TARDIEU-BLOT, TRYON etc.) who avoided COPELAND’s splitting up the family into 33 genera. In most of the herbaria, incl. Botanische Staatssammlung München, the “filmy ferns” are also divided in two genera. Hence J. P. CROXALL e. g. found it necessary to transfer Crepidomanes sarawakense Iwatsuki to Trichomanes sarawakense (Iwatsuki) Croxall; see Bot. J. Linn. Soc. 85 : 73 (1982).

In his studies on the “Microgonium erosum – group” PICHISERMOLLI (1982 b) described a new species of Hymenophyllaceae with the name of “Microgonium benlii” based on two specimens, i.e. G. & U. BENL Ka 74/6 from Cameroon and J. P. TILQUIN 144 from Zaïre. This taxon should be transferred here to

**Trichomanes benlii** (Pichi Serm.) Benl comb. nova.


According to the author’s statements the new species differs from the highly polymorphous _M. erosum_ mainly in having its thick-walled laminar cells arranged in regular rows, and from _M. chamaedrys_ in having spurious veinlets slender (not strong), fronds with margins flat (not crisped), entire to irregularly repand or faintly sinuate (not regularly lobate to pinnatifid).

By a thorough comparison of our respective material with PICHISERMOLLI’s detailed description it came to light that some specimens cited under “Trichomanes erosum var. erosum” agree well with the isotype (Ka 74/6 in M) of the

Like SCHELPE (1970: 76, 1979: 77), JACOBSEN (1983: 187) or SCHELPE & ANTHONY (1986: 73), I had subdivided *Trichomanes erosum* into two varieties, var. *erosum* and var. *aerugineum* (syn. *chamaedrys*). From PICIHI SERMOLLI’s careful studies it became clear that *aerugineum* has to be regarded as conspecific with *erosum*, whilst *chamaedrys* must be treated as a true species. The fourth species of the group, *Trichomanes ballardianum* Alston, with subcircular fronds seems not to be present in Bioko; we had found it on Cameroon Mt.

*Trichomanes borbonicum*: delete on page 23, line 2/3, “FP 153, Pico 890 m (26/1/1974), M;”
Key to families

of Pteridophyta occurring in Bioko

1 – Plants without true roots

1 – Plants with true roots

2 – Sporangia fused laterally into synangia

3 – Small plants up to 25 cm high; leaf divided into a patent sterile segment and an upright synangial spike with embedded sporangia

… … … OPHIOGLOSSACEAE (III : 3)

(Ophioglossum)

3 – Large plants with a massive rootstock; leaf-segments uniform; sporangia fused into short double rows forming submarginal synangia

… … … MARATTIACEAE (II : 3)

(Marattia)

2 – Sporangia separate

4 – Sporangia borne singly in or near leaf axils

5 – Sporangia and spores of one type; leaves lacking ligules

… … … LYCOPODIACEAE (I : 7)

5 – Sporangia and spores of two types; leaves having ligules

6 – Sedge-like aquatics

… … … ISOETACEAE (IV : 3)

6 – Moss-like terrestrials with apical spikes (strobili)

… … … SELAGINELLACEAE (I : 12)

4 – Several to many sporangia borne on a leaf

7 – Sporangia with a patch of thick-walled cells toward their distal end

… … … OSMUNDACEAE (I : 25)

(Osmunda)

7 – Sporangia with a complete annulus

8 – Annulus not vertical
9 - Annulus forming an apical cap; fronds scandent
    ... ... SCHIZAEACEAE (I : 22)
    (Lygodium)

9 - Annulus medial
10 - Annulus transverse; fronds pseudodichotomously
    branched ... ... GLEICHENIACEAE (I : 23)
10 - Annulus oblique; fronds otherwise
11 - Ferns of arborescent habit, with an erect trunk-like
    rhizome (caudex)
    ... ... CYATHEACEAE (I : 26)
11 - Very delicate ferns with translucent laminar tissue
    one cell thick
    ... ... HYMENOPHYLLACEAE (II : 4)

8 - Annulus vertical
12 - Rhizome with trichomes on younger parts, exceptionally
    intermingled with scales
13 - Lamina-margin flat; sori opening outwards
    ... ... DENNSTAEDTIACEAE (IV : 23)
    (Microlepia)
13 - Lamina-margin more or less revolute; sori opening
    inwards ....... HYPOLEPIDACEAE (IV : 24)
12 - Rhizome bearing scales at least on younger parts
14 - Sporangia confluent, acrostichoid
15 - Fronds uniform or nearly so
16 - Fronds to 2 m or more tall, pinnate; distal
    pinnae fertile throughout
    ... ... ACROSTICHACEAE (IV : 22)
16 - Fronds to 0.3 m long, simple; fertile region
    confined to a contracted apical part
    ....... POLYPODIACEAE (III : 12)
    (Belvisia)
15 - Fronds strongly dimorphic
17 - Sterile fronds nest-like; fertile ones dichoto-
    mous with soral patches
    ... ... POLYPODIACEAE (III : 9)
    (Platycerium)
17 - Fronds otherwise
18 - Lamina simple; stipe articulate to a phyllopodium at a short distance above rhizome; veins free
   .... ... ELAPHOGLOSSACEAE (V : 69)

18 - Lamina pinnate when mature, pinnae undivided or lobed; stipe non-articulate

19 - One narrow row of areolae along each side of pinna-costas
   .... ... BLECHNACEAE (IV : 63)
   (Stenochlaena)

19 - Veins free or differently anastomosed
   .... ... LOMARIOPSIDACEAE (V : 56)

14 - Sporangia not acrostichoid

20 - Sporangia following course of veins, exindusiate

21 - Lamina simple
   .... ... VITTARIACEAE (III : 5)
   (Antrophyum)

21 - Lamina divided
   .... ... HEMIONITIDACEAE (II : 29)
   (Coniogramme, Pityrogramma)

20 - Sporangia in discrete sori or in coenosori

22 - Indusia absent or fugacious; sori not immersed nor covered by reflexed leaf-margins

23 - Fronds simple, pinnatifid or pinnate-pinnatifid

24 - Veins free
   .... ... GRAMMITACEAE (III : 19)
   (Xiphopteris)

24 - Veins anastomosing

25 - Fronds with rounded sori
   .... ... POLYPODIACEAE in part (III : 8)

25 - Fronds with linear oblique coenosori
   .... ... LOXOGRAMMACEAE (III : 24)

23 - Fronds pinnate to decompound

26 - Rachis with median smooth groove above, confluent with grooves of pinna-costae
26 – Not as above

27 – Upper surface of rachis with unicellular acicular hairs

... ... THELYPTERIDACEAE (IV : 42)
(Pseudophegopteris, Stegogramma, Pneumatopteris in part)

27 – Upper surface of rachis with pluricellular hairs

... ... ASPIDIACEAE (V : 47)
(Lastreopsis, Tectaria in part)

22 – Sori with a true, mostly persistent, indusium or immersed or covered by modified leaf-margins

28 – Sori and coenosori marginal or back of the margin

29 – Lamina narrowly linear, grass-like; sporangia in two immersed coenosori

... ... VITTARIACEAE (III : 7)
(Vittaria)

29 – Lamina not grass-like

30 – Indusia opening outwards

31 – Sori solitary on thickened vein-endings; indusia cup-shaped; pinnae not jointed to rachis

... ... DAVALLIACEAE (III : 27)
(Davallia)

31 – Sori in two rows almost parallel to costa; indusia round-reniform; pinnae jointed to rachis

... ... NEPHROLEPIDACEAE (III : 31)

30 – Indusia or pseudoindusia opening inwards

32 – Fronds dimorphic; fertile pinnae strongly contracted

... ... BLECHNACEAE (IV : 63)
(Blechnum)

32 – Fronds uniform
33 - Sporangia protected by sharply reflexed marginal flaps

... ... ADIANTACEAE (II : 25)
(Adiantum)

33 - Sporangia protected by a continuous narrow pseudoinusium formed from recurved often scarious leaf-margin

34 - Ultimate fertile segments with a distinct sterile apex

... ... PTERIDACEAE (IV : 4)
(Pteris)

34 - Ultimate fertile segments without a distinct sterile apex

... ... SINOPTERIDACEAE (III : 4)
(Pellaea)

28 - Sori dorsal on undersurface

35 - Sori linear to oblong or elliptic, straight or curved, (sub)parallel to the oblique lateral veins

36 - Sori usually linear along costal side of a vein, never doubled; scales normally clathrate

... ... ASPLENIACEAE (V : 1)
(Asplenium)

36 - Sori elongated to hook-shaped, single or doubled; scales non-clathrate

... ... ATHYRIACEAE in part (IV : 36)

35 - Fronds simple with the stipe node-articulate to a persistent phyllopodium; venation free

37 - Fronds otherwise
38 – Deep smooth groove of rachis with raised edges on upper surface, open to costa-grooves; lamina tissue glabrescent; ve­nation free

... ... ASPIDIACEAE (V : 33)

(Didymochlaena,
Dryopteris in part, Poly­ystichum)

38 – Not this combination of characters

39 – Unicellular pointed hairs usually abundant at least on upper side of rachis and costae; venation free or basal veins of adjacent pinna­lobes connivent to form an excurrent veinlet to the sinus

... ... THELYPTERIDACEAE in part (IV : 42)

39 – Pluricellular (septate, “ctenitoid”) hairs on frond axes

40 – Veins clearly anasto­mosing

... ... ASPIDIACEAE (V : 52)

(Tectaria in part)

40 – Veins free

41 – Septate hairs on ra­chis and costae to ca 1 mm long but sparse; stipe-bases fleshy-swollen

... ... ATHYRIACEAE (IV : 38)

(Dryoathyrium)

41 – Septate hairs on ra­chis and costae abundant but shorter; stipe-bases rather woody, dry

... ... ASPIDIACEAE (V : 38)

(Ctenitis,
Triplophyllum)
ACKNOWLEDGEMENTS


Meantime I had the opportunity to see more relevant material in the Bolus Herbarium (Univ. Cape Town, Rep. S. Africa) by courtesy of the late Professor E. A. C. L. E. SCHELPE. The Herbarium of the Botanical Institute in Barcelona (BC) generously provided for my studies the ample fern collections of E. GUINEA and A. ESCARRÉ, from Bioko.

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REFERENCES


CHRISTENSEN, C.— Index Filicum. (1905-1906).— Suppl. 1. (1913).— Suppl. 2. (1917).— Suppl. 3. (1934).— Suppl. 4. (1965).— Suppl. 5. (1985).


HOLTTUM, R.E.—Vegetative characters distinguishing the various groups of ferns included in Dryopteris of Christensen’s Index Filicum, and other ferns of similar habit and sori.—Gard. Bull. Singapore 17: 361-367. (1960).


KUHN, M.– Filices Africanae.– Lipsiae. (1868).


KUNZE, G.- Plantarum acotyledonearum africæ australioris recensio nova.- Linnaea 10: 481-570. (1836).


MACLEAY, K.N.G.- The ferns and the fern-allies of the Sudan.- Sudan Notes and Records 34: 286-298. (1953).

MERTENIUS, G.- Filices horti botanici lipsiensis.- Leipzig. (1856).


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