THE PTERIDOPHYTA
OF FERNANDO PO

(Contributions to a Flora of the island)

II: Marattiaceae, Hymenophyllaceae, Adiantaceae, Hemionitidaceae.

by G. BENL

Botanische Staatssammlung München

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

MARATTIA Swartz

Marattia fraxinea J. Sm. var. fraxinea, Pl. Icon. Ined. 2: t. 48 (1790).


Rhizome massive, tuberous, almost globular (up to 40 x 30 cm), covered at first with leaf-bases and later with clean leaf-scars, with persistent fleshy stipules and numerous stout mycorrhizal roots containing the endophytic fungus Stigeosporium marattiacearum West. Fronds close-set, arching, very large, usually 1 - 2 m tall but attaining 3 - 4(5) m in favourable situations, highly polymorphous. Stipes up to 2 m long, 2 - 3.5 cm in diameter, clavately swollen (up to 5 - 6 cm thick) at the base, smooth, the lower part brown, often minutely spinulose or beset with deciduous scales, the upper part cane-like, brownish-green and showing whitish or creamy lenticel spots or vertical streaks when fresh; base provided with a pair of distinct wing-like stipular outgrowths of the stem which persist after the leaf has fallen. Rachis normally glabrous, swollen at the nodes, also marked with whitish lenticels, sometimes winged towards the apex. Lamina up to 1 m or more in width, 2- or rarely 3pinnately divided into ca 8 pairs of pinnae when fully sized, simply pinnate when very young. Pinnae petiolate (petiole 5 - 7 cm in length, with a swelling at the base, articulated with the rachis), oblong in outline, 30 - 75(90) cm long by 20 - 30 cm wide, pari- or imparipinnate; costa sometimes slightly winged and/or provided with fibrous brown scales or with spinules. Pinnules 2 - 3 cm apart, subsessile or rarely with a petiolule up to 6 mm in length, linear- to oblong-lanceolate or linear-triangular, up to 30 each side, slightly rounded or obliquely cuneate at base, articulate, gradually or abruptly caudate-acuminate at apex, rather coriaceous in texture. Pinnules with sharply or bluntly serrate, rarely crenulate or entire margins and simple or mostly forked free veins with clavate apices, medium-green and shining above (dark green when dry), paler beneath, fairly variable in size: the leaflets being longest in the middle of the pinna (at most 26 x 3.5 - 4.5 cm, but normally smaller), shorter toward the base. Large thick-walled sporangia, each dehiscing by a ventral longitudinal slit, borne dorsally on veins in numerous oblong-brown synangial, involucrate, bivalved sori forming close straight submarginal rows. In each sorus the sporangia are laterally tightly fused into two opposite linear synangia 1.5 - 2.8(3.6) mm long, with up to 16 sporangia (6 - 11 on average) on
each side; the bivalved sorus splitting longitudinally over the vein to expose the sporangia.

The eusporangiate Marattiaceae are an ancient family (fossils are known from Carboniferous strata) which, however, did not play a part in the evolution of modern ferns (see Pichi Sermolli 1977: 354).

Ecological notes: Preferring permanently damp, shady places especially in primary montane forests, near streams, in ravines and gullies. In Fernando Po it may be seen from lowland swamps up to 1900 m altitude, occasionally in tree fern groves. We observed a large population on the Loreto Crater at 980 - 990 m elevation.

Citations: Barter 1456 & 2054, K; s.n. (6/1857), K; Mann 131 (12/1859), K; Guinea 423, Balea (28/12/1946), MA; 733, “Bosque de la carretera de San Carlos, Km 35” (31/12/1946), MA; 1027, Musola Monkey Bush (9/1/1947), MA; 2098, “Moka - Concepción a la altura de las Costeras” (28/1/1947), MA; Escarré 3653, Parador de Musola (12/1964), BC; 3654, Biaó (2/1965), BC; G. & U. BENL FP 62, Carretera Luba - Moka, Mte Baká 1460 m (22/1/1974), M; FP 236, Río Borabaabo (“Borabecho”) ca 10 m (18/12/1975), BC, M, YA.


Family HYMENOPHYLLACEAE

1 - Sori borne on a short columnar receptacle included in the base of a cup-shaped, deeply divided (bivalve or two-lipped) indusium (involucre). Fronds often red-brown when dry

... ... Hymenophyllum J. Sm.

1 - Sori borne on a considerably elongated columnar receptacle often protruding bristle-like from the mouth of a tubular or obconic indusium. Fronds persistently green

... ... Trichomanes L.
HYMENOPHYLLUM J. Sm.

1 - Leaf margins acutely toothed
    ... ... *triangulare* Baker (1)

1 - Leaf margins entire
   2 - Blades glabrous
       ... ... *polyanthos* Swartz var. *kuhnii* (C. Chr.) Schelpe (2)

2 - Blades bearing stalked stellate hairs
   3 - Stipe not at all winged
       ... ... *capillare* Desv. (3)

3 - Stipe winged in upper part
   4 - Trichomes distributed throughout the blade
       ... ... *splendidum* v. d. Bosch (4)

4 - Trichomes restricted to veins and margins
    ... ... *hirsutum* (L.) Swartz (5)


*Synonymy*: see TARDIEU-BLOT 1964 : 74.

Rhizome filiform, long-creeping, densely clad in yellowish-brown articulate hairs (up to 1.5 mm long), especially on the buds, hairs more or less deciduous when old; the long-stipitate, highly variable fronds 2 - 5 cm apart. Stalk slender, dark, varying from 5 - 10 cm in length (sometimes longer than the blade), hairy toward the base like the rhizome, bearing a toothed wing toward the blade when young, completely unalate with age. Lamina translucent, green to brown or reddish-brown with age, ovate-lanceolate or ovate-triangular or deltate in outline, bipinnate or (mostly) tripinnatifid, glabrous, 8 - 20 cm long by 5 - 8 cm broad. Rachis usually terete at the base, narrowly winged toward the apex, the wings bearing distinct spine-like teeth 1 - 1.5 mm long. Pinnae (up to 15 each side) patent to ascending, rhomboid-lanceolate in outline, cuneate-truncate at base, the lower ones from 2 - 6 cm in length, oblong-deltate; pinnules asymmetrically rhomboid, deeply pinnatifid. Costae conspicuously winged throughout. Ultimate segments linear, simple or (mostly) forked, 4 - 8 mm long, completely hairless but having spinulose teeth. The few sori usually solitary, mainly produced on the upper pinnae, axillary at the base of first acroscopic pinnules. Involucre valvate, dark green, unusually large (4 x 2.5 mm), ovate, cleft to about halfway, the base scarcely immersed when mature, the edges entire or slightly crenate. Receptacle usually about the same length as the valves, rarely protruded.

With all its variability in frond shape, this filmy fern is easily distinguished in the field by its serrately toothed margins visible to the naked eye.
**Ecological notes:** An epiphyte, not uncommon in the island, occurring on branches of trees in undisturbed mountain rain forest and *Schefflera* mountain forest (800 - 1800 m alt.). It grows most luxuriantly where there is constant high humidity, e.g. in regions of persistent cloud (Moka area!) or near running water.

**Citations:** MANN 333, Pico 900 m (1860), K; s.n. (1861), K, P; MILDBRAED 6302, Pico 1100 - 1400 m (16/8/1911), B, HBG; 6447, Pico 800 - 1000 m (8/1911), B, HBG; GUINEA 2165, Moka “camino de las Cascadas” (29/1/1947), BM; ADAMS 1072, near Iladyi Falls “in Cyathea woodland” 1200 m (8/12/1951), BM, GC, MA; 1139, Pico 900 m (14/12/1951), BM, GC, K; 1139 A, Pico 900 m (14/12/1951), GC; WRIGHTLEY & MELVILLE 694 b, S of Moka in gully “with Utricularia mannii and Psilotum” 1260 m (21/9/1959), K; G. & U. BENL FP 81, Bião inside the crater border ca 1800 m (22/1/1974), BC, M; FP 117, forest along Rio Iladyi 1180 m (24/1/1974), BOL, FR, GZU, K, M, MO, YA; FP 174, Rio Iladyi above the Falls 1180 - 1190 m (28/1/1974), BC, BM, M, Hb. Pic. Ser.

**Geogr. distribution:** Known at present from Cameroon, Equatorial Guinea (FP - holotype), Tanzania, Rwanda.


**Synonymy:** see SCHELPE 1966: 156.

Rhizome very slender, thread-like, with hair-like ferrugineous scales mainly at the nodes; the graceful fronds arising at intervals of up to 5 cm. Well-developed leaves pendent, finely but not always symmetrically dissected, glabrous throughout, up to 60 x 10 cm (including stipe); stipe chestnut-brown, up to 10 cm long or more, filiform, narrowly winged at least towards the blade. Lamina wavy, green to brownish-green becoming reddish-brown to brownish-red when dry, narrowly elliptic, elongate-triangular or linear-lanceolate in outline, often tapering towards the apex, bipinnate to tripinnatifid, sometimes showing seasonal growth. Rachis slightly zigzag and narrowly winged throughout. Pinnae delicate, more or less symmetrical, patent, elongate-lanceolate or elongate-triangular, sometimes obtuse at apex, up to 8 x 1.5 cm, pinnate or bipinnatifid almost to costa; pinnules 3 - 5 on each side of pinna, trapezoid-oblong in outline, deeply lobed, the segments linear-rounded, close-set (overlapping when young), up to 12 x 2.5 mm, simple or forked, completely hairless, with margins quite entire. Lower pinnae may be reduced. The numerous sori (2 - 12 per pinna) mostly terminal on acroscopic basal segments of the upper frond portions; the two-parted indusia broader than the segment, divided nearly to the base into orbicular to obovate, entire or slightly denticulate flaps up to 1.8 mm wide; receptacle small, narrowly clavate.

**Ecological notes:** A common filmy fern of flaccid habit, recorded mostly as an epiphyte in humid forests, hanging in sometimes interwoven masses on the
branches; found up to 1400 m alt. in the island, up to 3300 m in other areas. Plants at higher altitudes tend to have larger fronds.

**Citations:** MANN 328 p.p. (1860), BM; 329, Pico 900 m (1860), K; 330, Pico 750 m (1860), K; 336, Pico 600 m (1860), K; MILDBRAED 6448, Pico 800 - 1000 m (8/1911), B, HBG; 6475, Pico ca 1300 m (8/1911), B; WRIGLEY & MELVILLE 598, Biaô Crater 1920 m (12/9/1959), BM, K; G. & U.BENL FP 108, N of Praderas de Moka ca 1250 m (24/1/1974), M; FP 112, margin of tree fern forest SE of Praderas de Moka ca 1230 m (24/1/1974), M; FP 118, woodland along Río Iladyi above the Falls 1180 m (24/1/1974), M; FP 136, Pico 800 m (26/1/1974), M; FP 167, woodland along tributary to Río Iladyi 1190 m (28/1/1974), BC, GZU, M, MO; FP 181 a, forest margin S of Praderas de Moka 1230 m (28/1/1974), M; FP 437, Pico 1260 m (6/1/1976), GC, M; FP 567, between Residencias de Moka and Riasaca 1180 m (15/1/1976), BC, M; FP 613, Laderas de Moka 1400 m (17/1/1976), FR, M, YA.


Var. *polyanthos*, which occurs in tropical America and Asia, has much smaller fronds than var. *kuhnii*; there are, however, forms transitional between these two varieties.

Var. *mossambicense* Schelpe (Bol. Soc. Brot. 40 : 157, 1966) from Mozambique is distinguished from var. *kuhnii* by having smaller and more openly dissected fronds.


**Synonym:** *Sphaerocionium capillare* (Desv.) Copel., in Philipp. J. Sci. 67 : 33 (1938).

For further synonymy see SCHELPE 1970 : 80.

Rhizome wiry, red-pilose, producing the pendent fronds 1 - 5 cm apart. Stipes 1 to 6 cm long, terete, filiform, unwinged, clad with fragile and partly deciduous branched hairs. Lamina linear-lanceolate, yellowish-brown when dried, hairy throughout, up to 40 cm or more long, up to 4 cm wide, widest about the middle and tapering to both ends, pinnately divided. Rachis usually unwinged, terete, but bearing long stellate trichomes. Pinnae more or less remote, alternate, ascendent, shortly peltiolate or broadly decurrent, oblong- or deltate-lanceolate, 1 - 2 x 0.6 cm, irregularly pinnate to pinnatifid, the lowest
pinnae smaller and more distantly spaced; pinnules 3 - 9 per pinna, simple or forked, 3 - 5 x 1 - 1.5 mm, linear-oblong, rounded or broadly acute at apex, nearly overlapping, bearing pale yellow stalked, branched or stellate hairs up to 0.5 mm or more long on veins and margins, the margins appearing denticulate from the insertions of the trichomes. Terminal sori occurring on any segments except the lowest, 1 - 1.2 mm in diameter; involucre truncate or cuneate at base, densely clothed in stellate hairs, the roundish lips closely dentate with teeth bearing long simple or branched hairs; soral receptacle included.

Ecological notes: Inhabiting montane forests as an epiphyte on mossy trees or lithophytic on rock faces.

Citation: WRIGHTLEY & MELVILLE 480 b, “rim of Biaô Crater” 1950 m, epiphyte 2.5 - 3 m up (12/9/1959), K. - A new record for Fernando Po, predicted by C. D. ADAMS (1957 : 494).


_Hymenophyllum capillare_ Desv. var. _alternialatum_ (Pic. Ser.) Faden of Mt Kenya was described in 1968 (: 196) by PICI SERMOLLI under the name of _Sphaerocionium capillare_ var. _alternialatum_.


_Synonyms:_ _Hymenophyllum ciliatum_ Swartz var. _splendidum_ (v.d. Bosch) C. Chr., Ind. Fil.: 368 (1906).  
_Hymenophyllum plumieri_ Hooker & Grev., Ic. Fil. t. 123 (1829).  

Rhizome creeping, filiform, branched, densely pilose (the pale red-brown articulate hairs ca 1 mm long), bearing pendent fronds 1 - 6 cm apart; fronds hairy throughout, yellowish-green turning (olive-)brown in older mature plants. Stipe 2 - 10 cm long in our material, setaceous, alate toward the blade. Lamina 15 - 45 x 3 - 6 cm, (linear-)lanceolate, elongate, generally tapering to both ends, bipinnatifid. Rachis provided with a broad and plane wing (5 mm). Pinnae 1.5 - 2 x 1 cm, rhomboid-oblong, decurrent, patent to ascendent, the lower ones remote; segments regular, linear, erect, contiguous, 2 - 2.5 mm wide, rounded at apex, sometimes dichotomously divided, finely denticulate with hair-bearing projections at the margin. Short yellowish stipitate-stellate trichomes, (shortly) branched horizontally, cover the flexuous rachis, the costae and nerves, and are scattered over the whole laminar surface (here their density is rather variable). The apical sori (ca 1.5 mm long) with their broadly cuneate to truncate base are
narrower than, and sunk in, the terminal segments: indusial valves rounded, denticulate-ciliate with somewhat smaller branched hairs mainly near their edges; the filiform receptacle included.

This magnificent filmy fern is remarkable for its regular branching pattern and characterized by its hairs covering the whole frond.

Ecological notes: Epiphytic on branches and trunks of trees, lithophytic on moist shaded rocks in cloudy submontane forest. Rarely below 800 m altitude in the island.

Citations: MANN 332 (1860), K; MILDBRAED 6306, Pico 1100 - 1400 m (16/8/1911), B, HBG; ADAMS 1137, Pico 900 m (14/12/1951), BM, GC, K, MA; WRIGLEY & MELVILLE 480 a, “rim of Biaó Crater” 1950 m (12/9/1959), K; ESCARRÉ 2019, Belebú-Balachá (3/1965), BC; G. & U.BENL FP 79, Biaó inside the crater border ca 1800 m (22/1/1974), BC, BOL, K, M; FP 168 b, tributary to Río Iladý 1190 m (28/1/1974), M; FP 176, woodland above Río Iladý 1180 m (28/1/1974), BM, FR, GZU, M, Hb. Pic. Ser., YA; FP 417, Pico 1600 m (6/1/1976), M; FP 434, Pico 1260 m (6/1/1976), BC, M.


Rhizome filiform, extensively creeping, ramose, covered with pale hairs ca 1 mm long; fronds arising at intervals of 1.5 - 7 cm, brownish, finally pendulous. Stalk 1.5 - 5 (10) cm long, decurrently winged at least in upper part, covered with simple or ramified (4-rayed or more) reddish hairs, subglabrous when old. Blade extremely variable in size, 15 - 20 (40) x 2 - 4 (6) cm, usually broadest at the middle, oblong-ovate or varying to deltate or ovate-lanceolate, 2- (rarely 3-) pinnatifid, simply pinnate in juvenile leaves. Rachis and costae supplied with an equally broad, often crisped wing throughout. Pinnae ovate to linear in outline, 1 - 3 cm long, decurrent, more or less contiguous, the lower ones shorter and sometimes more compact (rhomboidal or subflabellate), all more or less irregularly pinnatifid; segments 3 - 5 (9) paired, linear, obtuse, 4 - 6 x 1 - 1.5 mm, often (sub)unilateral and pointing upward, mostly forked or trifid.
Rachis, costae, veins and frond margins bearing stiff, stellately branched, tawny
to ferrugineous trichomes with an elongate stalk cell; marginal hairs borne on
projections which remain after the hairs are lost, thus the segments appear
denticulate. Surface of leaf between the veins glabrous. Numerous terminal sori
(2 - 13 occurring in one pinna) mainly in the upper part of the frond, one or two
per segment; involucre immersed in part, ca 1.5 mm long and about as broad as,
or somewhat broader than the segment, divided halfway to the subcuneate or
(obliquely) cordate base into two flaps appearing denticulate, their margins
densely long-ciliate with simple or furcate hairs; receptacle included, cylindrical
to clavate.

This filmy fern, not really common in the island, is distinguished from other
species with hairy fronds by having the leaf lamina between the veins glabrous.

Ecological notes: Erect or pendent on damp tree trunks (also trunks of tree
ferns) from lowland rain to mist forests with their moisture-laden air; up to 1400
m altitude in Fernando Po. In other countries (e.g. Liberia, Zaïre) also found as
a lithophyte.

Citations: MANN 334, Pico 900 m, K; MILDBRAED 6348, Pico above
Basilé ca 750 m (16/8/1911), B, HBG; ADAMS 1068, near Iladyi Falls “in
Cyathea woodland” 1140 m (8/12/1951), BM, GC, K, MA; WRIGLEY &
MELVILLE 694a, S of Moka in gully “with Utricularia mannii & Psilotum”
1260 m (21/9/1959), K; G. & U.BENL FP 115, forest along Río Iladyi 1180 m

Rep., Equatorial Guinea (FP, Annobon), S. Tomé, Gabon, Congo, Zaïre, Rep. S.
Afr., Mozambique, Tanzania; Madagascar, Mascarene Is, Comoro Is, Seychelles.
- Tropics in America and Asia, New Zealand. - Tropical and subtropical humid
regions throughout the world.

TRICHOMANES L.

1 - Fronds clustered, borne on an erect or suberect rooted rhizome

2 - Fronds tripinnate to quadripinnatifid; rachis narrowly winged towards the
top; ultimate segments of pinnae linear-elongate, ca 0.2 mm wide

... ... ... rigidum Swartz (1)

2 - Fronds usually tripinnatifid; rachis broadly winged; ultimate segments of
pinnae tongue-like, 1 mm or more wide

... ... ... guineense Afz. ex Swartz (2)

1 - Fronds more or less regularly spaced or scattered on a long-creeping rhizome
without roots
3 - Rhizome thick (over 1 mm in diameter); fronds attaining 50 cm in length, bipinnate to quadripinnatifid
   ... ... rhizome thick
   ... radicans Swartz (3)

3 - Rhizome slender (less than 1 mm, mostly less than 0.5 mm in diameter); fronds much shorter
4 - Fronds undivided, with a spurious submarginal vein; rarely over 5 cm long
5 - Fronds entire to irregularly lobed or crenate
   ... ... erosum Willd. var. erosum (4)
5 - Fronds more or less regularly lobed or pinnatifid
   ... ... erosum var. aerugineum (v.d. Bosch) Bonap. (5)

4 - Fronds divided in different degree
6 - Fronds up to 9 cm long, lamina irregularly or regularly incised into linear segments; breadth of blade sometimes equaling its length
7 - Stipe unwinged, proliferous, i.e. bearing a second (and third) frond, or mostly provided with a small bud (easily visible with the help of a lens); lamina palmately to pinnately dissected, with vein-like costular folds when dried
   ... ... mannii Hooker (6)
7 - Stipe never proliferous
8 - Stipe usually very short; fronds subsessile, flabellate, smooth, light green, never provided with spurious veinlets, i.e. with single rows of thickened cells (visible as darker lines with the help of a lens) not connected with the vascular system or with longitudinal folds on drying
   ... ... mettenii C. Chr. (7)
8 - Not this combination of characters
9 - Fronds light or dark green, deeply lobed (more than halfway to middle) or pinnatifid; linear segments with isolated spurious veins near their edges, but without drying folds. Rhizome clothed in a reddish or blackish-brown tomentum somewhat prolonged at stipe base
   ... ... clarenceanum Ballard (8)
9 - Fronds dark green, palmately divided or irregularly incised; linear segments without false veins but with drying folds. Rhizome densely clothed with brown hairs
   ... ... chevalieri Christ (9)

6 - Fronds up to 20 cm (though rarely so much) long, pinnately divided; fertile blade more than twice as long as wide
10 - Fronds mostly once-pinnate; pinnae varying between 6 - 13 on each side, lobed; drying folds absent; rachis provided with unusually broad wings, decurrent to the black stipe which is up to 3 cm long  
...... fallax Christ (10)

10 - Not this combination of characters, the fronds being compound

11 - Indusium very narrow, tubular to urceolate (2 - 2.5 x 0.6 mm), appearing winged for its entire length. Rhizome covered with (light) brown to ferrugineous hairs. Fronds smooth, bipinnate to tripinnatifid  
...... borbonicum v.d. Bosch (11)

11 - Indusium shorter and broader (1.5 x 1 mm), mostly turbinate to campanulate; rhizome clad in dark hairs

12 - Indusia bilabiate, usually terminal on segments, borne especially on upper lobes; fronds without folds in the dry state; short stipe clearly winged in upper half  
...... africanum Christ (12)

12 - Indusia non-bilabiate, mostly appearing axillary, not preferentially restricted to upper part of fronds; fronds always with drying folds; ultimate narrow segments relatively long; stipe unwinged or indistinctly alate below the blade  
...... pyxidiferum L. var. melanotrichum (Schlechtendal) Schelpe (13)

(1) Trichomanes rigidum Swartz, Prodr.: 137 (1788).


For further synonymy see SEHNEM 1971: 88; SCHELPE 1977: 64.

Rhizome stout, 3 - 5 mm in diameter, clad in lanceolate, twisted, dark brown hairs up to 1.5 mm long, producing about half a dozen crowded, subtriangular, finely dissected fronds which rarely are proliferous at the tips. Stipes rigid, erect, varying from 7 to 16 cm in length, more or less sulcate, unilate, grey-brown on drying, with twisted hairs as on the rhizome, these restricted to the very base in old fronds. Lamina narrowly deltate-ovate or lanceolate to oblong-lanceolate, up to 27 cm long (in our material), 7.5 - 12.5 cm wide, widest below the middle, tapering gradually to the apex, subcoriaceous to harsh and rigid in texture, dark green in life turning to olive-brown or almost black in a dry state. Rachis wiry, terete, narrowly winged toward the apex, hairy when young like the stipe. Pinnae opposite to alternate, up to 18 on each side,
(elongate-)ovate, short-stalked, erecto-patent, the longest below the middle, up to 7.5 cm long and 2.5 cm broad, pinnate alternately into oblong subsessile pinnules (up to 14 each side), the acroscopic basal ones parallel to rachis reaching 20 x 9 mm, the other ones decreasing in size to the tips, tending to curl up when dry; pinnules obliquely and more or less symmetrically pinnate to deeply 2pinnatifid into extremely thin segments with narrowly linear subacute lobes various in length. Costae and costules narrowly winged. Sori 1 to 13 per pinnule, superaxillary, situated near the costae of pinnae. Involucre small (ca 1.5 mm long and 0.6 mm in diameter), almost completely free and bent down, suburseolate to cylindrical, slightly widened at the mouth; persistent receptacle often very long when perfect.

**Ecological notes:** Terrestrial on wet boulders of shaded steep stream-banks and similar positions in high forest, rarely found also as an epiphyte on tree ferns; 600 to 1900 m altitude.

**Citations:** MANN 447, 300 m (4/1860), K; s.n. (2/1861), B; MILDBRAED 6299, Pico above Baslé 600 - 800 m (15/8/1911), B, HBG; ADAMS 1037, Moka "terrestrial by stream-bank" 1260 m (7/12/1951), GC, MA; 1065, near Iladyi Falls 1110 m (8/12/1951), BM, GC, P; 1086, Moka by stream-bank 1200 m (8/12/1951), GC; 1090, Moka by rocky stream 1200 m (8/12/1951), GC; WRIGHT & MELVILLE 651, Moka 1350 m (21/9/1959), BM, K; G. & U.BENL FP 116, Rio Iladyi 1180 m (24/1/1974), FR, M; FP 168, eastern tributary to Rio Iladyi (28/1/1974), BM, M, Hb. Pic. Ser., YA; FP 188 a, Bosque del Rio Chubá (28/1/1974), M; FP 332, Valle Moka near Carretera 1550 m (31/12/1975), BC, GZU, M; FP 570, between Residencias de Moka and Riasaca 1160 m (15/1/1976), M, Hb. Pic. Ser.


**Nomenclatural note:** *Trichomanes rigidum* Swartz is regarded by most authors as conspecific with *Trichomones cypressoides* Desv., in Mem. Soc. Linn. Paris 6 : 330 (1827).

(2) *Trichomanes guineense* Afz. ex Swartz in Schrader, Jour. für die Bot. 1800 (2) : 96 (1801).


For further synonymy see TARDIEU-BLOT 1964 : 91.

The ascending to erect short hairy rootstock (up to 3 mm in diameter) produces more than a dozen tufted fronds. Stipe wiry, sulcate, winged in upper
half, pubescent in basal part, with non-twisted dark hair-like paleae 1 - 1.5 mm long; stipe attaining a height of 15 cm (occasionally surpassing lamina in length) and a diameter of ca 1.5 mm, dark castaneous with age. Lamina of herbaceous texture, light green when juvenile but darkening later; broadly ovate to narrowly triangular in outline, up to 15 x 10 cm, always widest at base. Rachis irregularly sulcate and unequally but conspicuously winged throughout, somewhat hairy in younger stages. Costae distinctly alate. Pinnae (up to 12 occurring each side) and pinnules broadly decurrent. Lowest pinnae oppositely arranged at right angles to the rachis, broadly ovate in outline, 3 - 5 x 1.5 - 2.5 cm, unequally 2pinnatifid; pinnules up to 10 each side, linear-lanceolate, the basiscopic ones to 1.3 cm long, exceeding acrosopic ones, especially near the rachis. The more distal pinnae ovate-oblong, pinnatifid, steadily decreasing in size towards apex. Tips of upper alternate pinnae in young plants resembling dilated tongues 3 - 4 mm broad (the fern was named "T. batrachoglossum" by COPELAND!), ultimate segments sometimes resembling narrow tongues (up to 2 mm broad, often shortly lobed), distinctly wider than in the preceding species. Sori numerous, sessile, scarcely immersed, bent downward above the plane of the frond; indusia ca 1 mm long, subcylindric to campanulate, very narrowly winged and scarcely dilated at their mouth; the persistent curved receptacle 2 -3times as long as the indusium.

Ecological notes: Terrestrial, liking wet clay near water-courses in deep damp shade in lowland rain forest, providing constant high humidity. Apparently very local in the island.

Citation: G. & U.BENL FP 230, Río Borabaabo ("Borabecho") ca 10 m altitude, where a nice population of young plants has been discovered (18/12/1975), BC, BM, GC, GZU, M, MO, YA. - New for Fernando Po.

Geogr. distribution: Guinea, Sierra Leone (holotype), Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Río Muni, FP), Gabon, Congo. - Native to tropical West Africa.

(3) Trichomanes radicans Swartz in Schrader, Jour. für die Bot. 1800 (2) : 97 (1801).

Trichomanes giganteum auct., non Bory.
For further synonymy see COPELAND 1933 : 213, excl. T. speciosum Willd.

Rhizome extensively trailing, with abundant rootlets, robust (1.2 - 2.5 mm in diameter), densely covered with persistent dark-coloured bristle-like articulate hairs up to 3 mm long, producing finely dissected fronds at intervals of 2 - 10 cm. Stipe erect, terete, usually short but varying from 1/5 of the blade's length to nearly as long as the lamina. Leaf stalk strong, winged throughout or
non-olate except at the top, glabrous or with sparse articulate hairs. Lamina dark green when fully expanded, broadly ovate to ovate-lanceolate, 15 - 50 x 20 cm, broadest below the middle, closely 2- to 3pinnate or -pinnatifid, rarely 4pinnatifid. Rachis evidently winged and provided with some hairs, mainly at the insertion of the pinnae, like those clothing the stipe. Pinnae up to about 22 each side, alternately arranged, short-stalked, ovate-lanceolate, falcate, translucent, gradually decreasing in size towards the top, the largest being up to 10 x 3.5 cm, with 11 to 15 pairs of deltate or rhomboidal pinna segments (at most 2.5 x 1.5 cm), these pinnatifid to 2pinnatifid. Costae and costules winged throughout. Ultimate segments linear, short, 0.5 - 1 mm wide, the larger ones cleft. Sori 1 - 4 per pinnule, appearing subaxillary; involucres narrowly campanulate to urn-like, stalked or sessile or somewhat immersed, truncate or dilated at the mouth, very slightly bilabiate. The exserted receptacle may attain 4times the length of the indusium, i.e. 6 mm.

A conspicuous filmy fern very plastic in its size and dissection but unique among the creeping species in the island for its large fronds and relatively thick hairy rootstock.

Ecological notes: Another moisture-loving species, creeping as an epiphyte up to 4 m on tree trunks, or as a lithophyte on shady wet rocks, from lowland rain forest to Schefflera mountain forest. Up to 1900 m altitude in the island.

Citations: MANN 669, Pico 1299 m (12/1860), BM, K; MILDBRAED 6304, Pico 1100 - 1400 m (16/9/1911), B, HBG; 7142, Pico 1400 - 1900 m (11/1911), B, HBG; ADAMS 1118, “near Moka Lake, creeping on trunk and roots of tree above pool at outlet of lake” 1590 m (9/12/1951), BM, GC, MA; 1168, Pico 1800 m, on rocks near dried-up stream (14/12/1951), GC; WRIGLEY & MELVILLE 669, ca 2 - 3 miles SW of Lago de Biaó mostly in top half of gully 1200 m (24/9/1959), BM.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (FP), S. Tomé, Zaïre, Angola, Tanzania, Kenya; Madagascar, Mascarene Is, Comoro Is. - Pantropic.

Nomenclatural and taxonomic notes: Up to recently (MORTON 1973 : 273 - 274, FADEN 1974 : 28) West African specimens of this species were determined by some authors as Trichomanes giganteum Bory ex Willd., characterized by the non-olate stipe and rachis. In T. radicans “the stipe and rachis are usually evidently, sometimes broadly winged; but the wing may disappear very completely after being present, and be wanting from the start on the lower part of the stipe” (COPELAND 1933 : 214; see CHRISTENSEN 1932 : 5, TATON 1946 : 38).

Following COPELAND (1938 : 54) a few authors renamed T. radicans as Vandenboschia radicans (Swartz) Copel. There is now a proposal for the generic name Trichomanes L. to be conserved against Vandenboschia Copel. (HOLTTUM 1976 : 203; see BENL 1974 : 314).
Some authors have mistakenly identified *Trichomanes speciosum* Willd. (n = 72) from Macaronesia and Britain with *T. radicans* Swartz (n = 36); see BENL 1974: 313.


For further synonymy see KUNKEL 1963: 211.

Rhizome wide-creeping, filiform, more or less ramose, clad in red-brown to darkish crispate hairs ca 0.5 mm long, finally caducous; producing long rows of polymorphous fronds 0.5 to 5 cm apart. Frond about 4 (-6) cm long by 1 (-3) cm broad when mature, simple, varying widely in outline, being elliptic, obovate, or ovate-oblong, with a cuneate base more or less tapering to a short slender stalk, this rarely exceeding 1.5 cm in length but commonly shorter, densely paleate when young with paleae like those of the rhizome. Blade “bright glossy green” (ADAMS’ no 1163), but mostly maturing to a dark green when full sized; in young stages bearing light brown articulate deciduous hairs (simple or stellate), especially on the midrib (continuing the stipe) and margins. Midrib strong, pinnately branched (sometimes twice) or flabellate in larger fronds. In addition there are many subparallel spurious veinlets not in connection with the primary veins and ending toward the straight margin, mostly anastomosing with a more or less distinctly visible, sometimes evanescent submarginal false vein. Margin entire or shallowly and irregularly lobed or crenate. Marginal sori situated in the upper portion of the leaf, usually up to 9 in number. Indusia slender, fusiform to urceolate, ca 1.5 mm long and 0.4 mm in diameter, very attenuate at base, sunk into the lamina or into processes of the lamina, thus being surrounded by a narrow rim up to the mouth, this distinctly dilated but hardly bilabiate. Soral receptacle (slightly) exserted when old.

*Ecological notes*: The dwarf plants (called “Ausgenagter Becherfarn” by WILLDENOW) establish themselves upon and below wet rocks or on densely shaded mossy tree trunks near running water or swamp in humid forests both primary and secondary, sometimes forming close coverings; rarely found at the base of tree ferns. Seen from sea-level to about 900 m in the island.

*Citations*: BARTER s.n., “on oil palms” (6/1857), K; MANN 329, K; G. & U. BENL FP 284, above Rebola near running clear water 310 m (27/12/1975), GC, M; FP 516, Balea 510 m (12/1/1976), M; FP 521, Pantano del Km 35 of Western Highway Malabo - Luba 10 m (14/1/1976), BC, M, YA.


**Synonyms:** *Crepidomanes chamaedrys* (Taton) Kunkel, in Nova Hedw. 6: 212 (1963).


For further synonymy see SCHELPE 1970: 76; cf. MAURI 1969: 200.

Differs from var. *erosum* in its distinctly lobed, querciform or deeply pinnatifid lamina with often crispate margin; in the presence of sori on the lower, as well as the upper, half of the frond; and in the often strongly exserted receptacles. However, the two varieties are linked by forms which show transitional states in all these characters.

**Ecological notes:** Var. *aerugineum* appears to be more frequent in the island than var. *erosum*. It occurs in similar situations but prefers wet places at higher elevations. The two varieties are sometimes found together.

**Citations:** BARTER s.n., K; MANN 327, 600 m (1860), BM, K; ADAMS 1163, Pico 1500 m (14/12/1951), BM, GC, MA; G. & U. BENL FP 392, Pico 1780 m (4/1/1976), M; FP 396, Pico 1800 m (4/1/1976), GZU, M; FP 435, Pico 1260 m (6/1/1976), M; FP 444, above Belebú-Balachá path to Ureka 720 m (8/1/1976), BC, BM, M, YA; FP 490, above Ruiché path to Caldera 810 m (10/1/1976), M.


**Synonyms:** *Trichomanes musolense* Brause ex Brause & Hieron., in Bot. Jahrb. 53: 377 (1915).


For further synonymy see KUNKEL 1963: 212.

Rhizome thread-like, long-creeping, branched, densely clothed in light to blackish-brown, deciduous hairs, producing fronds 0.5 to 3.3 cm apart. Stalk filiform, terete, unwinged, glabrous except at the very base, in fertile plants mostly 1 - 1.5 cm but attaining 2.5 cm in length. Blade dark green, (1-)3 (-5) x 1 - 3 cm (branched fronds in our material reaching up to 9 cm long!), composed of narrow cells ca 100 x 40 μ, irregular in general outline, varying from
suborbicular to ovate, deltate or rhomboid, cuneate at base, finely dichotomously dissected on a basically palmate or flabellate pattern; segments rather unequal, narrowly linear, 1.5 - 10 x 0.5 - 2 mm, obtuse or emarginate, sometimes (pluri-)pinnatifid more than halfway to an alate rachis; on drying the lamina develops longitudinal folds which may resemble traces of spurious veins. Minute paleae present on nerves in earlier stages of leaf-development. Sori marginal, up to 8 in number, often axillary, situated in sinuses between lobes of the upper part of the frond. Indusia turbinate to campanulate, ca 1.7 mm long, appearing exserted but slightly bordered; mouth fairly widened, spreading collar-like, waved, scarcely two-lipped. Receptacle persistent, often strongly projecting.

A delicate filmy fern of highly variable shape (see KORNAS 1976 : 389, 391), but remarkable for its proliferous stipes always exhibiting a small bud (often consisting of some minute scales only but visible on closer examination) unless this has already grown out. These buds indeed seem to be a most reliable and convenient feature enabling one to distinguish the species instantly from other small-growing taxa.

Ecological notes: Clothing in profusion mossy trunks and branches or colonizing rock faces in wet mountain forest and mist forests from 600 to 1500 m altitude; relatively frequent in our area. The fronds often curl up when growing in habitats near forest margins, but unfold within a short time when put into water.

Citations: MANN s.n., K; s.n. (1861), B, HBG; MILDBRAED 7057, between Musola and Moka 600 - 1200 m (11/1911), B, HBG; ADAMS 1082, Iladyi Falls “in Cyathea woodland” 1140 m (8/12/1951), BM, GC, K; 1148, Pico 1350 m (14/12/1951), BM, GC, MA; WRIGLEY & MELVILLE 597, Moka 1380 (12/9/1959), K; 693, S of Moka “in damp gully” 1260 m (21/9/1959), K; G. & U.BENL FP 109, N of Praderas de Moka 1250 m (24/1/1974), FR, M, MO, HB. Pic. Ser.; FP 337, Rio Mioko near Carretera de Valle Moka, between Km 20 and 21, 1450 m (31/12/1975), M; FP 445, above Belebú-Balachá path to Ureka 720 m (8/1/1976), M; FP 477 a, above Bocoricho path to Laguna Lombé 800 m (10/1/1976), M; FP 478, above Bocoricho path to Laguna Lombé 880 m (10/1/1976), M; FP 575, between Residencias de Moka and Riasaca 1160 m (15/1/1976), BC, BM, M, YA; FP 588, descent to Mioko Fountain 1410 m (17/1/1976), GZU, M.

(7) **Trichomanes mettenii** C. Chr., Ind. Fil.: 644 (1906).

*Synonymy:* *Vandenboschia mettenii* (C. Chr.) Kunkel, in Nova Hedw. 6: 214 (1963); see PICHI SERMOLLI 1968: 197.

*Trichomanes subsessile* Mett. ex Kuhn, Fil. Afr.: 37 (1868), non Splitg.

Rhizome capillary, widely creeping, densely tomentose with blackish-brown hairs, bearing usually subsessile fronds 2 - 4 cm apart. Stipe absent in very juvenile fronds of up to 0.8 cm tall, short (1 - 3 mm) in sterile plants of ca 1.5 cm in length, 3 - 7 mm long in fertile ones; covered with hairs (like those of the rhizome) in lower part, winged at top. Lamina membranous, composed of rather thick-walled large cells (ca 70 \(\mu\) in diameter), cuneate at base, light green, smooth, remaining plane, pinnatifidly fan-shaped and about as long as broad when young, variable in outline when mature; blades may be ovate to rhomboid-oblung (not over 2.2 x 1.8 cm) or attenuately elongate (up to 2 x 0.9 cm), 2pinnatifid with erecto-patent sublinear pinnae and linear, obtuse or emarginate, close-set segments. The subpinnately branched nerves (sometimes bearing tiny scales) are conspicuous. Sori up to half a dozen, usually terminal on upper segments. Involucure more or less immersed, winged, with an obconical to funnel-shaped tube and a rather dilated mouth.

*Ecological notes:* A rare fern epiphytic on tree trunks and lithophytic on wet rocks and stones of streamlets in high (fringing) forest, often associated with mosses; up to 1400 m altitude.

*Citations:* MILDBRAED 6309, Pico 1100 - 1400 m (16/8/1911), B; G. & U.BENL FP 304 a, Oloita 610 m (29/12/1975), BOL, M, Hb. Pic. Ser., YA.


(8) **Trichomanes clarenceanum** Ballard, in Kew Bull. 1937: 346.


*Trichomanes frappieri* auct., non Cordemoy.

Rhizome thread-like, creeping and sometimes widely spreading, set with a reddish- or blackish-brown pubescence of hair-like scales, bearing light to dark green membranous subsessile or stalked fronds. 0.3 - 4 cm apart. Stipe black, filiform, up to 1 cm long (usually much shorter), slightly winged towards the
blade, with minute sparse scales in lower part. Lamina (built of thick-walled cells) 3 - 5 cm long, to 2.5 mm wide, obovate to subpalmate or lanceolate-oblong in outline, cuneate at base, deeply incised or (2)pinnatifid into linear erector-patent segments, these simple or forked, sometimes exceeding 7 mm in length. True veins with tiny scales, false veins running irregularly some distance in from the margins, often strongly interrupted into stripes of various length. Sori immersed in abbreviate segments, mostly appearing axillary; indusia funnel-shaped, ca 1.5 mm in length, (narrowly) winged, the mouth distinctly dilated, the lips, if any, very short and obtusely rounded; the setaceous receptacle may be fairly well exserted when old.

Our material includes sessile flabellate specimens scarcely 1 cm in length but already showing mature sori. Stalked elongate plants may superficially resemble *T. pyxidiferum* var. *melanotrichum* in young stages.

**Ecological notes:** Chiefly occurring as an epiphyte, on moist mossy trees in (undisturbed) forest, at elevations from 600 to 1500 metres.

**Citations:** MANN 331, Pico 600 m (1860), B, K; ADAMS 1146 A, Pico 1200 m (14/12/1951), GC; 1160, Pico 1500 m, mixed with *T. borbonicum* (14/12/1951), BM, GC, MA; G. & U.BENL FP 304b, Oloita 610 m (29/12/1975), M; FP 451a, above Belebú-Balacha path to Ureka 740 m, intermingled with *T. chevalieri* (8/1/1976), BOL, M, P, Hb. Pic. Ser.

**Geogr. distribution:** Liberia (found on the base of a cliff), Nigeria, Cameroon, Equatorial Guinea (FP-holotype). - Native to tropical West Africa.


**Synonym:** *Vandenboschia chevalieri* (Christ) Kunkel, in Nova Hedw. 6 : 213 (1963).

Rhizome wiry, creeping, much-branched, with dense medium-brown tomentum, producing small dark green fronds often very close together and even caespitose. Stipe 0.5 - 2.5 cm long, slender, terete, tomentose like the rhizome at the very base, more or less winged at the top and here bearing minute light brown scales like those seen on the lamina in fresh material. Blade of firm texture, composed of small but not thick-walled cells (45 μ in diameter), 1 - 2.5 cm long and often equally wide, cuneate-flabellate to -palmate or irregularly pinnatifid; 5 - 6 segments up to 12 mm long and 1 - 2 mm broad, simple or forked with a rounded or emarginate top. Sori terminal on upper segments or axillary, exserted in part; involucres about 1 mm in length, nearly free from lamina, funnel-shaped to urceolate with an attenuate basal region and the mouth strikingly dilated, deflexed collar-like, and somewhat bilabiate. Receptacle included or more or less elongate.

This delicate species may be confused with *T. mettenii* when young, but its fronds are darker in colour, often bluish-green, the thin-walled cells considerably
smaller. More mature plants are quickly identified by their well-differentiated vein-like drying folds. From *T. clarenceanum* it differs mainly by lacking the spurious submarginal veinlets and by the distinctive shape of indusia; from *T. mannii* by being devoid of proliferous buds on the stipe. Like the latter it shows costular folds and the preference to curl up in drier situations.

**Ecological notes:** Settling on humid mossy tree trunks including mangroves, occasionally on wet rocks. Found at altitudes below 1000 m in West Africa, at higher elevations in Kenya. - Certainly not frequent in Fernando Po and perhaps confined there to the high-rainfall areas of the southern districts.

**Citations:** THOROLD TF 22, Ureka 150 m (18/8/1951), BM; G. & U.BENL FP 451b, Belebú-Balachá path to Ureka 740 m, mixed with *T. clarenceanum* (8/1/1976), M, Hb. Pic. Ser.


**Synonymy:** see ALSTON 1959 : 31.

Rhizome clothed in short brown crisped hairs, much-branched and giving rise to a caespitose growth-form. Stipe filiform, black, varying from 0.5 to 3 cm in length and provided with a wing upwards from the base, continuing to the rachis, this widened by the conspicuous wing to 3 mm across. Lamina greyish-green, 6 - 10 (16) cm long and 2 (-3.5) cm wide, of translucent membranous texture, plane, ovate- (or narrowly deltate-) lanceolate, subacute, tapering to base and gradually decurrent into the stipe. Pinnae alternate, 6 - 13 each side in mature fronds, oblong, up to 2.2 cm long near the middle of the blade and 0.5 cm wide, broadly adnate, with some simple (or rarely dichotomously divided) lobes, to 1.2 cm in length and 0.2 cm in width, obtuse or slightly emarginate. Sori marginal, axillary or terminal, occurring on any segment except the lowest, always completely sunk into the lobes; involucre turbinate to campanulate, 1.5 mm long, the truncate mouth slightly dilated showing about 1.5 mm in diameter; receptacle persistent, sometimes strongly (to 5 mm) protruded.

A filmy fern distinctive in its simply pinnate (to 2pinnatifid) growth and its broadly winged rachis.

**Ecological notes:** Found growing as an epiphyte or a lithophyte restricted to the most humid microsites in misty forest.

**Citation:** ADAMS 1070, near Iladyi Falls 1170 m, "creeping on the branch of a tree in *Cyathea* woodland" (8/12/1951), GC. The only stand of this very hygrophilous fern discovered so far on the island, to our knowledge.
Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Equatorial Guinea (FP), Zaire (holotype), Uganda; Madagascar. - Tropical West African element.


Trichomanes pyxidiferum auct., non L.

Rhizome filiform, extensive, densely clad in light brown to ferruginous, narrowly linear hairs (up to 1 mm in length), producing the light green to olivaceous fronds 1 - 5 cm apart. Stalk somewhat compressed, up to 6.5 cm long, narrowly alate in upper half. Blade almost 15 cm long and 6.5 cm broad, elliptic to ovate-lanceolate, 3pinnatifid when full sized. PINNAE (6 - 14 occurring each side) ascending to (sub)patent, pinnate to 2pinnatifid, obliquely cuneate at base, 2 - 3.5 cm long by ca 1 cm wide, the longest near middle oblong-lanceolate, the lower ones triangular-ovate; the upper ones simple or forked. Lobes of pinnulae (not over 12 per median pinna) and ultimate segments smooth, translucent, each up to 3 x 0.8 mm, linear, obtuse or emarginate. Rachis, costae, and costules winged. Sori in young plants usually borne in upper portions of the leaf, situated on a small segment mostly near the rachis (and costa), appearing axillary. Indusia tubular to narrowly turbinate or urceolate, 2 - 2.5 mm long and ca 0.6 mm in diameter, completely immersed in the lobes and thus appearing more or less broadly winged, with the mouth dilated to 1 mm, often reversed collar-like, shortly (or not) bilabiate; receptacle persistent, often exserted up to 6 mm when perfect.

This graceful filmy fern is easily identified by the shape of its indusia combined with an absence of drying folds.

Ecological notes: Growing plentifully on trees and boulders in mountainside woods, liking constant presence of mist in altitudes upward from 900 metres (ADAMS 1954 : 181), where humid conditions prevail all year round; but occasionally seen below that elevation.

Citations: MANN 326, 600 m (1860), K; s.n. (2/1861), K; MILDBRAED 6362, Pico above Basilé 600 - 800 m (16/8/1911), B, HBG; 7120, between Musola and Moka 600 - 1200 m (11/1911), B; ADAMS 1073, near Iladyi Falls, “creeping on branch of tree in Cyathea manniana woodland” 1200 m (8/12/1951), GC; 1079, near Iladyi Falls “in Cyathea woodland” 1140 m (8/12/1951), GC, MA; 1138, Pico 900 m (14/12/1951), BM, GC; K; 1146, Pico 1200 m (14/12/1951), GC; 1162, Pico 1500 m (14/12/1951), GC; 1164, Pico 1500 m (14/12/1951), GC; WRIGLEY & MELVILLE 694, “S of Moka with Utricularia mannii and Psilotum” 1260 m (21/9/1959), K; 695, “East slope of
Lago de Biaô, forest on steep slope" 1770 m (14/9/1959), K; G. & U. BENL FP 80, Biaô inside the crater border 1750 - 1850 m (22/1/1974), M; FP 153, Pico 890 m (26/1/1974), M; FP 168a, eastern tributary to Río Iladyi 1190 m (28/1/1974), M; FP 188b, Bosque del Río Chubá 1310 m (28/1/74), FR, GZU, K, M, MO, Hb. Pic. Ser.; FP 370, Pico 1730 m (4/1/1976), M; FP 373, Pico 1780 m (4/1/1976), M; FP 380, Pico 1730 m (4/1/1976), M; FP 387, Pico 1750 m (4/1/1976), BM, M, YA; FP 418, Pico 1600 m (6/1/1976), M; FP 460, above Belebú-Balachá path to Río Lombé 770 m (8/1/1976), BC, M.


(12) **Trichomanes africanum** Christ, in J. de Bot. 22 : 21 (1909).

**Synonymy:** *Vandenboschia africana* (Christ) Kunkel, in Nova Hedw. 6 : 213 (1963); see PICI SERMOLLI 1968 : 197.

*Trichomanes borbonicum* auct., non v.d. Bosch.

*Trichomanes melanotrichum* auct., non Schlechtendal.

*Trichomanes pyxidiferum* auct., non L.

Slender root-stock long-creeping, densely tomentose with dark brown to blackish hairs, producing a row of much-branched fronds arising at intervals of 0.8 - 4 cm or more. Stipe always present, up to 2 cm in length, broadly winged towards the blade. Mature lamina of membranous texture, usually ca 8 cm (exceptionally up to ca 20 cm) x 2 - 3 cm, oblong to deltate-acuminate or more usually ovate-triangular, more or less abruptly decurrent to stipe, 2- to 3pinnatifid, “daintily branched like a tiny flattened Christmas tree” (HARLEY). Rachis conspicuously alate, up to 2 mm across. Pinnae (ca 10 each side) broadly sessile, asymmetrical at their base (basiscopically less developed), obtusely ovate and rather contiguous when young, 1 - 2 cm long by 0.9 cm wide, flabellately divided down to the broadly winged costa, the close oblique pinnules being incised into short linear segments to 3 mm in length, glabrous. Veins distinctly forked bearing tiny brown scales when young. Sori 2 to 6 (rarely more) occurring in one pinna, mostly terminal on any ultimate segment except the lowest ones, but usually accumulated toward frond apex; a few may be axillary. Involucres 1.5 mm long, turbinate to campanulate (or urceolate), wholly sunk into the segments, appearing winged when young; mouth strongly widened up to 1 mm in diameter, collar-like, bilabiate or not; soral receptacle often protruding when old.

In its juvenile habit, **Trichomanes africanum** shows some resemblance to both the preceding and following species. However, it differs markedly from **T. borbonicum** in its relatively broader lower pinnae and shorter indusia, and from **T. pyxidiferum** var. **melanotrichum** in the absence of drying folds.
Ecological notes: Particularly found growing on mossy branches and twigs of trees (also on trunks of *Alsophila manniana*), rarely on moss-covered wet rocks; flourishing chiefly in damp deep shade of misty forests, but occurring at lower elevations too.

Citations: MANN s.n. (1860), BM; ADAMS 1098, near Moka 1350 m (9/12/1951), BM, GC; G. & U. BENL FP 303, Oloita 610 m (29/12/1975), BOL, M. - Some specimens cited in literature as *T. africanum* belong to *T. borbonicum* and *T. pyxidiferum* var. *melanotrichum*.


**Synonym:** *Trichomanes africanum* auct., non Christ.

For further synonymy see SCHELPE 1977 : 63.

Rhizome wiry, creeping, fairly well branched (and thus the plants often more or less caespitose), with a tomentum of blackish setaceous hairs scarcely 1 mm long; fronds arising 0.3 - 4.5 cm apart. Stipe 0.5 - 3.2 cm long (in our material), unalate or slightly winged toward the blade, bearing caducous hairs at its base. Mature blade dark green (often turning yellowish-green after collection), rarely over 10 x 3 cm, ovate-oblong to more often lanceolate (in our material), 2- to 3-pinnatifid; rachis winged almost throughout. Pinnae decurrent, up to 15 on each side, 0.5 - 2.2 cm long by 0.3 - 1 cm wide, longest near or below middle of the blade, fairly distant (up to 1.3 cm apart), ovate- or narrowly-rhomboid, deeply incised into narrow pinnules which are emarginate or (dichotomously) forked or pinnatifid. Ultimate lobes linear, up to 8 mm (!) long, sometimes (sub)parallel. Pinnae exhibiting characteristic longitudinal costular folds in the dry state, some of them appearing in young plants at first glance like false veinlets. Veins provided with numerous minute brown scales, easily visible in fresh material. Sori 1 - 7 per pinna, mostly axillary, situated in the sinuses between pinnules or ultimate lobes, prominent and sometimes bent above the plane of the leaf, more or less equally distributed throughout the whole lamina. Indusia unalate or subwinged, 1.5 - 2 mm long and ca 1 mm in diameter, obconical to campanulate, with the mouth dilated and sometimes waved though not two-lipped. Persistent receptacle usually visible.

Young individuals may superficially resemble *T. clarenceanum*.

Ecological notes: Commonly established on tree trunks and low branches in evergreen (riparian) forest, both virgin and secondary, uncommon on wet rocks in wooded stream-banks and ravines; on isolated trees in the Moka area. Known from 500 to 1500 m elevation in the island, up to 2500 m in other countries.
Citations: MILDBRAED 6296, Pico above Basilé 600 - 800 m (15/9/1911), B; 6918, Bokoko “unterer Tropenwald” (10/1911), B, HBG; 7120, between Musola and Moka 600 - 1200 m (11/1911), B; ADAMS 1089, Moka 1200 m (8/12/1951), GC; G. & U. BENL FP 153, Pico 890 m (26/1/1974), M; FP 336, Río Mioko near Carretera de Valle Moka between Km 20 and 21, 1450 m (31/12/1975), BM, M; FP 470, above Bocoricho path to Laguna Lombé 720 m (10/1/1976), M; FP 477b, above Bocoricho path to Laguna Lombé 800 m (10/1/1976), M; FP 569, Río Chubá, in profusion on wet rocks, 1180 m (15/1/1976), GZU, M, MO; FP 587, descent to Mioko Fountain 1410 m (17/1/1976), BC, M, YA.


Taxonomic notes: We are here following E, SCHHELPE, who explains: “The West Indian T. pyxidiferum has larger and more open fronds than in similarly luxuriant forms of the African plants but since no consistent differences seem to exist between the more common smaller forms in the two geographical areas, the South African segregate is treated here as a variety of the American plant” (1964 : 181). See also TATON 1946 : 34 and PICIHER SERMOLLI 1956 : 130.

Family ADIANTACEAE

ADIANTUM L.

1 - Fronds simply pinnate, proliferous at the apex. Stipe and rachis glabrous; pinnae broadly oblong to lunular, borne on slender stalks 1 - 2 (4) cm long

... ... ... philippense L. (1)

1 - Fronds bi- to quadripinnate, never proliferous

2 - Fronds bipinnate. Stipe scaly throughout; pinnae and pinnules short-stalked, the latter rhomboidal; rachis hirsute

... ... ... vogelii Mett. ex Keys. (2)

2 - Fronds tri-, rarely quadripinnate. Stipe scaly at the very base; ultimate segments roundish to fan-shaped, articulate, deciduous, borne on filiform persistent stalks; rachises glabrous

... ... ... poiretii Wikstr. (3)

Synonymy: see SCHELPE 1977 : 87.

Rhizome short, erect to suberect, 0.5 - 1.0 cm in diameter, with subulate, atro-castaneous, entire scales 3 - 8 mm long; fronds tufted, of variable size (up to 60 cm long), more or less arching to pendulous, sometimes proliferous at the apex. Stipe wiry, dark chestnut-brown, shining, sparsely paleate soon becoming smooth, grooved, 10 - 28 cm in length. Lamina up to 30 (40) x 12 cm, lanceolate in outline, once-pinnate into about a dozen or more pinnae each side of the rachis. Pinnae alternate, palish green when fresh, thin-textured, glabrous and glossy on both surfaces, broadly oblong to lunate (subdimidiate at base), relatively large, 2 - 3.8 (6) cm long, 1.2 - 2.5 cm broad; rounded acroscopic margin irregularly denticulate in sterile pinnae, notched or incised, sometimes deeply, into 4 - 10 truncate lobes 3 - 7 mm long, in fertile ones; veins free and flabellate; petioles 1 - 2 (4) cm long, slender, persistent, articulate. Terminal leaflet of irregular shape, more or less obtriangular, or the brightly castaneous to ebeneous non-alate rachis extended beyond the pinnae when rooting at the extremity. Sori transversely elongated or sometimes lunate, borne in a (sub)continuous line between the notches and incisions (these of various deepness) of the rounded pinna-margin, often appearing confluent; reflexed indusial flaps linear or linear-oblong, their length corresponding with that of the lobe they occupy.

Ecological notes: Growing on humid rocks and on volcanic tuffs and ashes in shady or sunny places, in damp underwood, at forest margins, but also in cultivated ground and on walls; up to 1200 m altitude.

Citations: ESCARRÉ 3668, Cophoatá (6/1965), BC; G. & U.BENL FP 10, Río Sampaka, sea-level (16/1/1974), BM, M; FP 201, Batete on walls 300 m (29/1/1974), M, YA; FP 228, Río Consul in cocoa plantation 70 m (17/12/1975), BC, FR, M; FP 238, Eastern Highway near Km 4 on roadside bank 30 m (21/12/1975), M; FP 495, Balea 470 m (12/1/1976), M. - Has not appeared previously in fern literature concerning Fernando Po.


Synonymy: see SCHELPE 1977 : 87.

Rhizome creeping, covered with dark brown, subulate-attenuate scales, these pseudo-serrate or entire, with a hair-point, 1.5 - 2.5 mm long; fronds
bipinnate, borne 0.3 - 1 cm apart. Stipe strong, erect, blackish, shining, canaliculate, up to 37 cm long and 3 mm in diameter, clothed with light to medium brown, more or less crispate hairs throughout, as are the unwinged rachis and thecostae. (Young plants with light green fronds also have, on their axes, larger pale deciduous scales with twisted processes). Lamina glabrous, deltate-lanceolate in outline, 10 - 30 x 8 - 23 cm, bipinnate, the lateral pinnae in 2 - 6 pairs, the terminal one similar to them but usually larger. Pinnae linear, alternate, shortly petiolate, 8 - 14 x 2 - 4 cm, deltate with a serrate, shortly caudate apex. Pinnules numerous (up to 20 on each side), medium or dark green chartaceous-membranaceous, 0.6 - 3 x 0.3 - 1 cm; close-set, ovate or rectangular, trapezoid or rhomboid-oblong, strongly truncate at acroscopic base; acroscopic and apical margins irregularly incised into 5 - 6 sharply dentate lobes (except for very young plants) in sterile pinnules and in sterile portions of partly fertile ones. Nerves fan-shaped, several times forked, normally ending in the teeth. Sori occurring between the incisions, more or less crescent-shaped, 1.5 - 5 mm in length.

Ecological notes: Preferring shady places in usually secondary forests, especially on banks of water-courses. As a weed in cocoa plantations. Mostly in the lowland, but we found this maidenhair fern also at an altitude above 1000 metres.

Citations: VOGEL 147, “ad Clarence” (11/1841), K; MANN 141 (12/1859), K; s.n. (1860), BM; G. & U.BENL FP 37b, between Maule and Parador de Musola Km 10 - 11, 660 m (21/1/1974), M; FP 103 a, Loreto Crater ca 1040 m (24/1/1974), M; FP 217, road to Basilé ca 20 m (16/12/1975), FR, GC, M; FP 241, cocoa plantations between Río Togecha and Río Co, 15 m (21/12/1975), BC, M; FP 250, Highway Malabo-Aeropuerto Km 2 - 3, ca 10 m (23/12/1975), M.


Rhizome widely creeping, slender, densely clad in thick, lanceolate, irregularly but distinctly ciliate and reticulate scales up to 15 x 1 mm of a greyish colour, soon turning to brownish copper; lateral rhizome-branches thicker, producing delicately dissected fronds up to 1 m tall, at short or very short intervals (0.4 - 2.5 cm), thus fronds sometimes appearing tufted. Stipe wiry, normally 15 - 25 (40) cm long, but attaining 60 cm, usually dark chestnut,
shining, at first beset with brown scales similar to those of the rhizome, especially near the base, afterwards (sub)glabrous. Lamina (oblong-)ovate in outline, 30 - 45 cm or more long by 15 - 25 (35) cm broad, 3 (-4) pinnate; pinnae 4 - 8 paired, alternate, fairly spreading and arching, broadly ovate-lanceolate, the lower ones 15 - 30 x 7 - 15 cm with 4 - 6 pairs of secondary pinnae, usually bipinnate, the upper ones once-pinnate. Rachis and secondary rachises somewhat zigzag, finally chestnut-brown, polished, rarely with some ceraceous indumentum. The many ultimate pinnules (segments) divaricate, remote from each other, relatively small, bright or glaucous green, thinly herbaceous and smooth on both sides; shape variable, broadly obtuse to semi-elliptic, inversely triangular, suborbicular or flabellate-orbicular, (0.5) 1 - 1.2 (2) cm in diameter, somewhat wider than long in general; once to several times slightly notched at the convex outer edge, often minutely crenate or toothed round the upper margin of the somewhat larger sterile segments; veins several times dichotomously forked, fan-like, ending in the sinuses between the teeth or lobules, if present. The articulate, easily deciduous pinnules with short and hair-like black petioles 2 - 4 mm long, falling when mature or dried. Sori oblong, lunate or crescent-shaped, produced on the 2 - 6 lobes of a segment. Membranous marginal flaps semi-circular, up to 2.5 mm long, entire or slightly erose, with a little horn of leaf tissue on either side of the flap. Yellow wax often present among the sporangia.

Ecological notes: Not occurring in lowland areas, but at elevations of (700-) 1600 - 2500 (-3000) m, according to PICHISERMOLLI, especially on dry, more or less shaded floors of humid montane forest; in very dry areas restricted to damp situations. Usually growing in small populations.

Citation: G. & U. BENL FP 411, Pico near path to the top, crossing an old weathered lava flow in primary forest 1640 m (6/1/1976), BC, BM, M, YA. - New to Fernando Po.


There are other varieties of this species in South America; var. sulphureum (Kaulf.) Tryon is also sporadic in South and East Africa.
Family HEMIONITIDACEAE

1 - Fronds well spaced, simply pinnate (to bipinnate in lower part); pinnae few and large, without a white powder; rhizome creeping

... ... *Coniogramme africana* Hieron.

1 - Fronds tufted, compound, composed of many small segments, with a white mealy powder on lower surface; rhizome (sub)erect

... ... *Pityrogramma calomelanos* (L.) Link

**CONIOGRAMME** Fée

*Coniogramme africana* Hieron., in *Hedwigia* 57: 293 (1916).

*Synonyms: Coniogramme fraxinea* auct., non Diels.

*Gymnogramme javanica* auct., non Blume.


Rhizome creeping, rather stout, up to 7 - 10 mm in diameter, more or less densely clothed with thin subferrugineous scales (creamy to green when fresh), these deltate- or elongate-lanceolate, acuminate, entire or denticulate, 3 - 7 mm long, narrow. Fronds arching, spaced 1 - 2 cm apart, 0.5 - 1.5 (2) m tall. Stipe often longer than the lamina, pale green to stramineous, grooved, glabrous, with scales resembling those of the rhizome only in the basal part (ca 1 cm). Lamina oblong to ovate in outline, usually up to 60 - 80 x 20 - 40 cm, broadest above the middle, imparipinnate, with 5 - 8 pairs of pinnae; terminal leaflet like lateral ones, lower pairs often auriculate to pinnatifid or bipartite. Rachis stramineous, glabrous, canalicate on upper surface. Pinnae (glaucous-)green, glabrous, herbaceous to subcoriaceous, lanceolate-(elliptic), normally 10 - 25 cm long and 3 - 4 cm wide, but larger under favourable growth-conditions, (unequally) cuneate or subrounded at base, abruptly caudate at apex, the lower pinnae with petioles 2 - 4 cm long, the middle ones sessile, the 2 - 3 upper pairs decurrent; margins sometimes undulate, entire to (irregularly) toothed especially towards apex; the numerous veins free, simple or 2 - 3times forked, appearing parallel, ending in prominent hydathodes. Sori 1 - 3 cm in length, without indusium, continuous along the veins, nearer to costa than to margin. Sporangia intermingled with small articulate paraphyses.

**Ecological notes:** Usually growing in constantly humid situations, e.g. near stream-beds, in ravines and gullies, especially in virgin forest; mostly found above 1000 metres in the island. (In the cloudy montane forest of the Biaó crater we measured pinna lengths of more than 35 cm by a width of 7.4 cm.).

**Citations:** MANN s.n. (1861), BM, M; MILDBRAED 6269, Pico above Baslé 600 - 800 m (8/1911), B, HBG; ADAMS 1044, Moka, “terrestrial, creeping
along the top of stream-bank in shade” 1260 m (7/12/1951), BM, GC, MA; 1077, near Iladyi Falls, “pathside bank in shade in Cyathea woodland” 1170 m (8/12/1951), BM, GC; WIRGLEY & MELVILLE 600, South outer slope of Biaó 1800 m (14/9/1959), BM, K; ESCARRÉ 3658 & 3659, Parador de Musola (12/1964), BC; G. & U.BENL FP 73, East inner slope of Biaó ca 1800 m (22/1/1974); M; FP 464, Río Lombé 810 m (8/1/1976), M; FP 568, Río Chubá 1180 m (15/1/1976), FR, M; FP 596, Fuente de Mioko 1350 m (17/1/1976), M.


PITYROGRAMMA Link


Rhizome short, upright or rarely procumbent, with short-creeping branches, 8 mm or more in diameter, bearing linear-lanceolate entire scales of light to golden brown or ferrugineous colour and 3 - 4 mm in length, producing up to 20 or more dissected fronds in a dense tuft. Stipes normally 15 - 20 cm (maximum ca 55 cm) long, shiny, dark maroon to dark violet or purplish, with sparse scales towards the base, covered with white waxy powder when young. Fronds arching to erect, variable in size and shape. Rachisatro-castaneous to violet, polished, distinctly grooved on upper surface like the stipe. Lamina oblong-lanceolate to long-triangular in outline, normally 25 - 30 x 10 - 12 cm, but reaching at most 60 cm in length and 30 cm in breadth, usually widest towards the middle, tapering towards apex; bipinnate to tripinnatifid at base, the stalked ascending pinnae (15 or more pairs) alternate, (acute-)lanceolate to triangular, equilateral, sometimes long-acuminate, 10 - 12 (20) cm long and 2 (-4, -5) cm wide, usually largest in the middle of the lamina, gradually shorter towards the apex, scarcely reduced toward the base. Pinnules chartaceous, subopposite or alternate, ascending, sessile and decurrent in a wing along the costa, largest 2.5 - 3 x 0.5 - 1 cm, lanceolate to ovate-acute or elliptic, oblique, cuneate and often auriculate at the base, sometimes pinnatifid (ending in adnate lobes), entire or toothed on the acrosopic margin; pale to dark green above, the undersurface without scales but covered throughout with a whitish to silvery waxy powder (see WOLLENWEBER 1978 : 17). Veins pinnate in larger segments, forked in smaller ones. Sori up to 3 mm long, without indusia, at first distinctly borne along the veins, then often appearing diffuse and confluent when mature, concealing the whitish colour and turning the lower leaf surface brown.
Ecological notes: The terrestrial "Silver Fern" (very exceptionally epiphytic; s. BENL 1976 : 55) is common in grassy open places and disturbed areas including plantations; it is dominant on dryish banks and walls, but especially in roadside ditches, up to 1400 m altitude. Masses grow in profusion on the sunny southern slopes of the island near Biapa, but we found individuals with fronds more than 90 cm tall also on fallen tree trunks right on the northern coast.


Geogr. distribution: Senegal, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (FP), Principe, Gabon, Congo, Angola, Mozambique, Zambia, Tanzania, Uganda; Madagascar, Mascarene Is, Comoro Is, Seychelles, India, Sri Lanka, Malayan Archipelago, Taiwan. - A common weed now ranging widely throughout the American and African tropics and subtropics, the Azores being its northern limit. “The first appearance of P. calomelanos var. calomelanos outside the Americas was in the West African Islands” (SCHELPE 1975 : 101).

Var. aureoflava (Hooker) Weatherby ex Bailey, also introduced from South America, is known in Africa from Zambia, the Rep. S. Afr. and Mauritius.

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