

## Family OPHIOGLOSSACEAE

### OPHIOGLOSSUM L.

*Ophioglossum reticulatum* L., Sp. Pl. 2: 1063 (1753).

*Synonymy*: see WIEFFERING 1964: 327.

Rhizome upright, short (0.5 - 1.5 cm), stout, cylindric to subglobose, sometimes stoloniferous, with rather fleshy and hairless mycorrhizal roots, producing spirally disposed annual fronds, usually one only per rainy season, soon withering; mature fronds varying in total length from 4 to 40 cm, in our area from 15 to 25 cm on average. A common basal stalk (up to 16 cm, in our area to 7 cm long) arising from the top of the rhizome forking into a patent sterile segment (trophophyll) and an upright fertile part (sporophyll). Sterile portion a bract-like, mostly thin-textured blade, attached halfway up the whole frond, at most 9 x 7.5 cm (ca 3 - 5 x 2 - 3.5 cm in extant material), broadly ovate or roundish, usually cordate or broad-truncate at base, sessile or long-attenuate (to about 1 cm), sometimes apiculate at apex, glabrous; venation profusely reticulate, without a distinct midrib, the numerous anastomosing veins evident, forming areoles with free-ending venules included. Fertile frond segment a long-stipitate spike borne below or at the base of the blade, the stipe up to 18 cm long, the apical proper spike 1.2 to over 5 (7) cm long, linear-compressed, mucronate, bearing two rows of (15) 40 - 48 (60) sporangia immersed in the tissue of the spike and laterally joined together. Sporangium subspherical, thick-walled, large (ca 0.5 - 1 mm in diameter), devoid of an annulus, dehiscent by a transverse slit as in other primitive ferns; discharged spores uniform.

*O. reticulatum* is a highly polymorphous species subdivided by some authors into several forms. It differs from the closely allied *O. vulgatum* L. especially in having non-persistent sheaths at the frond-bases and reticulately ornamented spores. The relationship of the whole family to the true ferns is dubious, representing "a blind conservative line of evolution which has reached our times without modifying its archaic features" (PICI SERMOLLI 1977a : 354).

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\* Les "Contributions..." núm. 1 i 2 han aparegut als volums 31 i 32, respectivament, de l'*Acta Botanica Barcinonensia*.

*Ecological notes:* Locally not uncommon in open or shady sites, on bare sandy habitats or in grassy poor soils of damp areas. The "Adder's-Tongue" is easily overlooked, being so unlike a 'normal' fern.

*Citations:* EXELL 786a, Moka grassland region ca 1370 m (28/1/1933), BM; GUINEA 683, "Cacaotal de la carretera de San Carlos", Km 35 (31/12/1946), BM, MA; 684, "Bosque del Km 35 de la carretera de S. Carlos" (31/12/1946), BC; 690, "Bosque del Km 35 de la carretera de S. Carlos, cacaotal y cafetal" (31/12/1946), MA, MO.

J. MILDBRAED (1922 : 177) cites a specimen of *Ophioglossum reticulatum* collected by MANN on the summit of the Pico. "Unfortunately neither this specimen nor a similar specimen collected recently in a corresponding habitat on the Cameroons mountain are sufficiently complete to confirm a suspicion that this may in fact be a form of the temperate *O. vulgatum* L." (ADAMS 1957: 493).

*Geogr. distribution:* Senegal, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Chad, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP, Annobon), S. Tomé, Gabon, Congo, Zaïre, Angola, Namibia, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Zanzibar, Kenya, Burundi, Rwanda, Uganda, Ethiopia, Sudan; Madagascar, Mauritius (holotype), Réunion, Comoro Is; Cape Verde Is. - Tropical and subtropical regions of both hemispheres. The species is said to be gondwanic in distribution and also therefore a plant of great antiquity.

*Ophioglossum gomezianum* Welw. ex A. Br. in Kuhn var. *gomezianum*, a markedly smaller species (common stalk subterranean; blade 1 - 2 x 0.5 cm), is recorded by ALSTON (1959 : 19) for Fernando Po. The author refers to BARTER's no 1363, which we could not find (for all the kind help of Dr. JARRETT and Mr. CRABBE) either at K or in BM.

## Family SINOPTERIDACEAE

### PELLAEA Link

*Pellaea doniana* J. Sm. ex Hooker, Spec. Fil. 2: 137, t. 125A (1858).

*Synonymy:* see SCHELPE 1970 : 129.

Rhizome compact, (sub)erect, 1 - 2 cm in diameter, with densely scaly copious brown, narrow-linear paleae, these uniformly (dark) brown or with paler borders, up to 7 mm long, minutely toothed. Fronds tufted, up to about 15 in

number, of rigid habit, long-stipitate. Stipe stiffly wiry, brittle, chest-nut brown to purplish-black, up to 35 (45) cm long and 0.5 cm in diameter, almost glossy below, provided mainly at or toward the base with hair-like scales similar to those on the rhizome, and with a unilateral, hirsute to tomentose indumentum of crowded short hairs (in our material) all along the stipe, including the rachis and short pinna-petioles. Lamina green, to 55 x 20 cm, narrowly oblong to ovate-lanceolate in outline, distinctly once-pinnate with 7 to 20 (23) pairs of short-stalked lateral pinnae, these ovate-oblong to lanceolate, the terminal subequalling the lateral ones or somewhat larger; all pinnae entirely glabrous, thin-leathery, paler green on lower surface, ca 6 - 10 (14) x 1.5 - 2.0 (3.2) cm, gradually acuminate, subserrate to crenate in sterile parts, the base obtuse or cordate, margins modified as a thin tissue. Pinna-petioles 1 - 5 mm long, persistent, articulated at apex; pinnae deciduous with age. Rachis sulcate and pubescent above. Costa of pinnae prominent and blackish-shining in its lower half on undersurface; veins obscurely free-forking. Sori covering vein-tips, more or less fusing laterally, at length continuous along the margins which are narrowly deflexed to a pseudoindusium but finally covered by the protruding sporangia. Paraphyses wanting.

*Ecological notes:* As *Pellaea doniana* inhabits relatively dry forest in West Africa, it was not expected to occur in Fernando Po (see ADAMS 1957 : 484).

*Citations:* ESCARRÉ 2005, Concepción (7/1965), BC; MALEST 2209, Concepción (20/6/1967), BC. - Both collections came from inland from the Bahía de Concepción and represent the only records for the island.

*Geogr. distribution:* Senegal, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Chad, Cameroon, Centr. Afr. Rep., Equatorial Guinea (FP, Annobon), S. Tomé (holotype), Príncipe, Congo, Zaire, Angola, Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Sudan; Seychelles. - Widely diffused in tropical Africa.

### Family VITTARIACEAE

1 - Fronds not grass-like. Sori following the reticulate veins

... .. *Antrophyum* Kaulf. (1)

1 - Fronds grass-like. Sori confined to a submarginal vein near the edges of the frond

... .. *Vittaria* J. Sm. (2, 3)

According to PICHI SERMOLLI (1977a : 402) the family may be derived from the Hemionitidaceae. There is no evidence for splitting the vittarioid ferns into two families, Antrophyaceae and Vittariaceae.

## ANTROPHYUM Kaulf.

(1) *Antrophyum mannianum* Hooker, Sec. Cent. Ferns : t.73 (1864).

Epiphytic or rarely lithophytic plants with fleshy short-creeping rhizomes (ca 1 cm in diameter) densely tomentose with brown root-hairs. Rhizome scales lanceolate to subulate, ca 6 x 2 mm, clathrate with black thickened lateral cellwalls, denticulate, more or less iridescent. Fronds simple, borne in clusters, long-stipitate, pendent and flaccid with age, glabrous. Stipe compressed-slender, canaliculate, more or less curved, usually longer than the lamina, turning from light to dark brown. Lamina ranging widely in shape and size, from roundish, ovate or obovate-orbicular to elliptic and rhomboid-acuminate, continued into a caudate or cuspidate extremity, usually up to 20 x 15 cm, with a broad-cuneate base and a subentire to crenate margin often coarsely sinuate-serrate towards the apex, of a submembranous and pellucid texture becoming chartaceous and brown-olivaceous when dry. Midrib never prominent, veins subflabellate, radiating from base to circumference, uniformly anastomosing into numerous oblong-hexagonal areoles opened toward the margin. Sori superficial, occupying the veins for the most part, thus forming a striking netted pattern; numerous club-shaped, reddish-brown paraphyses present.

*Ecological notes:* A mountain species liking full shade in moist woodland, locally abundant in *Schefflera* forest with over 3800 mm rainfall on the Pico, collected there by us up to 1750 m elevation; but the largest specimens with fronds of 58.5 x 17.2 cm (see BENL 1975 : fig. 12) were found in damp primary forests of the southern upland, at about 1300 m altitude.

*Citations:* MANN 367, Pico 900 m (1860), B, BM, K; s.n. (1861), K; NEWTON s.n., 600 m, K; MILDBRAED 6318, Pico above Basilé 1400 - 1500 m (16/8/1911), B, HBG; 7059, between Musola and Moka 600 - 1200 m (11/1911), B, HBG; GUINEA 2548-2550, Pico "Descenso del refugio" (3/3/1947; see "En el país de los Bubis", 1949 : 215 map 43, 272 fig. 101); ADAMS 1158, Pico 1500 m (14/12/1951), BM, MA; ESCARRÉ 3647, Basilé (4/1965), BC; WRIGLEY & MELVILLE 521, Moka 1380 m (1/9/1959), BM, K; G. & U. BENL FP 182, Bosque del Río Chubá 1310 m (28/1/1974), BC, BM, BOL, M, YA; FP 186, l.c. ca 1310 m (28/1/1974), FR, G, GZU, M, MO; FP 382, Pico 1750 m (4/1/1976), M; FP 420, Pico 1600 m (6/1/1976), BC, M; FP 424, Pico 1560 m (6/1/1976), M; FP 431, Pico 1260 m (6/1/1976), G, M; FP 459, Belebú-Balachá path to Río Lombé 770 m (8/1/1976), G, M; FP 475, above Bocoricho path to Laguna Lombé 790 m (10/1/1976), M; FP 594, Mioko Fountain 1350 m (17/1/1976), G, M; FP 615, Laderas de Moka 1370 m (17/1/1976), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Nigeria, Cameroon, Equatorial Guinea (Río Muni, FP - lectotype), S. Tormé, Gabon, Zaïre, Mozambique, Malawi, Tanzania, Uganda, Ethiopia. - Widespread in tropical Africa.

## VITTARIA J. Sm.

- 1 - Rhizome scales black, more or less iridescent, pseudoserrate, ovate to lanceolate, without a hair-point, 1.5 - 2.5 mm long

... .. *guineensis* Desv. var. *guineensis* (2)

- 1 - Rhizome scales brownish, entire, subulate-attenuate with a long hair-point, 3 mm long or more

... .. *guineensis* var. *camerooniana* Schelpe (3)

- (2) *Vittaria guineensis* Desv. var. *guineensis*, in Mag. Ges. Naturf. Freunde Berlin 5: 325 (1811).

Rhizome short-creeping, up to 2 mm in diameter, brown, densely clothed in hairy roots and short blackish paleae, these composed of internally thick-walled cells, oblong-deltate to lanceolate, very acute but without a persistent hair-point, marginally pseudoserrate, opaque to clathrate in part, up to 2.5 mm long and 0.5 mm wide at base. Fronds closely spaced, glabrous on both surfaces, suberect or usually pendent, short-petiolate, often in clumps; stipe subrotund, 2 - 5 x 0.2 cm, dark-castaneous or -violaceous. Blade narrowly linear to linear-lanceolate, 20 - 60 cm long and 6 - 12 mm across at or below the middle, acute at top with a terminal hydathode, gradually narrowed into the stipe, thickly chartaceous, olivaceous-greenish, revolute when dry. Midrib conspicuously raised on leaf under-surface especially towards base, triangular in cross-section. Lateral veins oblique, undivided, obscured (except in young plants), united in a submarginal vein on which the linear-elongate, immersed sori are borne. Paraphyses ferruginous, articulate, with a thickened end-cell.

*Ecological notes:* The "Grass Fern" or "Shoestring Fern" not infrequent as an epiphyte hanging on oil palms, on trees in the open and in forest to 1700 m altitude or more.

*Citations:* BARTER s.n., "growing on oil palms" (6/1857), K; MANN 124, at the beach (12/1859), K; KALBREYER 81 (3/1877), K; MILDBRAED 6321, Pico above Basile 1400-1500 m (16/8/1911), B, HBG; 6953, Bokoko (10/1911), B; GUINEA 1435, "Musola Servicio Agronómico" (16/1/1947), BM, MA; THOROLD TF 26, Ureka ca 150 m (18/8/1951), BM; ADAMS 1107, near Lago de Biaó 1710 m (9/12/1951), GC; G. & U. BENL FP 49, Maule oil palm plantation 380 m (21/1/1974), BC, BM, FR, M, Herb. Pic. Ser.; FP 248, Highway Malabo - Airport Km 2-3 (23/12/1975), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria (holotype), Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP), S. Tomé, Principe, Gabon, Congo, Zaïre, Angola, Uganda. - Tropical West Africa.

- (3) *Vittaria guineensis* Desv. var. *camerooniana* Schelpe, in Contr. Bolus Herb. 1 : 23 (1969b).

Differs from var. *guineensis* in its rhizome scales being longer (3 - 5 mm long), subulate with a long apical hair, entire, distinctly clathrate and lighter in colour.

*Ecological notes:* Var. *camerooniana* occurs in the same situations as var. *guineensis*, but the two varieties were not found growing together.

*Citations:* EXELL 848, Moka 1200 - 1350 m (1/2/1933), BM; ADAMS 1039, Moka 1260 m (7/12/1951), GC, K; 1129, near Moka 1290 m (9/12/1951), GC; 1149, Pico 1350 m (14/12/1951), GC; WRIGLEY & MELVILLE 444a & b, Moka 1380 m (2/9/1959), BM; G. & U. BENL FP 131, Praderas de Moka, ca 1250 m (24/1/1974), BM, G, K, M; FP 423, Pico 1560 m (6/1/1976), BC, FR, M; FP 541, Mte Baká 1470 m (15/1/1976), M, YA.

WRIGLEY & MELVILLE 427 from Moka 1380 m (1/9/1959), BM, is a transient form between the two varieties; rhizome scales pseudoserrate but in part bearing a hair-point longer than 2.5 mm.

*Geogr. distribution:* Discovered so far only in Cameroon (holotype) and Fernando Po.

*Vittaria guineensis* var. *orientalis* from East and South-East tropical Africa was described by HIERONYMUS in Bot. Jahrb. 53 : 426 (1915).

### Family POLYPODIACEAE

- 1 - Fronds markedly dimorphic with basal nest-leaves specialized for collecting detritus and with more divided fertile foliage
- 2 - Fronds densely stellate-pubescent, sterile ones appressed with their base to substrate, fertile ones pendent. Sori acrostichoid  
     ... .. *Platyserium stemaria* (Beauv.) Desv. (1)
- 2 - Fronds (sub)glabrous, all upright; sessile bract leaves shaped like oak-leaves. Segments of the stalked fertile leaves articulate to rachis. Sori not acrostichoid  
     ... .. *Drynaria* (Bory) J. Sm. (2, 3)
- 1 - Fronds all more or less alike
- 3 - Sori acrostichoid on a narrowed apical region  
     ... .. *Belvisia spicata* (L.f.) Mirbel in Lam. & Mirbel (4)
- 3 - Sori not acrostichoid
- 4 - Fronds irregularly lobed to pinnatifid (simple only in young plants) with

(sub)globose sori obviously sunk into the blade; stipe may equal length of blade

... .. *Phymatosorus scolopendria* (N.L. Burm.) Pic. Ser. (5)

4- Fronds always simple and entire. Stipe distinctly shorter than the blade or wanting

5- Rhizome short-creeping, fronds subtufted, up to 30 - 90 x 6 cm or more.  
Sori numerous, irregularly scattered

... .. *Microsorium punctatum* (L.) Copel. (6)

5- Rhizome long-creeping, fronds spaced apart. Sori in a regular row on either side of midrib

6- Fronds up to 20 (40) cm long, all uniform. Paraphyses peltate

... .. *Pleopeltis* Humb. & Bonpl. ex Willd. (7, 8)

6- Fronds up to 8 cm long, the fertile narrower than the sterile ones.  
Paraphyses filiform

... .. *Anapeltis lycopodioides* (L.) J. Sm. var. *owariensis*  
(Desv.) Benl (9)

#### PLATYCERIUM Desv.

(1) *Platycerium stemaria* (Beauv.) Desv., in Mém. Soc. Linn. Paris 6 : 213 (1827).

*Synonymy*: see TARDIEU-BLOT 1964b : 198.

Rhizome short-creeping, branched, obscured by nest-leaves and roots, clothed with fibrils and reddish scales, these narrowly triangular-lanceolate with a hair-like point, broadly attached at base, with margins sparsely ciliate. Fronds with a canescent tomentum of stellate hairs. Moisture- and humus-holding nest-fronds clasping convex, imbricate, roundish or oblong, to ca 30 - 40 x 20 cm, (sub)cordate at base, subentire or shallowly lobed towards ascending apex, the greenish surfaces slowly turning brown and pergamentaceous. Nerves often conspicuously raised; primary veins dichotomous, secondary ones reticulate with included veinlets. Foliage fronds (sporophylls) up to about 40 - 50 x 25 - 30 cm, with a short articulate stipe, arising in a cluster from the sinus of the basal fronds. Lamina (sub)coriaceous, vigorous, erect then pendulous, cuneate to wide-triangular in outline, once or twice (rarely 3-4 times) dichotomously divided, segments divaricating. Fertile parts situated in area around the sinuses of ultimate bifurcations and passing into the lobes without reaching apex; sporangia confluent and mixed with stellate paraphyses.

The "Elk's-horn Ferns" ("Stag's-horn Ferns") with their persistent sterile and deciduous fertile fronds appear to be an isolated group highly specialized in adaptation to epiphytic life, but "rather primitive in other features, for instance in the dichotomous fronds" (PICI SERMOLLI 1977a : 377). Among the 18

species *Platyserium stemaria* belongs to the "more primitive members of the Afro-American line" of evolution (HOSHIZAKI 1970 : 151).

*Ecological notes:* Generally found on trunks of lofty trees in the open or in secondary evergreen forest or rain forest at low elevations, rarely in high-altitude forest. In Fernando Po occurring abundantly on coconut palms near the beach (10 m alt.) of northern and western coasts (see BENL 1975 : fig. 5). Rarely terrestrial, but the species has been found on wooden bridges and even on bare lava (see BENL 1976b : fig. 5).

*Citations:* VOGEL 185 (11/1841), K; BARTER s.n. (6/1857), K; MANN 146 (12/1859), K; MILDBRAED 6808, San Carlos (21/10/1911), B, HBG; 6893, Bokoko (10/1911), B, HBG; GUINEA, "Servicio Agron., sobre los troncos de la palmera de aceite" (9/1945: ), MA; ESCARRÉ 2027, Playa de Carboneras (2/1965), BC; G. & U. BENL FP 191, Western Highway Malabo-Luba on a wooden bridge ca 10 m (29/1/1974), BC, M; FP 205, Río Consul "Water-fall" in Malabo on a wooden bridge ca 10 m (14/12/1975), M; FP 252, Highway Malabo - Airport Km 2-3 ca 10 m (23/12/1975), M.

*Geogr. distribution:* Senegal, Gambia, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Benin, Nigeria (holotype), Cameroon, Equatorial Guinea (Río Muni, FP), S. Tomé, Príncipe, Gabon, Zaïre, Angola, Sudan; Comoro Is. - Typical Guinean element, restricted to tropical West and Central Africa.

#### DRYNARIA (Bory) J. Sm.

1 - Light brown rhizome scales scarious transparent, ciliate with irregular long thin prolongations; no pseudonerve

... .. *laurentii* (Christ ex De Wild. & Durand) Hieron. (2)

1 - Castaneous to ferrugineous rhizome scales not transparent, with a firm black pseudonerve and short marginal hair-teeth

... .. *volkensii* Hieron. (3)

(2) *Drynaria laurentii* (Christ ex De Wild. & Durand) Hieron., in Engler, Pfl. welt Afr. 2 : 57 (1908).

See fig. 11 in ALSTON 1959 : 47.

*Synonyms:* *Polypodium propinquum* Wall. ex Mett. var. *laurentii* Christ ex De Wild. & Durand, in Ann. Mus. Congo, Bruxelles, Bot. sér. 2, 1 : 70 (1899). See PICHI SERMOLLI 1977b : 70.

*Polypodium propinquum* Wall. ex Mett. var. *intermedium* De Wild., in Ann. Mus. Congo, Bruxelles, Bot. sér. 5, 1 : 6, t.3 (1903); fide PICHI SERMOLLI 1977b : 72.

Rhizome thick and succulent (1 - 2.5 cm in diameter), sparsely branched, creeping, with well-spaced fronds, densely paleate with loose masses of ovate-



oblong to linear slender scales, these up to 12 x 1.5 mm, long-tapering apically, composed of thin-walled concolorous cells except for the dark centre of the peltate base; scale margins long-ciliate with delicate flexuose prolongations borne mainly toward the apex. Humus-collecting sterile leaves sessile, 13 - 23 x 5 - 11 cm, concave, ovate in outline, cordate at base, shallowly or deeply cut into obtuse or acute lobes, scarious-rigid to papery and long persistent; veins very prominent. Normal fronds herbaceous, stalked, stipe 5 - 18 cm long, winged throughout or only toward the lamina. Lamina reaching about 60 x 30 cm, ovate-oblong in outline, pinnatisect (nearly) down to rachis into linear, (sub)acute, pinna-like segments up to 18 x 2.5 cm, broadly attached, decrescent downwards, subcoriaceous, articulated to the hard rachis, falling away after maturity. Compound anastomosing nerves forming several rows of conspicuous areoles with smaller areoles included. Sori in one row on each side of and near the costa, without paraphyses. Spores finely spinose.

*Ecological notes:* Epiphyte on large upper branches of trees as well as on trunks closer to the ground, in evergreen forest at elevations between ca 300 and 2500 metres; liking open shade and full sun.

*Citations:* GUINEA 1960(?), "Ascensión al Pico de San Joaquín" (25/1/1947; see "En el país de los Bubis", 1949 : 163); ADAMS, Rebola 300 - 400 m (see 1957 : 483); G & U. BENL FP 279, Basilé 450 m (27/12/1975), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP), S. Tomé, Príncipe, Gabon, Zaïre (holotype), Tanzania, Uganda, Rwanda, Ethiopia.-Tropical Africa.

(3) *Drynaria volkensii* Hieron., in Bot. Jahrb. 46 : 393 (1911).

See fig. 21 in SCHELPE 1973 : 66.

Rhizome stout, 1 - 1.5 cm thick, long-creeping with spaced fronds; scales ca 6 - 8 x 2 mm, consisting of a basal peltate part with a dark brown centre of thick-walled cells and a linear upper portion tapering to a long point, with a pseudovein towards the base, at length turning black throughout; margins ciliate with short setaceous prolongations. Nest-leaves erect, (sub)sessile, 10 - 35 x 5 - 22 cm, broadly ovate or ovate-oblong in outline, cordate at base, with ovate-deltate lobes acute to obtuse, scarious, permanent; venation very conspicuous. Normal leaves erect to arcuate, stalked; petiole 10 - 18 cm long by 0.3 - 0.5 cm wide, scaly at base, winged in upper region. Lamina of firm herbaceous texture, attaining ca 70 (100) x 30 (40) cm, ovate-oblong in outline, pinnatisect almost to rachis into linear acuminate segments at most 23 x 4 cm, entire or subundulate, abscissile from the rachis, the sterile lower ones with abruptly broadened bases. Nerves branching and anastomosing to form regular major areoles enclosing fine minor ones. Sori (2 - 2.5 mm in diam.) borne superficially close to midrib; no paraphyses. Spores verrucose.

*Ecological notes:* Usually thriving on tree trunks and branches at the edges of secondary forests (400 to 2000 m alt.) and in old neglected cocoa plantations. In Malawi and Zambia found on rocks.

*Citations:* MANN 339, 390 m (1860), K; GUINEA 1958, "subida al Pico Serrano" (25/1/1947), BC; 1959. Moka "ascensión al Pico Serrano" (25/1/1947), MA; THOROLD TF 23, Bombe Estate near San Carlos ca 390 m, "epiphyte on old neglected native Cacao tree" (22/8/1951), BM; WRIGLEY & MELVILLE 429. Moka 1380 m, on trees 2 - 7.5 m up (1/9/1959), K; G. & U. BENL FP 162, Praderas de Moka on living fences 1230 m (28/1/1974), M; FP 315, Carretera de Valle Moka 1350 m (29/12/1975), M; FP 438, Pico 1260 m (6/1/1976), M; FP 554, Mte Baká 1460 m (15/1/1976), M; FP 580, between Residencias de Moka and Riasaca 1160 m (15/1/1976), M; FP 592, descent to Mioko Fountain 1370 m (17/1/1976), M; FP 611, Laderas de Moka 1320 m (17/1/1976), M. - Appears to be more frequent in the island than *D. laurentii*.

*Geogr. distribution:* Cameroon, Equatorial Guinea (FP), S. Tomé, Principe, Zaïre, Mozambique, Zambia, Malawi, Tanzania (holotype), Kenya, Uganda, Somalia, Ethiopia, Sudan. - Tropical African element.

#### BELVISIA Mirbel in Lam. & Mirbel

- (4) *Belvisia spicata* (L.f.) Mirbel in Lam. & Mirbel, Hist. Nat. Vég. 5 : 111 (1803).

*Synonymy:* see SCHELPE 1970 : 159.

Rhizome short-creeping, woody, coated with ovate-acute or lanceolate entire scales, these shortly acuminate, peltate at base, fuscous to black from the thick-walled central cells, pale at the thin edges. Fronds close-set, stipitate; lamina glabrous, subcoriaceous, elliptic-linear, usually 10 - 30 x 1 - 2 (3) cm, broadest about the middle, very gradually attenuate to the stalk; margins undulate; stalk firm, 1 - 4 (5) cm long, winged upwards, becoming reddish-brown and darkening at the base, articulate to the rhizome. Costa conspicuously prominent below, lateral veins and uniform areoles distinct or obscure. Distal part of the frond contracted to a spike-like portion 3 - 8 cm long and 0.2 - 0.4 cm wide, bearing acrostichoid sporangia on its lower surface, with the reflexed margins more or less protecting the sporangia. Paraphyses peltate as is characteristic of the *Pleopeltis* group.

At once distinguished by the abruptly delimited fertile apex of its fronds. PICHI SERMOLLI (1977a : 374) puts the genus *Belvisia* with the pleopeltidaceous ferns.

*Ecological notes:* Epiphyte or lithophyte occurring at about 600 - 900 m altitude, rare in Fernando Po. (In Mauritius we found specimens in several localities, with fronds up to 38 cm long.)

*Citation:* ADAMS, Pico north side 600 - 800 m (see 1957 : 483).

*Geogr. distribution:* Ivory Coast, Cameroon, Equatorial Guinea (FP), S. Tomé, Gabon, Zaïre, Rep. S. Afr., Mozambique, Zimbabwe, Tanzania; Madagascar, Mauritius (holotype), Réunion, Comoro Is, Seychelles. - Tropical Africa and its islands.

#### PHYMATOSORUS Pic. Ser.

(5) *Phymatosorus scolopendria* (N.L. Burm.) Pic. Ser., in Webbia 28 : 460 (1973).

*Synonymy:* *Microsorium scolopendria* (N.L. Burm.) Copel., in Univ. Calif. Publ. Bot. 16 : 112 (1929).

*Phymatodes scolopendria* (N.L. Burm.) Ching, in Contr. Inst. Bot. Nation. Acad. Peiping 2 : 63 (1933).

For further synonyms see SCHELPE 1977 : 123 - 124.

Rhizome firm, fleshy green (4 - 10 mm in diam.) or woody, very wide creeping, covered by linear-lanceolate to subulate-setaceous, peltately attached, clathrate scales up to 4 mm long, these more or less scattered, light to dark brown with (somewhat) paler borders bearing small ciliate projections, finally caducous leaving the rhizome bare and chalky-white except at apex. Fronds erect, ca 4 - 8 cm apart; stipe firm, articulate to rootstock, about 7 - 40 (70) cm long, smooth, unwinged, pale green turning glossy brownish-red. Lamina highly polymorphous, ranging widely in size and shape, 10 - 90 x 15 - 60 cm, ovate-deltate to oblong-lanceolate in outline, short-decurrent at base, (thin-)leathery, glabrous, slightly lobed or deeply pinnatisect into a variable number of subopposite ascending segments up to 18 x 3.5 cm, these linear to oblance-oblong, obtuse or acute, connected by a costal wing of 1.5 to 5 cm wide, forming a widely rounded sinus; the blade broad-lanceolate if undivided. Midrib and pinna-costae prominent, lateral veins often manifest beneath; the irregular venation abundantly areolate, areoles with copious free veinlets inside ending in hydathodes. Sori large, circular (2 - 3 mm in diam.) or elliptic, forming one or two rows in narrow fronds, several irregular series in broader fronds, (more or less) impressed in cavities with the upper surface raised wart-like opposite each sorus, from which the species is called Wart Fern in the U.S.A. Small hair-like paraphyses present, sometimes enlarged at top.

*Ecological notes:* A very common and extremely variable hardy climber mainly in the lowland, this fern is frequent on trees (with preference for mature oil palms) and rocks in second growth and fringing forest, also settling on earth; it enjoys a wide range of habitats in full sun or shade, colonizing dry stone walls around villages and even bare lava, from near sea-level upwards to about 1200 m elevation.

*Citations:* VOGEL 172 (11/1841), K; 1024 (8/1842), B; BARTER s.n. (6/1857), K; MANN 128 (12/1859), K; s.n. (1860), BM; BRADLEY GREGORY

s.n. (1874), BM; MILDBRAED 6916, Bokoko (10/1911), B; 6957, Bokoko (10/1911), B, HBG; GUINEA 1394, "Musola, praderas sobre lavas" (13/1/1947), MA; THOROLD TF 25, "Bombe Estate near San Carlos" ca 390 m (8/1951), BM; ESCARRÉ 3645, Playa de Carboneras (2/1965), BC; 3646, Playa de Ureka (3/1965), BC; 3656, Basilé (4/1965), BC; 3677, Cophoatá (6/1965), BC; G & U. BENL FP 5, Playa de Carboneras (16/1/1974), M; FP 320, Maule 330 m (31/12/1975), M; FP 529, Río Bichibi 15 m (14/1/1976), BC, FR, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP), S. Tomé, Príncipe, Congo(?), Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Tanzania, Zanzibar, Uganda, Ethiopia, Sudan; Madagascar, Mascarene Is, Comoro Is, Seychelles. - Widely distributed in the Palaeotropics (holotype from India).

*Nomenclatural note:* As shown by MORTON (Amer. Fern J. 60 : 125. 1970) the generic name *Phymatodes* C. Presl (1836 : 195) adopted by many authors is illegitimate.

#### MICROSORIUM Link

(6) *Microsorium punctatum* (L.) Copel., in Univ. Calif. Publ. Bot. 16 : 111 (1929).

*Synonymy:* see SCHELPE 1970 : 156, 1977 : 121 - 122.

The rather short-creeping rhizome stout, fleshy or woody, up to 1.5 cm in diameter, with abundant woolly rootlets holding debris; scales sparse, ovate to lanceolate, peltifixed, ca 3 mm long, clathrate in the centre with thick lateral cell-walls dull-brown to black, toothed or lacerate with prolongations on the paler margin, caducous. Fronds rather close together, 30 - 70 (90) x 4 - 7 (9) cm, broadly linear-lanceolate or oblanceolate-elongate with an acute or blunt apex, broadest above the middle, sometimes sessile and somewhat auriculate at the base, sometimes gradually attenuate into a short thick stipe appearing more or less winged; glabrous, (thin-)leathery. Midrib very prominent on lower surface, lateral main-veins reaching the margin, but all veins indistinct in living condition; venation reticulate with 5 - 8 rows of copious fine areoles including free veinlets ending in hydathodes, easily visible in dry state. Sori minute, abundant, superficial or semi-immersed, rounded (less than 1 mm in diameter), without paraphyses, occupying chiefly the apical region of the leaf undersurface across its entire width.

*Ecological notes:* This fern usually occurs as an epiphyte on trunks and branches, sometimes high up on forest trees, in open shade to full sun light, but is also lithophytic on rocks in low forest and even on modern lava flows (Cameroon Mt); from near sea-level to ca 1000 m altitude.

*Citations:* VOGEL s.n., K; BARTER s.n. (1857), K; BRADLEY GREGORY s.n., ca 150 m (1874), BM; GUINEA 2383, Ureka forest (15/2/1947), BM, MA; 2384, Ureka forest (15/2/1947), BC; 2385, l.c. (15/2/1947), MA; THOROLD TF 28, Laka (24/8/1951), BM; ESCARRÉ 3652, Ureka (3/1965), BC; G. & U. BENL FP 22a, Río Musola near mouth (19/1/1974), BC, M; FP 208, Río Mataro sea-level (14/12/1975), M; FP 505, Balea on the shore of the "Lago" 490 m (12/1/1976), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (Río Muni, FP, Annobon), S. Tomé, Príncipe, Gabon, Zaire, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Malawi, Tanzania, Zanzibar, Uganda, Ethiopia; Madagascar, Mascarene Is, Comoro Is. - Tropical Africa, Asia (holotype from China), Australia; Polynesia, Philippines.

*Nomenclatural note:* The genus name is usually spelt *Microsorium*, although it was published as *Microsorium* by LINK 1833 : 110 "both on that page and in the Index, and there seems no warrant for treating his spelling as an error" (SLEDGE 1960: 142, footnote). On the other hand LINK subsequently (1841: 116, 135) corrected the spelling himself, hence MORTON (Amer. Fern J. 60 : 126, 1970) recommends retention of the usual spelling.

#### PLEOPELTIS Humb. & Bonpl. ex Willd.

- 1 - Lower surface of the frond clothed with minute fimbriate scales dark in the centre, pale round the circumference. Rhizome scales light brown; stipes distant. Texture of frond subcoriaceous, veins immersed, not visible; sori superficial, often pulvinate

... .. *macrocarpa* (Bory ex Willd.) Kaulf. var. *macrocarpa* (7)

- 1 - Both surfaces of the frond glabrous. Rhizome scales dull brown to almost black, iridescent; stipes rather close set. Texture of fronds herbaceous, veins visible; sori (somewhat) sunk in cavities

... .. *excavata* (Bory ex Willd.) Moore var. *excavata* (8)

- (7) *Pleopeltis macrocarpa* (Bory ex Willd.) Kaulf. var. *macrocarpa*, in Berlin. Jahrb. Pharm. 21 : 41 (1820).

*Synonymy:* *Pleopeltis lanceolata* Kaulf., Enum. Fil.: 245 (1824).

For other synonyms see PICHI SERMOLLI 1965a : 353-354.

Rhizome wiry (ca 2 mm in diameter), branched and widely trailing, covered with peltate, lanceolate to lanceolate-acuminate scales ca 3 x 0.5 mm, these minutely lacerate, composed of thick-walled cells forming a dark centre and stripe, and thin-walled marginal ones. Fronds to 2.5 cm and more apart, stipitate. Stalk 3 - 5 (8) cm long, terete, slender, greyish-brown to straw-coloured, winged upwards, usually more or less paleaceous, articulate to the rhizome.

Lamina linear-lanceolate varying to lanceolate-elliptic, coriaceous, to 20 (28) x 1.8 cm in our material, shortly or gradually narrowed near base, subacute at apex, margins often somewhat inflexed; upper surface glabrous or provided with sparse paleae, the underside bearing numerous orbicular to ovate-lanceolate, appressed, peltate scales with expanded heads, less than 1 mm long, shorter than those on stipes. Midrib conspicuously prominent. The thick, subglobose sori (to 4 mm in diam. in our material) mostly in upper half of the blade, seriate, forming a row on either side of the midrib. Paraphyses stalked, peltate, clathrate, appearing similar to scales, covering the sporangia in young condition, soon deciduous.

*Ecological notes:* Established on tree trunks, stumps and moss-covered rocks from the upper lowlands through the montane forest belt up to the alpine belt (HEDBERG 1957 : 31), between 900 and 3600 metres. In Fernando Po mainly on isolated trees in the Moka area and in southern upland grasslands with their high rainfall; rolling up during a dry period, recovering fast in the rainy season.

*Citations:* GUINEA 1956, "ascensión al Pico Serrano" (25/1/1947), BM, K; 3006, Pico (1/3/1947), BC; ADAMS 1101, in mist forest above Moka 1500 m (9/12/1951), BM, GC, MA; 1123, near Lago de Biaó 1740 m (9/12/1951), GC; WRIGLEY & MELVILLE 433, Moka 1380 m (1/9/1959), BM, K; ESCARRÉ 3643, Pico 2400 m (4/1965), BC; 3644, Refugio del Pico (4/1965), BC; MALEST 2205, Lago Loreto (16/12/1967), BC; 2210, Valle Moka (16/1/1968), BC; G. & U. BENL FP 130, Praderas de Moka 1250 m (24/1/1974), FR, M; FP 542, Mte Baká 1470 m (15/1/1976), M; FP 582, between Residencias de Moka and Riasaca 1160 m (15/1/1976), M; FP 590, descent to Mioko Fountain 1380 m (17/1/1976), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Nigeria, Cameroon, Equatorial Guinea (FP), Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Somalia, Ethiopia; Madagascar, Mauritius, Réunion (holotype), Comoro Is, St. Helena, Tristão da Cunha. - Widely diffused in tropical and southern Africa with islands, tropical and subtropical America, India, Sri Lanka, Polynesia.

Variants with waved or irregularly sinuate fronds should belong to *Pleopeltis macrocarpa* f. *sinuata* (Sim) Schelpe (1969c : 96). *Pleopeltis macrocarpa* var. *trichophora* (Weath.) Pic. Ser. (1968a : 189) had been described from Mexico and Guatemala.

(8) *Pleopeltis excavata* (Bory ex Willd.) Moore var. *excavata*, Ind. Fil. : 347 (1857).

*Synonymy:* *Lepisorus excavatus* (Bory ex Willd.) Ching, in Bull. Fan Mem. Inst. Biol. 4 : 68 (1933).

*Pleopeltis preussii* (Hieron.) Tardieu, in Mém. Inst. Français Afr. Noire 28 : 217 (1953).

For more synonyms see SCHELPE 1969c : 97 - 98, 1977 : 118 - 119.

Rootstock firm, up to 3.5 mm in diameter, long-creeping, densely paleate with ovate-lanceolate, umbilicate, peltifixed, acuminate scales with metallic shine usually composed of central cells with thicker lateral walls and marginal thin-walled cells, ca 4 x 1 mm. Fronds (sub)aggregated, about 0.5 - 1.5 cm distant, stipitate; petiole 3 - 6 (8) cm long, greyish to brownish-green, with scales chiefly at base, resembling those on the rhizome, articulated to the rhizome. Lamina (linear-)lanceolate, membranaceous, 15 - 35 (42) x 1.5 - 4 cm, (shortly) cuneate into the stipe, more or less acute at apex, the prominent costa bullate-scaly. Nerves conspicuous on upper surface, more or less obscured below; free veinlets ending in hydathodes. Sori thick, borne in a row parallel with and near to costa, orbicular or slightly elliptic, ca 2 - 3 mm in diameter; when young almost completely protected by stalked peltate roundish paraphyses to 0.5 mm in diameter, dark in the middle, hyaline at the lacerate margin.

*Ecological notes:* This species was found epiphytic on trees in dense mist forest, on wooded and steep-sided stream-banks, on isolated trees in derived grassland of the southern upland, but also lithophytic on wet mossy stones in association with *Xiphopteris serrulata*; at 900 - 2550 m altitude in the island.

*Citations:* MANN 378, 1200 m, K; 449, 900 m (4/1860), K; GUINEA 2143, Moka - Concepción "Las Costeras" (28/1/1947), MA; ADAMS 1033, near Moka Falls 1260 m (7/12/1951), GC; 1050, Moka - Iladyi Falls 1200 m (8/12/1951), GC; 1091, Moka 1200 m (8/12/1951), GC; 1101 A, in mist forest above Moka 1500 m (9/12/1951), GC; 1106, near Lago de Biaó 1710 m (9/12/1951), GC; 1122 & 1123A, l.c. 1740 m (9/12/1951), GC; WRIGLEY & MELVILLE 432, Moka 1380 m (1/9/1959), BM, K; 433 A, Moka 1380 m (1/9/1959), BM; ESCARRÉ 3655, Refugio del Pico (4/1965), BC; 3678, "sin localidad" - frond length up to 45 cm! - (1965), BC; G. & U. BENL FP 127, Río Iladyi above the Falls 1180 m (24/1/1974), G, M; FP 165, Praderas de Moka, Gaesa 1230 m (28/1/1974), BM, G, GZU, M, Hb. Pic. Ser.; FP 179, Río Iladyi stream bed 1180 m (28/1/1974), M; FP 361, Pico 2550 m (2/1/1976), BC, FR, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Nigeria, Cameroon, Equatorial Guinea (FP, Annobon), S. Tomé, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Somalia, Ethiopia, Sudan; Madagascar, Mascarene Is (holotype), Comoro Is. - The taxon has a wide distribution throughout the Old World tropics and wet subtropics.

*Taxonomical note:* A study of the complete material collected in Fernando Po supports SCHELPE's view (1969c : 98) that the variation and intergradation of the distinguishing features within the *P. excavata* complex "precludes the recognition of any distinct species among the tropical African members of this complex".

There are two varieties in India: *Pleopeltis excavata* (Bory ex Willd.) Moore var. *mortonianus* (Bir & Trikha) Benl comb. nov. — Basionym: *Lepisorus excavatus* var. *mortonianus* Bir & Trikha, in Amer. Fern J. 64 : 56 (1974) —, and *Pleopeltis excavata* (Bory ex Willd.) Moore var. *himalayensis* (Bir & Trikha) Benl comb. nov. — Basionym: *Lepisorus excavatus* var. *himalayensis* Bir & Trikha, in Amer. Fern J. 64 : 58 (1974) —.

#### ANAPELTIS J. Sm.

- (9) *Anapeltis lycopodioides* (L.) J. Sm., Cat. cult. Ferns : 6 (1857) var. *owariensis* (Desv.) Benl comb. nov. et stat. nov.

*Basionym*: *Polypodium owariense* Desv., in Mag. Ges. Naturf. Freunde Berlin 5 : 314 (1811).

*Synonymy*: *Anapeltis owariensis* (Desv.) J. Sm., Ferns Brit. & For.: 86 (1866).

*Microgramma owariensis* (Desv.) Alston, in Bol. Soc. Brot. 30 (2. ser.) : 20 (1956).

*Microgramma lycopodioides* auct., non Copel.

Small fern with a long-creeping, branched, soft rhizome, 1 m or more in length, 2 - 3 (5) mm in diameter, clad in densely imbricate, peltate, lanceolate scales ca 6 mm long, these narrowed to a hair-like tip, entire, reddish-brown to ferruginous turning pale with age, composed of thin-walled cells darker toward the middle. Fronds arising singly, ca 1 to 5 cm apart, simple, smooth, sessile or short-stalked, consistently dimorphic when mature, the fertile fronds being linear contracted and longer than the sterile ones, all deciduous. Stipe 0.3 - 1 cm long, winged, articulated to the rhizome; blade thickly coriaceous, completely glabrous on upper surface, with a few scattered scales beneath mainly on the costa, margin entire. Lamina of sterile fronds suborbicular to ovate or obovate, 1.8 - 3.3 x 1.5 - 2.2 cm, or oblong to elliptic, 3.2 - 8.3 x 1.3 - 2.5 cm, margin repand and usually slightly decurrent. Midrib prominent on underside, especially near base; the highly complex and very inconstant venation angularly and arcuately anastomosing, clearly visible in our material on both surfaces of dried leaves, more or less obscured in fresh material: forming next to midrib a row of large, elongate, oblique areoles (including several smaller ones) between main-lateral veins and 2 (3) rows of areoles outward, most of them with enclosed veinlets forked or ending in hydathodes; a narrow range of irregular areoles bordering margins. Blade of fertile fronds linear-lanceolate, mostly acute, (strongly) narrowed toward base and apex, (3.5) 5 - 12.7 x 0.5 - 1.2 (2.2) cm in mature state, the edges often bluntly undulated and somewhat recurved, its venation relatively simple and often obscured in fresh leaves. One row of rather large, slightly impressed, rounded sori (2 - 2.5 mm in diameter), 7 to 25 each side of the costa, with filamentous more or less branched paraphyses.



*Ecological notes:* A common fern in the lowlands of Fernando Po as on the west African continent; usually epiphytic in open shade mostly throughout secondary forest areas, near the coast also on rocks and stone walls; often on oil palms.

*Citations:* BARTER s.n. (1859), BM; THOROLD TF 30, Laka ca 150 m (24/8/1951), BM; G. & U. BENL FP 206, Río Consul "Waterfall" in Malabo ca 10 m (14/12/1975), BC, M; FP 221, Malabo 10 m (16/12/1975), M, YA; FP 255, Highway Malabo - Airport Km 2 - 3 ca 10 m (23/12/1975), G, M; FP 276, Basile 500 m (27/12/1975), M; FP 520, "Pantano del Km 35" of Western Highway Malabo - Luba 10 m (14/1/1976), BC, G, GC, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria (holotype), Cameroon, Centr. Afr. Rep., Equatorial Guinea (FP, Annobon), S. Tomé, Principe, Gabon. - A native of Western Africa.

*Taxonomic and nomenclatural notes:* Whilst the typical West African form is distinguished by strongly dimorphous fronds, the true American *Anapeltis lycopodioides* (L.) J.Sm. var. *lycopodioides* which occurs also in southern Africa (Zaire, Mozambique, Zimbabwe, Zambia; see KORNAŠ 1974: 716) shows isomorphic fronds which are roundish or lanceolate, ranging between 2.8 and 21 cm in length, 0.5 and 4.5 cm in breadth when soriferous. But there are weakly dimorphic transitional specimens and "a clear distinction at specific level has not been found possible" (SCHELPE 1969c : 101).

COPELAND (1947) united the genera *Anapeltis*, *Microgramma* and *Craspedaria* into one under the name of *Microgramma*; but PICHI SERMOLLI (1977a : 376) points to the distinctive features of the three genera which concern the type of venation, the shape of sori, the paraphyses etc.

KUNKEL (1962 : 37) described a f. *nana* of Liberia.

## Family GRAMMITACEAE

### XIPHOPTERIS Kaulf.

- 1 - Apical subentire fertile portion of fertile fronds different from the lower sterile part

... .. *serrulata* (Swartz) Kaulf. (1)

- 1 - Fronds uniformly pinnatifid or pinnate-pinnatifid for their whole length

- 2 - One sorus per segment. Fronds to 6 (-9) cm long

... .. *oosora* (Baker in Henriq.) Alston var. *oosora* (2)

- 2 - Up to eight sori per segment. Fronds longer than 9 cm
- 3 - Rhizome long-creeping, fronds at intervals. Upper surface of lamina glabrous. Soral paraphyses present  
... .. *flabelliformis* (Poiret) Schelpe (3)
- 3 - Rhizome short, fronds tufted. Lamina villous. Sori without paraphyses
- 4 - Lamina membranous, gradually narrowed below, rachis black; soft light brown hairs to 1 mm long  
... .. *cultrata* (Bory ex Willd.) Schelpe (4)
- 4 - Lamina coriaceous, abruptly decrescent below, rachis obscure; bristle-like dark hairs to 3 mm long  
... .. *villosissima* (Hooker) Alston subsp. *villosissima* var. *villosissima* (5)

We are following SCHELPE (1969a : 2) in recognizing *Xiphopteris* as a genus distinct from *Grammitis* (cf. COPELAND 1951 : 94; MORTON, in Amer. Fern J. 60 : 123-124. 1970) and including *Ctenopteris* within *Xiphopteris*. (See also COPELAND 1956 : 381; PICHI SERMOLLI 1964 : 14.)

CHING (1940 : 264) established the Grammitaceae restoring Presl's tribal name, and HOLTUM (1947 : 128) used the etymologically corrected name Grammitidaceae. PICHI SERMOLLI (1970 : 242) points to the priority of the original spelling (see also COPELAND 1951: 97, footnote).

(1) *Xiphopteris serrulata* (Swartz) Kaulf., Enum. Fil. : 85, 300 (1824).

*Synonymy*: see SCHELPE 1970 : 144; KRAMER 1978 : 137.

Rhizome 0.2-0.5 mm in diameter, partly upright, elongate to 5 cm; rhizome scales deltate-lanceolate to lance-ovate, (yellowish)-brown to cinnamon, delicate with thin-walled cells, 1.5 - 3.5 mm long, deciduous. Fronds numerous, tufted, imbricate-ascending, linear in outline, 4.5 - 6.5 (10) cm long and ca 1.5 mm wide in our area, firmly thin-leathery, bright green becoming greyish, glabrous throughout, subdimorphic: sterile ones shorter, stalkless, the lamina evenly toothed all along with acute, decurrent lobes. Fertile fronds longer, the lamina separated into an upper soriferous part of variable length (1 - 5 cm) by 1 - 2 mm across with margins sinuate to subcrenate, often falcate-incurved, flat or becoming folded thus protecting the sori, and a lower sterile part of the blade 0.5 - 1.5 mm across, remotely serrate about halfway to midrib, or slightly serrulate, gradually attenuate to a long stipe-like base, lobes 15 -30, triangular-acute, long-decurrent, each with a conspicuous simple oblique vein. Sori elongate, up to 8 in a double line close to the midrib of the extremity, soon confluent. Sporangia non-setose.

*Ecological notes*: Recorded from the island as an epiphyte on trees in open shade; we gathered terricolous specimens from dense colonies on mossy stones, associated with *Pleopeltis excavata* var. *excavata* (BENL 1975 : 36).

*Citations:* MANN s.n., BM; ADAMS s.n., *Schefflera* mountain forest of the Pico "only from altitudes above 5000 ft." (see 1957 : 492); G. & U. BENL FP 175, Río Iladyi above the Falls 1180 m (28/1/1974), BC, BM, BOL, FR, G, GC, GZU, M, MO, Hb. Pic. Ser., YA.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Cameroon, Equatorial Guinea (Río Muni, FP, Annobon), Gabon, Zaïre, Rep. S. Afr., Zimbabwe, Madagascar, Mascarene Is. - West Indies (holotype from Jamaica), continental tropical and southern warm-temperate America; Hawaii, Galapagos Is.

This widely dispersed and fairly variable small fern belongs to the distribution type of "Tropical American - Tropical African Species" within the meaning of KRAMER (Amer. Fern J. 64 : 111. 1974).

(2) *Xiphopteris oosora* (Baker in Henriq.) Alston var. *oosora*, in Bol. Soc. Brot. 30 (2.ser.) : 26 (1956).

*Synonymy:* see SCHELPE 1970 : 143.

Rootstock erect or short-creeping, up to ca 1 mm in diameter; scales brown, ovate-lanceolate, more or less acuminate, 0.8 - 1.5 mm long, composed of thick-walled cells. Fronds tufted, upright, narrowly linear in outline, ca 4 - 6 (9) cm long and to 5 (6) mm wide, short-stipitate. Lamina subcoriaceous, glabrous on both surfaces, pinnate-pinnatifid into alternate patent segments, about 25 to 40 on either side, broadly adnate with somewhat acute sinuses, obtuse oblong (triangular) to deltate with longer decurrent lower sides, 2.5 (-3) mm long and to 2.2 mm broad in the middle of the blade, becoming smaller towards base and apex. Stipe attaining ca 5 mm long and 0.3 - 0.4 mm in diameter, initially short-pilose with pale brown jointed hairs of 0.5 mm long, finally glabrescent, the dark brown midrib bearing scattered hairs of the same kind beneath. Veins simple, short, terminating in a narrow-elliptic hydathode on upper surface. Sori single on each fertile segment, submedial, ovate to oblong, ca 1.5 x 1 mm; paraphyses absent. Sporangia non-setose.

This species, which is rare in the island, is easily recognized by the solitary sorus on each fertile segment.

*Ecological notes:* Usually epiphytic on trunks of trees in the montane zone (scarcely below 1500 m altitude), often hidden amongst a dense cover of mosses.

*Citations:* NEWTON s.n., Pico 2800 m "on the stem of *Erica arborea*" (6/1895), K; ADAMS, *Schefflera* mountain forest of the Pico "only from altitudes above 5000 ft." (see 1957 : 492); G. & U. BENL FP 401, Pico 1800 m (4/1/1976), BOL, G, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Cameroon, Equatorial Guinea (Río Muni, FP), S. Tomé (holotype), Malawi, Tanzania; Madagascar. - Tropical regions in West and East Africa, Madagascar.

Var. *micropecten* C.Ch. with distant segments is endemic to Madagascar.

- (3) *Xiphopteris flabelliformis* (Poirot) Schelpe, in Bol. Soc. Brot. 41 (2.ser.) : 217 (1967).

*Synonymy*: *Xiphopteris rigescens* (Bory ex Willd.) Alston, in Bol. Soc. Brot.

30 (2.ser.) : 27 (1956), errore "nigrescens".

For further synonyms see SCHELPE 1970 : 143.

Rhizome usually wide-creeping, clad in greyish brown, metallic lustrous, broad-lanceolate acuminate scales up to 4 mm long, composed of thick-walled cells. Fronds more or less distant, distinctly stalked. Stipe to 12 cm long, rigid, light to blackish brown or dark violet, up to 1 mm thick at base, slightly winged. Blade linear-lanceolate in outline, 8 - 15 (-20, -35) cm long and (0.5) 1 - 1.5 (2) cm wide, contracted slowly to both base and apex, glabrous or nearly so, (sub)coriaceous; pinnate-pinnatifid into ca 25 - 40 (60) obtuse oblong to quadrate, broadly adnate alternate lobes, up to 6 mm long and 3 mm wide, reduced downwards. Rachis and stipe glabrous or with sparse brown hairlets. Veins pinnate, ending in a conspicuous hydathode on upper surface, lateral veinlets hardly visible. Sori usually 1 to 6 per segment, intramarginal, roundish, set with light ferruginous to black filamentous paraphyses which are very conspicuous at times; sori at first solitary, finally more or less confluent. Sporangia non-setose.

Remarkable for its long-creeping rhizome densely clothed with iridescent scales; the elongate blade is sometimes pendulous.

*Ecological notes*: A fern of high African mountains (1850 - 4000 m altitude, HEDBERG), epiphytic on tree stems and similar positions, occasionally on rock faces or on mossy ground; also found on bare lava.

*Citations*: MANN 361, 1300 m (1860). K; BOUGHEY s.n., "Peak, Summit", BM; ESCARRÉ 3664, Pico 2100 m (4/1963), BC; G. & U. BENL FP 364, Pico 1700 m (4/1/1976), M.

*Geogr. distribution*: Cameroon, Equatorial Guinea (FP), Zaïre, Rep. S. Afr., Mozambique, Zimbabwe, Zambia(?), Malawi, Tanzania, Kenya, Uganda, Rwanda, Somalia; Madagascar, Mauritius, Réunion (lectotype). - Jamaica, South America especially along the Andes.

- (4) *Xiphopteris cultrata* (Bory ex Willd.) Schelpe, in Bol. Soc. Brot. 41 (2.ser.) : 217 (1967).

*Synonymy* : *Grammitis cultrata* (Willd.) Proctor, in Rhodora 63 : 35(1961).

For more synonyms see SCHELPE 1970 : 143.

Rhizome inconspicuous, erect or (very) shortly creeping, invested with narrow, brownish, strongly ciliate scales up to 1 mm long. Fronds tufted, short-stalked; stipes slender, 0.5 - 2 cm long, pendent in larger fronds, chestnut- to blackish brown, hirsute with abundant pale brown spreading hairs to about

1 mm long. Lamina brownish green, thin-herbaceous to (delicately) membranous. linear- or oblong-lanceolate in outline, ca 10 - 15 x 1.5 cm (up to 45 - 60 x 3 - 4.5 cm in American material), pinnate or deeply pinnatisect, gradually tapering below, more or less abruptly contracted to the apex; densely pilose on both surfaces with fine, (light) brown hairs as on stipe and rachis, hairs longest at the margins, often clustered. Rachis filiform, flexuose. Segments (about 15 to 30 in African specimens) alternate, close or distant, ovate-oblong to subacute, 6 - 8 mm long and 2 - 3 mm wide at the adnate base, unequal-sided with the inferior edge shortly decurrent; lowest lobes reduced, apical one minute. Costa subflexuose, visible, pinnately branched to 2 - 7 pairs of simple veinlets, these somewhat concealed. Sori circular, one to eight per lobe in a single row on each half of segment, medial or nearer to costa; paraphyses absent. Sporangia setulose with long whitish hairs.

The species is widely variable in size but is quickly recognizable by its thin-textured fronds soft-hairy throughout with silky hairs ca 1 mm long.

*Ecological notes:* Colonial on tree trunks in lower rain forest, sometimes saxicolous.

*Citations:* MANN 337, Pico ca 1000 m (1860), K; s.n., BM; MILDBRAED 6361, above Basilé 600 - 800 m (16/8/1911), B, HBG. - Seems to be rare in Fernando Po.

*Geogr. distribution:* Cameroon, Equatorial Guinea (FP), S. Toiné, Zaïre, Malawi; Madagascar, Mascarene Is, Seychelles. West Indies (holotype from Jamaica), continental tropical America.

*Nomenclatural note* concerning the correct specific epithet (*cultrata* against *elastica*): see MORTON & LOETSCHERT, Contribución a la Flora de Pteridófitas de Centro America. - Comun. Inst. Trop. Invest. Cient., El Salvador, 7 : 37 - 38 (1958); also MORTON 1967b : 107.

(5) *Xiphopteris villosissima* (Hooker) Alston subsp. *villosissima* var. *villosissima*, in Bol. Soc. Brot. 30 (2.ser.) : 27 (1956).

*Synonymy:* see SCHELPE 1970 : 142.

Rootstock stout (1.5 mm in diameter), erect or short-creeping, bearing densely crowded, linear-subulate, pale brown scales ca 4 mm long, these thin-walled, papery, glandulous. Fronds (sub)tufted, long-stipitate. Stipe up to 10 (15) cm long, attaining (in our collection) the length of the blade, up to 0.8 (1.8) mm thick, greyish brown, sometimes geniculate, patent-villous with numerous stiff dark ferrugineous or chestnut-coloured hairs ca 3 mm long. Lamina thick-textured, light to dark green becoming brownish, oblong-lanceolate in outline, 6 - 20 (40) x 2 - 4 cm, pinnate-pinnatifid into ca 20 - 30 segments each side (in our area), more or less densely clad on both surfaces with hairs as the stipe, hairs usually denser beneath than above. Rachis concolorous with the segments. These close, patent, ovate or (linear-)oblong, obtuse or subacute, up to 1.5 cm long

from a broad decurrent base. Veins invisibly subpinnate or twice forked. Sori subglobose, up to 6 pairs per lobe, in two rows; paraphyses absent. Sporangia non-setose.

Distinguished by its clearly stipitate, coriaceous fronds clothed throughout with dark stiff hairs ca 3 mm long.

*Ecological notes:* Colonising moss-covered branches of trees and dead tree trunks especially in the montane zone, at elevations between 1400 and 2200 metres.

*Citations:* MANN s.n. (1861), K; NEWTON s.n., Pico 2000 m (6/1895), K; MILDBRAED 7146, Pico above Basile 1900 - 2000 m (11/1911), B, HBG; ESCARRÉ 3627, Refugio del Pico (4/1965), BC; G. & U. BENL FP 402, Pico 1800 m (4/1/1976), BOL, G, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Cameroon, Equatorial Guinea (Rio Muni, FP), S. Tomé, Gabon, Zaïre, Malawi, Tanzania. - Type from "West Africa".

The Madagascan and Mascarene *Polypodium subpinnatum* Baker is treated by SCHELPE (1969a : 8) as *Xiphopteris villosissima* subsp. *subpinnata* (Baker) Schelpe. A var. *laticellulata* Benl (1976a : 152) from Cameroon Mt is distinct from the typical form by its constantly smaller and broader rhizome scales.

## Family LOXOGRAMMACEAE

### LOXOGRAMME (Blume) C. Presl

1 - Rhizome slender, long-creeping. Fronds usually 10 - 15 (25) x 1 - 2 cm  
... .. *lanceolata* (Swartz) C. Presl var. *lanceolata* (1)

1 - Rhizome stout, short-creeping. Fronds 30 - 35 (50) x 3 - 4 (7) cm  
... .. *lanceolata* var. *latifolia* (Bonap.) Benl (2)

The family was recognised by CHING in 1940, but its name was validly published only by PICHI SERMOLLI (1974/75 : 11). According to this author (1977a : 368) the fronds being non-articulated to the rhizome and the stomata structure (studied by COTTHEM 1970) indicate a relationship nearer to the Grammitaceae than to the Polypodiaceae. Cf. NAYAR, in *Taxon* 19 : 230 (1970).

(1) *Loxogramme lanceolata* (Swartz) C. Presl var. *lanceolata*, Tent. Pterid. : 215 (1836).

*Synonymy:* see SCHELPE 1970 : 149, 151.

Rhizome (to 5 mm in diam.) densely rooting, widely creeping, not wiry but clad with narrow-lanceolate hair-pointed scales up to ca 4 mm long, these ending in a gland cell, clathrate, dull brown from their thick lateral cell-walls; roots with a (reddish-)brown tomentum. Fronds simple, growing singly and well spaced (up to 5 cm apart), completely glabrous. Lamina in typical specimens at most 35 x 2.5 cm, normally much smaller, lance-shaped to narrowly elliptic with an acute point, margins mostly entire, tissue thickly subcoriaceous to somewhat succulent turning flaccid and curling up when dry, but expanding again in rain, tapering gradually down to a winged costa or a distinct, more or less compressed stipe 2 - 3 cm long, the latter bearing some scales as on the rootstock. Venation reticulate, forming numerous costal areoles, immersed; midrib raised on upper surface. The long linear coenosori obliquely subparallel with, or forming an angle of ca 15° to, the pale midrib, normally not or somewhat overlapping each other, reaching at most 2.3 x 0.4 cm, slightly sunk in grooves, becoming pulvinate when mature, mixed with filamentous, multicellular paraphyses.

*Ecological notes:* Mostly epiphytic, creeping on trunks and low branches of trees in deep shade or on stream-banks; sometimes lithophytic, forming mats on shaded rock faces. In Fernando Po reported from lowland and from mountain rain forest; we registered the fern on moist situations between 310 and 2090 m altitude. Rarely occurring on isolated trees in southern upland.

*Citations:* MANN 373, Peak 1000 m (1860), K; s.n. (1861), K; MILDBRAED 6390, Pico above Basilé 1100 - 1400 m (16/8/1911), B, HBG; 7015, above Musola ca 650 m (11/1911), B, HBG; ADAMS 1062, near Iladyi Falls 1080 m (8/12/1951), GC; 1085, Moka "epiphytic on tree trunk by rocky stream" 1200 m (8/12/1951), BM, GC, MA; 1156, Pico 1350 m (14/12/1951), GC; G. & U. BENL FP 68, above Moka-Malabo 1350 m (22/1/1974), FR, GZU, M; FP 285, above Rebola 310 m (27/12/1975), G, M; FP 302, Oloita 620 m (29/12/1975), BC, M; FP 357, Pico 2090 m (2/1/1976), G, M; FP 414, Pico 1600 m (6/1/1976), M; FP 504, Balea on the shore of the "Lago" 490 m (12/1/1976), M; FP 556, Mte Baká 1460 m (15/1/1976), M; FP 562, between Residencias de Moka and Riasaca 1190 m (15/1/1976), M; FP 591, descent to Mioko Fountain 1370 m (17/1/1976), G, M; FP 598, Mioko Fountain 1360 m (17/1/1976), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP, Annobon), S. Torné, Gabon, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Uganda, Somalia(?), Ethiopia, Sudan; Madagascar, Mauritius, Réunion (holotype), Comoro Is. - A typical Old World species widespread in tropical and subtropical Africa, also reported from India (Assam) and recently from the Western Himalayas (see DHIR 1980 : 116).

- (2) *Loxogramme lanceolata* (Swartz) C. Presl var. *latifolia* (Bonap.) Benl stat. nov.

*Basionym:* *Loxogramma latifolia* Bonap., Notes Ptéridol. 14: 334 (1923/24).

Differs from var. *lanceolata* in having a thicker, shortly creeping rootstock with dark scales, subtufted fronds of larger size, and sori more or less completely overlapping each other.

Among the ample herbarium material available we have found specimens intermediate between these two taxa, showing that none of the differential characters are completely constant and suggesting that varietal rank is most appropriate. Thus, for example, FP 312 has subtufted fronds up to 38 x 4.5 cm on a stout rhizome and the 3 cm long sori overlapping each other, but pale midribs and stipes (see TARDIEU-BLOT 1964a : 343). FP 572 has large fronds up to 47 x 4.5 cm, overlapping sori to 3.3 cm long, brownish midribs, deep brown stipes and blackish scales, but a slender rhizome (0.8 mm in diam.) emitting well-spaced fronds up to 3.5 cm apart. On the other hand, FP 414, which has 9 small fronds 15 - 25 x 1.3 - 2.3 cm, is a subtufted plant with dark brown stipes and sori overlapping each other even more clearly than in Bonaparte's holotype (P).

*Ecological notes:* Var. *latifolia* appears to be restricted to southern districts of Fernando Po with their higher precipitation; we saw it there growing epiphytic as well as terrestrial.

*Citations:* MELVILLE 624, Moka "epiphyte 6 ft up, in forest" 1365 m (19/9/1959), BM, K; G. & U. BENL FP 312, Carretera de Valle Moka 1160 m (29/12/1975), BM, M; FP 559, between Residencias de Moka and Riasaca 1200 m (15/1/1976), M; FP 572/1 & 2, between Residencias de Moka and Riasaca 1160 m (15/1/1976), BM, G, M.

*Geogr. distribution:* Ghana, Cameroon, Equatorial Guinea (FP), Zaïre (holotype), Angola, Uganda.

Apparently there are other infraspecific taxa of *Loxogramme lanceolata*, as suggested by ALSTON (1959 : 48); see also PICHI SERMOLLI in Bot. Notiser 117 : 14 (1964). One of them is represented by Pic. Ser. 6746 from Ethiopia, remarkable for its long rhizome scales, hair-like and pseudociliate in their distal half, with a striking metallic shine; it seems to approach BAKER's "*Gymnogramme abyssinica*" in Syn. Fil. 1874 : 517, cited by PICHI SERMOLLI, l.c.

TARDIEU-BLOT (1960 : 119) described a f. *nana* from Madagascar.



## Family DAVALLIACEAE

## DAVALLIA J. Sm.

*Davallia chaerophylloides* (Poiret in Lam.) Steudel var. *chaerophylloides*, Nom.  
Bot. Crypt. : 146 (1824).

*Synonymy*: *Davallia vogelii* Hooker, Spec. Fil. 1 : 168 (1846).

For more synonyms see SCHELPE 1977 : 133.

Rhizome dorsiventral, rather stout (about 1.5 cm in diameter), elongate, becoming woody, very densely set with crowded subulate paleae, these to 8 mm long, peltate at the broadened base (ca 3 mm), continued into a long hair-like tip, with a ferrugineous to blackish-brown centre and paler, distinctly ciliate margins. Fronds borne in two scattered ranks, remote, stalked, soon arching to pendent. Stipe firm, wiry, straw-coloured to medium- or reddish-brown, glabrous with basal scales only when young, channelled, up to 45 cm long, jointed to the rhizome a short distance above attachment. Lamina light green, herbaceous to firmly (sub)coriaceous, decompound and finely dissected, broad-deltate to ovate in outline, reaching 60 (70) x 40 (50) cm, 3 - 4(5)pinnate-pinnatifid. Pinnae remote, alternate, patent(-erect), with stalks up to about 5 cm, triangular to ovate-lanceolate in outline, the lowest attaining 30 x 15 cm, upper ones decreasing in length and often more acute. Secondary pinnae about the same shape, petiolate in lower pinnae, pinnate or deeply pinnatifid into 5 - 7 pairs of short-stalked or decurrent, triangular to lanceolate-acuminate pinnules again divided into about 6 cuneate segments with 1 - 1.5 mm broad lobes, producing inframarginal sori terminal over veinlets, below a transverse sinus between two lobes. Rachis, pinna-costa and costules like the stipe, sometimes flexuose and somewhat winged towards apices. Veins pinnate, free, with false veins between veinlets. Indusia covering sori like a half-ovate, truncated, leathery brown cup or pocket ca 1 mm long, manifestly attached by base and sides, open upwards, exceeded by one or both of the horn- or tooth-like lobes (see TARDIEU-BLOT 1964b : 69, fig. 7,8).

The Davalliaceae s. str. are suggested to be an epiphytically adapted offshoot from the stock which gave rise to the tectarioid ferns (SEN, SEN & HOLTUM 1972 : 242).

*Ecological notes*: Usually found creeping on (fallen) trunks or in forks of tall trees, up to 6 m from the ground and often pendent, sometimes growing over rocks; near sea-level to 1400 m elevation.

*Citations*: VOGEL 106, K; BARTER 1465, "on oil palm" (6/1857), K; G. & U. BENL FP 47, Maule oil palm plantation 380 m (21/1/1974), M; FP 260, Basupú del Este ("Fishtown") 115 m (26/12/1975), BC, FR, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP, Annobon), S. Tomé, Gabon, Congo, Zaire, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Tanzania, Kenya, Sudan; Madagascar (holotype), Mascarene Is, Comoro Is, Seychelles. - Widespread in forest regions throughout tropical and southern Africa including the islands.

Beside the typical form three varieties are known from Madagascar: *Davallia chaerophylloides* var. *bicornis* (C. Chr.) Tardieu, var. *stenochlamys* (C. Chr.) Tardieu, and var. *mauritiana* (Hooker) Tardieu.

## Family OLEANDRACEAE

### OLEANDRA Cav.

1 - Rhizome with scales appressed, acuminate. Stipe up to 5 cm long, mostly shorter. Lamina usually with an acuminate apex

... .. *distenta* G. Kunze var. *distenta* (1)

1 - Rhizome markedly squarrose, scales abruptly subulate to a long-pointed hair. Stipe up to 8 cm long. Lamina usually long-cuspidate

... .. *annettii* Tardieu (2)

The monotypic family was established by Ogura (1938 : 211), but the family name was validly published only by PICHI SERMOLLI (1965b : 745). The Oleandraceae exhibit a close affinity to the Davalliaceae.

(1) *Oleandra distenta* G. Kunze var. *distenta*, in Bot. Ztg. 9 : 347 (1851).

*Synonymy:* see PICHI SERMOLLI 1965b : 757 - 760.

Shoots slender, rope-like (to 5 mm in diam.) turning woody, extensively creeping, not dorsiventral, often bearing side-branches at irregular intervals in two alternating rows. Rhizome scales strongly appressed, narrowly imbricating, lanceolate long-acuminate, 4 - 7 mm long, rust-coloured to chestnut-brown attached by thick black-centred peltate bases to 1.5 mm wide, margins delicately ciliate to fimbriate with minute flexible hairlets when young; apical portion more or less caducous with age. Fronds simple, solitary, fairly close together or scattered and separated by up to 15 cm long leafless portions (developed by suppression of leaves), deciduous in dry season. Stipes about 1.5 - 5.5 cm long, almost cylindrical, not jointed to the rhizome but nodose-articulate at a distance of 0.2 - 2.5 cm from rootstock. The pedicels (called "phyllopodia") proximal to the point of

abscission persistent, the leaves being shed behind the rhizome apices in each dry period. Stipes smooth and polished throughout or subglabrous or provided mainly below the joint with abundant scales similar to those of the rhizome but smaller and sometimes completely deciduous. Lamina oblong-linear to -elliptic, (obtusely) acuminate, approximately 10 - 30 x 2 - 5 cm, light green in colour, thin-leathery to membranous in texture, bearing fine whitish, 1.3 mm long hairs profuse all over both surfaces and on the margins when young, entirely glabrous and satiny or rarely with caducous hairs (normally restricted to the underside) and with sparse caducous scales along the costa when adult; lamina (quickly) tapering to an acute or caudate apex sometimes deciduous with age, lower third occasionally remaining ciliate, base oblique or (roundish) cuneate, the cartilaginous margins entire, slightly undulate. Lamina free-veined; midrib very prominent beneath and grooved above, lateral veins simple or dichotomously divided, mostly near costa, spreading closely parallel to each other, almost perpendicular to midrib and ending in hydathodes which do not reach the margin. Sori superficial, round, near base of veins in a (sometimes very) irregular row on either side of and near the costa, protected by a reniform, persistent, brownish indusium, glabrous or glandular, ca 1.5 mm in diameter, affixed at its sinus, opened outside.

*Ecological notes:* This highly polymorphous, creeping or scandent fern occurs in very dissimilar habitats: hanging from trees in moist montane forests up to 2200 m altitude or tangling around the trunks of oil palms near sea-level, in deep shade or fully exposed to sun and sea-breeze, occasionally on rocky substrates or protruding from crevices. Seasonal leaf shed.

*Citations:* BARTER 1461 (6/1867), K; 1928, K; MANN s.n., K; ESCARRÉ 3650, "sin localidad" (1965), BC; G. & U. BENL FP 150, Pico 880 m (26/1/1974), FR, M; FP 244, Río Co, ca 20 m (21/12/1975), BC, GC, M; FP 263, Basupú del Este ("Fishtown") 120 m (26/12/1975), M; FP 281, above Rebola 270 m (27/12/1975), M; FP 319, near Maule on *Elzeis* 330 m (31/12/1975), M; FP 506, Balea on the shore of the "Lago" 490 m (12/1/1976), M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP, Annobon), S. Tomé, Príncipe, Gabon, Congo, Zaire, Angola, Rep. S. Afr. (isotype), Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Ethiopia, Sudan; Madagascar, Mascarene Is, Comoro Is, Seychelles. -Tropical and sub-tropical Africa and islands.

*Oleandra distenta* var. *welwitschii* (Baker in Hooker & Baker) Schelpe, 1968: 258, with a squarrose rhizome and gradually tapering scales, from Angola, Congo, Zaire and Zambia, had been treated by PICHI SERMOLLI (1965b : 764) as an independent species; see also KORNAŠ 1977 : 623 - 625, 1979: 112, HARMATA & KORNAŠ 1978 : 7 - 13.

(2) *Oleandra annetii* Tardieu, in Not. Syst. 14 : 332 (1952).

*Synonym: Oleandra distenta* var. *annetii* (Tardieu) Tardieu, in Not. Syst. 15 : 178 (1956).

Shoots long-creeping and subclimbing, sometimes yellowish-brown, densely squarrose-paleaceous; scales overlapping, narrowly deltate to subulate, up to 8 mm long, peltifixed with a broad dark brown to black persistent base to 1 mm wide, abruptly attenuate and excurrent into a long point with copious delicate, more or less twisted marginal appendages. Fronds 0.5 - 6 cm apart, up to 64 x 5.5 cm (in our material) including the complete petiole of up to 9.5 cm, but usually shorter; phyllopodia densely paleaceous reaching a length of 3 cm and a basal diameter of 4 mm. Lamina linear- to lanceolate-oblong, cuneate or oblique at base, acuminate to long-cuspidate at apex with a point 2 - 3 cm long, somewhat lustrous in texture. Costa usually scaly, markedly raised beneath, canaliculate above; nerves conspicuous, simple or free-forking mostly near their base. Occurrence of hairs and scales as variable as in the foregoing species: "All the intermediate stages from glabrescence to pubescence can be found in adult fronds" (PICI SERMOLLI 1965b : 760). Sori in two irregular series approximate to costa; indusium glabular when young.

The distinction between densely appressed-paleaceous and squarrose-paleaceous rhizomes has also been used as a key character in American species of *Oleandra* (e.g. MAXON 1914 : 393). We have not so far found any specimens which show an intermediate condition between appressed-paleaceous and squarrose-paleaceous rhizomes, among our available material (cf. KORNAŠ 1977 : 625). *O. distenta* and *O. annetii* can also be distinguished by differences in the size and structure of their spiny spores (see TARDIEU-BLOT 1952 : 333; BRAGGIO 1966 : fig. 2 & 5). For these reasons we agree with TARDIEU-BLOT (1964a : 107), PICI SERMOLLI (1965b : 763) and LETOUZEY (1968 : 118) in treating *O. annetii* as an independent species.

*Ecological notes:* As far as we can infer from the scant material available, *Oleandra annetii*, like *O. distenta*, shows great ecological plasticity. In one locality we found it growing with *O. distenta* var. *distenta*. In Cameroon it was gathered mainly from the litoral zone (see LETOUZEY 1968 : 118); in Fernando Po more collections come from higher regions.

*Citations:* MANN 364 (1860), K; MILDBRAED 6380, Pico above Basilé 800 - 1000 m (16/8/1911), B; GUINEA 1648, Finca de Marcelino Puente (20/1/1947; "En el país de los Búbis", 1949 : 145), MA, MO; G. & U. BENL FP 51, Maule oil palm plantation 380 m (21/1/1974), BC, M; FP 104, Loreto Crater 1070 m (24/1/1974), BM, BOL, M; FP 319a, near Maule on *Elaeis* 330 m (31/12/1975), M; FP 347, Pico 1620 m (2/1/1976), M; FP 422, Pico 1560 m (6/1/1976), BC, M, Hb. Pic. Ser.

*Geogr. distribution:* Cameroon (holotype), Equatorial Guinea (FP, Annobon), S. Tomé; Seychelles. - Only known so far from the Guinean area and from the Seychelles.

## Family NEPHROLEPIDACEAE

1 - Rhizome long-creeping; fronds distant. Stipes usually articulate

... .. *Arthropteris* J. Sm. ex J. D. Hooker

1 - Rhizome short, erect; fronds tufted. Stipes never articulate

... .. *Nephrolepis* Schott

The family name Nephrolepidaceae was given but not validly published by A. PONCE DE LEÓN (Rev. Soc. Cub. Bot., Habana, 10 : 39. 1953), to include only the genus *Nephrolepis*. PICHI SERMOLLI's Nephrolepidaceae (1974/75 : 8, 1978 : 115) consist of the genera *Arthropteris*, *Nephrolepis* and *Psammiosorus*. From LIEW's observation (1977 : 107) on spore structure *Arthropteris* is closer to *Oleandra* than to *Nephrolepis*.

## ARTHROPTERIS J. Sm. ex J. D. Hooker

1 - Apical pinna of frond (sub)similar to lateral ones; sterile pinnae entire. Stipe constantly articulate very near the rhizome

... .. *palisotii* (Desv.) Alston var. *palisotii* (1)

1 - Apical part of frond pinnatifid. Stipe not articulate near the rhizome

2 - Pinnae crenate with cretaceous white dots on upper surface. Stipe articulation indistinct or wanting

... .. *cameroonensis* Alston (2)

2 - Pinnae deeply pinnatifid. Stipe articulation distinct

3 - Stipe jointed in upper half. Up to 9 sori present on each lobe. Chalky-white dots often present on upper surface of the blade

... .. *orientalis* (J.F. Gmelin) Posth. var. *orientalis* (3)

3 - Stipe jointed in lower half. One sorus per lobe as a rule. White spots usually wanting

... .. *monocarpa* (Cord.) C. Chr. (4)

(1) *Arthropteris palisotii* (Desv.) Alston var. *palisotii*, in Bol. Soc. Brot. 30 (2.ser.) : 6 (1956).

*Synonymy*: *Arthropteris oblitterata* sensu C. Chr., Ind Fil. : 62 (1906), haud *Arthropteris oblitterata* (R. Br.) J. Sm.

For further synonyms see SCHELPE 1977 : 129.

Long-scandent fern with a very slender (1,5 - 3 mm in diam.) and widely twining, branched rhizome, clad in brown to ferrugineous hairs and —mainly towards apex— in peltifixed ovate to narrowly lanceolate scales, these approximately 1 - 2 x 0.2 - 0.5 mm, denticulate and often fimbriate, pale brown becoming dark brown to black, finally vanishing leaving black basal remnants.

Fronds (1.5) 3 - 7 (14) cm apart, simply pinnate throughout, 15 - 40 (48) x 5 - 6 (8) cm, subsessile or short-stalked. Stipe 0.3 - 3.5 mm long and up to 1 mm thick, yellow to light brown or reddish, articulate to a low "phyllodium" of ca 2 mm long which is densely paleaceous with scales as on the rhizome. Lamina lanceolate-ovate in outline, herbaceous to papyraceous in texture, constantly imparipinnate with 10 to 30 (40) alternate (sub)contiguous lateral pinnae and an apical one often somewhat longer and more acute. Lateral pinnae sessile or very shortly stalked, 1.5 - 3.5 (4.2) x 0.5 - 1.2 cm, oblique-oblong to trapeziform-obtuse, obliquely cuneate at their unequal-sided base, with a triangular auricle on the acroscopic side, the apex usually obtuse; margins of narrower fertile pinnae conspicuously crenate. Pinnae articulate to rachis, upper pinnae often dropping off, leaving a triangular remnant of the frond as is clearly shown by HARLEY (1957 : 47). Lower pinnae mostly reduced, deflexed. Rachis slightly winged, canaliculate above, densely tomentose with short reddish hairs on lower surface, glabrescent with age. Pinna-costa glabrous or hairy with simple hairlets as for rachis and stipe; lateral veins obvious, free, simple or forked, ending in hydathodes near margin. Sori round, 0.5 - 1 mm in diameter, terminal on the acroscopic branch of lateral veinlets, forming a row nearer to margin than to costa on either side; indusia round-reniform to -cordiform, more or less persistent.

*Ecological notes:* Climbing on trees in rain forest up to 8 metres above the ground, preferring humidity and full shade. In Fernando Po *Arthropteris palisotii* has been collected from sea-level up to about 1400 m altitude (ADAMS 1957 : 487); the largest specimens registered by us were twining around the buttresses of *Ficus* trees isolated in cocoa plantations (BENL 1975 : 19).

*Citations:* VOGEL 193 (11/1841), K; MANN 246 (1/1860), K; s.n. (1860), BM; MILDBRAED 6419, Pico above Basilé 800 - 1000 m (16/8/1911), B, HBG; GUINEA 648, "Bosque de la carretera de San Carlos, Km 35" (31/12/1946), MA; 649, l.c. (31/12/1946), MA, MO; 650, l.c. (31/12/1946), BC; 651, l.c. (31/12/1946), BM; G. & U. BENL FP 103, Loreto Crater 1020 m (21/1/1974), BM, M, Hb. Pic. Ser., YA; FP 210, Road to Basilé ca 20 m (16/12/1975), G, M; FP 225, Río Consul 60 m (17/12/1975), BC, GC, M; FP 262, Road to Basupú del Este ("Fishtown") 115 m (26/12/1975), G, GZU, M; FP 297, Oloita 620 m (29/12/1975), M; FP 497, Balea on the shore of the "Lago" 490 m (12/1/1976), FR, M.

*Geogr. distribution:* Senegal, Guinea, Liberia, Ivory Coast, Ghana, Nigeria (holotype), Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP), S. Tomé, Gabon, Congo, Zaïre, Angola; Madagascar, Comoro Is. - Tropical Africa, tropical Asia, Philippines.

In 1973 MORTON published *Arthropteris palisotii* var. *trichomanoides* (J. Smith ex Presl) Morton from the Philippines and Java; see Contr. U. S. Nation. Herb. 38 : 253.

(2) *Arthropteris cameroonensis* Alston, in J. Bot. 77 : 287 (1939).

*Synonym:* *Nephrodium punctulatum* Baker in Hooker & Baker, Syn. Fil.: 261 (1867).

Rhizome long-creeping, dorsiventral, 2 - 4 mm wide, soon becoming woody, its ebony black colour obscured by firmly appressed, imbricate, brown, fibrillose, peltate scales of variable shape and size, roundish or elongate, up to ca 3 x 2 mm, the smaller ones flat, the larger ones concave, with entire or minutely fimbriate margins, densely clad in light brown deciduous hairlets of ca 1 mm long. Fronds about 1 to 4 cm apart, stiffly erect, long-stipitate. Stipes black in lower portion, (dark) chestnut-brown higher up, sulcate with short upright hairlets in the furrow and with sparse peltate scales strongly appressed like those of the rhizome but smaller, finally becoming glabrous; stipe 16 to 38 cm long and 1.5 to 3 mm thick in our material, occasionally reaching length of blade; articulation more or less rudimentary. Blades pinnate, (long-)deltate or linear-lanceolate varying to narrowly elliptic-acuminate in outline, 15 (25) - 35 (50) x 11 - 14 (16) cm, yellowish- to light green turning dark brown when old, coriaceous in texture. Lateral pinnae in (12) 17 to 23 (25) pairs, alternate or opposite, sessile or very short-petiolate (up to 1.5 mm), clearly jointed to rachis, reaching 8.5 x 1.6 cm about the middle or towards base, lowest pinnae somewhat remote, sometimes reduced; base of pinna more or less unequal-sided cuneate, with the acroscopic side somewhat or not auricled; margins crenate to indistinctly sinuate-lobed. Terminal pinna triangular, reaching 5 x 2.3 cm, slightly to deeply lobed in lower portion, tapering to a caudate apex. Both surfaces glabrous except for the pinna-costa bearing minute upright hairs above like those on rachis and stipe, where the hairs are also restricted to upper side. Venation obvious, lateral veins in pinnate groups with 4 - 5 veinlets, ending above in hydathodes between costa and margin; hydathodes turning cretaceous white by calcareous incrustation. Sori numbering up to about 80 per pinna, mostly opposite to hydathodes, thus forming one to three irregular rows on each side of the costa distant from margins, finally more or less confluent; indusium reniform, persistent.

*Ecological notes:* This species shows particular preference for old degraded and for recent lava flows (see BENL 1976b : 209, 212), being frequently associated with *Nephrolepis pumicicola* Ballard.

*Citations:* GUINEA 1368, Musola "praderas sobre lavas" (13/1/1947), MO; 1370, l.c. (13/1/1947), BC; 1395, l.c. (13/1/1947), BM, MA; ADAMS 1083, Moka "creeping on rock in open grassland on hillside" 1220 m (8/12/1951; see 1957 : 488), BM, GC, MA; G. & U. BENL FP 55, old lava flow between Musola and Maule 730 m (21/1/1974), BC, G, M, Hb. Pic. Ser.; FP 341, l.c. (31/12/1975), FR, M, YA.

*Geogr. distribution:* Apparently restricted to a small volcanic area in West Tropical Africa: Cameroon (holotype), Fernando Po.

- (3) *Arthropteris orientalis* (J. F. Gmelin) Posth. var. *orientalis*, in Rec. Trav. Bot. Néerl. 21 : 218 (1924).

*Synonymy*: see PICHI SERMOLLI 1978 : 124 - 126.

Rhizome epiphytall or hypogaeous, very far-creeping or scandent, slender (to 3 mm thick), branching, greyish-brown turning ebenous, more or less covered with subappressed brown scales, these broadly obtuse-ovate, to 1.5 mm long, entire, peltate with a dark spot at the point of insertion, initially hairy but soon glabrous, darkening, deciduous. Fronds found at intervals of 0.5 to 20 cm, rarely clustered, up to 60 (90!) cm long, stiffly erect or arching. Stipe shorter or longer than the blade, brown, puberulous later glabrescent, with a joint at or above the middle where the leaf finally breaks off. Lamina ovate-lanceolate to lanceolate-oblong in outline, 25 - 40 x 7 - 17 cm, gradually tapering to an acuminate pinnatifid apex, often narrowed at base, subcoriaceous to herbaceous or papyraceous. Rachis straw-coloured becoming dark brown, densely hirsutulous with minute whitish hairs equally throughout or mainly above. Lateral pinnae 10 to 18 (24)-paired, ca 1.5 - 2.2 cm apart in lower half of blade, varying greatly in shape and size from oblong-attenuate to lanceolate or narrowly triangular, up to about 10 cm long and 2 cm across toward the middle when fully sized, truncated or broadly cuneate at their sessile, not clearly jointed base, minutely pubescent with short hairs on both surfaces especially on the costa, pinnae obliquely incised more than halfway down to costa into oblong, rounded or acute lobes of ca 6 - 9 x 2 - 3.5 mm, veins pinnate in the lobes with 3 - 4 simple or forked veinlets; pinnae often curling up in dry state. Basal pinnae opposite, apical ones alternate, the lowest sometimes reflexed. Sori roundish (ca 1 mm in diameter), up to 9 per lobe, uniseriate, borne halfway between costa and margin, terminal on veins from both sides of the costa. Indusium reniform, glabrescent, persistent.

As regards the calcareous incrustations of hydathodes see KORNÁŠ 1979: 114.

*Ecological notes*: Often reported as a terrestrial fern also creeping over the surface of rocks on hillsides; in Fernando Po almost exclusively observed as an epiphyte climbing on tress of fringing forest, from lowland to montane regions, often in very light and dry positions, generally avoiding moisture. The species was found as a pyrophyte by KORNÁŠ (1978 : fig. 6) in Zambia.

*Citations*: MANN s.n. (1860), BM, K; GUINEA 1135, "Trocha del Servicio Agronómico de Musola", SE of Musola (10/1/1947), BM, MA; ESCARRÉ 2022, Valle Moka (1/1965), BC; G. & U. BENL FP 101, Loreto Crater 990 m (21/1/1974), BM, GZU, M; FP 269, above Basupú del Este ("Fishtown") 240 m (26/12/1975), M; FP 316, Carretera de Valle Moka on roadside 1350 m (29/12/1975), BC, M; FP 576, between Residencias de Moka and Riasaca 1160 m (15/1/1976), FR, M.

*Geogr. distribution*: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (FP, Annobon), S. Tomé, Principe, Gabon, Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe,



Zambia, Malawi, Tanzania, Kenya, Uganda, Ethiopia, Sudan, Arabia (lectotype from Yemen); Madagascar, Mascarene Is. - Widespread in tropical Africa.

*Arthropteris orientalis* var. *humblotii* (Baker) Pic. Ser. is endemic to the Comoro Is; var. *subbiaurita* (Hooker) C. Chr. occurs in Madagascar and in the Mascarene Is.

(4) *Arthropteris monocarpa* (Cord.) C. Chr., Pterid., Cat. Pl. Madag. : 32 (1932).

*Synonym and typification*: see PICHI SERMOLLI 1978 : 129 - 130.

Rhizome slender, to 2 mm in diameter, long-creeping, greyish- to blackish-brown, more or less densely paleaceous with appressed brown scales, these sub-circular to broad-ovate, up to 1.5 mm long, fimbriate to subentire, peltate-based with a dark centre, softly pilose with vanishing light brown hairlets. Fronds widely (up to 25 cm) spaced, often arching, articulated near base of stipe, finally deciduous (see SCHELPE 1977 : t.23). Stipe to 18 cm long, light brown to blackish, bearing some scales near base and a short tomentum of whitish to reddish erect hairlets throughout, glabrate at maturity. Lamina lanceolate-oblong acute in outline, reaching 37 x 10 cm in our material; apical part (very) extenuate, ca 6 - 8 cm long, lobed in lower portion, crenate towards apex. Lateral pinnae 10 - 18-paired, subopposite or alternate, up to 7.5 x 1.5 cm; oblong(lanceolate), sessile with a broad equal-sided base, indistinctly articulate, deeply lobed to about half of their width, lobes roundish to narrowly oblong, entire, undulate, to 1 x 0.3 cm; texture thin-herbaceous or subcoriaceous, softer than in *Arthropteris orientalis*, finely puberulous with articulate hairs on pinna-costae, on midribs and veins of lobes especially on upper surface. Lowest pinnae reflexed and somewhat reduced. Rachis stramineous in fresh leaves, densely short-tomentose throughout with pale brown to whitish hairs. Sori usually one per lobe, terminal on the first acroscopic vein, roundish to ca 1.5 mm in diameter. Indusium reniform, membranous, sublacerate, glabrate or glabrous. The spores evidently larger than those of *Arthropteris orientalis* (see BRAGGIO 1966 : fig. 25 & 26).

*Ecological notes*: A mid-level, shade-loving epiphyte frequent in forest areas near permanent water, also ascending tree trunks from ground level upwards; sometimes lithophytic. Chiefly known from woodlands with high rainfall, ca 500 - 1800 m elevation in our island. Without pyrophytic habit (KORNAŠ 1978 : 383).

*Citations*: MANN 344, 450 m (1860), K; ADAMS 1060, Moka - Iladyi Falls "on rock in stream in open pasture" (8/12/1951), BM, GC, MA; WRIGLEY & MELVILLE 530, Moka 1380 m (2/9/1959), K; ESCARRÉ 3669, Refugio del Pico 1900 m (4/1965), BC; G. & U. BENL FP 37, between Maule and Parador de Musola 660 m (21/1/1974), M; FP 145, Pico 880 m (26/1/1974), M; FP 149, Pico 890 m (26/1/1974), BM, M; FP 277, Basile 500 m (27/12/1975), FR, G, M;

FP 300, Oloita 620 m (29/12/1975), G, M; FP 400, Pico 1800 m (4/1/1976) M, YA; FP 448, above Belebú-Balachá path to Ureka 730 m (8/1/1976), BC, M; FP 501, Balea on the shore of the "Lago" 490 m (12/1/1976), G, M.

*Geogr. distribution:* Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Equatorial Guinea (FP), S. Tomé, Príncipe, Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Ethiopia, Sudan; Madagascar, Réunion (neotype), Comoro Is. - Tropical African element.

### NEPHROLEPIS Schott

- 1 - Several tufted fronds from a perennial rhizome, never with tubers. Pinnae medium- to deep green, herbaceous to coriaceous
- 2 - Fronds suberect or arching, to ca 25 cm wide. Pinnae up to 40-paired in vertical plane, usually to 15 x 1.5 cm, without or with (very) small auricles. Sori opening towards lateral pinna-margin  
... .. *biserrata* (Swartz) Schott (1)
- 2 - Fronds stiffly vertical, to 4.5 cm wide. Pinnae up to 175-paired, horizontal, to 2.3 x 0.6 cm, clearly auriculate on acroscopic side; with lime dots. Sori opening towards pinna-apex  
... .. *pumicicola* Ballard (2)
- 1 - Solitary or few tufted fronds from an annual, very slender rhizome producing stolons with tubers persisting in dry season. Pinnae light to grass green, thinly membranous to papyraceous
- 3 - Fronds to 1.5 m long. Pinnae approximate to imbricate, narrowly triangular from a widely enlarged base auriculate on acroscopic side  
... .. *undulata* (Afz. ex Swartz) J. Sm. var. *undulata* (3)
- 3 - Fronds less than 30 cm long. Pinnae distinctly remote, triangular to ovate-oblong, obliquely truncate on basiscopic side of the hardly enlarged base  
... .. *delicatula* (Decne. in Jacquem.) Pic. Ser. (4)

(1) *Nephrolepis biserrata* (Swartz) Schott, Gen. Fil. 1 : sub t.3 (1834).

*Synonymy:* see SCHELPE 1977 : 125.

Rhizome erect, short, producing numerous slender stolons up to a metre or more long; rhizome scales present especially at apex, pale to reddish-brown shining, lanceolate attenuate to 2 mm long, sparingly ciliate or denticulate, hair-pointed. Fronds tufted, suberect to arching and pendent. Stipe stout, up to 50 (60) cm in length, densely paleate in juvenile leaves, with scales as on the rhizome, then glabrous and shining. Lamina oblong-lanceolate to narrow-elliptic in outline, to 2 m or more long, herbaceous or subcoriaceous, divided into about 40 pairs of alternate simple pinnae, these sessile or shortly petiolate, very narrow-oblong to lanceolate acuminate and curved towards apex, subequally

rounded to broadly truncate-cuneate at base or unequal with the acroscopic side more or less subauriculate and the basiscopic side rounded; lower sterile pinnae up to ca 5 cm apart, gradually more or less reduced, with margins entire or minutely serrate; fertile pinnae crenate, the crenations slightly serrate or with a small tooth between; all pinnae articulated to rachis, usually hirtellous on both surfaces with whitish to rufous hairs and often with small pale brown stellate-fimbriate scales, at least on costa. Veins free, once or twice forked, ending in hydathodes (rarely with lime spots) near margin. Rachis pale brown, finely fibrillose-scaly, glabrescent. Sori round, ca 1 mm in diameter, about 4 mm apart in a straight medial (to submarginal) line on either side of the costa; indusia (sub)orbicular, cordate when young, more or less peltately fixed, with a deep narrow sinus and contiguous lobes, persistent; sporangia protruding.

*Ecological notes:* This Sword-Fern, locally quite abundant in moist shady woods, is dominant as undergrowth in and near swamp forest at low to middle elevations, on the ground and on boulders, but also predominates on lava flows scarcely 60 years old (BENL 1976b : 210), even in sunny positions; as an epiphyte it occurs particularly in the leaf bases of oil palms in plantations. In Fernando Po it is found in abundance under coconut palms in the northern coastal zone; behind the *Raphia* swamps of the Boloko district (between Río Tiburone and Río Musola) plants with fronds of 2.7 m in length and with pinnae up to 19 cm long were registered.

*Citations:* BARTER s.n., BM; MANN s.n. (1860). BM; LOPE DEL VAL 242, Rebola (3/3/1939), MA; GUINEA 699, "Bosque Km 35 carretera S. Carlos" (31/12/1946), BC; 707, "Cafetal de la carretera de San Carlos, Km 35" (31/12/1946), MA; 745, "Bosque de la carretera de San Carlos, Km 35" (31/12/1946), BM; ESCARRÉ 3633, Bahia de Venus (2/1965), BC; 3634, Concepción (1/1965), BC; 3635, San Carlos (2/1965), BC; G. & U. BENL FP 3, Playa de Carboneras (16/1/1974), M; FP 251, Highway Malabo - Airport Km 2 - 3, ca 10 m (23/12/1975), M; FP 500, Balea on the shore of the "Lago" 490 m (12/1/1976), M.

*Geogr. distribution:* Senegal, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP, Annobon), S. Tomé, Príncipe, Gabon, Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Tanzania, Kenya, Sudan; Madagascar, Mauritius (holotype), Réunion, Comoro Is, Seychelles. - Pantropic.

(2) *Nephrolepis pumicicola* Ballard, in Kew Bull. 1955 : 467 (1956).

Rhizome upright, slender, paleaceous, to 15 cm long and 2.5 - 3 mm in diameter, with wiry stilt-like roots soon becoming woody like the rhizome; scales very close, long-subulate, tapering to curved, sometimes intricately curled hair-points, 3.5 - 5 mm long, uniformly light to medium-brown and ferrugineous except for the dark-centred, irregularly broadened base, turning blackish with age. Fronds strictly erect, imbricate, closely tufted, up to 12 or more in number,

attaining 1.3 m tall with stipes ca 20 cm long (in our material) and 2 - 2.5 mm in diameter at the base, stramineous to greyish-brown, initially clad in, later sparsely covered by, linear to hair-like subpeltifixed scales, these pale brown to whitish, resembling those of the rhizome but markedly decreasing in number and size towards the rachis. Blade narrowly sublinear, 1.5 to 4.5 cm broad (at maturity) near the middle, gradually attenuated towards base and apex, simply pinnate with up to 175 pairs of alternate, sessile, indistinctly articulate pinnae closely arranged except toward the base where much reduced, almost scale-like segments may be 1.5 - 2 cm apart; pinnae (lanceolate-)oblong to 23 x 6 mm, distinctly auriculate on acroscopic side of base, rather coriaceous in texture, usually glabrous on both surfaces or very sparsely fibrillose near/at the costa on underside; margins at first shallowly, in mature stages more distinctly crenate. Midvein flexuose, prominent and dark-coloured beneath when dry, lateral veins pinnate, mostly forked, with orbicular hydathodes on their endings turning cretaceous white. Rachis with a deep groove on upper side, with whitish, irregularly jointed hair-scales finally restricted to small tufts at the pinna-bases. Sori ca 1.3 mm in width, inserted about halfway between costa and margin, facing towards pinna-apex or slightly oblique. Indusium reniform or nearly so, its attachment becoming dark; sporangia protruding.

Before its description, the pumice-fern was erroneously cited as *Nephrolepis undulata* (Afz. ex Swartz) J. Sm., from which it is clearly distinguished by the key-features.

*Ecological notes:* *N. pumicicola* is a prime colonizer of fresh lava flows (see BENL 1976b : fig. 4), sprouting from cracks and crevices; this was especially observed on the Cameroon Mt, the only active volcano in West Africa, where the fern was registered up to 3700 m elevation. In Grand Comoro Island and in Réunion it is replaced by *Nephrolepis abrupta* (Bory) St. John; see BADRÉ & CADET, in Fern Gaz. 11 (1978) : fig. 3. In Fernando Po and S. Tomé the pumice-fern thrives on dense mossy, grassy, or marshy old lava ground, where it may display a luxurious growth completely taking possession of vast areas, locally dominating the whole vegetation or sporadically intermingled with *Arthropteris cameroonensis*. Oil palms in the neighbourhood of such habitats occasionally bear the pumice-fern as an epiphyte.

*Citations:* EXELL 827, Moka grassland "on the edge of the plateau" ca 1200 m (31/1/1933), BM; GUINEA 1243, Musola "orilla de la carretera, praderas sobre lavas" (11/1/1947), BM; 1244, "Musola borde de la carretera, praderas sobre lavas" (11/1/1974), MA, MO; ADAMS 1084, Moka "terrestrial among grasses in valley near stream" 1200 m (8/12/1951), BM, GC, MA; WRIGLEY & MELVILLE 500, "Lava flow hollow with 18 in. vegetation" (3/9/1959), BM, K; ESCARRÉ 2035, Lago Loreto (1/1065), BC; G. & U. BENL FP 54, old lava flow between Musola and Maule 750 m (21/1/1974; see BENL 1975 : fig. 8), BC, FR, M, Hb. Pic. Ser.; FP 96, Loreto Crater 980 m (24/1/1974), BC, M; FP 326, Valle Moka lava ground on roadside 1260 m (31/12/1975), G, M; FP 342, Pico 1620 m (2/1/1976), BC, M, YA.

*Geogr. distribution:* According to our present knowledge *Nephrolepis pumicicola* is restricted to the South West Province of Cameroon (holotype) and to the Guinea Islands of Fernando Po and S. Tomé. MANTON (in ALSTON 1959 : 79) cites Nigeria as a locality, but we could not find any reference for this.

(3) *Nephrolepis undulata* (Afz. ex Swartz) J. Sm. var. *undulata*, in Curtis Bot. Mag. 72, Comp.: 35 bis (1846).

*Synonymy:* see PICHI SERMOLLI 1978 : 117 - 118.

Annual with a shortly erect rhizome producing some wiry, sparsely scaly, often tuber-bearing stolons; the perennating tubers ellipsoid, 1.5 - 2.5 (3) cm long, densely paleaceous (like the leaf buds) when young, very easily detached. Fronds one to four or rarely more in a tuft, petiolate, upright to arching and pendulous. Stipe filiform, to 20 (35) cm long, mostly stramineous to yellowish-brown, glabrescent when fully sized except for brownish scales near the woody base, these narrow-lanceolate, hair-pointed, up to 4 mm long, similar to those of leaf buds and tubers. Lamina linear-elliptic to oblong-lanceolate in outline, attaining about 85 (120) cm long by 8 (10.5) cm wide, gradually narrowed from near middle towards base and apex, pinnate. Pinnae up to ca 70 pairs, alternate, (sub)sessile, articulated and deciduous, light to greyish green, mostly thinly papraceous in texture, with whitish hairlets especially on margins, costa and veins when young, (sub)glabrous on both surfaces when adult, widely auriculate at base (mainly) on acroscopic side, auricles distinctly covering parts of rachis or concealing it completely beneath; fertile upper pinnae ca 15 - 30 (50) mm long by 5 - 8 mm wide above the base, contiguous to imbricate, narrowly deltate to strongly falcate at times, base distinctly enlarged (to about 12 mm), margins crenate to serrate or sinuate-lobate with rounded lobes; sterile pinnae more or less distinctly differing in size and shape from fertile ones, ca 20 (-35) mm long by 9 - 12 mm wide, enlarged above the base to 16 mm, oblong-triangular, obtuse at apex, more distantly spaced; lowest pinnae slightly or markedly reflexed and reduced down to simple auricles. Costa prominent, often flexuose, dark; lateral nerves ca 6 - 10 (16) each side, simple or more often forked, not reaching margins, the thickened tips (more or less conspicuous hydathodes) often with a calcareous dot. Rachis fairly rigid, grooved, stramineous to light brown, glabrous or nearly so, with some hair-like, brownish to whitish scales about 2 mm long, especially at pinna-attachments. Sori reniform, crescent-shaped or roundish (ca 1.5 mm in diameter), up to 10 or more in one row on each side of the costa half-way to margin, terminating acroscopic branches of forked veins; the kidney-shaped membranous indusium attaching in its sinus and facing pinna-apex, persistent.

*Ecological notes:* This polymorphous plant (see PICHI SERMOLLI 1978 : 118) is also facultative in a wide range of ecological conditions, epiphytic as well as terricolous. Locally frequent in (seasonally) moist sites, on road-banks in the

lowland, in riverside thickets and on wooded stream-banks, on boulders on grassland, amongst rocks, upon old lava fields; it was found growing in oil palm and cocoa plantations. Occurring usually between about 1000 and 2500 m elevation it has been recorded in Fernando Po from 50 to 1700 metres.

*Citations:* VOGEL 127, Clarence, K; MILDBRAED 6326, Pico 1400 - 1500 m (16/8/1911), B, HBG; 6446, Pico above Basilé 800 - 1000 m "häufiger Epiphyt auf *Macaranga* bei ca 1000 m" (8/1911), B, HBG; 7021, woodland between Musola and Moka 600 - 1200 m, "häufiger Epiphyt auf *Allophylus*-Ästen" (11/1911), B, HBG; GUINEA 2541, Ureka forest (15/2/1947), MA; ADAMS 1026, Lago Loreto 900 m (6/12/1951), GC; 1031, near Moka "epiphyte on tree near stream" 1260 m (7/12/1951), GC; 1051, Moka - Iladyi Falls "epiphyte on rock in open field" 1200 m (8/12/1951), GC; WRIGLEY & MELVILLE 456, Moka (4/9/1959), BM, K; ESCARRÉ 2000, Cophoatá (6/1965), BC; 2020, Belebú-Balachá (3/1965), BC; 2044, Ureka (3/1965), BC; MALEST 2204, Lago Loreto (16/12/1967), BC; G. & U. BENL FP 121, forest along Río Iladyi above the Falls 1180 m (24/1/1974), M; FP 142, Pico 880 m (26/1/1974), M; FP 177, Río Iladyi ca 1180 m (28/1/1974), FR, M; FP 220, Road to Basilé 50 m (16/12/1975), M; FP 264, Road to Basupú del Este ("Fishtown") 120 m (26/12/1975), M; FP 287, below Laka 230 m (27/12/1975), M; FP 290, above Musola path to Belebú-Balachá 350 m (29/12/1975), BC, M; FP 295, l.c. 290 m (29/12/1975), M; FP 403, Pico on lava ground 1700 m (6/1/1976), BC, G, M; FP 409, Pico 1680 m (6/1/1976), M; FP 496, road to Balea 470 m (12/1/1976), M.

*Geogr. distribution:* Senegal, Guinea, Mali, Sierra Leone (holotype), Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Chad, Cameroon, Centr. Afr. Rep., Equatorial Guinea (Río Muni, FP), S. Tomé, Gabon, Congo, Zaïre, Angola, Rep. S. Afr., Mozambique, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Burundi, Rwanda, Ethiopia, Sudan; Madagascar, Comoro Is; Cape Verde Is. - Very common in tropical and South Africa.

From Madagascar a var. *aureoglandulosa* (Bonap.) Tardieu is known.

(4) *Nephrolepis delicatula* (Decne. in Jacquem.) Pic. Ser., in *Webbia* 23 : 181 (1968a).

*Synonymy:* see PICHI SERMOLLI 1968b : 275.

Annual from a (sub)erect short stock with sparse subulate scales, producing 4 - 5 or more thin stolons bearing ellipsoid to ovoid tubers about 1 cm long. Fronds one to three seldom four, very slender, short-stalked, soon pendent. Stipe filiform, 2.5 - 9 cm, greenish to stramineous, soon glabrous except for hair-like curled scales mainly near base. Lamina lanceolate-linear in outline, 10 - 35 x 2.5 - 4.5 cm, irregularly tapering to both ends. Pinnae up to 35-paired, articulated and deciduous, thinly membranous, glabrous or nearly so, not or faintly auriculate, scarcely overlapping the rachis, not or hardly concealing parts

of it (s. KORNÁŠ 1977 : fig. 2), truncate on the acroscopic and obliquely truncate on the basisopic side of the base, not or scarcely enlarged; mostly (sub)dimidiate with a blackish slightly zigzag midrib and with lateral veins (ca 6 forking pairs, ending in hydathodes and chalky dots) blackish at their base; all obviously spaced apart, never contiguous or imbricate, ca 5 - 8 mm distant in the middle of the blade, up to 18 mm distant below. Fertile pinnae narrowly triangular to falcate, 5 - 15 x 2.5 - 4 mm, sessile, margins shallowly crenate to obliquely lobate, apex (sub)acute, base strongly unequal-sided; sterile pinnae (in soriferous fronds) markedly fewer in number, ovate-oblong, ca 10 - 15 x 4 - 5 mm, the lower ones often shortly petiolate or sessile. Rachis filiform, subglabrous with a few short hairlets at pinna-attachments. Sori suborbicular, in unequal numbers (usually less than 6) on either side of costa, 1 mm in diameter; indusium smaller, reniform to lunate, persistent.

*Ecological notes:* Reported as a low-level epiphyte in shady woodland or in open humid situations; rarely lithophytic on moist rocks.

*Citations:* THOROLD TF 24, "on Cacao tree at Laka ca 120 m" (24/8/1951), BM; G. & U. BENL FP 328, Carretera de Valle Moka on roadside 1260 m (31/12/1975), M; FP 346, Pico on lava ground 1620 m (2/1/1976), M; FP 565, between Residencias de Moka and Riasaca 1180 m (15/1/1976), M.

*Geogr. distribution:* Guinea, Ghana, Cameroon, Equatorial Guinea (FP), Congo, Angola, Zimbabwe, Zambia, Tanzania. - Tropical Africa, tropical Asia (holotype from India).

*Taxonomical note:* *Nephrolepis delicatula* is a somewhat problematic species: KORNÁŠ (1977 : 623) reports on forms transitional to *N. undulata*; we too collected specimens which can be looked upon as intermediates, e.g. FP 280, above Rebola 260 m (27/12/1975), M. Perhaps the taxon should better be treated as a variety of *Nephrolepis undulata*, following W. J. HOOKER in his Spec. Fil. 4 : 151 (1862). On the other hand, however, we have to regard it taxonomically distinct from *N. undulata* on the basis of its different leaf characters.

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