Family ISOËTACEAE

ISOËTES L.

1 – Sporophylls up to 13 cm long, velum present, megaspores with rounded tubercles

... ... *biafrana* Alston (1)

1 – Sporophylls up to 40 cm long, velum wanting, megaspores with spinose protuberances

... ... *spinulospora* Jermy & Schelpe (2)

The somewhat enigmatic Isoëtaceae are regarded as highly reduced and specialized lycopods.

(1) Isoëtes biafrana Alston, in Bol. Soc. Brot. *30* (2. ser.): 15 (1956). See fig. 2 in ALSTON 1959 a: 13.

Totally submerged aquatics suggesting in habit sterile plants of tufted sedges. The lower part of a fleshy stem (usually referred to as a corm or rhizomorph) trilobate with brown dichotomous roots arising between the lobes. Flattened apex of the rhizomorph with elongate-subulate leaves in tufts of 5 to 12, tightly packed and spirally arranged in a dense rosette, 6 – 13 cm long, 1 mm wide when dry, pale brownish in the basal 0.8 – 2.5 cm, green higher up. Cross-section of the tubular leaves quadrate-circular, flattened above. Leaf-base abruptly ovate-oblong, alate by a membranous margin, provided with a delicate deltate ligula. Stomata lacking. All leaves may become fertile mega- or microsporophylls with a solitary sporangium embedded in an excavation ('fovea') of the sheathing base just below the ligula. A thin outgrowth of the tissue of the cavity, called 'velum', extending downwards from above and covering two thirds of the sporangium. Female megaspores ash-grey, to 575 µ in diameter, tetrahedral, tuberculate on both faces. Microspores bilateral, smooth.

Ecological notes: Isoëtaceae have a world-wide distribution, but only a few of the ca 125 species occur in the tropics. GUINEA (1949:167) remarked about his collection: "Un inesperado *Isoëtes*, mezclado con el *Scirpus" (S. brachyceras)*, and ADAMS (1957 : 490) noted: "Submerged in two to three feet of water near the outer edge of the marsh" of the Lago de Biaó (Moka).

Citations: GUINEA 2235, Lago de Moka (30/1/1947), BC, BM, K, MA; ADAMS 1115, Lago de Moka 1620 m (9/12/1951), BM, GC.

Geogr. distribution: Cameroon, Lake Oku (holotype); Equatorial Guinea (Bioko).– Apparently restricted to soft water lakes in montane districts of the Guinean Gulf region.

(2) **Isoëtes spinulospora** Jermy & Schelpe, in Contr. Bolus Herb. *10* : 151 (1982).

Recently another Isoëtes was described from almost the same locality: Rhizomorph probably bilobed; sporophylls to 40 cm long and 1 mm wide when dry, terete, tapering abruptly to an acute apex; leaf-base deltate-ovate. Velum lacking. Megaspores ca 100 µ in diameter, both proximal and distal faces spinulose. Microspores verrucose.

Ecological notes: In permanent lake with about 15 cm of mud; found by MELVILLE at 5.4 m depth with fertile leaves 30 to 45 cm high and in 0.6 m of water with fertile leaves 15 – 20 cm high.

Citation: F. MELVILLE 490 & 490a, Lago de Biaó (14/9/1959), BM, K.

Family PTERIDACEAE

PTERIS L.

1 – Fronds simply pinnate, pinnae undivided or irregularly lobed

2 – Terminal pinna petiolate; veins all free
... ... *manniana* Mett. ex Kuhn (1)

2 – Terminal pinna decurrent; veins anastomosing
... ... *burtonii* Baker (2)

1 – Fronds pinnate-pinnatifid to decompound

3 – Venation free; costae (midribs of pinnae) always with spines

4 – Fronds ternate, finely cut

5 – Spiny on all of the axes
... ... *intricata* C.H. Wright (3)

5 – Stipe and rachis not spiny
... ... *pteridioides* (Hook.) Ballard (4)

4 – Fronds not ternate

6 – Fronds gemmiferous

7 – Pinnae widely spaced, lobed to costa; pinna-lobes ca 3 mm broad
... ... *preussii* Hieron. (5)

7 – Pinnae closely spaced, not completely lobed to costa; pinna-lobes ca 5 mm broad
... ... *prolifera* Hieron. (6)

6 – Fronds not gemmiferous

8 – Sterile pinna-lobes regularly serrate; costulae (midribs of pinna-lobes) without spines
... ... *dentata* Forsskal subsp. *flabellata* (Thunb.) Runem. (7)

8 – Sterile pinna-lobes entire; costulae usually spinulose

9 – Stipe and rachis smooth; up to 14 (18) pairs of pinnae
... ... *togoënsis* Hieron. (8)

9 – Stipe and rachis consistently scabrous; up to 5 (6) pairs of pinnae
... ... *paucipinnata* Alston (9)

3 – Anastomosing veins forming costal areoles

10 – Fronds ternate ... *tripartita* Sw. (10)

10 – Fronds not ternate

11 – Lateral veins of pinna-lobes united along costule

12 – Fronds without gemmae; rachis scabrous only apically, costae normally spinose beneath, costulae smooth
... ... *atrovirens* Willd. (11)

12 – Fronds mostly with gemmae

13 – Fronds scandent, with up to 28 pairs of regularly lobed pinnae; rachis and costae spiny
... ... *similis* Kuhn (12)

13 – Fronds not scandent, with up to 7 (12) pairs of unevenly lobed pinnae; rachis and costae unarmed
... ... *burtonii* Baker (2)

11 – Lateral veins of pinna-lobes free

14 – Sterile tips of pinna-lobes entire
... ... *linearis* Poiret (13)

14 – Sterile tips of pinna-lobes clearly serrate or crenulate

15 – Stipe usually smooth; rachis and costae spiny
... ... *hamulosa* Christ (14)

15 – Stipe muricate; rachis and costae smooth
... ... *mildbraedii* Hieron. (15)

(1) **Pteris manniana** Mett. ex Kuhn, Fil. Afr.: 84 (1868).

Synonymy: Pteris cameroonіana Kuhn, Fil. Afr.: 207 (1868); see SCHELPE 1969 : 60.

Pteris jungneri Brause & Hieron., in Bot. Jahrb. Syst. *53* : 388 (1915).

Rhizome erect or short-creeping, rhizome scales lanceolate, bright brown, composed of central thick-walled and lateral thin-walled paler cells. Fronds dark green, tufted, to ca 1 m tall, mostly with a gemma at the base of upper pinnae. Stipe 4 mm in diameter near ground, usually 20 – 25 (50) cm long but occasionally exceeding the length of the blade, chestnut-brown or red in its lower parts, (greyish) straw– to honey-coloured higher up, channelled on upper surface as is the rachis, squamulous when young, paleate when adult with scales at the frond-base only. Lamina lanceolate-oblong varying to broadly ovate in outline, commonly 20 – 35 (45) × (10) 15 – 20 (35) cm, glabrous throughout, rather coriaceous in texture, once-pinnate. Lateral pinnae in 7 to 15 pairs ca 3 cm distant, linear-lanceolate to somewhat falcate, 10 – 15 (25) × 1 – 1.5 (2) cm, never decurrent hut sessile or shortly petiolate, apex (very) acute or somewhat obtuse, sterile pinnae and sterile tips of fertile ones (sub)entire or undulate, fertile pinnae narrower than sterile ones; terminal pinna like upper lateral ones but longer, lowest 1 or 2 pairs often bipartite. Costa grooved on upper surface; veins free, parallel, close, simple or forked from base, up to 100 pairs or more. Sori protected hy the revolute margins (pseudoindusia), not reaching base or apex of pinnae. Short paraphyses few.

Young specimens of *Pteris manniana* may show a superficial similarity with imperfect plants of *Lindsaea ensifolia,* but the venation is different.

Ecological notes: This easily recognized fern was found growing in the island up to ca 1000 m altitude, particularly beside paths in lowland and mountain rain forest, in gullies and along periodically drying water-courses.

Citations: BARTER s.n., K; MANN s.n. (1860), BM; MILDBRAED 6424, Pico above Basilé 600 – 800 m (16/8/1911), B; GUINEA 349 & 417, Balea (28/12/1946), BM; 433, Balea (28/12/1946), MA; 1480, Balachá (15/1/1947), MA, MO; ADAMS 1016, near Lago Loreto 1000 m (6/12/1951), BM, GC, K, MA; G. & U. BENL FP 23, Río Musola near mouth (19/1/1974), M; FP 33, Río Maloho near Km 41 – 42 of Western Highway (19/1/1974), BC, FR, M, Hb. Pic. Ser.; FP 98, Loreto Crater 980 m – frond lenght to 94 cm! – (24/1/1974), B, M; FP 103 b, Loreto Crater 1050 m (24/1/1974), M; FP 275, Basilé 460 m (27/12/1975), M; FP 325, between Maule and Parador de Musola 700 m (31/12/1975), M; FP 467, above Bocoricho path to Laguna Loinbé 700 m (10/1/1976), M; FP 494, above Ruiché path to Caldera 810 m (10/1/1976), M; FP 498, Balea on the shore of the "Lago" 490 m (12/1/1976), M; FP 511, Balea 500 m (12/1/1976), M; FP 535, Río Laric near Basakato del Oeste 100 m (14/1/1976), M.

Geogr. distribution: Ivory Coast, Nigeria, Cameroon (lectotype), Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko). – A native of Western Africa.

Note: According to GUINEA (1949 : 73, map 15) the family LINDSAEACEAE is represented in Bioko by *Lindsaea ensifolia* Sw. *("Schizoloma ensifolia")*, a "preponderantly Asiatic fern ... locally very rare in tropical Africa" (KRAMER 1974 : 115). No specimen from the island is housed in MA or BC, and we looked in vain for this fern in the locality indicated by GUINEA. Although ADAMS (1957 : 483) and ALSTON (1959 a : 44) have accepted GUINEA's citation, we are here following the opinion of Prof. K.U. KRAMER (pers. comm. of 10/1/1977) that an occurrence should not be taken for granted without a relevant record, especially in the present case.

(2) **Pteris burtonii** Baker, in Ann. of Bot. 5 : 218 (1891).
See fig. 10 in ALSTON 1959 a : 41.

Synonymy: see SCHELPE 1977 : 92.

Rhizome firm, shortly creeping, beset with crowded paleae, these narrow-subulate to 5 mm long, with a dark centre of laterally thick-walled cells, paler at the thin borders. Fronds clustered, often marked by a notably irregular sometimes odd construction, gemmiferous as a rule with one or more proliferous buds on the base of the terminal pinna and of the ultimate pinna pair(s) respectively. Stipe and rachis smooth, straw-coloured to (reddish–) castaneous, sulcate; stipe 15 to even 70 cm long in our material. Lamina (ovate–) lanceolate to deltate (–caudate) in outline, ca 15 – 40 by (12) 15 – 25 cm in our area, pinnately divided, subcoriaceous; rachis winged toward apex. Lateral pinnae in 3 to 7 (12) pairs, 3 – 6 cm distant from each other, sessile, very variable in shape, 18 cm long at most; lowest once-lobed on basiscopic side, upper ones decurrent, terminal pinna usually equalling upper lateral ones, more or less adnate to the uppermost pair; fertile pinnae usually more lobed than the sterile ones, especially in their middle portion; sterile pinna-tips mostly serrulate. Costa and costules prominent underneath, usually smooth, rarely short-spinulose below (our no FP 258). Lobes of variable lenght, denticulate at apex. Veins more or less reticulate, forming a (sometimes interrupted) series of areoles on either side of the grooved costa and 2 (3) irregular rows of areoles between costules and margins. Sori usually reaching the base (and following the softly rounded sinus) but never the apices of the lobes. Paraphyses wanting.

This very polymorphous species is remarkable for its fronds often departing from the conventional pattern; but tall mature plants may display a regular dissection and then approach *Pteris atrovirens* and *Pteris similis* (ADAMS in sched.).

Ecological notes: Preferring full shade in wet mountain forest regions at elevations from 700 to 1400 metres, but also occurring near paths in lowland plantations (e.g. our nos. 214, 219).

Citations: BARTER s.n. (2. Niger Exped.), K; GUINEA 1224, Musola (10/1/1947), MA; ADAMS 1142, Pico 1050 m (14/12/1951), GC; G. & U. BENL FP 132, Pico 750 m (26/1/1974), M; FP 187, Bosque del Río Chubá 1310 m (28/1/1974), BC, M; FP 214, Road to Basilé ca 20 m (16/12/1975), M, YA; FP 219, l.c. ca 30 m (16/12/1975), M; FP 258, Road to Basupú del Este ("Fishtown") 40 m (26/12/1975), M.

Geogr. distribution: Guinea, Sierra Leone, Ivory Coast, Liberia, Ghana (holotype), Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), Principe, Gabon, Congo, Zaïre, Angola, Tanzania, Burundi.– West African element stretching to the Tanzania territory.

(3) **Pteris intricata** C.H. Wright, in Kew Bull. *1906* : 252 (1906).

Synonym: Pteris adamii Tard., in Mém. Inst. Français Afr. Noire *28* : 76 (1953).

Rootstock to 1.2 cm in diameter, erect or ascending with several fronds close together, rarely creeping with spaced fronds; scales of rhizome-tip dark brown, linear-lanceolate, to 1 cm long. Fronds arching, up to 2 m in total length. Stipe and rachis dark chestnut to violaceous, polished, grooved, armed with strong erect or recurved spines up to 3 (5) mm long; stipe vigorous, attaining 80 cm in length and 1 cm in diameter, densely scaly at base with paleae resembling those of the rhizome. Lamina (broadly) ovate to deltate (–lanceolate) in general outline, dark green, herbaceous, to 1 m long and 0.6 – 0.9 m across, bi– to tripinnate. Lateral pinnae 8 – 10 paired, 5 – 8 cm apart, narrowly triangular, upper ones alternate, lower ones opposite; lowest pinnae much larger than the others, reaching 60 × 30 cm, stalked (to 5 cm) and basiscopically developed, thus rendering the frond tripartite to pedate. Pinnules narrowly ovate, (pinnate–)pinnatifid (see fig. 1 in TARDIEU–BLOT 1964 a : 167), ultimate lobes oblong to linear, acute to (sub)obtuse, about 10 – 25 × 5 – 7 mm, not cut to midrib, minutely serrate at their apex. Costae and costulae blackish-red, shining, grooved above, with conspicuous spines on lower surface. Veins free-forking above their base. Sori commonly restricted to basal half of lobe margins.

Immediately distinguished by its thorny fronds.

Ecological notes: Usually sporadic in dense shade of swampy mountain forests, up to about 1900 m altitude. In Bioko recorded only once, from a grassy stream bank in the higher-rainfall Moka area.

Citation: ADAMS 1057, between Moka and Iladyi Falls 1050 m (8/12/1951), BM, GC, MA.

Geogr. distribution: Guinea, Sierra Leone, Ivory Coast, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), Congo, Zaïre, Angola, Mozambique, Zambia, Tanzania, Kenya, Uganda (holotype), Rwanda, Burundi. – Throughout tropical Africa.

(4) Pteris pteridioides (Hook.) Ballard, in Kew Bull. *1937* : 348 (1937).

Synonymy: see SCHELPE 1970 : 117.

Rhizome (to 1 cm in diam.) suberect or ascending with fronds in a tuft, bearing at the apex lanceolate to narrowly ovate, thin entire brown scales of ca 5 × 2 mm. Fronds arching, long-stipitate, to over 1.2 m in total length. Stalk stramineous or greyish-brown like the rachis, thick at its paleate base, slightly muricate but not spiny, sulcate, up to 60 (90) cm long. Lamina (sub)-membranous, deltate to ovate-triangular in typical specimens, ca 30 – 40 (60) × 30 – 40 (60) cm, tripartite, the three divisions petiolate, almost equal in length (to about 25 cm) or the middle one somewhat longer than the basal pinnae, these mostly basiscopically developed; each branch pinnate-pinnatifid with 8 to 15 pairs of linear-lanceolate pinnules of 10 – 15 (20) × 1.5 – 2 cm in our material, tapering to a caudate apex (of ca 3 cm), incised to costulae into about 15 to 25 (35) pairs of oblong lobes (0.8 – 1.4 × 0.2 – 0.4 cm), slightly crenate or toothed apically. Rachis and pinna-costae grooved on upperside, smooth; pinnula-costae (costules) markedly raised on underside, grooved on upper surface and provided with 1.5 – 2.5 mm long spines at lobe-bases, smaller spines on main lobe-veins; 5 to 9 pairs of lateral nerves in each ultimate lobe, once-divided above their base. Sori short, ca 1/3 the length of lobe and medial on lobe margins, sunk in a depression.

Pteris pteridioides ("*P. brevisora* Baker") is quickly identified by its smooth rachis and the short thick sori occupying less than half the edges of segments.

Ecological notes: Locally frequent in undergrowth of moist intermediate to montane forest, 1000 – 2700 m elevation; in Bioko collected especially on rocky hillsides of the Pico and in the southern districts.

Citations: MANN 348, Pico 2100 m (1861), BM, K, P – in HOOKER, Second Cent. Ferns, London 1864 : t. 59; MILDBRAED 7130, Pico 1100 – 1400 m (11/1911), B; GUINEA 1679 & 1684, Finca Puente (20/1/1947), MA; 1683, l.c. (20/1/1947), BM; ADAMS 1015, Lago Loreto "on steep bank in deep shade near lake"900 m (6/12/1951), BM, GC, K; 1021, l.c. (6/12/1951), GC; 1040, near Moka (7/12/1951), GC, MA; ESCARRÉ 3632, Biaó (3/1965), BC; G. & U. BENL FP 64, Carretera Luba – Moka, Mte Baká 1460 m (22/1/1974), M; FP 86, Biaó outside the crater border 1750 m (22/1/1974), BM, M; FP 349, Pico 1635 m (2/1/1976), M; FP 353, Pico 1940 m (2/1/1976), BC, M, YA; FP 548, Mte Baká 1470 m (15/1/1976), M; FP 601, Mioko Fountain 1350 m (17/1/1976), M.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Río Muni, Bioko – holotype), S. Tomé, Zaïre, Rep. S. Afr., Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sudan; Madagascar. Widespread in tropical and wet subtropical Africa.

(5) Pteris preussii Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 399 (1915).

Synonym: Pteris deistelii Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 400 (1915).

Rhizome woody, 8– 15 mm thick, usually ascending with tufted fronds, seldom creeping with well-spaced fronds; scales of root-stock subulate, hair-pointed or bristle-like, up to 8 mm long and 1 mm wide at their bottom, margin light brown. Fronds 0.5 – 1.5 (2.2) m tall, arcuate, proliferous with a gemma at the base of uppermost pinna pair. Stipe and rachis relatively thin, thus rendering taller plants flexuose and flaccid; stipe trisulcate, medium-brown in lower, yellowish-stramineous in upper region, scaly when young, slightly muriculate at or towards the base in mature state. Lamina mostly long and narrow, linear-oblong varying to elongate-deltate or ovate-lanceolate, longer than the stipe, attaining 80 (150) × 30 (40) cm, pinnate-pinnatifid, texture firm-herbaceous, turning olive-green when dry. Rachis glabrous with a crest-like line on upper surface. Lateral pinnae in about 10 to 20 pairs, linear(–oblong), ca 10 – 20 (30) × 3 (4.5) cm, distantly (to 10 cm) spaced towards base, lower ones opposite and short-stalked, the lowest once-auriculate (auricles like pinnae but shorter), upper ones alternate and (suh)sessile, terminal pinna larger than upper lateral ones or not; all acuminate with caudate subentire or crenulate prolongation of 0.5 – 2 cm, free-veined, pinnatipartite, almost completely lobed to costa; this channelled above, prominent below, puberulous when young then glabrous, but always bearing on upper surface subuliform ca 1.5 mm long spines at the attachment of costules. Lobes 20 to 25 or up to more than 40 pairs in largest pinnae, very narrow, sometimes touching each other with their edges, falcate-oblong, 0.8 – 2 × 0.3 (0.4) cm, the obtuse apex entire; costulae (midveins of lobes) often with 0.5 – 1 mm long spines on the upper surface at insertions of lateral veins, these 14 to 20 in number, forked at base. Sori from near sinus to near apex of lobes. Short soral paraphyses present.

The species is similar in habit to *Pteris catoptera* Kunze from more southern and eastern regions of the continent, which however has no gemma and usually fewer pinnae. *Pteris preussii* is distinguished from other similar species by its elongated gemmiferous fronds and widely spaced pinnae with small lobes.

Ecological notes: A mountain species colonizing in intermediate to (sub)montane zones between ca 800 and 2000 m altitude. Tall specimens may be observed on the fringe of rain and mist forest among shrubs, growing like twining plants.

Citation: ADAMS, Iladyi river woodland 1190 – 1250 m. – So far the only record from Bioko (ADAMS 1957 : 486). We saw this fern growing in great abundance and luxuriance on the east slopes of Cameroon Mountain (BENL 1977 : 290), but were unable to find it in the island.

Geogr. distribution: Cameroon (holotype), Equatorial Guinea (Bioko), Tanzania, Kenya, Uganda, Rwanda, Burundi.– West African element extending to East Africa.

(6) **Pteris prolifera** Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 397 (1915).

Rhizome firm, short, protected at the apex by brownish, black-centred, narrow-lanceolate scales. Fronds close-set, to over 1 m tall, long-stalked, proliferous when fully developed, bearing usually one bulbil between the first or second (or third?) apical pinna pair. Stipe straw-coloured to greyish-brown and paleate at base, brownish-red higher up, deeply sulcate above, glandular–hairy when young soon becoming glabrous. Lamina deltate-cuneate to ovate-oblong or –lanceolate in outline, 35 – 45 (60) by 25 – 30 (40) cm when full sized, pinnate-pinnatifid, coriaceous in texture. Rachis reddish, thin, grooved. Lateral pinnae closely spaced (2 – 4 cm, at base up to 6 cm apart), in 8 to 15 pairs, (sub)opposite, linear-oblong, to 20 (25) cm long, lower ones shortly petiolate, lowest once-auriculate, all deeply lobed, apices abruptly tapering to a 2 (5) cm long entire appendage; costa puberulent (with reddish glands) when young, later smooth apart from spines at the attachment of costules on upper surface. Lobes numbering up to about 30 pairs in lower pinnae, sterile ones up to 3.5 × 0.9 cm, fertile ones somewhat smaller. Sterile apices of fertile lobes obtuse, entire, midvein spinulose above; lateral veins to 18 or 19 pairs in largest lobes, once or twice forked near base and/or toward the middle. Sori not reaching sinus or segment tips.

Pteris prolifera differs from *P. preussii* by having shorter and broader fronds with closer spaced pinna pairs and larger lobes.

Ecological notes: Particularly found growing on wooded banks of permanent water-courses and near paths in mountain rain forest areas, flourishing at elevations from 800 to 1400 metres.

Citations: MANN s.n. (1861), BM; GUINEA 1496, Balachá (15/1/1947), MA; 1499, Balachá (15/1/1947), BM; ADAMS 1025, Lago Loreto on steep crater bank above lake 900 m (6/12/1951), GC; 1059, between Moka and Río Iladyi ca 1170 m (8/12/1951), BM, GC; 1066, near Iladyi Falls in *Cyathea*-woodland 1260 m (8/12/1951), BM, GC; 1074, l.c. 1250 m (8/12/1951), GC.

Geogr. distribution: Liberia, Cameroon (holotype), Centr. Afr. Rep., Equatorial Guinea (Bioko), Zaïre, Congo, Uganda, Sudan. – West African element.

(7) **Pteris dentata** Forsskal subsp. *flabellata* (Thunb.) Runem., in Bot. Notiser *115* : 190 (1962).

Synonymy: see SCHELPE 1970 : 117.

Conspicuous fern with a short, commonly erect or ascending rootstock (to 1 cm in diam.) producing clustered arching long-stipitate fronds, rarely creeping with remote fronds, scaled at the apex with linear-lanceolate reddish-brown paleae to 5 mm long and slightly ciliate. Stipe and rachis straminous to atro-castaneous, very glossy, sulcate; the elongated vigorous stipe initially scaly at base, as long as the blade or even longer. Lamina light green, softly herbaceous in texture, narrowly deltate to broadly ovate in general outline, at most 1 (1.8) × 0.4 (0.6) m, more or less horizontally spreading with somewhat drooping apex, up to tripinnate, rarely further subdivided. Pinnae (ca 8 to 15 each side) 10 – 17 × 3 – 4 cm, lower two or three exceedingly variable, unequally bipinnatifid to bipinnate, often with pronounced basiscopic development; upper pinnae (including terminal one) narrowly oblong, simple but deeply pinnatifid into decurrent lobes. Ultimate segments (pinnules and pinnule-lobes) linear or linear-oblong, subfalcate, very variable in length and breadth, attaining 2.5 – 3 (4.5) × 0.5 (0.8) cm in typical specimens; sterile lobes and sterile parts of (the narrower) fertile ones with serrate to serrulate margins, the teeth sometimes hooked. Costae conspicuously prominent on lower surface, sulcate above with spines at the bases of costules. Veins all free, some arising from costa, mostly forked about the middle. Sori on old fertile plants elongated from near base to near apex of each ultimate segment; pseudoindusia narrow, soon vanishing.

This long-stiped fern is distinctive in its light green blades and the sharply serrate lobe margins in sterile regions of the pinnae.

Ecological notes: Settling in more or less open areas or rain forest and swampy woodland, as well as in (sub)montane derived grassland at about 1150 – 3000 m altitude; in Bioko occurring in the *Schefflera* mountain forest and in southern upland around Moka.

Citations: MANN 382, Pico 2200 m (1860), BM, K; s.n. (1861), BM, K; TESSMANN 2841, Moka grassland (15/11/1920), B; EXELL 839, Moka grassland ca 1200 m (31/1/1933), BM; GUINEA 2959, Pico (2/3/1947), BM; 2960, "regreso del Pico" (2/3/1947), K, MA; 2963, l.c. (2/3/1947), MA; 2964, l.c. (2/3/1947), MA, MO; ADAMS 1048, Moka 1260 m (7/12/1951), BM, GC, MA; G. & U. BENL FP 106, Río Chubá 1280 m (24/1/1974), BC, M, Hb. Pic. Ser.; FP 350, Pico 1635 m (2/1/1976), M; FP 391, Pico 1760 m (4/1/1976), M; FP 606, Mioko Fountain 1360 m (17/1/1976), FR, M.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko), S. Tomé, Congo, Angola, Rep. S. Afr. (holotype of subspecies), Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia; Madagascar, Mascarene Is; Ascension, St. Helena.– Subtropic regions with humid microclimate in Africa including its islands.

Subsp. *dentata,* which occurs in Yemen, Ethiopia, Sudan, Greece (Is of Ikaria), has longer and narrower lobes showing crenate to denticulate margins of their sterile parts; the lamina is usually greyish-green and subcoriaceous.

Taxonomic notes: According to KORNAŚ (1979 : 69) "the Zambian plants agree perfectly with RUNEMARK's description of subsp. *flabellata*", but part of the Ethiopian material (e.g. PICHI SERMOLLI's subsp. *flabellata* no 7062 with greyish-green herbaceous lamina, M) show somewhat grading features to subsp. *dentata;* it might be more appropriate to give the two infraspecific taxa varietal rank only. The author (RUNEMARK) himself mentioned a collection from western Angola "in many respects intermediate between the two subspecies" (p. 187). SCHELPE (1977 : 95) has meantime united them completely; so does recently PICHI SERMOLLI (1983 a: 226).

(8) Pteris togoënsis Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 402 (1915).

Synonyms: *Pteris kameruniensis* Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 393 (1915).

Pteris quadriaurita Retz. subsp. *togoënsis* (Hieron.) Schelpe, in Contr. Bolus Herb. *1* : 66 (1969); see ZOGG & KRAMER 1981 : 116.

Rhizome woody, upright, ascending or short-creeping, 3 – 4 × 0.5 – 0.6 (1.5) cm, with the apex clad in dense apical tufts of elongate-deltate pointed to bristle-like scales, delicately lacerate-fimbriate, tawny to brownish, up to 6 × 0.5 mm, at base of stipes to ca 10 × 0.8 mm. Fronds borne in clusters, upright, very variable in size, attaining total lengths of 1.5 – 2.5 m. Stalk usually 20 – 45 cm long but occasionally exceeding the lamina in length, 4 – 5 (10) mm in diameter at base, chestnut-coloured to ferruginous in its lower, straw-coloured to creamy in its distal parts, grooved above like rachis and costae, scaly and glandular when young, glabrate to smooth with age. Blade ovate-oblong to elongate-triangular, up to 70 (90) cm long and 30 (50) cm wide, pinnate-pinnatifid, tissue subcoriaceous. Lateral pinnae ca 14 – 18paired, opposite or alternately arranged, linear– to lanceolate-oblong in outline, deeply lobed, with a caudate apex of 1 – 4 (7) cm; longest central pinnae attaining 35 (40) × 7 cm, upper pinnae sessile, apical pinna larger than upper lateral ones, lower pinnae petiolulate, more or less falcate, spaced 4 – 5 (8) cm apart, lowest pair(s) once–, rarely 2 (3)–auriculate, auricles pinnatipartite like the pinnae but smaller. Pinna-costae prominent below, puberulous above when young and furnished with subulate spines up to 2 mm long (often in pairs at the edges of the groove) near costule-attachments. Lobes usually 20 to 25 on each side but up to 55 in largest pinnae, oblong, straight or subfalcate, 3 (4) × 0.7 – 1 cm at most, subopposite, contiguous with acute sinuses of 3 – 5 (10) mm wide at base; tips of all lobes entire; small but obvious costular spines present on upper face at the base of lateral nerves, these 14 to 20 (30) each side of midvein, free, mostly forked from near base almost to middle. Sori not attaining either the sinus base or the segment apex, leav-

ing 1 – 4 mm free at apex; pseudoindusia membranous, very narrow. Sporangia intermingled with paraphyses.

This species is easily recognized by the absence of a gemma combined with the smooth stalk and rachis, entire pinna-lobes and clearly spinose costae and costulae.

Ecological notes: Reported from a wide range of habitats: on river banks and at roadsides in evergreen forest, on rocks or on the ground at woodland margins, 330 – 2300 m elevation; in Kenya also observed in swamps.

Citations: VOGEL 70 (11/1841), K; BARTER s.n. (6/1857), K; MANN s.n., K, P; G. & U. BENL FP 63, Carretera Luba – Moka, Mte Baká ca 1460 m (22/1/1974), M; FP 318, Carretera de Valle Moka 1350 m (29/12/1975), B, M, TNS; FP 340, Río Mioko near Carretera de Valle Moka between Km 20 and 21, 1450 m (31/12/1975), M, Z; FP 499, Balea on the shore of the "Lago", 490 m (12/1/1976), M; FP 543, Mte Baká 1470 m (15/1/1976), BC, M, YA; FP 573, between Residencias de Moka and Riasaca 1160 m (15/1/1976), EA, M, MO; FP 617, Laderas de Moka 1350 m (17/1/1976), M.

Geogr. distribution: Senegambia, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo (syntypes), Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé & Principe, Gabon, Congo, Angola, Malawi, Tanzania, Kenya, Sudan; Madagascar (?). – West African element extending to East Africa.

Taxonomic notes: In fragments of GUINEA's collections 1497 & 1498, Balachá (15/1/1947), BC, costular spines are absent. SCHELPE (1970 : 120) notes under *Pteris friesii* Hieron. = *Pteris quadriaurita* Retz. subsp. *friesii* (Hieron.) Schelpe (1969 : 66): "Other specimens of the *P. quadriaurita* complex without costular spines but with costal spines are known throughout tropical Africa". Further investigation on the whole complex is needed; see also KORNAŚ 1979 : 69.

(9) Pteris paucipinnata Alston in Exell, in Bull. Inst. Français Afr. Noire *21* (sér. A, 2) : 443 (1959 b).

Synonym: Pteris quadriaurita sensu Alston in Exell, Cat. Vasc. Pl. S. Tomé : 84 (1944), p.p.

Rhizome short, erect, protected by subulate-linear scales to 3.5 × 0.25 mm, dark brown with lighter lacerate evanescent edges. Fronds closely spaced, up to ca 50 cm tall. Stipe reaching 25 cm in length and 2.25 mm in diameter at its base, stramineous when young, ageing to maroon and reddish-brown below in larger specimens, densely clothed mainly at base with scales like those on the rhizome, scabrous in lower parts with wart-like tubercles, representing scale-remnants, 0.1 – 0.2 mm long, these becoming smaller and sparser upwards but continuing into the rachis (and petiolules) sometimes up to the apex. Lamina shortly oblong-deltate to –lanceolate, of firmly herba-

ceous texture, attaining 15 – 25 × 10 – 17 cm, pinnate-pinnatifid, bearing 2 to 5 (6) pairs of lateral pinnae in our material, up to 10 × 3 cm, sessile; terminal pinna like the lateral ones but longer (to 14.5 cm), largely exceeding other pinnae in smaller (but mature) plants, pinnae of the lowest pair petiolulate, usually once-auricled; all deeply pinnatisect sometimes down to costa. Lobes numbering 12 to 25 (30) pairs in our material, narrowly oblong, subfalcate, 1 – 1.8 × 0.3 – 0.5 cm, with the apex rounded and entire; sterile and fertile lobes almost contiguous or separated by a sinus rarely to 2 mm wide. Rachis straw-coloured to pale castaneous, (slightly) scabrous, grooved like the stipe; costa canaliculate on upper surface, with pairs of subulate spines ca 1 mm long, borne at the base of subopposite costules. Costules irregularly spinose, with similar spines at the base of some lateral free veins furcate, ca 10 on either side. Sori not reaching base or apex of lobes; pseudoindusia membranous, narrow. Paraphyses present.

Ecological notes: In S. Tomé *Pteris paucipinnata* was collected at 110 to 1220 m altitude; in Bioko we discovered it established on rock faces and on dryish walls at or near sea-level.

Citations: G. & U. BENL FP 15, Bahia de Venus 2 – 3 m (17/1/1974), BOL, G, M, Hb. Pic. Ser.; MALEST, Islotes Loros near Playa de Aleños (17/1/1974), FR, K, M, MO, Z; G. & U. BENL FP 192, between Barcelonesa and Argelejos near sea-level (29/1/1974), BM, M, YA; FP 200, Playa de Bococo 5 m (29/1/1974), BC, GC, M; FP 209, shore between the mouths of Río Matadero and Río Borabaabo (14/12/1975), B, BOL, M.

Geogr. distribution: Known so far only from Equatorial Guinea (Bioko, see BENL 1976 : 153), S. Tomé (holotype), Principe (?). – Seems to be confined to the Guinean Gulf area.

Taxonomic note: The taxon is distinctive in its scabrous axes, sufficiently differing from other members of the *Pteris quadriaurita* complex to be maintained as a separate species.

(10) Pteris tripartita Sw., in J. Bot. (Schrader) *1800* (2) : 67 (1801).

Synonymy: Pteris marginata Bory, Voy. *2* : 192 (1804).
Litobrochia marginata (Bory) C. Presl, Tent. Pterid. : 149 (1836).

For further synonyms see BROWNLIE 1977 : 202.

Large fern with a stout tufted upcurving rootstock forming in very old specimens a trunk to 30 cm tall with aerial roots, paleate with thin broad (to 3 × 2 mm) light brown scales. Fronds arising in a cluster, greatly varying in size as a response to conditions of habitat, to over 2.7 m in total length. Stipe and rachis straw-coloured to pale brown and subcastaneous, purplish when adult, smooth, grooved; stipe stout, fleshy, up to 2 cm in diameter, commonly exceeding one metre, 2/3 to as long as the blade. Blade pale to dark green,

coriaceous, pedately branched, broadly ovate to deltate in general outline, 50 – 150 cm long and mostly 20 – 60 cm across but sometimes enlarging to 150 cm wide and decompoundly pinnate-pinnatifid: of three primary divisions (petiolate pinnae) the lateral opposite ones spreading, almost as long as the axial, this to about 100 × 25 cm, pinnate-pinnatifid, bearing 15 to 30 pairs of innules, the terminal pinnule similar; lateral basal branches again 2– or 3-parted, with a large basiscopic pinnate-pinnatifid branch (secondary pinna) towards the base, the lowest basal pinnule of this side-branch bearing on its basiscopic side several secondary pinnules; pinnules and secondary pinnules linear to linear-lanceolate, 7 – 25 cm long by 1 – 3 cm wide, rather deeply incised, the apices caudate to 3 – 4 cm; ultimate lobes uniformly arcuate-oblong, 5 – 16 (20) × 2.5 – 4 (5) mm, minutely crenulate at the rounded tips. Costa furrowed and (irregularly) spinulose on upper surface. Veins joined along costa to form a single row of arched areoles, costules flanked by areolate veins, free veins once or twice forked. Sori occupying about the lower two thirds of the lobe margins, more or less completely following the rounded sinuses. Soral paraphyses present.

This very polymorphic species (called Giant Brake in Australia) is the only tripartite fern among the taxa showing copiously anastomosing veins.

Ecological notes: A chiefly lowland fern found usually on the margins of swamps and in moist places in secondary woodland, but occasionally occurring on shaded mountain slopes or sunny hillsides at median elevations (700 – 900 m).

Citations: VOGEL s.n., K; BARTER s.n. (6/1857), K; ADAMS, Basakato del Oeste 90 m (see 1957 : 482); Lago Loreto 914 m (see 1957 : 486).

Geogr. distribution: Guinea, Sierra Leone, Ivory Coast, Ghana, Benin, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Congo, Zanzibar, Uganda, Ethiopia; Madagascar, Mascarene Is, Comoro Is, Seychelles. – Widely distributed in the tropics: Asia (e.g. Nepal, Taiwan, Sri Lanka, Java – holotype), Philippines, Polynesia (e.g. Fiji, Tahiti), Australia (Queensland), America (e.g. southern Florida, St. Lucia, Suriname). In the New World tropics at scattered localities and "generally regarded as an introduced alien, but this seems uncertain" (KRAMER 1978: 65; Amer. Fern J. 64: 115. 1974).

(11) Pteris atrovirens Willd., Sp. Pl. *5* : 385 (1810).

Synonym: Pteris spinulifera Schum., in Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. *4* : 233 (1829).

Rhizome short(–creeping), woody; rhizome scales present especially at the apex, crowded, narrow-lanceolate, ca 5 mm long, brownish with a darker central stripe. Fronds borne in a tuft, not scandent, not gemmiferous. Stalk slightly muricate or completely smooth, channelled, 20 – 40 cm long, stramineous to chestnut-brown, violaceous at base, eventually violaceous to ebony

throughout or only on the back like the rachis. Lamina coarse, ovate-lanceolate to -deltate, 20 – 60 (100) by 15 – 25 (30) cm, evenly pinnate-pinnatifid. Rachis sulcate as the costae, often scabrous towards apex. Lateral pinnae up to 7 on each side, (sub)opposite, broad- to oblong-lanceolate or subovate-oblong, acuminate, ca 10 – 20 (30) × 3 – 5 cm, the lower ones stalked; lowest pair usually longest, bipartite with a pinnatifid auricle; terminal pinna decurrent. Costae normally densely spinuliferous with conspicuous weak prickles underneath, smooth above; but there is a variant ("inermis") without any spinules (e.g. our nos. FP 524, 525). Lobes in about 10 to 20 (30) pairs, oblong, subfalcate, very obtuse, lateral ones 1.5 – 3 × 0.5 – 1.2 cm, separated by a (sub)acute sinus, the fertile ones in particular distinctly dentate at the (sterile) apex; terminal lobe up to 5 cm long, often caudate with a linear serrate apex. Venation more or less areolate, veins interconnected to form a costal row of areoles and irregular areoles along the smooth costules, the rest of the veins free. Sporangia in a continuous elongated sorus following the contours of the whole lobe margin up to the apical teeth. Paraphyses present.

Pteris atrovirens (in its normal form!) is easily distinguished from other non-scandent species that have anastomosing veins along the costa and in the lobes, by the presence of spinules on the costa of the lower lamina-surface.

Ecological notes: Usually growing in shady humid undergrowth in lowland evergreen forest, in cocoa plantations and oil palm groves; in Bioko occurring in coastal regions but more frequently in virgin and secondary wet forest at altitudes up to 1250 metres (see ADAMS 1957 : 486).

Citations: VOGEL 94 & 162, "ad Clarence" (11/1841), K; BARTER 1464 (6/1857), K; MANN s.n. (1860), BM; 135, K; GUINEA 652, "Bosque de la carretera de San Carlos, Km 35" (31/12/1946), MA; 697, l.c. (31/12/1946), BM; G. & U. BENL FP 13, Río Sampaka sea-level (16/1/1974), M; FP 28, Playa de Alcña (19/1/1974), EA, G, M; FP 39, Camino Pantano de Concepción sea-level (21/1/1974), BC, M, Hb. Pic. Ser.; FP 52, Maule oil palm plantation 380 m (21/1/1974), M; FP 223, Río Consul 40 m (17/12/1975), M; FP 524, "Pantano del Km 35" of Western Highway Malabo – Luba 10 m (14/1/1976), M, YA; FP 525, l.c. (14/1/1976), FR, GC, M, TNS.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin (holotype), Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Congo, Zaïre, Angola, Tanzania, Kenya, Uganda, Burundi, Sudan; Seychelles. – Throughout tropical Africa including Seychelles, in forest regions.

ZOGG & KRAMER (1981 : 118) report on a presumed hybrid "*Pt. atrovirens* Willd. × *Pt. burtonii* Baker" from Angola. Walg no 71 (in WAG) from S. Tomé may be interpreted in the same way.

(12) Pteris similis Kuhn, in Von der Decken's Reisen Ost-Afr., Bot. 3, *3* : 21 (1879).

Synonyms: see SCHELPE 1969 : 61.

Large fern with an erect to ascending rhizome, densely paleaceous with linear-lanceolate long-acuminate ferruginous scales, these provided with a black central stripe and entire margins. Fronds borne in a tuft, scandent, attaining 2 (3) m in total length, usually with 2 or more gemmae. Stipe and rachis commonly muriculate throughout, grooved; stipe 30 – 60 cm tall, violaceous to purplish at base, stramineous or brownish higher up. Lamina varying from subcordate-ovate to elongate-lanceolate in outline, 50 – 90 (180) cm long and 30 – 60 cm wide at base, light green, membranous, regularly pinnate-pinnatifid. Pinnae ovate– to elongate-lanceolate, long-acuminate, in up to 15 (30) lateral pairs, alternately arranged, sessile and somewhat decurrent, 6 – 10 cm apart, reaching 25 – 35 × 7 – 12 cm, with the apices entire, caudate, 2 – 6 cm long; lowest pinnae opposite, once-auriculate, apical pinnae often with a gemma at the base on upper surface, terminal pinna (sub)-similar to lateral ones, all pinnae lobed to about 2 – 3 mm from costa; lobes 8 – 15paired, separated by a 2 – 6 mm broad intervening sinus, attaining 5 × 1 cm, linear-lanceolate, acute with a sharply toothed sterile apex in typical specimens. Veins forming a regular series of areoles on either side of both costae and costulae, these scabrous with more or less hooked spinules underneath. Sori extending all along the edges of the lobes and sinuses except for a short interval at the apex of each lobe. Paraphyses wanting.

Well distinguished from the preceding species by its scandent gemmiferous fronds and by the spinulose costules.

Ecological notes: Apparently confined to constantly damp habitats like *(Raphia–)* swamps and shady margins of permanent water-courses. *Pteris similis* seems to be very rare in Bioko.

Citation: MANN s.n. (1860), BM. – No recent collection known from the island.

Geogr. distribution: Guinea, Mali, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé & Príncipe, Gabon, Congo, Zaïre, Angola, Tanzania, Uganda, Sudan (isotype?).– Native to West Africa, stretching to the Tanzania territory.

(13) Pteris linearis Poiret in Lam., Encycl. Méth. Bot. *5* : 723 (1804).

Synonymy: see TARDIEU-BLOT 1964 a : 163, except for *Pteris hildebrandtii* Hieron.

Rhizome short, upright, becoming woody, paleaceous at apex; scales narrowly lanceolate, ca 3 mm long, dark brown with lighter, more or less fimbriate edges. Fronds tufted, long-stalked, variable in size, to 2 m and more

tall, not gemmiferous. Stipe 35 to 80 cm long, straw-yellow to reddish (especially at base), smooth, paleate at the very base only, sulcate. Blade ovate-oblong to lanceolate in outline, usually 30 – 70 × 15 – 35 cm, (bi)pinnate-pinnatifid, submembranous. Rachis stramineous to maroon, smooth, grooved. Pinnae in 7 to 10 (15) lateral pairs, (sub) sessile, with the apical 2 – 3 cm tapering; middle ones linear-lanceolate, 4 cm apart, about 10 – 15 (25) × 3 – 5 cm, terminal pinna slightly larger than upper lateral ones, lowest pinnae petiolate, attaining 30 × 6 cm, auriculate with auricles to 15 (20) cm long, all pinnae more or less deeply lobed. Lobes numbering up to about 30 pairs, linear, always with a rounded entire apex, separated by a broader sinus when fertile. Pinna-costa markedly raised beneath, canaliculate and faintly spinulose above with small spines at the insertion of costules; these smooth, provided with 20 to30 pairs of lateral veinlets forked at their base, lowest ones from adjacent lobes meeting to form a complete or interrupted triangle or an arch below each sinus, thus forming a single series of areoles each extending from costule to costule. Sori (shortly) broken at sinus bases, nearly reaching the entire segment-tips. Paraphyses present with the sporangia.

The presence of costal areoles combined with free veins in entire pinna-lobes clearly characterizes this fern among all *Pteris* species in Bioko.

Ecological notes: Pteris linearis is ecologically diverse, ranging from the lowlands to the montane zone; it is known from dry walls, but more often occurs beside rivers in evergreen forest and in moist shady ravines.

Citations: VOGEL 182 (11/1841), K; ADAMS 1011, Lago Loreto 900 m (6/12/1951), GC; G. & U. BENL FP 42 a, Río Ruma 20 m (21/1/1974), M, YA; FP 50, Maule oil palm plantation 380 m (21/1/1974), M; FP 266, Río Borabaabo ("Borabecho") 160 m (26/12/1975), BC, M.

Geogr. distribution: Senegal, Guinea, Sierra Leone, Ivory Coast, Ghana, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé, Gabon, Congo, Zaïre, Zimbabwe, Zambia, Tanzania, Uganda, Burundi, Sudan; Madagascar, Mauritius (holotype), Réunion, Comoro Is; St. Helena. – Not uncommon in humid tropics of Africa and its islands.

Chinese specimens of "*Pteris biaurita*" are referred by CHING to *Pteris linearis;* see HOLTTUM 1966 : 408.

(14) Pteris hamulosa (Christ) Christ in De Wild. & Durand, in Ann. Mus. Congo, Bruxelles, Bot. sér. 5, *3* : 30 (1909).

Synonyms: Pteris quadriaurita var. *hamulosa* Christ in De Wild. & Durand, l.c. 5, *1* : 4 (1903).

Pteris acanthoneura Alston, in Estud. Ens. Docum., Junta Invest. Ultram., Lisboa, *12* : 15 (1954).

Rootstock short, suberect, 7 – 20 mm thick, fleshy becoming woody; rhizome scales narrow, linear-subulate, to 5 mm long, brown with a dark

central stripe and finely lacerate margins. Fronds close-set, erect or arching, 1.2 m tall at most but usually shorter. Stipe stramineous to pale brown, darker at the scaly base, grooved distally, completely smooth or slightly muriculate, 30 – 50 (80) cm long. Lamina ovate-oblong to narrowly deltate in outline, attaining 50 × 25 (40) cm, pinnate-pinnatifid, (sub)coriaceous. Rachis stramineous turning darker, spinulose, grooved. Lateral pinnae 3 to 6 each side, mostly opposite, spaced 3 – 7 cm apart, 15 (20) × 3 – 5 cm or nearly so, elliptic to narrowly oblong, apex abruptly caudate (2 – 3.5 cm); upper pinnae decurrent, terminal pinna similar to the lateral ones, lowest pinnae longest, once-auriculate, the auricle basiscopic, 10 – 14 cm long; all pinnae lobed to about 2 – 3 mm from costa. Lobes (sub)alternate, narrowly oblong, 1.5 – 2.5 × 0.2 – 0.5 cm, subacute or rounded and slightly falcate, with the sterile tips finely toothed. Costae grooved above, very conspicuous on lower surface (as are the costules), prickly with dense recurved spines of 1 – 1.5 mm; costules smooth or irregularly and faintly spinulose. Veins united only below the sinuses to form shallow, more or less completely arching areoles along pinna-costa; lateral veins of costules free-forking except in distal part. Sori extending down to base of lobes, not reaching tips. Paraphyses present.

Pteris hamulosa is distinctive in having costal areoles but free veins in the pinna-lobes, and lobes with finely toothed apices.

Ecological notes: Terrestrial in rain forest up to 1200 m, and also at lower altitudes in semi-shade in plantations; uncommon in Bioko.

Citation: G. & U. BENL FP 53, Maule oil palm plantation 380 m (21/1/1974), M. – The only stand of this fern discovered so far in the island; see ADAMS 1957 : 485, BENL 1975 b : 32.

Geogr. distribution: Guinea (?), Ivory Coast, Ghana, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), Gabon, Congo, Zaïre (holotype), Angola, Mozambique, Uganda, Burundi, Sudan. – West and Central African element.

(15) Pteris mildbraedii Hieron. in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 415 (1915).

Impressive fern with an upright rhizome paleaceous at apex. Scales linear to elongate-deltate, very acute, ca 5 mm long, brownish with a black pseudonerve and small bordering cells. Fronds closely spaced, of vigorous habit, long-stipitate, to about 1.5 m in total length. Stipe 50 – 75 (100) cm tall, always longer than the lamina, usually tawny or ferruginous in its lower ca 10 cm portion, stramineous in upper parts, sulcate as are rachis and costae, paleate turning muricate (spinulose) especially near frond-base. Rachis initially yellowish, more or less compressed, unarmed as are costae and costulae. Lamina ovate(–acute) in outline, commonly to 50 cm long and 40 cm across, pinnate-pinnatifid, coarse, (sub)coriaceous. Lateral pinnae in 2 to 4 (6)

pairs, subopposite, elliptical or lanceolate or narrowly obovate in outline, 6 – 8 cm apart, subsessile and somewhat decurrent, not deeply lobed (sinus ca 6 – 7 mm from costa), abruptly caudate with a terminal acuminate lobe of 3.5 – 5 (7) × 1 cm, the apex subcrenate-denticulate; largest lateral pinnae in the middle of the blade ca 30 by 10 – 12 cm, terminal pinna somewhat larger than upper lateral ones, lowest pinnae once-auriculate, auricle pinna-like but smaller. Pinna-lobes in 20 to 25 pairs, deltate-falcate, up to 5 – 6 × 1.5 cm, glaucous-greenish, (thickly–)papery, margins of the sterile ones serrate to (sub)crenate towards apex, separated by acute sinuses, more or less contiguous in basal parts; fertile ones narrower with an acute crenulate apex. Costae becoming dark brown on lower surface like the rachis. Lowest veins of two lobes forming an areole parallel to pinna-costa, with one or two smaller ones between them; free lateral veins of costules up to about 25 each side, once-forked except the upper 4 to 6. Sori more or less continuous from lobe to lobe, almost reaching their tips. Paraphyses absent.

The fronds of *Pteris mildbraedii* are remarkable for exhibiting spinules on the stipe only; the long costal areoles are interrupted by one or two shorter ones.

Ecological notes: Showing particular preference for low-lying habitats in moist woodlands and *Raphia*-swamps.

Citations: Guinea 535, Balea (28/12/1946), BM; 536, l.c. (28/12/1946), BC (erroneously cited as *P. barombiensis* in BENL 1975 b : 23); 537, l.c. (28/12/1946), MA; ESCARRÉ 3641, Ureka (5/1965), BC; G. & U. BENL 508, Balea 500 m (12/1/1976), BC, EA, GC, M, MO, Hb. Pic. Ser., TNS, YA.

Geogr. distribution: Liberia, Ivory Coast, Ghana, Benin, Nigeria, Cameroon (holotype), Equatorial Guinea (Río Muni, Bioko), Gabon, Congo, Zaïre, Zimbabwe, Sudan. – A native of tropical Africa.

Nomenclatural note: SCHELPE (1969 : 63) points to *Pteris dubia* Kuhn which "may be conspecific with *P. mildbraedii,* in which case *P. dubia* is the earliest name". *Pteris dubia* Kuhn (Von der Decken's Reisen Ost-Afr., Bot. 3, *3* : 71. 1879) is based on J.M. HILDEBRANDT no 1763 (B) from the Comoro-Is Johanna; it shows serrulate pinna-apices somewhat reminiscent of *P. mildbraedii,* but the lobes are more acuminate, the sinuses broader and the sori restricted to about the middle third of the margin length, never reaching or rounding the sinus. HIERONYMUS (l.c.: 415) put it closer to *Pteris barombiensis* Hieron., an endemic of Cameroon, although the latter has entire lobe apices, as stated by the author himself.

Family ACROSTICHACEAE

ACROSTICHUM L.

F.O. BOWER (The Ferns 3 : 61.1928) suggested the close relationship between *Pteris* and *Acrostichum*. Later chromosome counts not only supported this view but also indicated that *Pteris* (n = 29) had wrongly been classified with *Pteridium* (n = 52). HOLTTUM (1966 : 409) points to the West Indian *Neurocallis praestantissima* Bory ex Fée which is intermediate in several features between *Acrostichum* and *Pteris* (see also L.D. GÓMEZ, in Amer. Fern J. *62* : 100. 1972; PICHI SERMOLLI 1977 b : 394). For other taxonomic reasons, however, it has become necessary to remove *Acrostichum* from the family Pteridaceae (see PICHI SERMOLLI 1982 : 235; CHING 1982 : 240). The genus is best treated as a member of the Acrostichaceae established in 1877 (based on *Acrostichum aureum*) and adopted by CHING in 1940.

Acrostichum aureum L., Sp. Pl. *2* : 1069 (1753).

Synonymy: see SCHELPE 1970 : 99.

Rootstock stout (up to 3 cm in diam.), tufted, erect to procumbent, turning woody, producing numerous thick fleshy prop roots; paleae rigid, older ones 5 (8) × 1.8 mm at most, dark brown with pale erose edges, mixed with narrow thinner scales. Fronds upright, 2 – 3 (4) m tall. Stipe stiff, yellow– or grey-brown, to 80 cm and longer, sparsely scaly near base. Blade imparipinnate, up to 2.3 (3.0) × 0.6 m, oblong-lanceolate or elliptic, simply but often irregularly pinnate, thickly coriaceous. Rachis grooved above, with short spines in lower region. Lateral pinnae in 8 to 15 fairly distant pairs, entire, elliptic to lanceolate-elliptic, the lower ones oblique, petiolate (to 3 cm), always sterile, up to 30 (45) × 7 (10) cm, with the cuneate base somewhat unequal and the apex abruptly rounded to truncate or shortly mucronate; only some of the distal pinnae (upper 5 pairs and the terminal one) fertile, these slightly smaller than the sterile ones, the uppermost sessile or adnate, with the entire undersurface (except costa) conspicuously covered by a rusty mass of acrostichoid arranged sporangia and capitate or lobed paraphyses. Venation uniformly and closely reticulate, oblique, anastomosing into irregular narrow areoles, often obscure.

Ecological notes: The "Leather Fern" is locally extremely abundant in mangrove swamps especially toward the landward side, in brackish marshy ground in the estuaries of larger rivers, always in full sun; sometimes also in costal areas free of mangrove, as is the case on the northern and western coasts of Bioko; see BENL 1975 a : 132, 1975 b : 22. It can also be seen in small clumps seaward the permanently sinking coast (BENL 1975 b : fig. 4).

Citations: VOGEL s.n. (1857), K; MANN 147, "in swampy places" (12/1859), K; ESCARRÉ 2028, Cunha Lisboa (7/1965), BC; G. & U. BENL FP 7, Río Timbabé sea-level (16/1/1974), M.

Geogr. distribution: Senegal, Guinea Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zanzibar; Madagascar, Mauritius. – Circumtropical. (Syntypes from Jamaica and Santo Domingo).

Faminy DENNSTAEDTIACEAE

MICROLEPIA C. Presl

Microlepia speluncae (L.) T. Moore var. *speluncae,* Ind. Fil.: XCIII (1857).

Synonymy: see SLEDGE 1957 : 524.

Rhizome up to 1 cm and more in diameter, short– to long-creeping, fleshy when young, pubescent with copious soft pale brown trichomes, sending up two rows of large fronds to 3 m and more tall, these close together or spaced up to ca 6 cm apart, occasionally forming large clumps of up to ca 50 semi-erect to arching leaves; young fronds fragile, covered with pale hairs reaching 4 mm long. Stipe becoming vigorous, somewhat rough with tubercle-hairs like those on the grooved brownish rachis (and costae), up to 60 (80) cm or more in length and 6 mm in diameter, greenish to straw-coloured, often purplish at base, finally glabrescent. Lamina delicately dissected, tri– to pluripinnate (usually tripinnate-tripinnatifid in our area), commonly attaining 120 (180) × 60 (100) cm, deltate to ovate(–lanceolate) acuminate in general outline, dull palish green, softly herbaceous, downy or finely villose on both surfaces especially underneath. Pinnae (sub)alternate, spaced about 8 cm apart, 15 – 20 cm long by 5 – 7 cm wide in the middle, the lowest up to 60 × 15 (20) cm, narrowly oblong to ovate-lanceolate acute, short-petiolate or almost sessile. Pinnules from narrowly triangular to (linear–)lanceolate acuminate, (sub)sessile, 8 – 15 (25) × 2 – 6 (10) cm, the basal acroscopic ones often largest, all cut to or nearly to the winged midrib, lace-like by further subdivisions. Ultimate segments oblique oblong-obtuse or rhomboid, (sub)entire or crenate to deeply toothed (halfway to midrib), 4 – 12 × 3 – 4 mm, thintextured, pubescent along, and less densely between, costules and veins; these pinnate, mostly free, hardly raised. Sori ca 1 mm in diameter, fairly regularly arranged, 2 to 10 (20) per segment, back of the unmodified margin between lobes, borne on vein-endings which exhibit a hydathode above opposite each sorus. The true indusium a thinly membranous, more or less pubescent semi-orbicular cup attached at base and sides to the leaf-tissue, opening outside against the margin, soon obscured by protruding sporangia, mostly deciduous. Paraphyses sometimes present.

This tall graceful fern is very plastic in degree of frond dissection and in pubescence depending on its age and habitat, but can at once be identified by the half cup– or pouch-like indusia, to be seen most clearly in young stages. Another distinguishing feature is the glassy glittering pluricellular trichomes on blades and young stipes.

Ecological notes: Microlepia speluncae var. *speluncae* is typical of secondary woodlands, where it likes wet sites in fairly bright light, such as open stream banks, marshy and swampy situations; also found below overhanging rocks and protruding from small caves, hence its specific name. From Bioko ADAMS (1957 : 486) recorded the Cave Fern at elevations between 914 and 1295 metres, GUINEA (1968 : 131) up to 1900 metres; we registered uncommonly large plants of 4 – 5 m tall near the NW coast at about 120 m altitude.

Citations: BARTER s.n. (6/1857), K; MANN 129, at the beach (12/1859), K; ESCARRÉ 2002 & 2003, Concepción (7/1965), BC; 2007, Musola (8/1965), BC; MALEST 2201, Banapá (20/6/1967), BC; 2207, Musola (24/8/1967), BC; G. & U. BENL FP 48, Maule oil palm plantation 380 m (21/1/1974), M; FP 199, S of Bococo between Río Bama and García ca 120 m (29/1/1974), M, Hb. Pic. Ser.; FP 245, Río Co ca 20 m (21/12/1975), BC, M.

Geogr. distribution: Senegambia, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko), S. Tomé, Gabon, Congo, Zaïre, Angola, Namibia, Botswana, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Burundi, Ethiopia, Sudan; Madagascar, Réunion, Comoro Is, Seychelles. – Widely distributed although nowhere in abundance in tropical and subextratropical regions in the Old World (holotype from Sri Lanka), rare and sporadic in South America and the West Indies.

Recognised varieties from outside Africa are var. *hancei* (Prantl) C. Chr. & Tard. and var. *villosissima* C. Chr. from Malaysia (see HOLTTUM 1966 : 315), var. *pubera* (C.B. Clarke) Sledge from Sri Lanka.

Family HYPOLEPIDACEAE

1 – Lamina glabrous, glaucous beneath; veins usually anastomosing; sori (sub)continuous, submarginal; indusium formed from reflexed edge of the lamina
... ... *Histiopteris incisa* (Thunb.) J. Smith var. *incisa* (1)

1 – Lamina more or less densely pubescent, not glaucous

2 – Sori submarginal, always small, protected by deflexed flap of the modified leaf margin; veins free
... ... *Hypolepis* Bernhardi (2, 3)

2 – Sori marginal, more or less elongate, protected by one or two indusia

3 – Veins all reticulate ... ... *Blotiella* R. Tryon (4 – 8)

3 – Veins all free or forming large costal areoles only

4 – Rhizome succulent; lamina hairy on upper surface; sori confined to sinuses ... *Lonchitis occidentalis* Baker (9)

4 – Rhizome woody, very long and branched, hypogaeic; lamina hairy on lower surface; sori linear, rounding the entire margin
... *Pteridium aquilinum* (L.) Kuhn subsp. *aquilinum* var. *aquilinum* (10)

The family name Hypolepidaceae was given by Ching (Sunyatsenia 5 : 221. 1940) and validated by PICHI SERMOLLI (Webbia *24* : 705. 1970). The above-mentioned genera are, together with *Paesia* Saint-Hilaire, often associated with the certainly related family Dennstaedtiaceae, but they differ in a number of shared characteristics such as the margin of the lamina being more or less revolute, the sori opening inwards; in particular, there are important differences in chromosome number and spore features (see PICHI SERMOLLI 1977 : 431 – 433). In 1975 CHING (Acta Phytotax. Sin. *13* : 96) established yet a new family, Pteridiaceae, based on the genus *Pteridium*.

HISTIOPTERIS (Agardh) J. Smith

(1) Histiopteris incisa (Thunb.) J. Smith var. *incisa*, Hist. Fil.: 295 (1875).

Synonymy: Pteris incisa Thunb., Prodr. Pl. Cap. *2* : 171 (1800).

For further synonyms see SCHELPE 1970 : 85 – 86.

Rhizome 5 – 10 mm thick, fleshy becoming woody, long-creeping, deep-rooting, branched, bearing chiefly at the apex dense, bright brown, linear to lanceolate-attenuate scales ca 4 mm long intermingled with golden-brown or reddish filiform trichomes of equal length. Fronds arising at short or long intervals, showing indefinite growth, attaining 0.3 – 3 m tall, exceptionally to over 5 (10) m in total length, upright or arching, larger ones often sprawling over bushes or scrambling, green to bluish-green especially below, young ones milky-glaucous. Stipe stout, very variable in length, to over 1.5 cm in diameter, glabrous except at the scaly-muricate frond-base, (semi)glossy, yellowish-orange to pale or dark purple-brown or castaneous. Rachis glabrous, coloured like the stipe. Lamina ovate-triangular to broadly lanceolate in typical specimens, tapering to a pinnatifid apex, variable in dissection,

2 – 4pinnate (most often 2pinnate-pinnatifid), the sterile less divided than the fertile ones, up to 2 m broad but usually less, texture papyraceous or soft and fleshy, but brittle. Pinnae (sub)opposite, sessile, horizontally spreading, deltate-oblong to lanceolate in outline, acute to acuminate, (20) 60 × 25 cm or larger, lobed in young plants, but cut into pinnules when mature. Pinnules oppositely paired, to 6 cm apart, 2 – 12 (20) cm long, shallowly lobed to pinnatisect (nearly) down to costules; the lowest pairs (strictly) reduced to stipule-like segments at pinna-base, more or less overlapping the rachis, sometimes having a bat's wing or butterfly appearance. Ultimate lobes acute or linear-rounded, entire to deeply incised. Veins partially reticulate, forming conspicuous but not prominent areoles along costa and costules. Sori linear-elongate from base of or near sinus to near apex of lobes, mainly produced on the upper pinnae, protected by the modified indusioid margin of the lamina.

The Bat's-wing Fern ("*Histiopteris vespertilionis* J. Smith") or Oak Fern is attractive by its glaucous fronds variable in dissection, the lobes never being toothed.

Ecological notes: Histiopteris incisa var. *incisa* is a colonial light-demanding fern thriving in open positions along water-courses or fringes of evergreen forest, in clearings with derived grassland, and on shrubby slopes; in Africa it is found mostly in (sub)montane zones with cool moisture, in Bioko chiefly above 1000 m altitude in southern districts.

Citations: EXELL 830, Moka ca 1200 m (31/1/1933), BM; ADAMS 1008, near Lago Loreto "in grassland pasture" 930 m (6/12/1951), GC, MA; 1032, Moka "in open with *Pteridium*" 1260 m (7/12/1951), BM, GC, K; 1053, Moka – Iladyi Falls in open field 1200 m (8/12/1951), BM, GC, K; 1103, Mioko heights (9/12/1951), GC, MA; WRIGLEY 576, grassland above Moka 1440 m (8/9/1959), BM, K; ESCARRÉ 2036, Biaó (12/1964), BC; G. & U. BENL FP 85, Biaó inside the crater border 1750 – 1850 m (22/1/1974), M; FP 454, above Belebú-Balachá path to Ureka 760 m (8/1/1976), M; FP 539, Mte Baká 1470 m (15/1/1976), M; FP 607, descent to Mioko Fountain 1420 m (17/1/1976), M.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Congo, Zaïre, Angola, Rep. S. Afr. (holotype of variety), Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Rwanda, Burundi, Somalia; Madagascar, Mascarene Is, Comoro Is, Seychelles; Ascensión. – Pantropical, widespread and locally common especially in Southern Hemisphere, chiefly in tropical mountain.

Var. *carmichaeliana* (Agardh) C. Chr. has been described as endemic to Tristan da Cunha; see GROVES, in Bull. Br. Mus. Nat. Hist. (Bot.) *8* : 404 (1981).

HYPOLEPIS Bernhardi

1 – Stipe and rachis straminеous, smooth when mature; costae, costules and veins with pale hairs; pseudoindusia small, pale, subentire
... ... *sparsisora* (Schrader) Kuhn (2)

1 – Stipe and rachis dark-purplish when mature, rough with reddish hairs; costae, costules and veins with castaneous hairs mixed with pale ones; pseudoindusia large, green, more or less lacerate-dentate
... *rugosula* (Labill.) J. Smith var. *africana* C. Chr. (3)

(2) Hypolepis sparsisora (Schrader) Kuhn, Fil. Afr.: 120 (1868).

Synonymy: Hypolepis anthriscifolia C. Presl, Tent. Pterid.: 162 (1836).

For more synonyms see SCHELPE 1970 : 92.

Rhizome slender and very wide-creeping along ground, up to 4 m long by 2 – 5 mm in diameter, branched, with long internodes, bearing pluricellular (reddish–)brown hairs. Fronds few, arising singly, well spaced to 20 – 30 cm apart, upright, very variable in size, at length finely dissected. Stipe stout, 60 – 120 cm high, greenish to straw-coloured and pale brown, maroon only in lower parts, grooved, pubescent with short greyish hairs when juvenile, glabrous when adult as is the rachis. Blade thinly herbaceous, pubescent on costae, costules and veins with pale spreading more or less deciduous hairs, triangular to ovate-triangular in outline, up to 3pinnate-4pinnatifid; initially tripartite developing three diverging branches almost equal in length, then (in well-sized plants) the side branches becoming the lowest opposite petiolate pinnae (to 60 – 100 × 30 – 60 cm) of a blade with an intermittent growth of its apex, attaining ca 250 × 150 cm or more. Other pinnae (of the central branch) to 45 – 50 × 17 – 25 cm, ovate-lanceolate in outline, subopposite, often 10 – 15 cm apart, with ca 12 pairs of alternate deltate-acute pinnules to 10 cm long, these divided further down. Ultimate segments 0.5 – 1 cm long, adnate, lobed to deeply cut. Veins pinnate, all free. Sori lying singly on vein-endings at the sinuses, on the acroscopic side of ultimate segments, indusiate by flaps of the modified deflexed margin when young, thus opening inwardly.

The highly compound habit reminds one of *Microlepia speluncae*, but a glance at the sori will immediately dispel this confusion.

Ecological notes: Hypolepis sparsisora is not uncommon in wet sunny situations in mountain woodland, where sometimes it forms part of thickets at forest edges and in glades; in the island recorded between 1200 and 2600 m elevation.

Citations: MANN 345, Pico 1200 m (1860), K; GUINEA 1685, Finca de Marcelino Puente (20/1/1947), BM, MA; 1686, l.c. (20/1/1947), MO; ADAMS 1105, Mioko heights "open hillside pasture" 1800 m (9/12/1951),

BM, GC, MA; G. & U. BENL 346 a, Pico 1620 m (2/1/1976), M, YA; FP 412, Pico 1600 m (6/1/1976), M, TNS.

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

(3) **Hypolepis rugosula** (Labill.) J. Smith var. *africana* C. Chr., in Dansk Bot. Ark. *7* : 121 (1932).

Synonym: Hypolepis goetzii Hieron. ex Reim. in Mildbr., in Notizbl. Bot. Gart. Berlin *12* : 189 (1934).

Differs from the preceding taxon in a determinate pattern of growth, in its dark red-brown or purplish tuberculate stipe and rachis, the costa having conspicuous crisped hairs, some of them with glandular tips. See key-features for other differences.

Ecological note: Seems to prefer similar habitats to *Hypolepis sparsisora.*

Citations: MANN 381, Pico 2100 m (1860), K; ADAMS 1132, Pico 720 – 780 m (14/12/1951), GC. – ADAMS (1957) calls this plant "a rough-stiped bracken type of fern" in "an almost impenetrable thicket on the lower northern slopes of the Pico" (p. 481); he also cites it from Lago Loreto, 914 m (p. 486), and from thickets in the Moka grassland (p. 490). Our own collection (BENL 1975 b : 37, 39) is not definite enough to be cited here.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko), Tanzania, Kenya (see SCHELPE in Amer. Fern J. *41* : 72. 1951), Zaïre, Uganda, Rwanda; Madagascar (holotype of variety). – "Mountains of Central and East Africa" (C. Chr., l.c. : 121).

Different varieties have been described from outside the African continent: Var. *rugosula* (errore "*rugulosa*") from Australia and New Zealand; var. *poeppigii* (Kunze) C. Chr. et Skottsb. from Argentina and Chile; var. *villoso-viscida* (Thouars) C. Chr. from Tristan da Cunha and St. Helena.

Taxonomical notes: Var. *africana* is "a somewhat doubtful form, formerly referred by authors either to *Hypolepis punctata* or to *H. tenuifolia;* it is evidently different from both but not very different from typical *H. rugosula* from New Zealand, New Caledonia, Chile, etc." REIMERS (l.c. : 190) designated the synonym "*Hypolepis goetzii* Hieron." as an Australian element of the African flora which had just reached continental Africa via Madagascar; see also C. CHRISTENSEN, in Notizbl. Bot. Gart. Berlin *9* : 185 (1927). Yet, there are authors (e.g. FADEN 1974 : 29) who apparently do

not make a distinction between *Hypolepis rugosula* var. *rugosula* and var. *africana*.

BLOTIELLA R. Tryon

1 – Sori elongate, continuously or interruptedly bordering the margins of pinnae and/or pinna-lobes; terminal pinna (sub)hastate with two broadly lanceolate lobes; stipe and rachis (finally) smooth

2 – Frond pinnate to pinnate-pinnatifid or bipinnate, rachis becoming subglabrous towards the apex; lamina with scattered white hairlets almost restricted to veins and veinlets; sori continuous or interrupted
... *currorii* (Hook.) R. Tryon (4)

2 – Frond invariably once-pinnate, rachis remaining more or less villous with long, jointed hairs even towards the apex; lamina with scattered white hairlets evenly dispersed on and between veins and veinlets; sori always continuous
... *mannii* (Baker in Hook. & Baker) Pic. Ser. (5)

1 – Sori short, usually arranged in the bottom of sinuses only; terminal pinna not hastate; stipe and rachis finally scabrous

3 – Rhizome creeping; lamina bi- to mostly tripinnate(–pinnatifid); venation conspicuously prominent on lower surface
... *glabra* (Bory) R. Tryon (6)

3 – Rhizome erect; lamina pinnate or bipinnate; venation level with the surface

4 – Lamina pinnate-pinnatifid, up to 55 cm tall, light green underneath, more or less evenly bearing soft white hairs; lowest pinna pair reduced, recurved
... *reducta* (C. Chr.) R. Tryon (7)

4 – Lamina bipinnate(–pinnatifid), up to 1 m tall, dark green, unevenly furnished with bristle-like whitish hairlets usually arising from costae, costules and veins
... *tisserantii* (Alston & Tard. ex Tard.) Pic. Ser. (8)

(4) Blotiella currorii (Hook.) R. Tryon, in Contr. Gray Herb. *191* : 99 (1962).

Synonyms: Pteris currorii Hook., Sp. Fil. *2* : 232, t. 140 (1858).

Lonchitis currorii (Hook.) Mett. ex Kuhn, in Von der Decken's Reisen Ost-Afr., Bot. 3, *3* : 10 (1879).

Rhizome massive, erect to short-creeping with many strong roots, becoming woody, bearing numerous shaggy ferruginous or golden hairs.

Fronds tufted, 1.5 to over 2.5 m tall. Stipe stramineous to light brown, densely clothed at base in crisped ferruginous hairs (to about 1 cm long), sparsely pilose and glabrescent higher up, grooved above, attaining about 1 m in length and 1 cm in diameter. Blade deltate or oblong-lanceolate in outline, apex hastate pinnatisect, texture firmly herbaceous. Rachis pale brown, pubescent with ca 1 mm long yellowish hairs at the pinna-bases, otherwise slightly hirsute, eventually glabrescent, grooved above. Free lateral pinnae alternate, (sub)sessile, broadly ovate to lanceolate with an acute apex, 5 to 8 cm apart, 15 – 35 (75) × 4 – 6 (11) cm, broadly and deeply sinuated to pinnatifid; pinnules subopposite, (broadly) lanceolate-acuminate, sessile and often broadly winged, the lower half or two-thirds of their length again sinuate or (deeply) lobed; both surfaces with scattered white hairs of ca 1 mm long especially on veins, later glabrescent; midribs with yellowish to ferruginous hairlets, grooved above. Veins all copiously anastomosing, with a row of long areoles at the costae and costules and several rows between midrib and margin. Sori marginal under the rolled edge (but soon protruding), continuous or interrupted sometimes in several short sections, not reaching tips. Sporangia borne on a delicate veinlet connecting vein-endings. Paraphyses numerous.

Ecological notes: Locally common in wet shady sites in primary and secondary forests, also forming dense hummocks in swamps; in Bioko in undergrowth of mountain rain forest where "the forest canopy has been broken by tree fall" (ADAMS 1957 : 485); becoming tallest in the upland.

Citations: MANN 365, Pico 1000 m (1860), K; 661, Pico 900 – 1500 m (12/1860), K; GUINEA 431, Balea (28/12/1946), BC; 432, l.c. (28/12/1946), MA; 1417, "Musola Servicio Agronómico" (16/1/1947), BC; 1418, l.c.(16/1/1947), MA, MO; 1419, l.c. (16/1/1947), BC; 1420, l.c. (16/1/1947), MA; MELVILLE 615, Moka "steep valley in forest" 1365 m (19/9/1959), BM, K; G. & U. BENL 139, Pico 870 m (26/1/1974), FR, K, M, Hb. Pic. Ser.; FP 183, Bosque del Río Chubá 1310 m –frond length 3.45 m!– (28/1/1974), BM, M; FP 440, above Belebú-Balachá path to Ureka 700 m (8/1/1976), M, Z; FP 442, l.c. 710 m (8/1/1976), BC, M.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Congo, Zaïre, Angola, Zambia, Uganda, Burundi, Sudan; Madagascar. – West African species extending east.

(5) **Blotiella mannii** (Baker in Hook. & Baker) Pic. Ser., in Webbia *31* : 250 (1977 a).

Synonyms: Pteris mannii Baker in Hook. & Baker, Syn. Fil.: 168 (1867).

Lonchitis mannii (Baker in Hook. & Baker) Alston, in Bol. Soc. Brot. *30* (2. ser.) : 18 (1956).

Rhizome erect to short-creeping, at length woody, clad in reddish-brown hairs. Fronds clumped, up to 1.5 m tall or more. Stipe (pale) castaneous, clothed towards base with crisp whitish hairs, becoming scabrous, grooved above, attaining more than 0.7 m in length and 1 cm in diameter. Blade to 45 (75) × 25 (40) cm, simply-pinnate, oblong-lanceolate in outline, herbaceous in texture. Rachis rather thickly covered with fine spreading whitish hairs, the pubescence continued into pinna-costae. Terminal pinna subhastate with two lobes, lateral pinnae linear in 5 – 8 (15) subopposite pairs, 5 – 7.5 (10) cm apart, middle ones 10 – 15 (20) × 2 – 2.5 (3) cm, the lowest pair but one usually the largest (to 25 × 4 cm); all pinnae acutely pointed, the margins entire, straight or slightly sinuated, the base more or less deeply cordate, often auricled there (in large fronds) on one or both sides; both surfaces very evenly hairy with scattered white hairs. Veins copiously and regularly anastomosing to one row of elongate areoles along the costa and 3 to 5 (7) series of areoles towards the margin. Sori continuous along the edge nearly to the point.

Ecological note: Occurring in Bioko at similar habitats as *B. currorii.*

Citations: MANN s.n., BM, K; ADAMS 1058, between Moka and Iladyi Falls "in sparse woodland in valley bottom" 1050 m (8/12/1951), GC; G. & U. BENL FP 123, forest along Río Iladyi above the Falls 1180 m (24/1/1974), EA, M; FP 184, Bosque del Río Chubá 1310 m (28/1/1974), M.

Geogr. distribution: Guinea, Liberia, Nigeria, Cameroon, Equatorial Guinea (Bioko-holotype), S. Tomé & Principe. – Tropical West Africa.

Taxonomical note: According to F. BALLARD (Kew Bull. *1937* : 348) BAKER construed *"Lonchitis mannii"* as "based on young, simply-pinnate fronds of *Lonchitis currorii"*. Most of the relevant authors joined in this opinion, treating *"L. mannii"* as a synonym of the latter species. However, in the light of I. MANTON's cytological results (*L. currorii* n = 76, *L. mannii* n = 38; published in 1958, 1959), ALSTON confirmed the "doubtful plant" as a true species and PICHI SERMOLLI agreed with him. Our no FP 184 is a fern of almost 1.5 m frond lenght with 15 pairs of unlobed pinnae up to 26 cm long and completely soriferous, matching all the details of BAKER's description.

(6) Blotiella glabra (Bory) R. Tryon, in Contr. Gray Herb. *191* : 99 (1962).

Synonym: Lonchitis gracilis Alston in Exell, Cat. Vasc. Pl. S. Tomé, Suppl. : 7 (1956).

For other synonyms see SCHELPE 1970 : 82.

Rhizome massive, creeping, hranched, woody, with closely spaced fronds, densely covered with golden hairs to 6 mm long. Fronds up to 2 – 3 m tall, sun forms normally smaller and less dissected. Stipe pale brown, to over 80 cm long, having silky castaneous hairs at base, otherwise thinly pu-

bescent with more or less scattered tawny hairs of 0.5 – 2 mm long later subglabrous, the upper side grooved as are rachis and costae. Blade to 1.3 (2) × 0.8 m, ovate-lanceolate to elliptic in outline, texture weakly herbaceous to membranaceous. Free pinnae oblong-ovate or lanceolate acuminate, to 40 – 45 cm long by 13 cm wide, ca 3 cm apart, sessile, lowest pair somewhat reduced. Free pinnules sessile, to about 10 × 2.5 cm, at least the upper ones connected by a wing to costa, lanceolate oblong, acuminate. Ultimate segments broadly obtuse or rounded, short (to 1.5 × 0.8 cm), separated by broad soriferous sinuses, hirsute on both surfaces with soft pale hairlets of ca 1.5 mm long especially on costae and costules, finally becoming glabrescent. Rachis rather densely pubescent with long pale articulate hairs. Veins hairy on both sides forming few areoles: outside the costular areole only 1 or 2 rows of smaller ones present between costule and sinus. Sori short, crescent-shaped in the sinuses of the pinnules, longer in the larger sinuses of the pinnae. Paraphyses apically recurved.

Characterized by round ultimate segments formed by regular and equal incisions of larger leaves from apex nearly to base; at least the upper 6 to 8 pinnules decurrent and forming a wing of 2 – 3 mm on either side of the pinna-costa.

Ecological notes: In wet (shady or sunny) situations chiefly of secondary woodland, from 1600 to 2600 m elevation; large fronds may be supported by shrubs.

Citations: MANN s.n. (1861), K; ADAMS 1100, near Moka ca 1500 m (9/12/1951), BM, GC; G. & U. BENL FP 60, Carretera Luba-Moka, Mte Baká 1460 m (22/1/1974), FR, M; FP 67, above Moka-Malabo 1350 m (22/1/1974), M; FP 372, Pico 1730 m (4/1/1976), EA, M; FP 377, Pico 1750 m (4/1/1976), BC, M, MO; FP 595, Mioko Fountain 1350 m (17/1/1976), M, Z.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko), S. Tomé, Gabon, Zaïre, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Tanzania, Kenya, Uganda, Rwanda, Burundi; Madagascar, Réunion (holotype). – Mountain regions in tropical and South Africa including islands.

From Kenya a hybrid of *Blotiella glabra* with *B. stipitata* (Alston) Faden is known.

(7) **Blotiella reducta** (C. Chr.) R. Tryon, in Contr. Gray Herb. *191* : 100 (1962).

Synonym: Lonchitis reducta C. Chr., in Feddes Repert. *9* : 370 (1911).

Rhizome erect, subglobose, closely covered with reddish(–brown) hairs. Fronds borne in a dense rosette. Stipe 10 – 15 (20) cm tall, tawny to stramineous, thin, grooved above, clad in soft whitish hairs and occasional scales of variable shape; hairs arising from thickened permanent bases, these eventually rendering the surface scabrous. Rachis furrowed, with indumen-

tum like the stipe, hairs and scales occurring most densely at pinna-bases. Lamina ovate in outline, 20 – 30(35) × 15(25) cm, simply pinnate to pinnatifid towards apex, somewhat narrowed towards base, thinly-herbaceous, becoming membranous when dry, softly pubescent on either side with white hairs of 1.5 – 2 mm long. Free pinnae in 5 to 7 (10) pairs, opposite or alternate, 3 – 5 cm apart, oblong-lanceolate in outline, subentire or lobed with (broadly) rounded lobes of 0.5 – 2.2 × 0.8 – 1.2 cm, entire or (shallowly) sinuate; middle pinnae 7 – 10 (15) × 2 – 3 (4.5) cm, sessile or very shortly petiolate (petiolule extremely hairy), truncate or subcordate at base, apex acute, somewhat tapering, lowest pair(s) reduced (to about 1/2 to 2/3 the length of middle ones), upper pinnae adnate, uppermost confluent. Costa conspicuously prominent and pale on lower surface, obscured by shaggy hairlets and some (broadly–)subulate scales on upperside. Veins copiously anastomosing, forming some irregular rows of areoles between costa (costules) and margin. Sori 2 – 3 mm long, usually arranged at the sinus bottom. Paraphyses with a curved obtuse apical cell. Spores ovate.

This uncommon species is clearly distinguished by being softly hairy throughout, by having the blade only once-pinnate and light green in colour, and the lower pinnae reduced and recurved.

Ecological notes: Occurring on or below rocks in shady, humid undergrowth, and on hillsides in evergreen submontane forest; also reported from swampy habitats at lower elevations.

Citations: MANN s.n. (1860), BM; G. & U. BENL FP 452, above Belebú-Balachá path to Ureka 740 m (8/1/1976), M.

Geogr. distribution: Guinea (holotype), Sierra Leone, Liberia, Ivory Coast, Ghana, Cameroon, Equatorial Guinea (Bioko), Gabon, Zaïre, Rep. S. Afr., Malawi, Tanzania, Uganda. – Tropical and southern Africa.

(8) Blotiella tisserantii (Alston & Tard. ex Tard.) Pic. Ser., in Webbia *37* : 132 (1983 b).

Basionym: Lonchitis tisserantii Alston & Tard. ex Tard., in Mém. Inst. Français Afr. Noire *28* : 85, t. 13, fig. 5,6 (1953).

Rhizome upright, 10 – 15 cm tall, to 1.5 cm in diameter, densely scaly-hairy at apex; rhizome scales bristle-like, yellowish-brown to reddish. Fronds numerous, arranged in a rosette. Stipe stramineous or pale brownish when dry, grooved above, with patent pale hairs to 2.5 mm long, arising from obvious pustules, these eventually rendering the stipe scabrous. Rachis grooved on upper face, hirsute with hairs like those on stipe but shorter, strongly hairy at the insertion of pinna-costae, these also grooved and hairy. Blade to 1 m tall, oblong-lanceolate, dark green; apex deltate, formed by 3 to 6 adnate confluent pinnae. Free pinnae in 9 to 12 or more pairs, opposite, to 20 cm long, falcate-oblong in outline, lower ones 4 – 6 cm apart, shortly petiolate, spreading right-angled to rachis, pinnatifid toward apex. Free pinnu-

lae in ca 7 to 10 pairs, about 2 cm apart in lower pinnae, subopposite, (sub)sessile, membranous, to ca 3 × 1 – 1.5 cm, truncate at base, subacute or roundish at apex, minutely lobed, upper ones connected by wings to costa, the uppermost confluent. Veins forming long narrow areoles extending singly from costule to costule, 1 or 2 rows to margin, bristly with whitish acicular hairlets of 1.2 mm long on either side, the tissue between them almost glabrous. Sori small to very small (3 to 1 mm long), usually subcircular sitting in the minute sinuses along pinnule-margins, sometimes crescent-shaped rounding the sinuses between the pinnules in less dissected parts. Paraphyses numerous, with a small non-recurved pointed apical cell. Spores falciform.

Recognised by its dark green bipinnate lamina with short sori at the sinus bases.

Ecological notes: Known from 450 to 1300 metres altitude. In Bioko found in clearings in Pico forest and in open woodland of southern districts.

Citations: MANN s.n. (1860), BM; 350, Pico 450 m (1860), K; 357, Pico 600 m (1860), K; ADAMS 1151, Pico 1350 m (14/12/1951), GC; ESCARRÉ 2021, Belebú-Balachá (3/1965), BC, BM, K; G. & U. BENL FP 458, above Belebú-Balachá path to Río Lombé 770 m (8/1/1976), BOL, EA, M, Hb. Pic. Ser.

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

LONCHITIS L.

(9) Lonchitis occidentalis Baker in Hook. & Baker, Syn. Fil. : 128 (1867).

Synonyms: see TARDIEU-BLOT 1958 : 79; SCHELPE 1970 : 86.

Rhizome short– to long-creeping, fleshy green, ca 6 mm in diameter when dry, bearing articulated flattened (light) brown translucent hairs, sending up solitary fronds 1 to 2 cm apart, up to 2 m and more tall. Stipe to 1 cm thick, strong, about as long as the blade, stramineous to reddish and dark purple with age like the rachis, glabrous except for a sparse pubescence near base consisting of crispate hairs to 1 cm long, similar to those on the rhizome. Lamina rather succulent, up to 50 × 20 cm in our material, pinnate-pinnatifid to bipinnate-tripinnatifid, oblong– to ovate-deltate in outline, apex acute to acuminate, the upper surface with a short reddish tomentum of caducous flattened hairs along rachis, costae and costules. Pinnae (sub)opposite, deltate-lanceolate, lower ones petiolate, up to 10 cm apart, 25 – 35 (45) × 15 – 20 (25) cm, (long–)caudate, upper ones sessile, adnate, decurrent, confluent towards apex. Pinnulae lanceolate, to 5 – 7 × 1 – 2 cm, sinuate to deeply lobed; ultimate lobes rounded, entire. Veins free-pinnate and –forking in ultimate segments, the basal veins from adjacent costules sometimes meeting so as to form a triangular areole below the sinus. Sori

marginal, to 2 mm long, linear or curved, borne in and around the sinuses of ultimate segments. Indusium pale, glabrous, formed by the reflexed margin, opening inwards. Paraphyses present.

Ecological notes: This large fern primarily inhabits shady sites near permanent water, in moist undergrowth, on wet rocks in high rain forest; up to 1800 m elevation in Bioko.

Citations: BARTER 2043 (6/1857), K; MILDBRAED 7038, woodland between Musola and Moka 600 – 1200 m (11/1911), B; ADAMS, 1019, Lago Loreto "on steep crater bank" 900 m (6/12/1951), GC; WRIGLEY 557, Moka bank of stream 1380 m (5/9/1959),K; MELVILLE 617, Moka river bank in forest 1365 m (19/9/1959), BM, K; G. & U. BENL FP 78, East inner slope of Biaó ca 1800 m (22/1/1974), FR, M, YA; FP 140, Pico 870 m –frond length 2.18 m!– (26/1/1974), M, Hb. Pic. Ser.; FP 291, above Musola path to Belcbú-Balachá 360 m (29/12/1975), BC, M.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko), S. Tomé, Gabon, Congo, Zaïre, Angola (holotype), Zambia, Tanzania; Madagascar. – Widespread in tropical Africa including Madagascar.

Nomenclatural note: The species has been distributed in many herbaria as *Anisosorus occidentalis* (Baker) C. Chr., but the generic name *Anisosorus* had to be placed in synonymy under *Lonchitis;* see R. TRYON, in Contr. Gray Herb. *191* : 94 (1962), and D. LELLINGER, in Taxon *26* : 578 (1977).

PTERIDIUM Gleditsch ex Scopoli

(10) Pteridium aquilinum (L.) Kuhn subsp. *aquilinum* var. *aquilinum*, in Von der Decken's Reisen Ost-Afr., Bot. 3, *3* : 11 (1879).

Synonymy: see SCHELPE 1970 : 88.

Rootstock cord-like, deep-seated, to 3 cm thick, extensively creeping, much-branched, woody, its tip covered with setose rusty to dark brown hairs. (Cross-section of the rhizome shows a bird-like vascular structure, hence the specific name.) Fronds arising singly in two rows as ascending branches of the rhizome at variously long intervals, invested with golden-brown hairs when very young, finally (0.5) 1 – 2 (4) m tall. Stipe more or less equalling the blade in length, ca 1 cm in diameter, stramineous to tawny, rigid, woody at the dark hairy base, glabrous above; rachis pubescent especially in the groove upperside. Blade of rather indefinite size, roughly ovate-triangular in outline, bipinnate-pinnatifid to quadripinnate, (sparingly or densely) pubescent beneath, glabrous above, grey-green, coriaceous in texture. Pinnae ovate to lanceolate, lowest 70 × 35 cm at most, lower ones (sub)opposite, petiolate, usually bipinnate, short– or non-

caudate, upper pairs sessile, pinnate. Pinnules in 10 – 25 pairs, ovate to oblong or linear, up to 20 × 3 – 6 (7) cm, sessile, alternate, nearly at right angles to costa, short– or long-caudate, lower ones dissected once or twice into broad-based contiguous straight to falcate segments. Veins in ultimate segments once or twice forking, open except for a marginal connecting vein (commissure) bearing the continuous linear sori protected by an indusioid membranous margin (pseudoindusium, outer indusium) and a minute scarious outgrowth of the commissure; this more or less vestigial inner true indusium obscured by the numerous sporangia. Soral paraphyses wanting.

Ecological notes: The common Bracken or Brake often occupies extensive areas, its success due to its subterranean branching stems and high fire-resistance (see GLIESSMAN 1978). It prefers light acid soils in exposed more or less sunny places in a wide variety of habitats, ascending to 3000 m and more in Africa. In Bioko *Pteridium aquilinum* is recorded chiefly from larger clearings in mountain rain forest (800 – 1400 m) and *Schefflera* forest (1400 – 2100 m), as well as from grasslands around forest margins at about 1250 – 1700 m altitude.

Citations: VOGEL 205 (11/1841), K; EXELL 807, Moka 1200 – 1500 m (30/1/1933), BM; ESCARRÉ 2025, "Extremo Norte" (1/1965), BC; 2026, "Casa Banana" (4/1965), BC; G. & U. BENL FP 271, Basilé 460 m (27/12/1975), M; FP 586, descent to Mioko Fountain 1440 m (17/1/1976), M, TNS.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Equatorial Guinea (Río Muni, Bioko), S. Tomé & Principe, Gabon, Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Zanzibar, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sudan; Madagascar, Mascarene Is, Comoro Is. – Worldwide in tropical and temperate regions.

Taxonomical notes: There is a series of at least 8 different varieties belonging to subsp. *aquilinum*. Another subspecies, subsp. *caudatum* (L.) Bonap., is composed of 4 varieties (Tryon 1941, PAGE 1976). However, there is no unanimity among authors over the taxonomy of the genus *Pteridium*.

Family ATHYRIACEAE

1 – Lamina proliferous; veins regularly anastomosing
... *Callipteris prolifera* (Lam.) Bory var. *prolifera* (1)

1 – Lamina non-proliferous

2 – Sori circular, indusium rudimentary; veins all free
... *Dryoathyrium boryanum* (Willd.) Ching var. *boryanum* (2)

2 – Sori elongate, indusium obvious, attached laterally to the veins

3 – Veins all free; sori more or less hooked, always single-sided
... *Athyrium ammifolium* (Mett. ex Kuhn) C. Chr. (3)

3 – Veins free or sparingly united; sori linear, at least some of them double-sided (diplazioid) on basal acroscopic veins
... *Diplazium* Sw. (4, 5)

CALLIPTERIS Bory

(1) Callipteris prolifera (Lam.) Bory var. *prolifera,* Voy. *1* : 283 (1804).

Synonymy: Asplenium proliferum Lam., Encycl. Méth. Bot. *2* : 307 (1786).

Diplazium proliferum (Lam.) Kaulf., Enum. Fil.: 182 (1824); see BALLARD, in Kew Bull. *1954* : 559 (1955).

Asplenium decussatum Sw., in J. Bot. (Schrader) *1800*(2): 51 (1801).

Diplazium incisum Schum., in Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. *4* : 232 (1829).

Diplazium serratum Schum., l.c. : 233 (1829).

Rootstock upright, massive, fleshy, ca 1 cm thick, fusco-paleaceous with subulate-attenuate, delicately ciliate-toothed scales, occasionally becoming a stout trunk, producing tufted, erect-spreading fronds. Stipe 30 – 60 cm long, firm, scaly and roughly muricate by (small) ferruginous spines, these confined to base or more often continued higher up. Rachis muricate, glabrescent, grooved on upper face as are the costae. Lamina 0.6–2 × 0.4–0.5 m, herbaceous to subcoriaceous, normally simply pinnate; terminal portion proportionally large, (elongate–)deltate, 15 – 20 × 7 – 10 (15) cm, serrate at apex, deeply lobed toward its base, decurrent and more or less adnate to the uppermost lateral pinnae. Free pinnae oblong-lanceolate acuminate, ca 7 – 15 each side, alternate, 5 – 8 cm apart, upper ones sessile, lower short-stalked, largest at about the middle, here attaining ca 20 × 6 cm in our material but up to 40 × 8 cm in specimens from other areas, sometimes deeply lobed to nearly pinnate toward their base; all (finely) toothed at apex, with margins bluntly serrated to slightly lobed (the lobes serrulate), their base truncate or unequally cuneate, with a more or less conspicuous obtuse auricle on acroscopic side, less often auriculate on both sides. Pinna-axils (especially upper ones) producing adventitious buds covered in copious brown scales and developing into plantlets before falling off. Lateral veins at ca 60° to costa, 8 – 12 mm apart, pinnately branched to veinlets uniting with those of adjacent groups, forming fairly regular areoles except near margins. Sori more or less occupying the whole of the veinlets without reaching the

margin, often in diagonal pairs forming an ornamental pattern (see BENL 1975 b : fig. 6).

Ecological notes: The robust Bud Fern prefers low-lying swamps and *Raphia* plantations; in Bioko it is found in damp sites mostly about sea-level.

Citations: VOGEL s.n., K; BARTER s.n. (6/1857), K; MANN 132 (12/1859), K; s.n. (1860), BM; G. & U. BENL FP 21, Río Musola near mouth (19/1/1974), BC, M; FP 159, Río Co 305 m (26/1/1974), BC, FR, M, Hb. Pic. Ser.; FP 204, Río Ococo 230 m (29/1/1974), BM, M; FP 237, Río Borabaabo ("Borabecho") ca 10 m (18/12/1975), M, YA; FP 242, Río Co ca 35 m (21/12/1975), GC, M; FP 528 a, "Pantano del Km 35" of the Western Highway Malabo – Luba 10 m (14/1/1976), M.

Geogr. distribution: Guinea, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, Bioko, Annobon), S. Tomé & Principe, Gabon, Zaïre, Uganda, Sudan; Madagascar, Mascarene Is, Comoro Is. – Wide-ranging throughout Old World tropics.

Callipteris prolifera var. *proliferoides* (Bory) Benl comb. nova –Basionym: *Diplazium proliferum* var. *proliferoides* (Bory) Morton, in Contr. U.S. Nation. Herb. *38* : 237 (1973)– from Mauritius and Réunion.

DRYOATHYRIUM Ching

(2) Dryoathyrium boryanum (Willd.) Ching var. *boryanum*, in Bull. Fan Mem. Inst. Biol., Bot. *11* : 81 (1941).

Synonymy: Athyrium glabratum (Mett. ex Kuhn) Alston, in Bol. Soc. Brot. *30* (2. ser.) : 11 (1956).

For further synonyms see SLEDGE 1962 : 282; SCHELPE 1970 : 207, excl. *Thelypteris glabrata* var. *hirsuta* Tard.

Rootstock stout, erect or rarely procumbent, the apex densely covered with thin broadly to narrowly lanceolate (sub)entire pale brown scales up to 1 cm long. Fronds clustered, up to 2.7 m tall, soon arching. Stipe to 1 m long by ca 0.8 cm in diameter, greenish-brown, furrowed, distinctly paleate toward and at the swollen base. Lamina ovate(–lanceolate), acute, to over 1.5 m long and 0.8 m broad, bipinnate or more compound, herbaceous, thin-textured, bright green ageing to matt-green. Rachis and costae slightly sulcate; rachis, midribs and veins very sparsely provided with thick brown septate hairlets on upper surface, rarely on both sides in our material. Pinnae about 20 to 30 in number, alternate, the lower ones 4 – 10 cm apart, oblong-lanceolate, short-stalked with adnate base, largest to 40 × 15 cm, basal ones reduced. Pinnules spaced 2 – 3 cm apart, oblong-acuminate, 3.5 – 10 × 1 – 2.5 cm, basal ones somewhat decrescent, usually connected by a very narrow

but regular green costa-wing especially towards apex, deeply pinnatifid (to bipinnatifid) with ligulate-oblong, blunt, crenate-serrate segments up to 9 (15) × 3 cm, lowest more or less reduced. Midribs of segments pinnately branched; lateral veins free, simple or forking. Sori suborbicular, usually about 0.6 mm in diameter, lying inframedial on veinlets, ca 3 to 5 on either half of segments in larger specimens. Indusium small, rounded-reniform (dryopteroid), caducous in mature sori.

Showing some resemblance to *Microlepia speluncae* in general appearance but instantly recognizable by the distinctive structure of the indusia. The members of the genus *Dryoathyrium* are characterized by exhibiting a mixture of dryopteroid and athyrioid features.

Ecological notes: This large fern occurs primarily in shady humid situations in riparian woodland between 600 and 2000 m elevation; in Bioko occurring on the Pico mainly in *Schefflera* mountain forest, as well as in southern upland.

Citations: MANN s.n. (1861), BM; s.n., K; GUINEA 945, Musola Monkey Bush (9/1/1947), MA; 1533, Balachá (15/1/1947), BM; 1536, l.c. (15/1/1947), MA; ADAMS 1045, Moka 1260 m (7/12/1951), BM, GC; 1178, Pico 1860 m (14/12/1951), BM, GC; ESCARRÉ 2012, Parador de Musola (12/1964), BC; G. & U. BENL FP 125, forest along Río Iladyi above the Falls 1180 m (24/1/1974), BM, K, M, Hb. Pic. Ser.; FP 133, Pico 750 m (26/1/1974), M; FP 296, Oloita 620 m (29/12/1975), FR, GZU, M, YA; FP 412 a, Pico 1640 m (6/1/1976), M; FP 466, above Bocoricho path to Laguna Lombé 680 m (10/1/1976), BC, M.

Geogr. distribution: Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Bioko), Congo, Rep. S. Afr., Mozambique, Zimbabwe, Tanzania, Kenya, Uganda, Rwanda, Ethiopia; Madagascar, Réunion (holotype). – Also widely distributed in tropical Asia.

A form with strikingly long white flattened articulate hairs distributed throughout the lower lamina surface but more densely on midribs and veins, was described from Ivory Coast by TARDIEU-BLOT (in Not. Syst. *14*: 344. 1952) as "*Thelypteris glabrata* (Mett.) Tard. var. *hirsuta* Tard." There is another specimen of this taxon at M, collected in Sri Lanka (ex Herb. G. MANN 1917 no. 67566). I propose to transfer the variety to *Dryoathyrium*, as follows: *Dryoathyrium boryanum* var. *hirsutum* (Tard.) Benl comb. nova.

ATHYRIUM Roth

(3) Athyrium ammifolium (Mett. ex Kuhn) C. Chr., Ind. Fil. : 139 (1905).

Synonym: Asplenium ammifolium Mett. ex Kuhn, Fil. Afr. : 96 (1868).

Rhizome erect or obliquely ascending, bearing ovate-lanceolate acuminate membranous entire light brown to rufescent scales up to 1 cm long,

sending up a tuft of fronds to over 1 m tall, becoming flaccid. Stipe comparatively slender, shorter than or equalling the length of blade, up to 4 mm in diameter, stramineous, paleaceous at base like the rootstock, glabrous higher up, grooved on upper face as are the glabrous rachis, the winged costae and costules. Blade ovate to elongate-triangular in outline, 30 – 80 × 10 – 20 (25) cm, bi– to tripinnate, of membranous to subcoriaceous texture, glabrous on both surfaces. Pinnae in 10 to 14 pairs, subsessile, (sub-lanceolate–)oblong, acute, often tapering to apex, more or less falcate, the middle ones ca 4 – 5 cm apart, largest up to 15 (22) × 6 (8) cm, lower ones somewhat decrescent; all divided into petiolulate or (sub)sessile deltate to oblong pinnulae, these 0.5 to 1.5 cm apart, ca 2 – 4 × 0.3 – 1.7 cm, obtuse or subacute, divided more or less completely down to the broadly winged costules into oblong-obtuse or oblique acute, dentate segments again more or less dissected. Veins forked. Sori borne along veinlets near the midrib, elongate and somewhat curved; usually one sorus per segment-lobe. Indusium erose, often caducous.

Immediately distinguished from *Dryoathyrium* by having athyrioid indusia, the ribs and veins being glabrous throughout.

Ecological notes: A mountain species commonly established in undisturbed submontane and montane regions up to 2600 metres altitude. Most collections made in Bioko came from the *Schefflera* forest on the Pico.

Citations: MANN 347, Pico 2100 m (12/1860), K; 353, Pico 1500 m (12/1860), K; s.n. (1860), BM; GUINEA 2892, Pico (2/3/1947), K, MA?; 2989, Pico (2/3/1947), BM, MA?; ADAMS 1071, near Iladyi Falls in *Cyathea*-woodland 1170 m (8/12/1951), BM, GC, MA; 1155, Pico 1350 m (14/12/1951), GC; 1169, Pico 1800 m (14/12/1951), GC; 1175, Pico 1860 m (14/12/1951), GC; 1177, Pico 1860 m (14/12/1951), BM, GC; G. & U. BENL FP 75, Biaó inside the crater border 1750 m (22/1/1974), M; FP 77, l.c. 1800 m (22/1/1974), BOL, M; FP 366, Pico 1700 m (4/1/1976), M; FP 371, Pico 1730 m (4/1/1976), BC, M; FP 599, Mioko Fountain 1360 m (17/1/1976), B, BOL, EA, FR, G, GZU, M, MO, Hb. Pic. Ser., TNS, Z; FP 603, l.c. (17/1/1976), M.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (Bioko-holotype). Seems to be restricted to the Guinean Gulf area.

DIPLAZIUM Swartz

1 – Lamina simply pinnate to pinnate-pinnatifid, the apex conspicuous, more or less abruptly attenuate, deeply pinnatifid; some veins uniting
... *welwitschii* (Hook. in Hook. & Baker) Diels (4)

1 – Lamina bipinnate-pinnatifid, gradually tapering into a lobed or roughly serrate apex; veins always free
... *nemorale* (Baker) Schelpe (5)

(4) Diplazium welwitschii (Hook. in Hook. & Baker) Diels in Engler & Prantl, Natürl. Pflanzenfam. 1 (4) : 226 (1899).

Synonyms: see SCHELPE 1977 : 163.

Rhizome upright, rarely shortly ascending, provided with strong black roots; rhizome scales sublinear to deltate, (long–)acuminate, 8 × 1 mm, thin-walled, the edges with short tooth-like prolongations. Fronds tufted, erect-spreading, to ca 1.3 m long. Stipe firm, attaining 60 cm long by 1 cm in diameter, greyish-stramineous to –brown, paleaceous at the darker base, grooved above (like rachis, costae and costules), furrows with glandular hairs; at length glabrescent throughout. Lamina ovate(–lanceolate) or deltate in outline, 50 – 70 × 30 – 40 cm, thinly herbaceous in texture, terminating in an (elongate–)deltate pinnatifid apex almost 10 cm long by 4.5 cm wide at base and often with 2 or 3 adnate lateral pinnae. These in 10 to 18 pairs, usually alternate, linear-lanceolate, acuminate to (long–)tapering, truncate and more or less distinctly auriculate at base on acroscopic side, margins crenate or appressed-serrate; upper ones sessile, middle ones to 20 – 25 × 5 cm, middle and lower ones petiolulate, in larger fronds cut down to lobes to 1/3 or 2/3 of their breadth, lowest pinnae usually (distinctly) reduced. Pinna-lobes subovate, rounded, irregular in length, up to 4 × 1 cm, entire or slightly serrate, glabrous on either side. Veins pinnate, veinlets unbranched or forking, some forming elongate areoles, many appearing soriferous in larger incised pinnae. Sori ca 4 to 8 mm long, oblique, usually not reaching from costule to margin; those nearest to costa often diplazioid, i.e. paired, seated back-to-back and opening away from each other.

Ecological notes: Diplazium welwitschii is recorded mostly from hill forest up to 800 m elevation, growing in semi-shade in undergrowth, in ravines or on swampy ground, sometimes on buttresses of trees.

Citations: MANN s.n. (1860), BM; MILDBRAED 6418, Pico above Basilé 600 – 800 m (16/8/1911), B, HBG; GUINEA s.n., near sea-level? (1947), BC; G. & U. BENL FP 513, Balea 500 m (12/1/1976), BC, BOL, GC, M, MO, YA.

Geogr. distribution: Sierra Leone, Liberia, Ivory Coast, Ghana, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), Gabon, Congo, Zaïre, Angola (holotype), Tanzania, Uganda, – Native to tropical West Africa, stretching to the Tanzania territory.

(5) Diplazium nemorale (Baker) Schelpe, in Bol. Soc. Brot. *41* (2. ser.) : 212 (1967).

Synonymy: Asplenium hylophilum Hieron. in Engler, Pfl.welt Ost-Afr. *C* : 84 (1895).

For further synonyms see SCHELPE 1970 : 205.

Rootstock erect or ascending, more or less arborescent, paleaceous at

apex with lanceolate long-acuminate dark brown scales 1 – 1.7 × 0.2 – 0.3 cm, slightly dentate. Fronds clustered, arching, attaining more than 2 m tall; stipe stout, 1 cm in diameter and equalling the length of blade, green when fresh, drying olivaceous to dark brown, stipe-base with scales as on the rhizome, otherwise glabrous, grooved on upper face as are the stramineous to castaneous smooth rachis and the narrowly winged costae. Lamina to 1.5 × 0.9 m, ovate or deltate in outline, acute, membranous to firmly herbaceous, bright green, glabrous on both surfaces. Pinnae 12– to 15paired, the uppermost confluent, forming the lamina apex; free ones triangular-lanceolate, 5 – 13 cm apart, petiolate (to 2 cm), the largest attaining 45 × 15 cm, the two basal pairs reduced; all pinnate in lower part, produced into a serrate apex. Pinnules in larger specimens to 20paired, the free ones lanceolate, truncate at base (cordate in the type specimen; see C. CHRISTENSEN 1932 : t. 30, fig. 13), distinctly stalked, 4.5 – 8 (10) × 2.5 (5) cm, incised into obtuse oblique (sub)entire lobes up to 1.5 (2) × 0.5 (0.9) cm, glabrous throughout. Veins of lobes pinnate, veinlets (2) 5– or 6paired, single or forked, all free. Sori up to 4 pairs per lobe, linear, 3 – 6 mm long, sometimes appearing predominantly diplazioid; indusium membranous with entire margin.

Ecological notes: A shade loving fern from rain forests at mid-level (900 – 1800 m), preferring stream banks.

Citations: MANN s.n., K; ADAMS 1136, Pico 900 m (14/12/1951), GC. – Rare in the island.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Equatorial Guinea (Bioko), Mozambique, Zimbabwe, Malawi, Tanzania, Kenya, Uganda; Madagascar (holotype?), Comoro Is. – Tropical East African species extending to West Africa; nowhere common.

Family THELYPTERIDACEAE

1 – Veins free (lowest veins sometimes meeting below the sinus base between two pinna-lobes)

2 – Fronds bipinnate; veins terminating within the margin; rachis and costae not grooved

3 – Small, delicate plants with fronds at most 0.4 m tall, costa winged; sori indusiate

... *Metathelypteris fragilis* (Baker) Holttum subsp. *guineensis* Benl (1)

3 – Large, robust plants with fronds up to 1.5 m tall, costa more or less unwinged; sori exindusiate

... *Pseudophegopteris* Ching (2, 3)

2 – Fronds pinnate; veins reaching the margin; rachis and costa grooved

4 – Lower pinnae (to 10 pairs and more) abruptly reduced in size; veins commonly 12 to 14 per lobe; rhizome scales glabrous
... *Pseudocyclosorus pulcher* (Bory ex Willd.) Holttum (4)

4 – Lower pinnae gradually or weakly reduced; veins fewer than above; rhizome scales hairy

5 – Sori orbicular, supramedial, indusia very small; veins commonly 6 to 9 per lobe
... *Amauropelta bergiana* (Schldl.) Holttum var. *bergiana* (5)

5 – Sori consistently elongate, medial, without indusia; veins commonly 6 or 7 per lobe
... *Stegnogramma pozoi* (Lagasca) Iwatsuki var. *pozoi* (6)

1 – Veins (at least the lowermost) anastomosing with corresponding veins of adjacent lobes to form an excurrent veinlet running to sinus base

6 – No bud present near apex; pinnae lobed, pinna base not dilated; lowest pinnae more or less reduced. Dense or scattered hairs on upper surface of pinna-lobes; sori orbicular

7 – Rhizome long-creeping; sori restricted to the short pinna-lobes; costae with hairs ca 0.2 mm long
... *Amphineuron terminans* (Wallich ex Hook.) Holttum (7)

7 – Rhizome erect or short-creeping; sori not confined to pinna-lobes; costae with hairs up to 1 mm long
... *Christella* Léveillé (8, 9)

6 – Not this combination of characters

8 – No bud present near apex; rhizome long-creeping; basal pinnae not or hardly reduced in size; costae bearing broad deciduous scales on lower surface; only basal veins anastomosing
... *Cyclosorus* Link (10, 11)

8 – Not this combination of characters
... *Pneumatopteris* Nakai (12 – 16)

(Note: All key features refer only to species which occur in Bioko.)

METATHELYPTERIS (H. Itô) Ching

(1) Metathelypteris fragilis (Baker) Holttum, in J. S. Afr. Bot. *40* : 127, 1974 b, subsp. *guineensis* Benl, in Nova Hedw. *27* : 150 (1976).

Rhizome short erect; scales sparse as on stipes and rachises, variable in

size and shape, with a few acicular hairs. Fronds 6 to 8 in number, pale or light green to yellow-green when fresh turning olive-green to –brown with age, rather variable in size when fertile. (Members of this family often become fertile before reaching mature size.) Stipes 2.8 – 17.5 cm long, very thin, minutely pubescent. Lamina (oblong–)deltate, 5 – 22 × 3.5 – 11 cm, thinly herbaceous, its tapering apex formed by the gradually shortened upper pinnae. Free pinnae in 8 to 16 pairs, sessile, (sub)opposite or alternate, lanceolate, pinnate-pinnatifid; largest middle pinnae 1.2 – 5.7 × 0.6 – 1.9 cm, more or less decrescent at their bases, cut down to the narrowly winged costa (prominent on upperside) into 8 to 12 (14) pairs of more or less adnate oblong pinnules, the larger of them subfalcate; largest 0.7 × 0.22 cm, mostly lobed less than halfway to costule. Costules with (3) 4 (5) pairs of simple or forked veins terminating in thickened ends just short of the margin. Acicular hairs longer and much denser on upper than on lower surfaces of rachis, costae and costules, especially in Bioko material. Sori small, round, about 4 to 8 per pinnule; indusia persistent.

Ecological note: A population of more than 20 plants was found growing on moist banks of a rivulet in southern upland. This rare taxon seems to be confined to very humid places in virgin forest.

Citation: G. & U. BENL FP 166, eastern affluent of upper Río Iladyi 1190 m (28/1/1974), BM, BOL, K, M, Hh Pic. Ser.

Geogr. distribution: Equatorial Guinea (Bioko-holotype), S. Tomé. – Known up to the present from two Guinean islands only.

Subsp. *fragilis* is endemic to Madagascar.

PSEUDOPHEGOPTERIS Ching

1 – Pinnules of large blades broadly adnate to costa and cut into contiguous segments almost down to midrib; segments with entire to crenate edges and rounded tips
... *cruciata* (Willd.) Holttum (2)

1 – Pinnules of large blades partly adnate to costa and deeply cut into spaced segments; these dentate or lobed, their tip slightly acute
... *aubertii* (Desv.) Holttum (3)

(2) **Pseudophegopteris cruciata** (Willd.) Holttum, in Blumea *17*: 21 (1969).

Synonyms: Thelypteris cruciata (Willd.) Tard., in Not. Syst. *15* : 91 (1955).

Macrothelypteris cruciata (Willd.) Pic. Ser., in Webbia *23* : 179 (1968).

For more synonyms see HOLTTUM 1974 b : 129.

Rootstock upright, scales thin, lanceolate, ca 5 × 0.8 mm, pale to medium brown with superficial hairs, margin entire or with some tiny prolongations. Fronds tufted, up to 1.5 m in total length. Stipe firm, to 30 – 40 (60) cm long, grooved, reddish-brown, stramineous or bright tawny higher up, deciduously scaly throughout but glossy with age like the rachis, becoming woody. Lamina ca 40 – 100 × 25 – 30 cm, ovate acuminate to lanceolate, herbaceous to firmly membranous, bipinnate. Pinnae opposite or nearly so, sessile, 8 – 10 cm apart, gradually decrescent higher up to the subpinnatifid apex; largest pinnae lanceolate, to 20 – 25 (30) × 3 – 4 (5) cm, the lowest 2 or 3 pairs gradually reduced and more widely spaced. Pinnules numbering up to more than 20, attaining 7.5 cm long by 2 cm across about the middle of pinna, (sub)opposite, oblong-ovate acuminate from a truncate-subcuneate adnate base, regularly pinnatisect more than halfway, larger ones often cut almost to costule into numerous (ca 20) segments. These closely spaced, somewhat oblique, with the ciliate margins entire or at most crenate, with a blunt apex. Veinlets 3 to 6 pairs per soriferous segment, simple or forked, terminating within the margin often with thickened tips. Rachis densely hairy especially toward apex. Costa winged when young but not grooved; costa, costules and midrib of pinnule-lobes bearing acicular white hairs of ca 0.7 mm long underneath; upper surface subglabrous. Sori small, orbicular, abundant, ca 6 to 8 (9) on larger lobes, placed midway between midrib and margin. Sporangia non-setose.

Ecological notes: Pseudophegopteris cruciata was found in montane woodlands and ravines, near permanent water.

Citations: ADAMS 1018, Lago Loreto "by path near crater lake" 914 m (6/12/1951), BM, GC; 1047, near Moka, near stream 1260 m (7/12/1951), GC; 1092, l.c. 1200 m (8/12/1951), BM, GC; G. & U. BENL FP 83, Biaó inside the crater border 1750 m (22/1/1974), BM, M, Hb. Pic. Ser.; determination kindly confirmed by Prof. PICHI SERMOLLI.

Geogr. distribution: Liberia, Ivory Coast, Ghana, Cameroon, Equatorial Guinea (Bioko), Congo, Tanzania, Kenya, Uganda; Madagascar, Mauritius (holotype), Réunion, Seychelles. – West African specimens seem to be different from East African ones (see HOLTTUM 1974 b : 130).

(3) Pseudophegopteris aubertii (Desv.) Holttum, in Blumea *17* : 18 (1969).

Synonyms: Macrothelypteris aubertii (Desv.) Pic. Ser., in Webbia *23* : 177 (1968).

For more synonyms see HOLTTUM l.c. : 18.

Rhizome erect, producing clumped fronds up to at most 1.5 m tall. Thin scales present on the rhizome and on basal parts of the stipes, narrowly lanceolate with short white hairs on the surface, colourless in living plants, turning brown only on drying (fide FADEN). Stipe equalling length of blade, becoming glossy like the rachis (this winged towards apex), stramineous

ageing to a red-brown flush. Lamina (elongate–)deltate, 30 – 70 (80) cm long with the basal pinnae more or less reduced, texture thin to moderately firm. Pinnae opposite or nearly so, oblong-lanceolate, the longest 30 – 45 × 15 cm, petiolulate. Pinnules subalternate, lanceolate acuminate, 2 – 3 cm apart, sessile and partly adnate; largest below the middle ca 9 – 10 × 2 (2.5) cm, basal ones smaller, all cut into 20 to 30 segments almost to the costule, leaving there a narrow wing. Pinnule-segments conspicuously widely spaced, ca 15 × 3 – 4 mm, subacute, the margin dentate or lobed up to halfway to midrib. This pinnate with 6 to 8 pairs of mostly forked veinlets not reaching the margins with their more or less thickened tips. Costa, costules and midrib of segments bearing acicular hairs 0.5 – 0.6 mm long on lower surface, soft hairlets on the upper side. Sori large, 8 to 10 (12) per segment, globose tending in part to elliptic in our material. Sporangia non-setose.

Ecological note: Another unfrequent submontane species reported from moist forests in dense shade.

Citation: G. & U. BENL FP 429, Pico 1260 m (6/1/1976), K, M, Hb. Pic. Ser. (Collection kindly determined by Prof. HOLTTUM). – First record for West tropical Africa.

Geogr. distribution: Equatorial Guinea (Bioko), Kenya; Madagascar, Mauritius, Réunion (holotype).

Notes: PICHI SERMOLLI discovered this fern on the southern slopes of Mt Kenya, and it appeared to be the first collection in the African continent, but "perhaps some of the specimens from continental tropical Africa, identified as *Thelypteris (Dryopteris) cruciata,* belong to this species" (1968 : 179). In 1974 FADEN reported on this "uncommon plant", found by him and his collaborators in several localities of Upland Kenya.

"The distinctions of size of pinnae" of the two closely related species, "and of reduction of pinnules at bases of the larger pinnae, can only be seen by comparisons of complete fronds of fully mature plants" (HOLTTUM 1969 : 21). We, therefore, based our key-features on other details.

PSEUDOCYCLOSORUS Ching

(4) Pseudocyclosorus pulcher (Bory ex Willd.) Holttum, in J. S. Afr. Bot. *40* : 138 (1974 b).

Synonymy: Thelypteris zambesiaca (Baker) Tard., in Not. Syst. *14* : 344 (1952).

Thelypteris longicuspis (Baker) Schelpe, in J. S. Afr. Bot. *31* : 262 (1965).

Thelypteris pulchra (Bory ex Willd.) Schelpe, in García de Orta, Sér. Bot. *3* : 54 (1976).

For more synonyms see HOLTTUM 1974 b : 138.

Rhizome (obliquely) erect, apically bearing pale to dark brown ovate-acute scales to 5 mm and more long, sending up a tuft of large arching fronds, which may attain a total length of 2 to 2.4 metres. Stipe thick (6 – 8 mm in diam.), (30) 50 – 70 (85) cm tall up to the lowest normal pinnae, broadly grooved above, (purplish–)brown at base, stramineous to pale brown higher up like the rachis, with appressed basal scales and a fine pubescence of white subappressed evanescent hairlets. Lamina oblong-deltate to –lanceolate in outline, up to about 1.5 (2.1) × 0.5 (0.6) m, herbaceous to coriaceous, the base abruptly transient into a long row of (extremely) dwarfed pinnae. Free pinnae very numerous, to 40 and more pairs alternate, sessile, linear-lanceolate, cut down almost to the grooved costa, often long-tapering to a crenate apex; the largest about 30 (35) × 2 – 3 (3.5) cm, gradually reduced to a pinnatifid caudate lamina apex; lower 6 to 10 (and more) pairs suddenly shortened to auriculi– or glanduliform laciniate appendages, ranging from ca 2.5 cm down the stipe to 2 – 3 mm in length. Lobes to about 40paired, narrowly oblong-oblique, subfalcate, 12 (18) × 2 (3.5) mm, the costules up to 4.5 mm apart, the edges white-ciliate. Veins (10) 12 – 14 (18) pairs; lowest acroscopic vein usually excurrent to the short sinus-membrane, lowest basiscopic to lobe margin above the sinus base. Costae, costules, veins and tissue of lamina variably short-hairy underneath, glabrous or provided with scattered unicellular hairs on upper side. Sori abundant, up to ca 20 – 25 per lobe; indusia firm, persistent, smooth, sometimes pilose or glandular.

This large fern is characterized by the abrupt transition of the pinnae into auriculiform rudiments.

Ecological notes: A mountain species of the submontane and montane zone (900 – 2600 m altitude) favouring open evergreen woodland mainly of streamsides, in marshy soil, above lakes.

Citations: ADAMS 1028 A, Lago Loreto 900 m (6/12/1951), BM, GC; WRIGLEY & MELVILLE 601, South outer slope of Biaó near exit of river 1710 m (14/9/1959), BM, K; ESCARRÉ 3670, Biaó (2/1965), BC; G. & U. BENL FP 103 c, Loreto Crater 1070 m (24/1/1974), M; FP 105, Loreto Crater 1050 m (24/1/1974), M; FP 163, Praderas de Moka 1230 m (28/1/1974), M, EA; FP 327, Carretera de Valle Moka on roadside 1260 m (31/12/1975), BC, M; FP 362, Pico 2600 m (2/1/1976), M; FP 405, Pico 1700 m (6/1/1976), M, YA.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (Bioko), Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia (?), Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia; Madagascar, Mauritius, Réunion (holotype), Comoro Is. – Tropical Africa with adjacent islands.

AMAUROPELTA Kunze

(5) Amauropelta bergiana (Schldl.) Holttum var. *bergiana*, in J. S. Afr. Bot. *40* : 133 (1974 b).

Synonym: Thelypteris bergiana (Schldl.) Ching, in Bull. Fan Mem. Inst. Biol., Bot. *10* :251 (1941).

For further synonymy see HOLTTUM 1974 b : 133.

Rhizome suberect, thick, densely clad towards apex with pale brown deltate to linear acuminate scales ca 8 × 1.5 mm, bearing glandular and/or acicular white hairlets. Fronds clustered, up to about 1.2 (1.5) m tall, arching, finely puberulous throughout. Stipe (10) 15 – 30 cm long, grey to brownish, initially shortly villous, sparsely paleate at base, the scales resembling those of the rhizome. Lamina (15) 30 – 60 (90) × 15 (35) cm, oblong-lanceolate or narrowly elliptic to subovate in outline, membranous, alternately pinnate; upper pinnae gradually reduced and confluent into a crenate or subentire tip. Free lateral pinnae in (12) 20 to 25 pairs, sessile with an equally truncate non-broadened base, lanceolate, apex serrately acuminate, deeply pinnatifid ca 3/4 to almost completely to the sulcate costa into close entire lobes, the more or less zigzag costules 3 – 4 mm apart. Longest middle pinnae (4) 7 – 12 (15) × (1) 1.5 – 2 (2.5) mm, 1 – 3 cm apart; lower (1) 2 or 3 (4) pairs more widely (to 5 – 7 cm) spaced, gradually reduced to 0.5 – 2 cm long, lowermost deltate to auriculiform or wing-shaped. Lobes slightly oblique, subfalcate, elliptic(–oblong), 6 – 10 × 2 (4) mm. Rachis slender, sulcate, stramineous to greyish, puberulent with white hairlets throughout. Veins (4) 6 to 9 (10) pairs per fertile lobe, very distinct, basal ones completely free. Lower lamina surface finely puberulous with slender erect hooked hairs, without glands; rachis, costae and costules bearing short spreading hairs beneath, some of them hooked too; upper surface finely pubescent throughout. Sori (to 14 per lobe) smal, usually submarginal, i.e. lined up nearer to margin than to costule, often appearing exindusiate; indusia minute, bearing a few acicular hairs, fugacious. Sporangia non-setose.

The hooked hairs on the undersurface of lobes are characteristic of this taxon.

Ecological notes: A locally common fern of humid evergreen woodlands ranging from 600 to 2150 m elevation, found on shaded banks beside permanent water, in rock crevices etc. In our area confined to southern upland and the *Schefflera* mountain forest.

Citations: MANN 342, Pico (1860), K; s.n. (1861), K; GUINEA 2870, Pico ca 2000 m (2/3/1947), BM, MA; ADAMS 1042, Moka 1260 m (7/12/1951), BM, GC; 1095, Moka 1200 m (8/12/1951), BM, GC; ESCARRÉ 3631, Lago de Biaó (3/1965), BC; G. & U. BENL FP 66, above Moka-Malabo 1350 m (22/1/1974), M, Z; FP 163 & 163 a, Praderas de Moka 1230 m (28/1/1974), M, TNS; FP 170, eastern tributary to Río Iladyi 1190 m (28/1/

1974), M; FP 348, Pico 1620 m (2/1/1976), BC, M, YA; FP 564, between Residencias de Moka and Riasaca 1180 m (15/1/1976), B, GZU, M; FP 605, Mioko Fountain 1360 m (17/1/1976), M, MO.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (Bioko), Congo, Zaïre, Angola, Rep. S. Afr. (holotype), Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Somalia (?), Ethiopia, Sudan; Madagascar, Mascarene Is. – Tropical and temperate Africa, adjacent islands.

Var. *calva* Holttum from Cameroon without hooked hairs, the lamina hairless underneath.

Var. *tristanensis* Holttum from Tristan da Cunha, with abundant longer hairs beneath, hooked hairs present.

STEGNOGRAMMA Blume

(6) Stegnogramma pozoi (Lagasca) Iwatsuki var. *pozoi*, in Acta Phytotax. Geobot. *19* : 124 (1963).

Synonymy: Thelypteris pozoi (Lagasca) Morton, in Bull. Soc. Bot. France *106* : 234 (1959).

Leptogramma pilosiuscula (Wikström) Alston, in Bol. Soc. Brot. *30* (2. ser.) : 17 (1956).

For further synonyms see IWATSUKI l.c. : 124-125 (1963); HOLTTUM 1974 b : 149.

Rhizome erect, short, becoming stout with age, the apex conspicuously paleaceous; scales thin, medium- to dark brown, broadly lanceolate (to ca 4 × 1 mm), set with slender acicular hairs on surface and edges. Fronds clumped, herbaceous, finely villous throughout. Stipe 10 – 35 cm long, normally shorter than the blade, at first slightly scaly with larger scales (to 6 mm long) than on the rhizome, in addition to a permanent pubescence of deflexed to appressed whitish hairlets; grading into the pale brown grooved rachis bearing longer hairs. Lamina about (15)25 – 35 (45) × (6) 8 – 10 (15) cm, ovate-lanceolate acuminate to (narrowly) elliptic attenuate in outline, with several (ca 10 to 20) pairs of pinnae adnate to the rachis, these merging with each other and tapering to a deltate lobed or crenate apex. Fully free lateral pinnae numbering up to about 8 pairs, alternate, (sub)sessile, lanceolate with truncate basiscopically narrowed base and a short-acuminate apex; largest pinnae 4 – 8 (12) × 1.0 – 1.5 (2.5) cm, basal pinnae slightly reduced and often (moderately) deflexed, all weakly to strongly lobed up to halfway to the grooved costa; lobes oblique, oblong-obtuse, costules 4 – 6 mm apart. Veins free, in (5) 6 or 7 (9) pairs per lobe, pinnately arranged, simple or forking; lowest opposite pair not uniting at the sinus. Underside of costae and costules pilose with stiff hairs to 1.5 mm long, veins and leaf tissue

with shorter ones; upper surface covered with appressed shorter hairs throughout. Sori 1.5 – 3 mm long, lying on the middle part of veins, turning blackish when ripe; indusium none. Sporangia copiously setiferous.

Stegnogramma pozoi is distinguished from similar ferns by having more than half of its pinnae broadly adnate to the upper rachis portion.

Ecological notes: Reported from humid localities in forests, at ca 1000 to 1750 metres elevation. In Madeira we observed this species between 500 and 1000 metres altitude in rather dry positions as well as in shady laurel woods (Brit. Fern Gaz, *10* : 165, 170. 1971).

Citations: MANN 358, 450 m (1860), K; s.n. (1860), BM, K; ADAMS (see 1957 : 482) records it from "near sea-level". – The fern seems to be rare in Bioko.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko), Rep. S. Afr., Zimbabwe, Malawi, Tanzania, Rwanda, Ethiopia, Sudan; Comoro Is. – Spain (holotype), Madeira, Azores. – A paleotropical species widely scattered in Africa, in northern Spain, Madeira and the Azores.

Var. *petiolata* (Ching) Sledge and var. *mollissima* (Kunze) Sledge (1981 : 49 – 50) are recorded from Sri Lanka and other parts of Asia. The species needs further investigation.

AMPHINEURON Holttum

(7) **Amphineuron terminans** (Hook.) Holttum, in Amer. Fern J. *63* : 82 (1973 a).

Synonym: Thelypteris wagneri Fosb. & Sachet, in Smiths. Contr. Bot. *8* : 6 (1972).

For further synonymy see HOLTTUM 1977 a : 207.

Rhizomes long and spreading, 3 – 5 (8) mm in diameter, densely paleaceous with linear-lanceolate thin deciduous scales reaching 8 × 1 mm. Fronds widely apart, long-stalked. Stipes 30 – 50 (60) cm long, slender, medium brown with a reddish flush, slightly scaly at base like the rhizome, hairy in the groove, later glabrescent. Lamina attaining 80 – 90 (120) cm long and 40 (60) cm wide, ovate-oblong in outline, herbaceous to submembranous, the apex variable in shape, generally pinna-like. Pinnae in up to 25 pairs, (sub)alternate, linear-oblong to lanceolate-linear, the largest 17 – 20 (35) × 1.7 – 2.0 (2.5) cm, petiolulate, the narrowed bases subtruncate to cuneate, the apex long-acuminate; pinnatifid 1/4 to 1/3 (rarely 1/2) of the distance to costa into numerous subovate to triangular segments slightly falcate and broadly pointed, with ciliate margin. Lowest pinna pair(s) often reduced. Rachis and costae grooved and densely hairy above; costules (4 – 5 mm apart), veins and surface near edge with scattered hairlets on upperside;

lower face of lamina usually with short acicular hairs and small pale glands on the veins mainly near tips of lobes. Veins in 6 – 9 (12) pairs, the basal one, rarely two (three) pairs anastomosing to a long veinlet terminating in a translucent band called the sinus-membrane; next proximal veins arcuately oblique, one or two passing to the sides of the sinus-membrane. Sori confined close to margins of the short lobes; indusia conspicuous, glabrous or with some hairlets.

Restriction of the sori to the margins of markedly short free pinna-lobes is a significant key-feature.

Ecological notes: The species has been recorded from permanently wet places in rain forest, but more often from areas with a distinct dry season.

Citation: VOGEL s.n. (K).

Geogr. distribution: Centr. Afr. Rep., Equatorial Guinea (Bioko). – "In Africa only known from one collection from Central African Republic and one from Fernando Po" (HOLTTUM 1974 b : 163). – Widespread in Southern and Southeastern Asia (holotype from N. Burma), the Philippines, Queensland, New Guinea.

CHRISTELLA Léveillé

1 – Pinnae very deeply lobed, excurrent veinlet from the joined lowest veins therefore short and both second veins regularly running to the edges of their pinna-lobes distinctly above sinus base. Upper surface of pinnae with acicular and gland-like capitate hairs.
... *hispidula* (Decne.) Holttum var. *hispidula* (8)

1 – Pinnae less deeply lobed, excurrent veinlet from the joined lowest veins therefore rather long and the second acroscopic vein never passing to the edge of its pinna-lobe. Gland-like capitate hairs entirely absent.
... *dentata* (Forsskal) Brownsey & Jermy (9)

For a clear separation of the above species an examination of the venation (with the help of a simple lens) is necessary.

(8) Christella hispidula (Decne.) Holttum var. *hispidula,* in Kew Bull. *31* : 312 (1976 b).

Synonyms: Christella hilsenbergii (C. Presl) Holttum, in J. S. Afr. Bot. *40* : 142 (1974 b), Webbia *30* : 192 (1976 a).

Cyclosorus quadrangularis (Fée) Tard., in Not. Syst. *14* : 345 (1952).

Thelpteris quadrangularis (Fée) Schelpe, in J. S. Afr. Bot. *30* : 196 (1964).

For more synonyms see HOLTTUM 1976 b : 312 – 313; SLEDGE 1981 : 32.

Rootstock large, erect or suberect, 1.5 – 3 cm in diameter, closely surrounded by the stipe bases; rhizome apex densely set with dark brown subulate-attenuate to hair-pointed, lustrous scales, these entire or finely ciliate, 3 – 6 (8) mm long; rhizome producing numerous fronds in a cluster. Stipe 15 – 35 (55) cm long and 1.5 – 5 mm in diameter, stramineous or pale brown flushed with anthocyanin towards the base, clothed with short pale caducous hairlets especially in the groove; basal stipe-scales like those of the rhizome but larger (up to 1 cm long). Lamina about 20 – 60 (75) × 7 – 20 (30) cm, of thinly herbaceous to rigid texture, oblong– to lanceolate-elliptic in outline with apex more or less resembling a deeply pinnatifid pinna. Lateral pinnae (sub)opposite in 20 to 30 (rarely more) pairs, very narrowly oblong, very deeply lobed (ca 3/4 towards costa), apex short-acuminate to strongly tapering, base truncate; largest pinnae below the middle up to about 15 × 1.5 (2.5) cm; lower 1 to 4 (6) pairs more distant, slightly decrescent, deflexed, lowermost 2 – 3 cm long, sometimes with acroscopic auricle, but never auriculiform. Pinna-lobes narrow, oblique to bluntly falcate, basal acroscopic ones longer; costules 3 – 4 mm apart. Veins (4) 7 to 9 (11) pairs per lobe, simple, pinnately arranged, only lowest pair obliquely uniting with a short excurrent veinlet, next pair running to margins of lobes above the sinus. Sparse long hairs (> 0.5 mm) present among shorter ones on both surfaces of the grooved rachis and costae; shorter hairs on costules, on veins and between veins beneath; short acicular hairs with scattered longer ones on upper surface of costules and veins; some short capitate gland-like hairs on costules and veins beneath and among acicular hairlets on leaf tissue above. Sori up to 15 per pinna-lobe, (supra)medial, orbicular; indusia small, persistent, densely pilose with white hairs of variable length. – Diploid cytotype (n = 36).

Ecological notes: Christella hispidula is commonly established in undergrowth of rain forests, on deeply- and half-shaded stream banks, near waterfalls; preferring sheltered places, but also living as a sun loving species in open swamps and on dry slopes. Recorded from sea-level up to 1700 m altitude.

Citations: VOGEL 69, "ad littus" (11/1841), K; BARTER s.n. (6/1857), K; ADAMS 1028, Lago Loreto on crater bank above lake 900 m (6/12/1951), GC, K, MA; G. & U. BENL FP 322, between Maule and Parador de Musola 700 m (31/12/1975), BC, GC, M.

Geogr. distribution: Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé, Angola, Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Ethiopia, Sudan; Madagascar, Mascarene Is, Seychelles. – Now known from the tropics of all continents; holotype from Timor.

The species is more variable in the New World, from where four varieties are reported by A.R. SMITH (1971 : 64 – 69).

(9) Christella dentata (Forsskal) Brownsey & Jermy, in Brit. Fern Gaz. *10* : 338 (1973).

Synonyms: Thelypteris dentata (Forsskal) E. St. John, in Amer. Fern J. *26* : 44 (1936); SCHELPE 1970 : 97.

Cyclosorus dentatus (Forsskal) Ching, in Bull. Fan Mem. Inst. Biol., Bot. *8* : 206 (1938).

For more synonyms see HOLTTUM 1976 b : 314 – 315; SLEDGE 1981 : 32.

Rhizome shortly creeping to suberect, ca 7 mm in diameter, stout, soon becoming woody. Rhizome scales brown, ovate to lanceolate, acuminate to hair-pointed, ciliate, 4 – 8 mm long. Fronds closely spaced, arcuate, often short-stalked, somewhat dimorphic, the fertile fronds longer with more and narrower pinnae than the sterile ones. Stipes variable in length (ca 10 – 50 cm), pale brown to greyish-brown, often darkening to purplish (anthocyanin), grooved, shortly white-hairy or glabrous; basal stipe-scales ca 8 mm long, like those of the rhizome. Blade attaining 90 – 130 × 30 – 40 cm, narrowly elliptic or oblong- to ovate-lanceolate in outline, dark green, soft-hairy but varying in pubescence, thin but firm-textured, tapering to a pinna-like apex. Pinnae 15 – 25paired, all sessile, alternate, truncate at base, very narrowly oblong or attenuate towards an acuminate crenulate apex, edges incised more than halfway but less than 3/4 to costa; middle pinnae usually up to 15 (23) × 2 (2.7) cm, 1 – 3 cm apart; lower (1) 2 – 4 (6) pinna pairs gradually reduced in length (to 1 – 5 cm) and widely spaced (up to 10 cm apart), with an acroscopic basal lobe, lowermost pinnae sometimes auriculiform. Lobes hardly or somewhat falcate, acute or with rounded tips. Costules 4 – 5 mm apart. Veins unbranched, (6) 8 or 9 (10) pairs per lobe, 4 to 6 pairs soriferous; lowermost anastomosing with a long excurrent veinlet (2 – 4 mm) to the sinus, second acroscopic vein running to the excurrent veinlet or to side of the short sinus-membrane. Pubescence more uniform than in *C. hispidula*. Lower surface of the purplish rachis with hairs ca 0.3 mm long; costae and costulae bearing hairs ca 0.2 mm long with intermingled longer ones (up to 0.5 mm); veins and leaf tissue minutely pilose with more scattered erect hairs. Upper surface with stiff hairs up to 1 mm long, very dense on the sulcate rachis and costae, scattered on costulae and veins; upper leaf tissue very short-haired. Capitate subsessile hairs nowhere present. Sori orbicular, mostly medial, up to 14 per lobe in rows parallel to costules; indusia persistent, short-hairy, glabrous at times. Sporangia non-setose. – Tetraploid cytotype (n = 72); see GHATAK, MANTON & HOLTTUM, in Brit. Fern Gaz. *10* : 185 (1971).

Ecological notes: Usually observed in slightly sheltered wet places in secondary evergreen woodland with open canopy, at forest margins, usually in partial shade; distributed also as a weed in plantations and palm groves.

Registered from sea-level to about 1800 m elevation, occasionally associated with *Christella hispidula*.

Citations: G. & U. BENL FP 41, Camino Pantano de Concepción sea-level (21/1/1974), M; FP 45 b, Maule oil palm plantation 380 m (21/1/1974), M; FP 211, Road to Basilé ca 20 m (16/12/1975), M; FP 227, Río Consul 70 m (17/12/1975), M; FP 256, Road to Basupú del Este ("Fishtown") 30 m (26/12/1975), BC, M; FP 270, above Basupú del Este ("Fishtown") 200 m (26/12/1975), M. – This seems to be the first record for Bioko.

Geogr. distribution: Senegal, Gambia, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Benin, Niger, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko, Annobon), S. Tomé & Principe, Gabon, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sokotra, Sudan, Yemen (holotype); Madagascar, Mauritius, Comoro Is, Seychelles. Macaronesia, Spain (Cadiz), Crete. – The most cosmopolitan fern of the family Thelypteridaceae, occurring throughout the tropics and subtropics of the Old World; naturalized in the New World (earliest collection from Alabama in 1914).

"*Thelypteris dentata* var. *buchananii* Schelpe" with less deeply (ca 1/3) incised pinnae, more strongly anastomosing veins and sparsely setose sporangia, is judged by HOLTTUM (1974 b : 142, 158) to be a possible hybrid between *Pneumatopteris afra* and *Christella dentata*. We have found some specimens of this kind: FP 2, Playa de Carboneras (16/1/1974), M; FP 203, Río Ococo 230 m (29/1/1974), M; FP 212, Road to Basilé ca 20 m (16/12/1975), M – seen by Prof. HOLTTUM; FP 532, above Basakato del Oeste 130 m (14/1/1976), FR, M, Z.

This taxon was hitherto reported from Sierra Leone, Liberia, Ghana, Nigeria, Mozambique (holotype), Zimbabwe, Tanzania and Uganda.

The hybrid *Christella dentata* x *parasitica* is known from Sri Lanka; see SLEDGE 1981 : 40.

CYCLOSORUS Link

1 – Pinnae 2.5 – 3 cm broad, pinnatifid more than halfway down to costa; pinna-lobes up to 1.8 cm long, falcate
... *striatus* (Schum.) Ching (10)

1 – Pinnae less than 2.5 cm broad, cut one-third to one-half the way to costa; pinna-lobes to 0.6 cm long, triangular
... *interruptus* (Willd.) H. Itô (11)

The genus *Cyclosorus* comprises three species, i.e. *C. striatus*, *C. interruptus* and *C. tottus (Thunb.) Pic. Ser.*, the latter being recorded within the continent with certainty only from Rep. S. Afr., Rwanda and Burundi.

(10) Cyclosorus striatus (Schum.) Ching, in Bull. Fan. Mem. Inst. Biol., Bot. *10* : 249 (1941).

Synonymy: Thelypteris striata (Schum.) Schelpe, in J. S. Afr. Bot. *31* : 268 (1965).

For further synonyms see HOLTTUM 1974 b : 151.

Rhizome very far-creeping (ca 5 mm in diam.), black, tortuous, branched, copiously rooting, protected by dark brown ovate-subulate to -acuminate scales of about 2 × 0.6 mm. Fronds stiff, widely spaced (to 15 cm apart), attaining 4 m in length when trailing. Stipes moderately stout, ca 5 mm in diameter, usually 40 – 60 (90) cm long, stramineous to pale brown, blackish-brown at the sparsely scaly base, grooved on upper surface, glabrous or nearly so. Lamina narrowly oblong-ovate acute to lanceolate in outline, usually 45 – 60 (100) × 20 – 30 (40) cm, rigid, coriaceous to almost pergamentaceous, subglossy, alternately to subopposite pinnate, gradually decreasing apically to a lobed extremity. Pinnae subsessile, narrowly oblong– or subovate-lanceolate, ca 10 – 20 (30) × (1.2) 1.8 – 3 (5) cm, spreading from a truncate somewhat contracted base to an evenly attenuate serrated apex; lower ones not reduced. Pinnae deeply pinnatifid (often to 2 mm from costa) into about 30 to 50 pairs of linear-oblong slightly falcate roundish or subacute lobes, (0.6) 1.0 – 1.2 (1.8) × (0.3) 0.4 – 0.5 (0.8) cm toward the middle of soriferous pinnae, the prominent costulae 5 – 8 mm apart, apices obscurely serrulate, margins white-ciliate. Rachis angled, pale, provided with stiff white hairlets vanishing with age; costa, costulae and veins thinly pilose underneath, costa pale with deciduous brown scales on lower face, subglabrous or sparsely hairy on the grooved upper side. Veins in (9) 15 – 20 (25) pairs, prominent beneath, giving the lobes a striate appearance; only the basal pair joining below the sinus, next pair to sinus-membrane. Sori abundant (ca 35 per pinna-lobe), minute, orbicular, in two rows between costula and margins (nearer to margins), following the sinus, contiguous when mature. Indusia glabrous; sporangia usually non-setose.

Cyclosorus striatus is easily recognized by its long pinna-lobes and unreduced lower pinnae.

Ecological notes: Widespread and locally abundant, but chiefly confined to swampy forests and edges of swampy areas where dense populations may occur; plants 3 – 4 metres tall when climbing up bushes. In Bioko "subaquatic" in open grassy marsh around lakes and lagoons.

Citations: VOGEL s.n. (11/1941), K; BARTER s.n. (1857), K; GUINEA 2225, Lago de Biaó (30/1/1947), MA; 2233, l.c. (30/1/1947), BM; G. & U. BENL FP 481, Laguna Lombé 840 m (10/1/1976), M.

Geogr. distribution: Senegal, Gambia, Guinea Bissau, Guinea (holotype), Mali, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin,

Niger, Nigeria, Chad(?), Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé, Gabon, Congo, Zaïre, Angola, Rep. S. Afr., Zambia, Malawi, Tanzania, Uganda, Rwanda, Burundi, Sudan. – Confined to tropical Africa.

(11) Cyclosorus interruptus (Willd.) H. Itô, in Bot. Mag. (Tokyo) *51* : 714 (1937).

Synonymy: Thelypteris interrupta (Willd.) Iwatsuki, in J. Jap. Bot. *38* : 314 (1963); FOSB. & SACHET 1972 : 8.

For more synonyms see HOLTTUM 1974 b : 152, 1977 b : 181, 1982 : 386.

Rhizome creeping widely in wet ground, copiously rooting, slender (3 – 6 mm in diam.), black, with sparse flat brown scales; fronds erect, up to 12 cm apart. Stipes varying much in length from 20 to 60 (100) cm, tough, characterized by a reddish flush above the black base, this bearing flat scales when young. Lamina ca 30 – 50 (100) × 10 – 20 (30) cm, oblong-lanceolate in outline, pale green, firm-textured to leathery; apex pinna-like but normally with a broader base. Pinnae 15 – 25paired, spreading horizontally or oblique, broadly cuneate or truncate at base, narrowly oblong and attenuate to an acute apex; largest pinnae below the middle 10 – 15 (30) × 1.0 – 1.8 (2.2) cm, subsessile, lowest pinnae not or scarcely reduced, short-stalked, all cut to less than one-half (usually one-third) the distance to costa into oblique triangular to broadly rounded short-pointed lobes with cartilaginous edges. Rachis brown to purplish, channelled on upper surface and initially finely pubescent like the costae; rachis, costae, costules (3.5 – 4.5 mm apart) and veins somewhat hairy (hairlets pale, acicular) or glabrous on lower surface, costae there always with flat broadly ovate light brown fringed deciduous scales; costulae, veins and leaf tissue with sessile spherical red to orange glands underneath. Veins in 6 to 10 (15) pairs per lobe, raised beneath, only the lowest more or less obtusely joined, the next passing to sinus-membrane (this 2 – 4 mm long), all those above the basal pair arcuately ascending. Sori up to 18, supramedial on the veins except on basal pair and distal ones, forming a close row often confluent at maturity. Indusia glabrous or weakly short-hairy, obscured by the sporangia when ripened.

Similar to *C. striatus* in having non-reduced lower pinnae and in the kind of venation; yet the pinna-lobes are different in shape and length and consequently in the number of veins.

Ecological notes: Cyclosorus interruptus is the common marsh fern of the tropics and subtropics, occupying suitable aquatic habitats (*Phragmites* and papyrus swamps, bogs, ditches, lake shores, marshes, coastal bush) in exposed situations at elevations from 700 to 1500 metres, and often growing in large colonies; in Bioko only recorded from high rainfall areas of the southern upland.

Citations: GUINEA 2224, Lago de Biaó "borde del agua" (30/1/1947), MA; ADAMS 1116, Lago de Biaó "creeping through mud of lake margin" 1590 m (9/12/1951), GC; ESCARRÉ 2040, Bajada al Lago de Biaó (1/1965), BC; G. & U. BENL FP 483, Laguna Lombé 840 m (10/1/1976), M.

Geogr. distribution: Senegal, Gambia, Guinea, Liberia, Ivory Coast, Niger, Chad, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), Gabon, Zaïre, Angola, Botswana, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Zanzibar, Kenya, Burundi, Ethiopia, Sudan; Madagascar, Mascarene Is. – Tropical und subtropical Africa, Asia (northern India – holotype), Pacific region incl. Hawaii, America, northern Australia, New Zealand.

Nomenclatural notes: This fern may be found under different names (*C. goggilodus, C. goggylodus, C. gongylodes, C. tottus* etc.) in herbaria and literature, while the correct epithet *interruptus* has erroneously been applied to *Amphineuron terminans* (Hook.) Holttum. In consequence, HOLTTUM (1974 b : 152) indicated the "distribution in Africa uncertain". (Our specimen was kindly determined by himself.)

PNEUMATOPTERIS Nakai

1 – Indusia distinctly present

2 – More than 3 and up to 6 – 8 pairs of veins uniting
... ... *afra* (Christ) Holttum (12)

2 – Only the lowest 1 or 2 pairs of veins anastomosing
... ... *venulosa* (Hook.) Holttum (13)

1 – Indusia usually wanting

3 – Rachis with a bud near apex; lowest pinnae not or not conspicuously reduced

4 – Frond-apex formed by a single pinna; basal pinnae not auricled
... ... *blastophora* (Alston) Holttum (14)

4 – Frond-apex formed by lateral pinnae gradually reduced and confluent; basal pinnae auricled on acroscopic side
... ... *unita* (Kunze) Holttum (15)

3 – No bud present; lower 2 – 4 pinna pairs gradually but very conspicuously reduced, base of pinnae often overlapping the rachis
... ... *oppositifolia* (Hook.) Holttum (16)

(12) Pneumatopteris afra (Christ) Holttum, in Blumea *21* : 306 (1974 a), J. S. Afr. Bot. *40* : 157 (1974 b).

Synonymy: Cyclosorus afer (Christ) Ching, in Bull. Fan Mem. Inst. Biol., Bot. *10* : 242 (1941).

Thelypteris afra (Christ) Reed, in Phytologia *17*: 258 (1968).

For more synonyms see HOLTTUM 1974 b : 157.

Rootstock widely creeping and branching, to 7 mm in diameter; scales brown, subulate acuminate to hair-pointed, subentire, ca 3 (4.5) × 0.4 – 0.8 mm. Fronds approximate in juvenile states only, up to ca 5 cm apart in mature plants. Stipe (20) 35 – 50 cm long, to 0.7 cm in diameter, with scattered scales at base resembling those of the rhizome, medium to light brown higher up, grooved above, hairy when young becoming glabrescent. Lamina ovate-oblong acuminate in outline, attaining 120 cm or more long by 35 cm wide, coriaceous when fresh, papery when dry. Rachis stramineous, pubescent with whitish hairlets on both surfaces and sulcate on upper side as are the elevated costae. Lateral pinnae commonly (sub)alternate, sessile, (7) 12 to 20 (22) each side, largest below the middle up to about 20 (30) × 2.5 (4) cm; the base truncated or broadly cuneate and distinctly auricled acroscopically on lower pinnae, the apex long caudate-acuminate, the margins sharply crenate or shortly lobate to a depth of 1 – 3 mm; terminal pinna single, obviously larger and more deeply incised than the upper lateral ones, sometimes adnate to the uppermost; (1) 2 or 3 pairs of basal pinnae much-reduced often to auricle-like appendages of 1 – 5 × 2 – 3 cm. Costules numbering up to 50 or more from 2 to 4.5 mm apart, with scattered acicular hairlets especially underneath like those of the veins, rarely between the latter. Veins 6 – 12paired, ca 4 to 6 (8) pairs connivent below the sinus, forming an intermediate veinlet; the hyaline sinus-membrane very short. Punctate sori (ca 14) lined up in two rows on the middle of the veins, usually not reaching the lobes. Indusia more or less hairy, soon caducous; sporangia setose.

With its well-spaced fronds this species may easily be distinguished within the genus.

Ecological notes: Widespread in secondary forest, abundant in cleared areas (cocoa farms, palm groves), liking open shade, moderately sunny but humid sites including swamps, *Pneumatopteris afra* seems to be the most frequent representative of the family in the lowlands of Bioko and in coastal regions of Cameroon.

Citations: VOGEL 62 (11/1841), K; 120, "ad Clarence" (11/1841), K; BARTER s.n. (1857), K; MANN 140, "at the beach" (12/1859), K; s.n. (1860), BM; BRADLEY GREGORY s.n. (1874), BM; MILDBRAED 6888, Bokoko (see 1922 : 176); LOPE DEL VAL 257, Basuola – Basakato (18/1/1939), MA; 235, Rebola (3/3/1939), MA; ESCARRÉ 2043, Playa Carboneras (2/1965), BC; 3630, Ureka (5/1965), BC; 2023, Aeropuerto Nuevo (7/1965), BC; MALEST 2211, Banapá (20/6/1967), BC; 2206, Lago Loreto (16/12/1967), BC; G. & U. BENL FP 16, Bahia de Venus (17/1/1974), M, Hb. Pic. Ser.; FP 45 a, Maule oil palm plantation 380 m (21/1/1974), M; FP 135, Pico 780 m (26/1/1974), M; FP 194, Bococo-Drumen at sea-level (29/1/

1974), BC, M; FP 612, Laderas de Moka 1360 m (17/1/1976), M, YA.

Geogr. distribution: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Bioko), S. Tomé & Principe, Gabon, Congo (lectotype), Zaïre, Angola, Tanzania, Uganda, Burundi, Sudan. – Native of West tropical Africa, where it is widely distributed.

Note: A putative hybrid is mentioned under *Christella dentata.*

(13) Pneumatopteris venulosa (Hook.) Holttum, in Blumea *21* : 315 (1974 a), J. S. Afr. Bot. *40* : 159 (1974 b).

Synonymy: Cyclosorus elatus (Mett. ex Kuhn) Alston, in Bol. Soc. Brot. *30* (2. ser.) : 13 (1956).

Thelypteris venulosa (Hook.) Reed, in Phytologia *17* : 323 (1968).

Other synonyms see HOLTTUM 1974 b : 159 – 160.

Rhizome short, producing fronds in a clump. Stipe to more than 45 cm long, brownish-green like the rachis, canaliculate, (sub)glabrous; stipe-scales broad, thin. Lamina ovate-lanceolate in outline, acuminate, about 40 × 20 – 25 cm, subcoriaceous to membranous in texture. Pinnae dark green, oblong, sessile, somewhat contracted above the base, acuminate; largest middle pinnae 20 – 25 × 2.5 – 3 cm, all lobed about halfway to costa but lobes varying markedly in length, subfalcate-oblong, the margins somewhat serrated. Upper pinnae approximate, lower ones about 5 cm apart, their bases dilated. Basal pinnae (4 or 5 pairs) abruptly shorter, auricled on acroscopic base, the uppermost of them ca 5 cm long, the lowest 1.5 cm; these basal pinnae spaced 5 – 10 cm apart, the intervals increasing towards bottom. Rachis and costae grooved above, more or less hairy; costules ca 5 mm apart, very pale coloured. Veins pinnately arranged in 7 to 9 pairs, lower 1 or 2 pairs anastomosing below the sinus to an excurrent veinlet, one pair to sinus-membrane, the rest free to the margin, all glabrous. Sori inframedial, from costa almost to apex. Indusia thin, glabrous, reniform-cordate, persistent but soon obscured by the protruding glabrous sporangia.

Ecological notes: Recorded from Annobon in mist forest at 500 – 600 m altitude (MILDBRAED 6577), from Principe in very dense woods from the sea-shore to 310 m elevation.

Citations: MANN s.n. (1861), K; W. MÖNKEMEYER s.n. (5/1885), B.

Geogr. distribution: Equatorial Guinea (Río Muni, Bioko-holotype, Annobon), S. Tomé & Principe. – Known up to the present from the Guinean Gulf area only.

(14) Pneumatopteris blastophora (Alston) Holttum, in J. S. Afr. Bot. *40* : 156 (1974 b).

Synonyms: Cyclosorus blastophorus Alston, in Bol. Soc. Brot. *30* (2. ser.) : 12 (1956); HOLTTUM, in Blumea *20* : 124 (1972).

Thelypteris blastophora (Alston) Reed, in Phytologia *17* : 264 (1968).

Abacopteris letouzeyi Tard., in Not. Syst. *16* : 202 (1960). Type seen in P.

Rhizome short-creeping, ca 5 mm in diameter, firmly rooted, paleaceous; scales strongly appressed, ca 2.5 – 4 × 1 – 1.8 mm, of variable shape, dull brown, finely fimbriate. Fronds clustered or closely spaced, long-stipitate, up to 85 (110) cm in total length. Stipe slender, attaining lenght of the blade, sparsely paleate at and near base with scales as for the rhizome, chestnut-brown at base, stramineous higher up, grooved and minutely tomentose (in juvenile fronds) as are rachis and costae, especially on lower face. Lamina imparipinnate, lanceolate-oblong in outline, to 25 cm broad, chartaceous in texture, upper surface darker green, lower side finely warted. Lateral pinnae (sub)opposite to alternate, broadly linear-lanceolate, more or less abruptly acuminate-caudate towards apex, truncate to unequally cuneate at base, margins subentire or shallowly crenate; the 6 to 8 (12) pairs more or less decreasing towards apex and base, lower ones 4 – 6 cm, upper ones ca 3.5 cm apart, largest pinnae about the middle 12 – 15 (18) × 3 – 3.5 cm; apical pinna resembling the other, but stipitate (rarely with an adnate lobe), larger than the uppermost lateral pinnae and somewhat more incised, bearing the bud at its base in mature state of plant. Costulae in larger pinnae up to 30 – 35 in number, ca 4 mm remote. (5) 6 – 8 (9) pairs of veins, the lower 4 or 5 (6) anastomosing below the sinus to form a zigzag intermediate veinlet, each joining vein mostly bearing a sorus. Costulae and veins with tiny scattered hairs. Sori small roundish, exindusiate, arranged parallel to costules; sporangia glabrous.

A very distinctive species easily recognised by its comparatively broad, shallowly crenate and cuspidate lateral pinnae.

Ecological notes: Preferably growing in deep shade (ravines, wet depressions) of high forests; one of the rarer ferns in Bioko.

Citations: MANN 377, 300 m (1860), K; G. & U. BENL FP 472, Bocoricho path to Laguna Lombé 750 m (10/1/1976), K, M, Hb. Pic. Ser., Z; FP 484, Laguna Lombé – Bocoricho 830 m (10/1/1976), BOL, M, YA.

Geogr. distribution: Liberia, Ghana, Nigeria (holotype), Cameroon, Equatorial Guinea (Bioko), Uganda. – Tropical West African element.

(15) Pneumatopteris unita (Kunze) Holttum, in Blumea *21* : 304 (1974 a), J. S. Afr. Bot. *40* : 155 (1974 b).

Synonymy: Cyclosorus patens (Fée) Copel., Gen. Fil. : 143 (1947).

Thelypteris madagascariensis (Fée) Schelpe, in J. S. Afr. Bot. *31* : 267 (1965).

Cyclosorus costularis (Baker) Ching, in Bull. Fan Mem. Inst. Biol., Bot. *10* : 243 (1941).

For more synonyms see HOLTTUM 1974 b : 155 – 156.

Rhizome erect or suberect, with remnants of broadly appressed dark brown scales. Fronds tufted, to 2 (3) m in total length, arching. Stipe to 50 (75) cm long, straw-coloured to greyish and pale brown, initially short-hairy, with appressed dark brown scales at base as on the rhizome. Lamina to 150 cm long and 50 cm broad at the middle, broadly oblong to (ovate–)lanceolate in outline, membranous to subcoriaceous, dark green on upper surface. Pinnae (sub)opposite, horizontal, linear– or lanceolate-oblong, the largest up to 25 × 2.5 (3.5) cm, the lower ones spaced up to 6 cm apart; all pinnae sessile with an obliquely truncate base, gradually and very long acuminate, margin crenate or (serrately) lobed 1/4 to 1/3 of their width, lobes rounded or acute falcate, entire or subdenticulate, the basal acroscopic lobe more or less distinctly enlarged; basal pinnae not or scarcely reduced, deflexed, uppermost pinnae decrescent and confluent to a narrowly-deltate apex with one or two gemmae at its base. Rachis and costae sulcate, short-hairy especially on upper face, costae with flat brown scales below near insertion; costules 5 – 6 mm apart, with scattered hairlets beneath. Veins in 5 to 9 (12) pairs, usually the (2) 3 or 4 (5) lower ones united below the sinus, bearing exindusiate sori up to 20 per pinna-lobe, (very) near the costules; basal sori somewhat elongate! Sporangia glabrous.

A large proliferous fern with the frond apex not pinna-like.

Ecological notes: Recorded from deeply shaded wet localities, e.g. thickets by stream banks, ravines and depressions in rain forest, at about 100 to 2400 metres altitude; in Bioko also from higher elevations, i.e. around the Moka area in southern upland (see ADAMS 1957 : 486) and from the *Schefflera* mountain region.

Citations: G. & U. BENL FP 70, East inner slope of Biaó, ca 1800 m (22/1/1974), M; FP 407, Pico 1700 m (6/1/1976), M, YA; FP 602, Mioko Fountain 1360 m (17/1/1976), BC, M.

Geogr. distribution: Liberia, Ghana, Cameroon, Equatorial Guinea (Bioko), Zaïre, Rep. S. Afr. (holotype), Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia, Sudan; Madagascar. – Tropical Africa, Madagascar.

(16) Pneumatopteris oppositifolia (Hook.) Holttum, in Blumea *21* : 304 (1974 a), J. S. Afr. Bot *40* : 157 (1974 b).

Synonymy: Cyclosorus oppositifolius (Hook.) Tard., in Not. Syst. *14* : 346 (1953).

For more synonyms see HOLTTUM 1974 b : 157.

Rhizome short-creeping, stout; fronds tufted. Stipes erect, 30 – 75 cm long, grooved, sparsely scaly at base, pubescent upwards, yellowish– to medium-brown like the rachis. Lamina 75 – 150 × 30 – 45 cm, subcoriaceous, ovate or elongate-ovate in general outline, acute with a lobed apex which is not pinna-like. Pinnae in 20 to 30 (or more) pairs, ca 8 cm apart in lower portion, 3 – 4 cm distant in the middle, 2 – 3 cm apart towards apex, subopposite in lower half to two-thirds; all sessile with a truncated, cordately auricled base (auricles especially on acroscopic sides overlapping the rachis, thus creating the impression of perfoliate pinnae), oblong and gradually attenuate towards the acuminate-subcaudate apex, the largest about the middle up to 22 × 3.5 cm, with margins crenate to coarsely lobate-serrate, irregularly cut into falcate lobes ca 0.7 – 1.2 cm long, costules 3.5 – 5 mm apart; lower 2 – 4 pinna pairs gradually but conspicuously decrescent, lowest reduced to 2.5 – 1.5 × 1 – 0.5 cm. Rachis (no bud!) and costae covered with dense stiff hairs to about 0.5 mm long underneath, grooved and finely pubescent above; costules and veins sparsely hairy, surface glabrous between veins. Veins raised, in 6 to 8 rarely to 14 pairs, the lower 2 – 4 (5) uniting, the upper running to sinus-membrane and lobe margins, often once-forked. Sori exindusiate, small, slightly elongate, in two rows between each pair of costules; sporangia rarely setose.

The unequally lobed pinna-bases is a useful feature for identifying this fern among the *Pneumatopteris* species occurring in Bioko.

Ecological note: Found growing in permanently wet sites in the lowland of the island.

Citations: VOGEL 62 (11/1841), K; G. & U. BENL FP 503, Balea on the shore of the "Lago" 490 m (12/1/1976), M. This sterile plant of our collection was determined by Prof. HOLTTUM with the annotation: "I believe this to be an abnormal specimen of *Pneumatopteris oppositifolia* (Hook.) Holtt. (*Polypodium* Hook.). 5 July 1976. R.E. Holttum."

Geogr. distribution: As yet only collected with certainty in Equatorial Guinea (Bioko, Annobon) and S. Tomé (holotype).

Family BLECHNACEAE

1 – Sterile pinnae broadly adnate to rachis, pinna margin entire, often narrowly reflexed; numerous lower pinna pairs strongly but gradually reduced to small auricles. Rhizome densely scaly. Sori indusiate.
... *Blechnum attenuatum* (Sw.) Mett. var. *attenuatum* (1)

1 – Sterile pinnae not adnate to rachis, pinna margin serrulate; only 1 to 3 basal pinna pairs abruptly aborting. Tip of rhizome slightly sealy. Sori exindusiate
... *Stenochlaena mildbraedii* Brause (2)

BLECHNUM L.

(1) Blechnum attenuatum (Sw.) Mett. var. *attenuatum*, Fil. Hort. Bot. Lipsiae : 64 (1856).

Synonymy: see Schelpe 1970 : 235 – 236.

Epiphytic, rarely saxicolous fern with a procumbent elongate rhizome 1 – 2.5 cm in diameter, this woody, densely paleate. Scales long-subulate, medium to reddish-brown, concolorous or with a dark pseudonerve, 1.2 – 4.2 × 0.1 – 0.3 cm. Fronds spaced up to 2 cm apart, suberect or arching, dimorphic. Stipe (5) 10 – 15 (25) cm up to the lowest normal pinnae, (pale)brown, reddish toward the bottom, grooved, bearing caducous broad-based subulate hair-pointed scales, otherwise glabrous. Sterile blades of juvenile plants simple or pinnatifid, becoming lobed downwards; adult ones imparipinnate, usually about 35 – 100 (180) × 10 – 30 cm, (ovate–)lanceolate in outline, gradually tapering to both extremities, the apex resembling an oblong-elongate pinna. Young leaves of adult plants strikingly bright cherry-red (BENL 1975 b : 39), which is regarded as a diagnostic feature of this species. Fertile blades lanceolate in outline, ca 25 – 90 (160) × 4 – 25 cm, narrowing above and below like the sterile ones. Rachis stramineous turning reddish-brown, grooved on upper face, glabrous. Sterile lateral pinnae broadly adnate to rachis, more or less contiguous, linear-lanceolate with attenuate (to caudate) ends and (equally) widened bases, coriaceous, glabrous on either side, margins entire, often narrowly reflexed, veins parallel, free, simple or forking; middle pinnae usually up to 15 (25) × 1.2 (1.8) cm, sometimes variably undulate to incised, lower 6 to 10 (16) pairs markedly decrescent, lowermost dwarfed, auriculiform. Fertile pinnae mostly free, 1 – 1.5 cm apart, sessile, narrowly linear or arcuate with a dilated base, 3.5 – 15 × 0.15 – 0.3 (0.4) cm, strongly reduced below, bearing linear continuous sori parallel to the margins; ripe sporangia completely covering the surface except for the midrib and a mucronate tip. Indusium marginal, inflexed, opening inwards, ca 1 mm wide.

Ecological notes: Usually growing as a rhizome-climber on tree trunks, especially of tree ferns (BENL 1978 : 28), at a height of up to 5 and more metres above ground level, in deeply shaded habitats of moist submontane regions, at 1400 to 1800 (2500) metres elevation. In Réunion BADRÉ (Fern Gaz. *11* : 363. 1978) observed that "at middle altitudes the species may acquire a terrestrial habitat and even constitute a dominant part of the herbaceous stratum".

Citations: MANN s.n. (1861), BM, K; MILDBRAED 6333, Pico above Basilé 1100 – 1400 m (16/8/1911), B, HBG; GUINEA 2152, "Moka bosque virgen, camino de las Cascadas" (29/1/1947), BM, MA; ADAMS 1010, Lago Loreto 900 m (6/12/1951), BM, GC; 1076, near Iladyi Falls 1200 m (8/12/1951), GC; WRIGLEY 575, above Moka 1440 m (8/9/1959), BM; ESCARRÉ 2001, Parador de Musola (12/1964), BC; G. & U.BENL FP 59, Mte Baká 1460 m (22/1/1974), M; FP 82, Biaó inside the crater border 1750 – 1850 m (22/1/1974), M; FP 331, Carretera de Valle Moka 1550 m (31/12/1975), FR, M; FP 553, Mte Baká 1470 m (15/1/1976), M.

Geogr. distribution: Nigeria, Cameroon, Equatorial Guinea (Bioko, Annobon), S. Tomé, Zaïre, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Rwanda, Burundi, Ethiopia; Madagascar, Mauritius (holotype), Réunion, Comoro Is. – Mountain regions of tropical and South Africa and adjacent islands.

The non-epiphytic var. *giganteum* (Kaulf.) Bonap. occurs in Rep. S. Afr., Mozambique, Zimbabwe, Malawi. Intergrading specimens between the two varieties were seen by KORNAŚ (1979 : 119).

STENOCHLAENA J. Smith

(2) **Stenochlaena mildbraedii** Brause in Brause & Hieron., in Bot. Jahrb. Syst. *53* : 384 (1915).
See fig. in TARDIEU-BLOT 1964 a : t. 34, 5 & 6.

Synonymy: see LAWALRÉE 1971 : 2.

Rhizome scandent, attaining 3 m long and 1.5 cm in diameter, branched, almost scaleless with spreading narrow, caducous paleae towards and at the apex, adhering to tree trunks by clumps of roots. Fronds remote, up to 3.1 m in length, dimorphous; sterile fronds and rarer fertile ones both simply pinnate. Stipes ca 1 – 1.5 m long, stout, deeply sulcate on upper face, rounded below, ca 1.5 – 2 cm in diameter at base, shining reddish-stramineous. Sterile blade up to 2 m long, chartaceous, shiny, olivaceous, brownish-red when very young, glabrous or nearly so, oblong in outline, the apex pinna-like. Fertile blade of about the same length and outline. Rachis glabrous on either face, sulcate above, with narrowly decurrent wings

towards apex. Lateral sterile pinnae 15 – to 25paired, patent, upper ones subsessile, close-set, lower ones petiolulate, gradually further apart, the lowest abruptly dwarfed; pinnae linear-lanceolate acuminate, cuneate at base (this provided with a small gland on acroscopic side), longest pinnae varying in length up to 48 × 4 cm at most, margins cartilaginous-serrulate. Veins forming a narrow row of areoles along each side of costa, elsewhere free, numerous, close, simple or forked. Fertile pinnae of about the same length as the barren ones, but narrowly linear, contracted to 4 – 5 mm wide, sterile margins very narrow, entire. Sporangia acrostichoid, occupying almost the whole underface of fertile pinnae.

Ecological notes: Reported from low elevations as a root-climber on stems of *Raphia* in swamps, rarely on *Elaeis,* ascending from ground level upwards to about 3 metres.

Citations: MILDBRAED 6995, Musola ca 500 m (11/1911), B; ADAMS, Musola (see 1957 : 484). – Very rare in the island.

Geogr. distribution: Cameroon, Equatorial Guinea (Bioko-holotype), Zaïre, Angola, Uganda. – Native to tropical West Africa.

REFERENCES

ADAMS, C.D. – Observations on the Fern Flora of Fernando Po. – *J. Ecol. 45* : 479 – 494. (1957).

ADAMS, C.D. & A.H.G. ALSTON. – A list of the Gold Coast Pteridophyta. – *Bull. Brit. Mus. (Nat. Hist.) Bot. 1* : 143 – 185. (1955).

ALSTON, A.H.G. – In: **EXELL,** Catalogue of the Vascular Plants of S. Tomé (with Principe and Annobon). – *Br. Mus. Nat. Hist.,* London. (1944).

ALSTON, A.H.G. – Pteridophyta Fernandopoanae. – *Bol. R. Soc. Esp. Hist. Nat.* 49 : 189 – 199. (1951).

ALSTON, A.H.G. – New African Ferns. – *Bol. Soc. Brot. 30 (2. ser.)* : 5 – 27. (1956).

ALSTON, A.H.G. – The Ferns and Fern-Allies of West Tropical Africa. – London. (1959 a).

ALSTON, A.H.G. – In: **EXELL,** Addtions to the Flora of S. Tomé and Principe. – *Bull. Inst. Français Afr. Noire 21 (sér. A, 2)* : 439 - 476. (1959 b).

ANTHONY, N.C. & E.A.C.L.E. SCHELPE. – New species and new combinations in African Pteridophyta and Orchidaceae. – *Contr. Bolus Herb. 10* : 143 – 164. (1982).

BENL, G. – Impressions of a fern trip to Fernando Póo. – *Boissiera 24* : 131 – 133. (1975 a).

BENL, G. – Die Insel Fernando Póo und ihre Farne. – *Cour. Forsch. – Inst. Senckenberg 16* : 1 – 54. 13 Abb. (1975 b).

BENL, G. – Some new and rare ferns from West Tropical Africa. – *Nova Hedw. 27* : 147 – 154. (1976).

BENL, G. – Ferns in the Cameroons. II. The Pteridophytes of evergreen forests. – *Fern Gaz. 11* : 285 – 296. (1977).

BENL, G. – The Pteridophyta of Fernando Po. I – *Acta Bot. Barcinon. 31* : 1 – 31. (1978). – II. *Acta Bot. Barcinon. 32* : 1 – 34. (1980). – III. *Acta Bot. Barcinon. 33* : 1 – 44. (1982).

BRAUSE, G. & G. HIERONYMUS. – Pteridophyta africana nova vel non satis cognita. – *Bot. Jahrb. Syst. 53* : 376 – 433. (Pteris p. 388 – 419). (1915).

BROWNLIE, G. – The Pteridophyte Flora of Fiji. – J. Cramer, Vaduz. (1977).

BURROWS, J.E. & S.M. – A check-list of the Pteridophytes of Zimbabwe. – *J. S. Afr. Bot. 49* : 193 – 212. (1983).

CHING, R.C. – Validation of the family name Pteridaceae. – *Webbia 35* : 239 – 240. (1982).

CHRISTENSEN, C. – The Pteridophyta of Madagascar. – *Dansk Bot. Ark. 7* : 1 – 253. (1932).

DEVI, G. – Spore types, morphological evolution and phylogeny in the Pteridaceae. – *Grana 18* : 41 – 46. (1979).

EVANS, A.M. – Isoëtaceae. – In: **RADFORD, AHLES & BELL,** *Manual of the Vascular Flora of the Carolines.* – Univ. North Carolina Press, Chapel Hill. (1978).

FADEN, R. B. – Pteridophytes. In: **AGNEW,** *Upland Kenya wild flowers.* – Oxford. (1974).

FOSBERG, F.R. & M. – S. SACHET. – Three Indo-Pacific Thelypteris species reinterpreted and a new African species described. – *Smiths. Contr. Bot. 8* : 1 – 10. (1972).

FUCHS, H.P. – Nomenklatur, Taxonomie und Systematik der Gattung Isoëtes Linnaeus in geschichtlicher Betrachtung. – *Nova Hedw. Beih. 3* : 1 – 103. (1962).

GARCÍA DE LOPEZ, I. – Revisión del género Acrostichum en la República Dominicana. – *Moscosoa 1* : 64 – 70. (1978).

GLIESSMAN, St. R. – The establishment of Bracken following fire in tropical habitats. – *Amer. Fern J. 68:* 41 – 44. (1978).

GUINEA, E. – Ensayo Geobotánico de la Guinea Continental Española. – Madrid. (1946).

GUINEA, E. – En el país de los Bubis. – Madrid. (1949).

GUINEA, E. – Fernando Po. – *Acta Phytogeogr. Suec. 54:* 130 – 132. (1968).

HALL, J.B. – Observations on Isoëtes in Ghana. – *Bot. J. Linn. Soc. 64* : 117 – 139. (1971).

HOLTTUM, R.E. – Ferns of Malaya. – Singapore. (1966).

HOLTTUM, R.E. – Studies in the family Thelypteridaceae. I. The genera Phegopteris, Pseudophegopteris, and Macrothelypteris. – *Blumea 17* : 5 – 32. (1969).

HOLTTUM, R.E. – Studies in the family Thelypteridaceae. III. A new system of genera in the Old World. – *Blumea 19* : 17 – 52. (1971 a).
HOLTTUM, R.E. – The genus Stenochlaena J. Smith with description of a new species. – *Amer. Fern J. 61* : 119 – 123. (1971 b).
HOLTTUM, R.E. – The identity of three type specimens in the Willdenow Herbarium. – *Amer. Fern J. 63* : 81 – 84. (1973 a).
HOLTTUM, R.E. – The family Thelypteridaceae in the Old World. – *Bot. J. Linn. Soc. 67, Suppl. 1* : 173 – 189. (1973 b).
HOLTTUM, R.E. – Studies in the family Thelypteridaceae. V. The genus Pneumatopteris Nakai. – *Blumea 21* : 293 – 325. (1974 a).
HOLTTUM, R.E. – Thelypteridaceae of Africa and adjacent islands. – *J. S. Afr. Bot. 40* : 123 – 168. (1974 b).
HOLTTUM, R.E. – Some new names in Thelypteridaceae, with comments on cytological reports relating to this family.– *Webbia 30* : 191 – 195. (1976 a).
HOLTTUM, R.E. – The genus Christella Léveillé, sect. Christella. – Studies in the family Thelypteridaceae. XI. – *Kew Bull. 31* : 293 – 339. (1976 b).
HOLTTUM, R.E. – Studies in the family Thelypteridaceae. XII. The genus Amphineuron Holttum. – *Blumea 23*: 205 – 218. (1977 a).
HOLTTUM, R.E. – The family Thelypteridaceae in the Pacific and Australasia. – *Allertonia 1* : 169 – 234. (1977 b).
HOLTTUM, R.E. – Thelypteridaceae. In: *Flora Malesiana, ser. II, vol. 1/5* : 331 – 560. (1982).
JACOBSEN, W.B.G. – The Ferns and Fern Allies of Southern Africa. – Butterworths, Durban/Pretoria. (1983).
JAEGER, P. & J.– G. ADAM. – Recensement des végétaux vasculaires des Monts Loma (Sierra Leone) et des pays de piedmont. II. Ebénacées – Ptéridophytes Filicales. – *Boissiera 33* : 1 – 397. (1981).
KORNAŚ, J. – Distribution and ecology of the Pteridophytes in Zambia. – Warszawa/Kraków. (1979).
KRAMER, K.U. – Notes on the distribution of the Pteridophytes of Suriname. – *Amer. Fern J. 64* : 107 – 117. (1974).
KRAMER, K.U. – The Pteridophytes of Suriname. – Utrecht. (1978).
LAWALRÉE, A. – Blechnaceae. In: *Flore du Congo, du Rwanda et du Burundi.* – Jard. Bot. Belg., Bruxelles. (1971).
LELLINGER, D.B. – The identity of Lonchitis aurita and the generic names Anisosorus and Lonchitis. – *Taxon 26* : 578 – 580. (1977).
MANTON, I. – Chromosomes and fern phylogeny with special reference to "Pteridaceae". – *J. Linn. Soc. London, Bot. 56* : 73 – 92. (1958).
MANTON, I. – Cytological information on the ferns of West Tropical Africa. – In: **ALSTON** 1959 a : 75 – 81. (1959).
MICkEL, J.T. – The classification and phylogenetic position of the Dennstaedtiaceae. – *Bot. J. Linn. Soc. 67, Suppl. 1* : 135-144. (1973).
MILDBRAED, J. – Wissensch. Ergeb. der Zweiten Deutschen Zentral-Afrika-Expedition 1910 – 1911. Bd. II : Botanik. – Leipzig. (1922).

MORTON, C.V. – The classification of Thelypteris. – *Amer. Fern J. 53* : 149 – 154. (1963).

PAGE, C.N. – The taxonomy and phytogeography of bracken – a review. – *Bot. J. Linn. Soc. 73* : 1 – 34. (1976).

PAOLILLO, D.J. – The developmental anatomy of Isoëtes. – *Illinois Biol. Monogr. 31* : 1 – 130. – Univ. Illinois Press Urbana. (1963).

PFEIFFER, N.E. – Monograph of the Isoëtaceae. – *Ann. Mo. Bot. Gard. 9* : 79 – 232. (1922).

PICHI SERMOLLI, R.E.G. – Fragmenta Pteridologiae – I. – *Webbia 23* : 159 – 207. (Macrothelypteris p. 177 – 179). (1968).

PICHI SERMOLLI, R.E.G. – Fragmenta Pteridologiae – II.– *Webbia 24* : 699 – 722. (Dennstaedtiaceae p. 704 – 705, Hypolepidaceae p. 705 – 707, Thelypteridaceae p. 709 – 711). (1970).

PICHI SERMOLLI, R.E.G. – Fragmenta Pteridologiae. – VI. – *Webbia 31* : 237 – 259. (1977 a).

PICHI SERMOLLI, R.E.G. – Tentamen Pteridophytorum genera in taxonomicum ordinem redigendi. – *Webbia 31* : 313 – 512. (1977 b).

PICHI SERMOLLI, R.E.G. – A further contribution to the nomenclature of the families of Pteridophyta. – *Webbia 35* : 223 – 237. (1982).

PICHI SERMOLLI, R.E.G. – A contribution to the knowledge of the Pteridophyta of Rwanda, Burundi, and Kivu (Zaire) – I. – *Bull. Jard. Bot. Nat. Belg. 53* : 177 – 284. (1983 a). – II. *Bull. Jard. Bot. Nat. Belg. 55* : 123 – 206. (1985).

PICHI SERMOLLI, R.E.G. – Fragmenta Pteridologiae. – VIII. –*Webbia 37* : 111 – 140. (1983 b).

REED, C.F. – Index Thelypteridis. – *Phytologia 17* : 249 – 328. (1968).

RUNEMARK, H. – A revision of Pteris dentata and related species. – *Bot. Notiser 115* : 177 – 195. (1962).

SCHELPE, E.A.C.L.E. – A revision of the African species of Blechnum. – *J. Linn. Soc. London, Bot. 53* : 487 – 510. (1952).

SCHELPE, E.A.C.L.E. – A review of the Southern African species of Thelypteris. – *J. S. Afr. Bot. 31* : 259 – 269. (1965).

SCHELPE, E.A.C.L.E. – Reviews of tropical African Pteridophyta 1. – *Contr. Bolus Herb. 1* : 1 – 132. (1969).

SCHELPE, E.A.C.L.E. – Pteridophyta. In: **EXELL & LAUNERT,** *Flora Zambesiaca.* – London. (1970).

SCHELPE, E.A.C.L.E. – Pteridophyta. In: **FERNANDES, LAUNERT & MENDES,** *Conspectus Florae Angolensis.* – Lisboa. (1977).

SCHELPE, E.A.C.L.E. & N.C. ANTHONY. – Flora of Southern Africa. Pteridophyta. – Pretoria. (1986).

SLEDGE, W.A. – Three species of Microlepia. – *Kew Bull. 1956* : 523 – 531. (1957).

SLEDGE, W.A – The Athyrioid ferns of Ceylon. – *Bull. Br. Mus. Nat. Hist. (Bot.) 2* : 275 – 323. (1962).

SLEDGE, W.A. – The Thelypteridaceae of Ceylon. – *Bull. Br. Mus. Nat. Hist. (Bot.) 8* : 1 – 54. (1981).

SMITH, A.R. – Systematics of the neotropical species of Thelypteris section Cyclosorus. – *Univ. Cal. Publ. Bot. 59* : 1 – 143. (1971).

SMITH, A.R. – Thelypteris Schmidel. In: **STOLZE,** Ferns and Fern Allies of Guatemala, II. – *Fieldiana Botany, n.s. 6* : 473 – 514. (1981).

SMITH, J. – Historia Filicum. – London. (1875).

TARDIEU-BLOT, M.–L. – Les Ptéridophytes de l'Afrique Intertropical Française. – *Mém. Inst. Français Afr. Noire 28.* – IFAN-Dakar. (1953).

TARDIEU-BLOT, M.–L. – Pteridacées. In: **HUMBERT,** *Flore de Madagascar et des Comores, 5, 4.* – Paris. (1958).

TARDIEU-BLOT, M.–L. – Ptéridophytes. In: **AUBRÉVILLE,** *Flore du Cameroun, 3.* – Paris. (1964 a).

TARDIEU-BLOT, M.–L. – Ptéridophytes. In: **AUBRÉVILLE,** *Flore du Gabon, 8.* – Paris. (1964 b).

THOMAS, B.A. – Fern hunting in West African rain forest. – *Brit. Pteridol. Soc. Bull. 2* : 27 – 29. (1979).

TRYON, R.M. – A revision of the genus Pteridium. – *Rhodora 43* : 1 – 31, 37 – 67. (1941).

TRYON, R.M. – Taxonomic fern notes. III. – *Contr. Gray Herb. 191* : 91 – 107. (1962).

VIANE, R.L.L. – Pteridophytes from the Cameroon Highlands I. New records. – *Willdenowia 16* : 247 – 251. (1986).

WALKER, T.G. – Cytology and evolution in the fern genus Pteris L. – *Evolution 16*: 27 – 43. (1962).

WANNTROP, H.–E. – The genus Isoëtes in South West Africa. – *Svensk Bot. Tidskr. 64* : 141 – 157. (1970).

ZOGG, E. & K.U. KRAMER. – New records of Pteridophytes from Angola. – *Candollea 36* : 115 – 118. (1981).

Accepted for publication November 1982.